A

DICTIONARY

OF

THE ECONOMIC PRODUCTS OF INDIA.

BY

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AND AGRICULTURE.

ASSISTED BY NUMEROUS CONTRIBUTORS.

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PREFACE.

THE following are the circumstances which led to the publication of the Dictionary of Economic Products. In 1877, the Agricultural Department of the North-Western Provinces was required to provide a collection of products for the Paris Exhibition, and again, in 1880, for the Melbourne Exhibition. Early in 1883, the Imperial Department of Agriculture was called upon for a third collection for the Exhibition at Amsterdam. Requisitions were at the same time received from the Governments of Italy and Belgium for sample collections of commercial products. The collections above referred to were all made, under the direction of the undersigned, by Babu Trailokhya Nath Mukharji, now the officer in charge of the Exhibition Branch in the Agricultural Department of the Government of India, and their formation led to the gradual compilation of a list of the more important Economic Products of India, which was illustrated by a series of samples or specimens arranged in glass-fronted tin cases designated the "Index collection." But the list was far from being complete, and was necessarily wanting in scientific detail and arrangement. Matters stood thus when a request was made to the Imperial Government by the Government of Bengal for assistance and co-operation in providing a collection of Economic Products for the Calcutta Exhibition of 1883-84. The opportunity was taken from the Government of Bengal, for the purpose of securing the scientific arrangement of the collection, the services of Dr. George Watt, of the Bengal Educational Department, who had been originally sent out to India as Professor of Botany, and who had already done useful work in the field of
botanical research. The Bengal Government had, at the same time, formed the intention of bringing into scientific order a valuable collection of Bengal products at the Provincial Economic Museum in Calcutta.

Dr. Watt, with the assistance of Babu Trailokhya Nath Mukharji, devoted himself, during 1883, to the combined duty which he was called upon to perform, of enlarging and arranging both the Imperial and Provincial lists and collections. The results were exhibited in the Economic Court at the Calcutta Exhibition, and formed a great stride in advance of all that had been previously done. The time, however (less than a year), allowed for the preparation of the Calcutta collection was too short for a full compilation of the facts and statistics which were necessary for the proper investigation and description of each product. Nor was the index collection itself sufficiently full. These circumstances, as well as the likelihood of having to provide a collection for the London Exhibition of 1886, led to the retention of Dr. Watt’s services by the Imperial Department for the purpose of preparing as complete a “Dictionary of Economic Products” as might be possible, with the information already existing in the Agricultural Office; Babu Trailokhya Nath Mukharji being at the same time entrusted with the duty of enlarging the “Index collection” of specimens.

It is needless to explain that the work upon which Dr. Watt has been thus engaged is one which it would have been in any case necessary for the Agricultural Department to carry out independently of any call which was made upon it in connection with Exhibitions. At the same time the utility of Exhibitions in forwarding the performance of the duty should not escape notice. Now that the work has reached the stage of a compilation of existing facts and statistics up to date, it will become the further duty of the Department to make, with the assistance of the Agricultural Departments of the Provinces, such investigations as may be necessary for obtaining the fuller informa-
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tion, which is still wanting, about many of the Economic Products of the country, as well as to maintain and publish periodical statistics of the production of or the traffic in the more important articles. It is intended, therefore, that in a few years a second and more complete edition of the present work should be published by the Department, and the present opportunity is taken to invite all who may be interested in the matter to contribute any information which may serve to correct or supplement the contents of the first edition.

E. C. BUCK,
Secretary to the Government of India,
Department of Revenue and Agriculture.

July 1st, 1885.
PREFACE.

The circumstances which led to the publication of the present work having been indicated by Mr. Buck, it may not be deemed out of place for me to offer a few words of explanation regarding the manner in which I have endeavoured to accomplish the task committed to me. The present edition professes to be an approximately complete résumé of the opinions of Indian authors, and of extensive official and private enquiries, regarding the Economic Products of India. Care has been taken to show the sources from which the more important facts have been obtained, and to give, in most cases, the entire list of works consulted in the preparation of the account of each product. I have chosen to adopt this course, even in dealing with facts so well known that they might legitimately have been published without acknowledgment. It is hoped that on this account the "Dictionary of the Economic Products of India" will be found a useful work of reference, and that it may form the nucleus of an extended and systematic enquiry into the productive resources of the Indian Empire. The limited time at my disposal has almost precluded original and personal investigation of critical questions, and therefore, except in so far as ten years of botanical research in India have supplied me with the means of rapidly correcting misunderstandings, the opinions of authors, even when apparently conflicting, have been placed side by side. One of the objects I have kept in view has been to remove the confusion and ambiguity due to wrong or antiquated botanical names being associated with economic products. If I have succeeded, an important step will have been taken in the right direction; and the Dictionary, though not a strictly scientific publication, will, I trust, be found sufficiently accurate in its scientific details for all practical and commercial purposes.

I have had to keep in view a twofold purpose; vis., on the one hand, to supply scientific information which may be useful to the administrative officer; and on the other, to meet the requirements of the reader in search of definite information regarding Indian economics. It may perhaps convey a not inadequate idea of the scope of the Dictionary to say that with this double purpose in view it is hoped that something may have been done to advance the material interests of India, and to bring the trade and capital of the West into more direct contact with the resources of the Empire.
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With regard to botany, Sir J. D. Hooker's *Flora of British India* has been taken as the standard of scientific names and synonyms, and the reference to that invaluable work will be found in the first line following the name of each species. The botanic diagnosis of the plants from Ranunculaceae to Acanthaceae has been entirely derived from the *Flora of British India*. For the plants which fall into the natural orders after Acanthaceae, a larger number of authors have had to be consulted; the scientific names used in this portion have been derived chiefly from Bentham and Hooker's *Genera Plantarum*; DeCandolle's *Prodromus*; Roxburgh's *Flora of British India*; The Linnaean Society's publications; Brandis's *Forest Flora*; Kurz's *Forest Flora of British Burma*; Thwaites' *Enum. Ceylon Plants*; Dalzell and Gibson's *Bombay Flora*; Stewart's *Panjáb Plants*; and Mr. Gamble's recent and most useful *Manual of Indian Timbers*. Until the authors of the *Flora of British India*, who are associated with Sir J. D. Hooker, have completed their account of the plants of India, it will be next to impossible for Indian authors to obviate a repetition of some of the errors of the older botanical writers. This is chiefly due to the fact that the libraries and collections available in India are too poor to admit of much literary and critical botanical research; moreover, work of this nature was not contemplated in connection with the present edition of the Dictionary.

A list of the principal authors from whom economic facts have been compiled will be found on page xiii. The economic products which belong to the Animal and Mineral Kingdoms have been but very imperfectly touched upon. It is hoped that these products may, however, receive more attention in a future edition, and the reader is, for the present, referred to the publications of the Geological Survey for detailed information about the Ores and Minerals of India. The majority of the brief notices regarding minerals which are here published, have, at the request of the Revenue and Agriculture Department, been kindly supplied by the Superintendent of the Geological Survey.

It may be explained that, with the permission of the Government of India, some 300 copies of each of my "Catalogues of the Economic Products of India" (Calcutta International Exhibition) were issued to officers of all Departments throughout India for additions and corrections. Of these 170 have been duly returned, and the Dictionary, incorporating as it does the new economic facts which have come to light through this combined enquiry, may be viewed as an improved and enlarged edition of the Catalogues. I have endeavoured to give as much prominence as possible to the information thus obtained, and the notes supplied will accordingly be found under each article following the symbol § and bearing an abbreviation of the name and address of each contributor. A full list of all contributors will be
found on page xxiii; but I must here express the very great obligation
I am under to them, all and severally, for the liberal and invaluable aid they
have given me.

With regard to the spelling of vernacular names, it may be stated
that it has been thought unwise to depart from the method adopted by the
authors from whom this work has been chiefly compiled. To correct the
names given to the same object in the numerous languages and dialects of
India would of necessity require the co-operation of many persons acquainted
with these languages. At the same time the economic plants known
to local authorities under certain vernacular names would have to be
botanically determined. As this could not be accomplished in the limited
time at my disposal, an effort has been made to indicate the long vowels
by a diacritic mark, and it is hoped this will enable the reader to pro-
nounce the majority of the vernacular names correctly. In a future edition
greater care will doubtless be observed and the vernacular names will be
revised and confirmed.

It may be explained that the vernacular names are given with refer-
ence to their provincial distribution rather than with regard to the language
to which they actually belong; thus BENG. may mean simply that the word
is in use in Bengal but need not be Bengali.

The alphabetical arrangement of the Dictionary is based upon the
scientific names of the animals, plants, and minerals. This has been
accepted as at once the most convenient and satisfactory standard, since it
secures uniformity. With regard to large commercial products obtained
from more than one species, such as silk, the subject has been treated col-
lectively, instead of being broken up into a number of sections under the
scientific names of the insects which yield the various kinds of silk. This
should cause no difficulty, however, as the numerous cross references will
serve to direct attention to the heading under which the detailed accounts
are to be found.

On the margin a number for each product or object has been given. It is
hoped that these numbers may not only prove useful for museum purposes,
but that they may also afford a convenient clue for correspondence regard-
ing the products. To avoid using an inconveniently large number of figures,
the numbers for each letter of the alphabet will be found to commence
anew. The index will contain all the European and Vernacular names.
It will give the corresponding scientific name, and will enumerate the
known and described products, referring the reader to the marginal number
for each; thus—Gum, A. 756, or Fibre, B. 399. It is hoped that in this
way the index may even prove useful as an independent work upon the
names given to the Economic Products; it will contain over 30,000 vernac-
cular words.
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I desire to acknowledge in this place the invaluable services of the following gentlemen: Sir J. D. Hooker, Director, Royal Botanic Gardens, Kew, for kindly permitting me to consult him upon difficult botanical points; Professor W. T. Thiselton Dyer, Assistant Director, Kew, for many valuable additions and corrections; Dr. George King, Superintendent, Royal Botanic Gardens, Calcutta, for the liberty to utilise freely the resources of the Herbarium and Library attached to the Gardens; Mr. C. B. Clarke, Inspector of Schools, Calcutta, for identifying doubtful plants; and Mr. J. F. Duthie, Superintendent, Botanic Gardens, Saharanpur, for notes and suggestions; Dr. H. Trimen, Director of the Botanic Gardens, Ceylon, for many important additions, more particularly with reference to Ceylon Botany. I am also specially indebted to Mr. E. T. Atkinson, Accountant General, Bengal, for many valuable additions to the proof-sheets of this work, and for having placed at my disposal manuscripts containing many interesting notes and original observations. I am likewise greatly indebted to the officers in charge of the Provincial Agricultural Departments, both for much personal assistance and for the prompt manner in which they have uniformly responded to my solicitations for the aid of local specialists.

To Dr. Charles Rice of New York, Dr. W. Dymock of Bombay, and Dr. Moodeen Sheriff of Madras, my best thanks are due for kindly consenting to revise the proofs of the present edition with the view of correcting the vernacular names and of adding to the information. I may be pardoned for quoting a passage from a private letter from Dr. Moodeen Sheriff as showing the liberal way in which he has co-operated with me: "In revising the vernacular names I am not solely depending upon my 'Supplement to the Pharmacopæia of India,' but am consulting many other works and making fresh enquiries. This, together with my experience, which is much greater than before, will, I hope, enable me to accomplish satisfactorily the work entrusted to me." I deeply regret the death of Dr. U. C. Dutt, of Serampore, the able author of "The Materia Medica of the Hindús," which has deprived me, in the greater portion of the work, of the assistance which he was so eminently qualified to render. Dr. Dutt undertook to supply a series of notes regarding the plants enumerated in the Glossary to his Materia Medica, and to revise the Sanskrit names in the bulk of the work. The latter duty has been generously undertaken by Dr. Rice, and as the result I have received from New York many valuable additions and corrections which cannot fail to prove valuable to students of Oriental literature. These distinguished scholars are not, however, in any way responsible for the accuracy of the vernacular names throughout the work, since many additions have been made subsequent to their kind supervision.
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My acknowledgments are specially due to Dr. Cumingham, Surgeon-General with the Government of India, for having encouraged the numerous medical officers throughout India to supply the series of notes which constitute a most important feature of the work.

The trade statistics have been furnished by Mr. J. E. O’Conor, Assistant Secretary, Department of Finance and Commerce, Government of India. In supplying these figures Mr. O’Conor has rendered me a most important service; at the same time he has obligingly offered many other suggestions and corrections.

Further, I would acknowledge the great personal interest taken in the work by Mr. E. J. Dean, Superintendent of Government Printing, India. Working with a staff of printers who have but an imperfect knowledge of the English language, Mr. Dean has shown, as I believe will be readily admitted, that he can produce an elaborate work of this nature in a manner worthy of a high-class European press.

GEORGE WATT.

Calcutta,
July 1st, 1885.
LIST OF WORKS CONSULTED.

The following is a list of the more important works, journals, reports, or other publications which have been either directly or indirectly consulted in the preparation of the "Dictionary of the Economic Products of India." As far as possible, the rule has been followed of quoting original authors, and an effort has been made to show the source from which every statement has been derived. It is hoped that this fact may be accepted as a decided advantage, but it has somewhat encumbered the work with references.

Ainslie, W.; Materia Medica of Hindustan, 1813.
**Materia Indica, 1826.**

**An Enumeration of the Indian Acanthacæ: Journal of the Linnæan Society, 1866.**

Anderson, John; Report on Expedition to Western Yunan, 1871.

Aitchison, J. E. T.; Catalogue of the Punjab and Sind Plants, 1869.

Archer; Economic Botany.


Baker and Hooker (W. J.); Genera Filicum, 1842.

Balfour, E.; Cyclopedia of India and of Eastern and Southern Asia, 1857-73.
**Timber Trees, &c., 1870.**

Ball, V.; Economic Geology, being Part III., Geology of India, 1881.

Ball; Cultivation and Manufacture of Tea in China, 1848.

Batten, J. H.; Tea Cultivation in Kumaon, 1878.


**The Ferns of Southern India, 1863-64.**
**The Ferns of British India, 1865-70.**
**Species Filicum, 1846-64.**
**Synopsis Filicum, 1868.**
**Hand-book of the Ferns of British India, 1883.**

Beke-Keeping in India; Papers published by the Revenue and Agricultural Department, 1883.


Bentham, George; Flora Hongkongensis, 1861.
**Flora Australiensis, 4 vols., 1863-73.**
**Genera and Species of Labiateæ, 1832-36.**

Bentham and Hooker; Genera Plantarum, 3 vols., 1867-83.

Bentley and Trimen; Medicinal Plants, 4 vols., 1880.


Bidie, George; Report on the Nilgiri Loranthaceous Plants, 1874.
**Raw Products of Southern India (Paris Exhibition Catalogue), 1878.**

**Monograph Burseraceæ in Transactions, Linnæan Society Vol. XXVII.**
**Industrial Arts of India, 1880.**
**Portfolio of Industrial Art, 1881.**

Blyth, Edward; Catalogue, Bengal Asiatic Society of the Mammalia, Birds, Feline Animals, Reptiles, &c., 1853.

Boissier; Flora Orientalis, 1867.
List of Works consulted.

BOOT; Illustrations of the genus Carex (Cyperaceae), 1858-67.
BRANDIS, D.; Forest Flora of the North-West and Central India, 1874.
BRITISH PHARMACOPORIA, 1868.
BRITISH MANUFACTURING INDUSTRIES; a series of 15 vols., edited by G. P. Bevan, 1876 to 1878.
BROWN, J.; The Forester, 1871.
BUCHANAN, F.; Journey through Mysore and Kanara, 1857.
BUCK, E. C.; Dyes and Tans of the N.-W. Provinces, 1876.
BURMANN; Flora Indica, 1768.
BURRELL; India Tea Culture, 1877.
BUTTER, D.; Medical Topography of the Southern Districts of Oudh, 1839.
CALVERT’S Dyeing and Calico-printing; Ed. by Stenhouse and Groves.
CAMPBELL, GEORGE; Ethnology of India, in the Bengal Asiatic Society’s Journal, 1866.
“ The Non-Hindú Tribes of the Borders of Hindústan, in the Journal of the Ethnological Society, 1867; and the Races of India, 1869.
CASSELS, W. R.; Cotton Culture in the Bombay Presidency, 1862.
CATHCART and HOOKER; Illustrations of Himalayan Plants, 1855.
CHURCH, A. H.; Food, 1882.
CHURCHILL’S Technological Hand-books, Vol. on Dyeing and Calico-printing, 1884.
CLARKE, C. B.; Composite Indice and Commelinaeaceae and Cyrtandraceae, 1876.
“ Ferns of Northern India, 1880.
CLEGHORN, HUGH; Forests and Gardens of Southern India, 1861.
CLEGHORN, J.; Notes upon the Pines of the N.-W. Himalaya, 1866.
CLIFFORD; Memorandum on the Timber of Bengal, 1862.
COIN, R. L. DE; Cotton and Tobacco, 1864.
COLEMAN; Mythology of the Hindús, 1832.
COLLINS; Report on Caoutchouc of Commerce, 1872.
COOKE, M. C.; Gums and Gum-Resins; Oil and Oil-seeds, 1874.
“ Report on Diseased Leaves of Coffee and other Plants, 1876.
COOPER, E.; Forest Culture and Eucalyptus Trees, 1876.
CUNNINGHAM; Ladakh, Physical, Statistical, and Historical, 1854.
DALTON, E. T.; Ethnology of Bengal; and Wild Tribes of Central India, in Journal of the Ethnological Society, 1867.
DALLER AND GIBSON; Bombay Flora, 1861.
DAVIES, R. H.; Report on the Trade and the Resources of the Countries on the North-West Frontier of British India, 1862.
DAVIES, R. H.; Coal and Iron in the Punjab, 1859.
DAY, F.; Fishes of India, 2 vols., 1876-78.
DE CANDOLLE; Prodromus, 17 vols., 1854-73.
“ Monographie, Phanerogamarum, Vols. I. to III., 1878-83.
DE LOURDEIRO; Flora Cochis Chinensis, 1792.
DEY, K. L.; The Indigenous Drugs of India, 1867.
DIGBY, W.; Famine Campaign in South India, 1878.
DOLLARD, W. M.; Medical Topography of Kali Kumaon and Shore Valley, 1840.
DON, D.; Prodromus Flora Nepalesiensis, 1845.
DRURY, H.; Useful Plants of India, 1873.
List of Works consulted.

DUTHIE AND FULLER; Field and Garden Crops of the North-Western Provinces, 2 vols., 1883.

DUTHIE, J. F.; Grasses of the North-Western Provinces, 1883.

DUTT, U. C.; Materia Medica of the Hindús, 1877.

DYMOW, W.; Materia Medica of Western India, 1883.

EDGEBWORTH; Catalogue of the Plants found in the Banda District, 1847.


ElliOT, W.; Flora Andhríca, 1859.


ElliOT, H. M.; Glossary of Indian Terms, 1860.

ELLISON; Hand-book of the Cotton Trade, 1858.

ENDLICHER; Genera Plantarum, 1836-47.

" Synopsis Coniferarum, 1847.


FAULKNER, A.; Dictionary of Commercial Terms, with their Synonyms in various languages, Bombay, 1856.

FAYER, J.; The Thanatophidia of India, being a description of the Venomous Snakes of the Indian Peninsula, 1872.

FIRMINGER, T. A. C.; Manual of Gardening for Bengal, 1869.

FLEMING, JOHN; Catalogue of Indian Medicinal Plants, &c., in Transactions of the Asiatic Society, 1810.

FLÉCKIGER AND HANSBURY; The Pharmacographia, 2nd Ed., 1879.

FORSYTH; The Highlands of Central India, 1871.


" A Visit to the Tea Districts in China and India, 1852.

FOSBERDY; The Mountain Tribes of the North-West Frontiers of India, 1869.

FRASER; Journey on the Himalayan Mountains, 1820.

FULLER, J. B.; Agricultural Primer for India, 1881.

GAMBLE, J. S.; List of the Trees and Shrubs of the Darjeeling District, 1878.

" Manual of Indian Timbers, 1881.

GAZETTETERS CONSULTED——


5. Oudh, in 3 vols., 1877.
6. Central Provinces, by C. Grant, 1870.
8. Rajputana (unauthenticated), 1879.
9. Sind, by A. W. Hughes, 1876.
18. Trichinopoly, by L. Moore, 1878.
List of Works consulted.

22. Ajmere, by J. D. LaTouche, 1875.

GEOGHAGAN, J.; Silk in India, 1880.
GORDON, K. W.; Cultivation of Chinchoras in Java, 1870.
GORDON, C.; Pinetum, 1875.
GRANT-DUFF, M. E.; Notes on an Indian Journey, 1876.

GRIFFITH, W. Itinerary Notes on Plants collected in India, 1877-78.
"" Icones Plantarum Asiaticarum, 1847-51.
"" The Palms of British East India, 1850.
"" Posthumous Papers, 1845.

GÜNThER, A.; Manual of Fishes, 1880.
"" Reptiles of British India, 1864.

HAMILTON, F. (Buchanan); The Fishes of the Ganges, 1852.
"" Statistical Account of Behar.

HANBURY, D.; Science Papers, 1876.
HANNAY, S. E.; Observations on the Timber Trees of Upper Assam, Agri.-Horticultural Society of India, 1845.

HANNAY, S. E.; Sketch of the Singhphos published by Government, 1847.

HARKNESS; Account of a Singular Aboriginal Tribe on the Nilgiris, 1832.

HAWKES, H. P.; Report on the Oils of Southern India shown at the Madras Exhibition, 1855.

HELPER; Provinces of Ye, Tavoy, and Mergui on the Tenasserim Coast, 1839.

HENDERSOll AND HOMK; Lahore to Yarkand, 1873.

HIEN; Monograph of Ebenaceæ, Cambridge Philological Society's Transactions, 1873.

HOLTZAPPFEL; Descriptive Catalogue of the Woods commonly employed in Mechanical and Ornamental Arts, 1852.

HOME; Report on the Vegetation of the Andaman Islands, 1874.

HÖNNBERGER, J.; Thirty-five years in the East, 1832.

HOOKER AND THOMSON; Flora Indica, Vol. I., 1855.
"" Rhododendrons of Sikkim-Himálaya, 1849.
"" Illustrations of Himalayan Plants, 1856.
"" Himalayan Journals, 1854.

HOOKER, W. AND BAKER; Synopsis Filicum, 1874.

HOOKER, W.; Musce Exotici, 1818-20.

"" Birds
"" Do. 1854-58.

HUC; Journey through Tartary, Thibet, and China, 1852.
"" Chinese Empire, 1853.

HUDON, T.; The Silkworms of Assam, Journal, of the Asiatic Society of Bengal, 1857.

HUNTER, ALEXANDER; Report on the Fibrous Materials shown at the Madras Exhibition, 1855.

HUNTER, W. W.; Statistical Account of Bengal, 20 vols.
"" Imperial Gazetteer, 9 vols.

List of Works consulted.

Hutton, T.; Notes on the Bombycidae, Supplement, Gazette of India, September 2nd, 1871.
Huxley; Ethnology and Archaeology of India, Journal of the Ethnological Society, 1863.
Indian Pharmacopœia; See Waring.
Indian Forester.
Irving, R. H.; General Medical Topography of Ajmere, 1841.
, , A short account of the Materia Medica of Patna, 1848.
, Letters from India, 1839.
James, A. G. F. E.; Indian Industries, 1880.
Jameson, W.; Report on Tea Cultivation in the North-West Provinces, 1857.
, Cultivation and Manufacture of Flax in the North-West Provinces,
, Tea in Kumaon and Garhwal, 1843-45.
, Suggestions for the importation of Tea-makers, Implements, and Seeds from
China to the N.-W. Provinces, 1852.
Jameson, W.; Formation of Plantations in Canal Banks, 1876.
Jenings, S.; Orchids and how to grow them in India, 1875.
Jerdon, T. C.; The Birds of India, 1862-64.
, , Ed. by Godwin-Austen, 1877.
, The Mammals of India, 1874.
Kevis; Indian Weights and Measures, 1886.
Johnson, T. W.; Chemistry of Common Life, edited by Church, 1880.
Johnson’s; Gardeners’ Dictionary, with a revised Supplement by N. E. Brown, 1882.
Journals and other Scientific Periodicals of which the following may be specially men-
tioned:—

Agri.-Horticultural Society of India.

Asiatic Society of Bengal.

Linnean Society, London.

Pharmaceutical Society, London.

&c., &c.

Kean, J. F.; Tribes of South India, 1860.
Keightley, E. F.; How to rear Silkworms in the Punjâb, 1884.

, Report on the Cultivation and Trade in Gânja in Bengal, 1877.

Kew Reports from 1877 to 1883; also Museum Catalogue and Guide to the Gardens, 1883.

King, G.; Manual of Cinchona Cultivation in India, 1880.
Keez; Report on the Vegetation of the Andaman Islands, 1870.
, Preliminary Forest Report of Pegu, 1875.
, Additions to our knowledge of Burmese Flora and other Papers in Journal of Asiatic
Society of Bengal.

Bamboo and its Uses, in The Indian Forester.


Lambert; Timber and Timber Trees, 1875.

Latham, R. G.; Descriptive Ethnology, 1859.

Le Maout and Decaisne; General System of Botany; translated by Mrs. Hooker and edited

Lewin; the Hill Tracts of Chittagong, 1869.
, Wild Races of South-Eastern India.
, A Fly on the Wheel, 1885.

Lotard, L.; Materials in India suitable for the Manufacture of Paper, 1880.
, Introduction of Carolina Rice into India, 1880.
, Memorandum on Dyes of Indian Growth and Production, 1881.
List of Works consulted.

Reports, Special. (12) Parliamentary Papers on Cotton Cultivation in Bengal. 1857.
   - (13) Calcutta International Exhibition, 1883-84.
   - (10) Area and Outturn of the Cotton Crop, N.-W. Provinces, Sec. Rec.,
     N.-W. Provinces, IV., VI., 1869-75.
   - (11) Reports of the Cotton Commissioner with the Government of India.
   - (12) Reports of the Manchester Cotton Supply Association from 1858.

Rhede; Hortus Indicus Malabaricus. 1678-86.

Richardson, G. G.; Corn and Cattle-Producing Districts of France.

Richter; Hints on Arboriculture in the Panjab, 1874.

Riley, C. V.; The Locust Plague. 1877.

Robertson, W. R.; Agriculture for Schools of South India, 1880.
   - Report on Agricultural condition of Negri and Coimbatore Districts,
     1881.

Robinson, P.; Synopsis of Tobacco Cultivation and Manufacture. 1872.

Robinson, W.; Account of Assam, 1841.

Rowdott, Natalis, M.; Green Dye of China, 1860.

Röpertoff, Fr. A. de; Vocabulary of Dialects spoken in Nicobar and Andaman Islands,
   1875.

Rottler; Indian Cyperace, 1772.

   - Plants of the Coromandel Coast, 1795-1819.
   - An account of the Tusseh and Arrindy Silkworms, in Transactions, Linnean
     Society, VII., 1802.

   - The Fibrous Plants of India, 1855.
   - Essay on the Productive Resources of India, 1840.
   - Production of Isinglass along the Coasts of India, with a notice of its
     Fisheries.
   - Arts and Manufactures of India.
   - Culture of Cotton in India, 1851.
   - Measures for the improved cultivation of Cotton in India, 1859.
   - Report on the progress of the Culture of the China Tea Plant in the Himâlayas
     from 1835 to 1847, 1849.

Rumph; Herbarium Amboinense, 1741-45.

Russell, P.; The Fishes of the Coromandel Coast, 1803.

Sarâkân Arjun; Catalogue of the Bombay Drugs, 1879.

Schlich; Report on the Fyin Kado Forests of Arakan and Rangoon, 1870.

Schonberg, Barok E. V.; Travels in India and Kashmir, 1853.

Schwarz, R. C. von.; Financial Prospects of the Chanda iron-works, 1882.

Seman, Berthold; Popular History of the Palms and their Allies, 1856.

Sen, Ramesh; Report on Agricultural Statistics in Jessore, 1874.

   - Hill Ranges of Southern India, 1870-71.
   - Rude Tribes (1870.
   - Leaf Festival, Madras, 1865.

Simmonds, F. L.; Tropical Agriculture, 1877.
   - Waste Products, 1876.

Siria, H. C.; Ceylon and the Singhalese; their History, Government, Religion, Antiquities,
   &c., 1860.

Skinner; Indian and Burman Timbers, 1862.

Skeeman; Journey through Oudh, 1858.


Smith, R. M.; Persian Art.

Spedoe, G. F.; The Indian Hand-book of Gardening, 1842.
List of Works consulted.

SPONS' ENCYCLOPEDIA; 1880.
STENDALE, R. A.; Natural History of the Mammalia of India, 1884.
STEWART, J. L.; Punjab Plants, 1869.
STEVEN, W. S.; Paper-making in India, Sel. Rec. N.-W. Provs., III.
STOCKS, J. E.; Botany of Scinde, 1841-59.
STRETTELL, G. W.; Note on Caoutchouc obtained from Chavannasia esculenta, 1874.

" Ficus elastica in Burma, 1876.
TALIFR-SHARIF (translated by G. Playfair), 1823.
TAYLOR, J.; Medical Topography of Dacca in Bengal, 1840.
TEMPLE, RICHARD; Aboriginal Tribes of Central Provinces, 1866.
TEINKENT, J. E.; Natural History of Ceylon, with Narrative and Anecdotes illustrative of the habits and instincts of the Mammalia, Birds, Reptiles, Fishes, Insects, &c., 1861.
THACKER AND HALLEN; More Deadly Forms of Cattle-diseases in India, 1880.
THEOBALD, W.; Catalogue of Reptiles in the Museum of the Asiatic Society of Bengal, 1868.

" Recent Shells (Cat. Beng. As. Soc.), 1866.
" Land and Fresh-water Shells of India, 1860.
THOMAS, H. S.; The Rod in India, 1881.

" Report on Pisciculture in South Canara, 1870.
THOMPSON; Report on Insects destructive to Woods and Forests, 1868.
THOMPSON; Western Himalaya and Thibet, 1852.
THWAITES; Enumeratio Plantarum Zeylaniae, 1864.
TOBOCO PLANTING and Manufacturing in South India, 1880.
TOD; Travels in Western India, 1859.

" in Rájputana.
ULAZ UDWIYEN; by Noureddeen Mohammed Abdulah Shirazy (translated by Francis Gladwin), 1793.


" Reports of the Commissioner of Agriculture up to 1884.
URE; Dictionary of Arts, Manufactures, and Mines, 1872-78.
VIGNY; A visit to Cabul, Ghuzni, and Afghanistan, 1840.

" A personal Narrative.
" Kashmir, 1842.
VOSCH; Hortus Suburbanus Calcuttensis, 1845.
WACE, E. G.; Punjaban wheat, 1884.
WAGNER; Chemical Technology, edited by Crookes.
WALLACH; List of the Woods of Nepal and Goalpara, in Jury Reports of the Exhibition of 1851-1852.

WALLACH; Planta Asiatice Rariores, Vols. I. to III., 1830-32.
WALTON, W.; Cotton in Belgaum and Kaládgi Districts, Bombay, 1880.
WARDLE, T.; The Wild Silks of India, 1881.
WARING; Pharmacopoeia of India, 1868.

" Bazar Medicines, 1874.
WATSON, J. FORBES; Cotton in India, 1859.

" A Classified and Descriptive Catalogue of the Indian Department of the International Exhibition of 1862, 1862.
" Index to names of Eastern Plants and Products, 1868.
" Textile Manufactures and Costumes of India, 1866.
" List of Indian Products, 1872.

" Report on the Preparation and Uses of Rhea Fibre, 1875 and 1884.
WATT, A.; Soap-making, 1884.
WATT, G.; Catalogue of the Economic Products of India shown at the Calcutta International Exhibition—Part I., Gums and Resins; Part II., Dyes and Tans; Part III., Fibres; Part IV., Oils; Part V., Medicines; Part VI., Foods; and Part VII., Timber; 1883.
List of Works consulted.

Weddell, H. A.; Quinquinas, Notes on, 1871.

Wheat Production and Trade; Published by Revenue and Agricultural Department, 18

Wheat of Panjāb; See Wace.

Wight; Icones Plantarum Indicis Orientalis, 1840-53.

Illustrations of Indian Botany, 1838-53.

The Timber Trees of the Madras Presidency.

Contributions to the Botany of India, 1834.

Illustrations of Indian Botany, principally of the Southern parts of the Peninsular

1831.

Wight and Arnott; Prodromus Florae Peninsulae Indicis Orientalis, 1834.

Wilcox; Asiatic Researches in the Bor-Kampti Country, Vol. XVII., 1856.

Wilson, H. H.; Glossary of Indian Terms, 1855.

Winter; Six months in British Burmah, 1853.

Wise; Hindu Medicine.

Wolff; Mission to Bokhara, 1845.


Yarkand; Lahore to Yarkand, by Henderson and A. O. Hume, 1873.

Second Mission to—, 1875.

Scientific Results of the Second Mission to—, XI. Parts, 1873-1885.
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ROBINSON; Surgeon-Major Mark, Coorg.
ROSS; Surgeon George Cumberland, Delhi.
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LIST OF ABBREVIATIONS.

Authors' names are abbreviated and printed in italics after the name given by them to an animal or plant. This is necessary, since the same object may have come to receive more than one name, and may even have been referred to two distinct genera—a result either due to ignorance of what had already been published, or in consequence of a difference of opinion regarding the nature of the species. The ambiguity thus caused through the existence of more than one name for the same object, or through the application of the same name to two distinct objects, is mitigated by affixing the author's name in full, if this be composed of only one syllable, or (when of more than one syllable) some convenient abbreviation to represent the author's name. The abbreviation once adopted by one author is never assumed by a second author who may chance to bear the same, so that Wallich is accepted by all botanists in the world to stand for Dr. Wallich, one of the most distinguished of Indian botanists.

The multiplicity of synonyms for the same object is one of the most perplexing evils—and an unavoidable evil—which besets systematic science. The changing of names is not, however, the result of fancy, but is a necessary consequence of improved knowledge and extended acquaintance with the forms of life. The difficulty of synonymy experienced by Indian students is scarcely felt in Europe, where the names given to the animals and plants are thoroughly established. This explanation is offered because of the very general complaint against the changes which have, within the past few years, been made in the names given to Indian animals and plants. It should be recollected, that the natural history of an empire, like that of India, cannot be worked out in a century, and that any attempt to systematise the scattered publications which have appeared from time to time must result in the suppression of names which have come incorrectly into existence. The following list gives the principal abbreviations adopted for authors' names:

Abbreviations of Names of Botanists and Botanical Authors.

<table>
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<tr>
<th>Abbreviation</th>
<th>Full Name</th>
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<td>Ack.</td>
<td>Acharius</td>
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<td>Adams.</td>
<td>Adanson.</td>
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<td>Afr.</td>
<td>Afzelius.</td>
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<td>Ag.</td>
<td>Agardh.</td>
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<td>C. Ag.</td>
<td>C. A. Agardh.</td>
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<td>J. Ag.</td>
<td>J. G. Agardh, son.</td>
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<td>Alt.</td>
<td>Alton.</td>
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<td>Aitch.</td>
<td>Aitchison.</td>
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<td>All.</td>
<td>Allioni.</td>
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<td>Amm.</td>
<td>Amman.</td>
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<td>Anderson.</td>
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<td>Aresch.</td>
<td>Areschoug.</td>
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<td>Arr.</td>
<td>Arnott.</td>
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<td>Arrh.</td>
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<td>Asa Gray.</td>
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<td>Asch.</td>
<td>Ascherson.</td>
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<td>Aubl.</td>
<td>Aublet.</td>
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<td>B. Cah.</td>
<td>Botanical Cabinet.</td>
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<td>B. Reg.</td>
<td>Botanical Register.</td>
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<td>Bab.</td>
<td>Babington.</td>
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<td>Bail.</td>
<td>Baillon.</td>
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<td>Balb.</td>
<td>Balbis.</td>
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<td>Balbis.</td>
<td>Balbis (John Baptist), a French Professor of Botany.</td>
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<td>Baldwin.</td>
<td>Baldwin.</td>
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<td>Balfour.</td>
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List of Abbreviations.

Barn = Barnédou.
Barr. = Barreller.
Bart. = Benj. Smith Barton.
W. Bart. = W. P. C. Barton, nephew.
Bart. = John Bartram.
Bartr. f. = Wm. Bartram.
Bonh. = Bauhin.
G. Bauh. = Bauhin (Johannes).
Beauv. = Palisot de Beauvois.
Bedd. = Beddome.
Benj. = Benjamin.
Benr. = J. J. Bennett.
A. Benn. = A. W. Bennett.
Benth. or Bth. = Bentham.
Berg. = Bergius.
Berk. = M. J. Berkeley.
Berk. = Berkhey.
Berken. = Berkenhout.
Berland. = Berlandier.
Bernh. = Bernhardi, a German botanist.
Bert. = Bertoero.
Bertol. = Bertoloni.
Bess. = Besser.
Bieb. = Marschall von Bieberstein.
Bigel. = Jacob Bigelow.
Bivon. = Bivona (a Sicilian botanist).
Bl. or Blume. = Blume.
Bl. Cat. = Blume’s Catalogue.
Bakhm. = Bochmer.
Boehr. = Boerhaave.
Boiss. = Boissier.
Boland. = Bolander.
Bong. = Bongard.
Booth. = Dr. Booth.
Bonpl. = Bonpland.
Bork. = Borkhausen.
Bosc. = Bosc, a French botanist, &c.
Borsz. = Borsczow.
Brach. = Wm. D. Brackenridge.
Brevis. = Brebisson.
Bref. = Brefeld.
Brid. = Bridel.
Brong. = Brongniart.
Brot. = Brotero.
Brouss. = Broussonet.

Br. or R. Br. = Robert Brown.
Br. or N. E. Br. = N. E. Brown.
P. Br. = Patrick Browne.
Brunf. = Brunfels.
Ham. = Buchanan Hamilton.
Buch. = Dr. F. Hamilton (formerly Buchanan).
Buch. Herb. = Buchanan’s Herbarium.
Buch. MSS. = Buchanan’s Manuscripts.
Buckl. = Buckley.
Bull. = Bulliard.
Burch. = Burchell (Wm.), a South African traveller and botanist.
Burm. = Burman.
Burm. Ind. = Flora Indica, by N. L. Burmann.
Buxb. = Buxbaum.
Cam. = Camerarius.
Camb. = Cambessedes.
Cambs. = Campadera.
Cand. = De Candolle, usually DC.
Casp. = Caspary.
Cass. = Cassini.
Catesb. = Catesby.
Cav. = Cavanilles.
Cerva. = Cervantes.
Cham. = Chamisso.
Chav. = Chavannes.
Chois. = Choisy.
C. B. C. = C. B. Clarke.
Clayt. = Clayton.
Clus. = Clusius.
Colebr. = Colebrooke (H. T.), a well known English writer on Indian plants.
Collad. = Colladon.
Colm. = Colmeiro.
Comm. = Commelin.
Corn. = Cornuti.
Cosso. = Cosson.
Cunn. = Cunningham, A. or J.
Curt. = Wm. Curtis.
Cyril. = Cyrilili, an Italian botanist.
Dalech. = Dalechamps.
Dalib. = Dalibard.
### List of Abbreviations

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<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
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<tbody>
<tr>
<td>Dals.</td>
<td>Dalzell.</td>
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<tr>
<td>Dals. &amp; Gibs.</td>
<td>Dalzell and Gibson.</td>
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<td>Darl.</td>
<td>Darlington.</td>
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<td>DC.</td>
<td>A. P. De Candolle.</td>
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<tr>
<td>DeC.</td>
<td>Alphonse De Candolle, son.</td>
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<tr>
<td>Cas. DC.</td>
<td>Casimir De Candolle, grandson.</td>
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<td>Decne.</td>
<td>Decaisne.</td>
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<td>Deless.</td>
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<td>Dennst.</td>
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<td>Desv.</td>
<td>Desvaux.</td>
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<td>Dicks.</td>
<td>Dickson, an English crypto-ganic botanist.</td>
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<td>Dietb.</td>
<td>Diesbach.</td>
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<td>Dieter.</td>
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<td>Dod.</td>
<td>Dodonaeus (Dodeens).</td>
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<td>Don.</td>
<td>D. Don.</td>
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<td>D. Don.</td>
<td>Don (D.) Prodomus florae Nepalensis.</td>
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<tr>
<td>G. Don.</td>
<td>Don (G.) in Miller's Dictionary.</td>
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<tr>
<td>Cantab.</td>
<td>D. Orbigny.</td>
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<td>D'Orb.</td>
<td>Dorstenius.</td>
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Guilem.  Guilemin.
Guimp.  Guimpel.
Gunn.  Gunnerus.
Guss.  Gussone.

Habl.  Hablizl, a Russian botanist.
Hagenb.  Hagenbach.
Hall.  Haller.
Hamilton.  Hamilton.
Hamilton (Dr. Francis), formerly Buchanan.
Hanb.  Hanbury.
Hanst.  Hanstein.
Hartm.  Hartmann.
Hartw.  Hartweg.
Harv.  Harvey.
Hass.  Hassall.
Hassk.  Hasskarl.
Hausm.  Hausmann.
Haw.  Haworth.
Herbarium (Madras), by Drs. Klein, Heyne, and Rottler.

Heberr.  Hebennest.
Hed.  Hedwig.
Heigel.  Hegelmaier.
Hegetsch.  Hegtschweiler.
Heist.  Heister.
Heldr.  Heldreich.
Helm.  Helwing.
Hemsl.  Hemslay.
Henc.  Henckel.
Henfr.  Henfrey.
Hens.  Henslow.
Herb.  Herbert.
Herm.  Hermann.
Hild.  Hildebrand.
Hochst.  Hochstetter.
Hoffm.  G. F. Hoffmann.
Hoffmann.  Hermann Hoffmann.
Hoffmanns.  Hoffmannsegg.
Hofm.  Hofmeister.
Hohen.  Hohenacker.
Holmsh.  Holmskiold.
Homb.  Hombron.
Hook.  Wm. J. Hooker.
Hook, J. D. Hooker, son.
Hopk.  Hopkirk.
Hornem.  Hornemann.
Hornsch.  Hornschuch.
Horst.  Horstfield.
Houst.  Houston.
Houtt.  Houttyn.
Huds.  Hudson.

Hueb.  Huebener.
Humb.  Humboldt.
H. B. K.  Humboldt, Bonpland, and Kunth.
Jack.  Jack (Dr. William), a most distinguished botanist.
Jacq.  N. J. Jacquin.
Jacq. f.  J. F. Jacquin, son.
Jordan.  Jordan.
Jungb.  Jungbuhn.

Kamp.  Kemper.
Kart.  Karsten.
Kaulf.  Kautz.
Kindb.  Kindberg.
King.  G. King.
Kirsch.  Kirschlieger.
Kitaibel.  Kitaibel.
Koch.  Koch, Professor at Erlang.
Kölreuter.  Kölreuter.
Koenig.  Koenig (J. Gerard), a Danish botanist and pupil of Linnaeus.
Korthals.  Korthals.
Kosteletzky.  Kosteletzky.
Kremplhuber.  Kremplhuber.
Krombhols.  Krombhols.
Kuh.  Kuh, an eminent Prussian botanist.
Kuetzing.  Kuetzing.
Kunze.  Kunze, a German Cryptogamic botanist.
Kurs.  S. Kurz.

L. or Linna.  Linnaeus.
Labill.  La Billardière.
Last.  Lestadius.
Lag.  Lagasca.
Lallement.  Lallement.
Lamarck (Monnet de Lamarche).

Lamarck (J. Be Monet de) Flore Francaise.
Lamarck (J. B. Monet de) Illustration des genres.
Lamb.  Lambert.
Lamouroux.  Lamouroux.
Langsd.  Langsdorf.
La Peyr.  La Peyrouse.
La Pyr.  La Pyrás.
**List of Abbreviations.**

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Parl. = Parlatore.
Pasq. = Pasquale.
Pav. = Pavon.
Perl. = Perleb.
Pers. = Persoon.
Philib. = Philibert.
Planch. = J. E. Planchon.
Pluk. = Plukener.
Plum. = Plumer, Lat. Plumerius.
Popp. = Poppig.
Poir. = Poirret.
Poit. = Poitau.
Poli. = Polich.
Post. = Postels.
Pouw. = Pouret.
Pringsh. = Pringsheim.
Pris. = Pritzel.
Putter. = Putterlich.
Raben. = Rabenhorst.
Raddh. = Raddioker.
Raf. = Rafinesque-Schmaltz.
Rasp. = Raspail.
Red. = Redouté.
Reich. = Reichard.
Reichenb. f. = H. G. Reichenbach, son.
Reinw. = Reinwardt.
Reiss. = Reisseck.
Reta. = Retzius.
Reut. = Reuter.
Rheed. aucl. = Rheed, author of Hortus Malabaricus.
A. Rich. =
Richards. = John Richardson.
Richt. = Richter.
Ridd. = Riddell.
Riv. = Rivinus.
Ruhl. = Rehling.
Ram. = J. J. Roxmer.
Ram and Sch. = Roxmer and Schultes.
Rap. = Rapper.
Rohrb. = Rohrbach.
Roscoe. = Roscoe.
Roth. = Rostkovius.
Roth. = Roth (A. W.)
Rothr. = Rothrock.
Rottb. = Rottboll.
Rottl. = Rottler.
Roum. = Roumegère.

Roxb. = Roxburgh.
Roye. = Royle.
Roye. Ill. = Royle's Illustrations.
Roy. = Royen.
Rudb. = Rudbeck.
Rupr. = Ruprecht.
Sac. = Saccardo.
Sad. = Sadler.
St. Hila. = A. Saint Hilaire.
Salisb. = Salisbury.
Sauss. = Saussure.
Schimp. = Schimper.
Schh. = Schkuhr.
Schlecht. = Schlechtendal.
Schleich. = Schleicher.
Schomb. = Schomburg.
Schrad. = Schrader.
Schreb. = Schreber.
Schueb. = Schuebeler.
Schult. = Schultes.
Schultz. = C. H. Schultz, Bipontinus
Bip. = (Zweibrucken).
Schum. = Schumacher.
Schnitzl. = Schnitzlein.
Schwarz. = Schwagrichen.
Schw. = Schwein.
Schweinf. = Schweinfurth.
Schwend. = Schwendener.
Scop. = Scopoli.
Seem. = Seemann.
Sendt. = Sendtner.
Seneb. = Senebier.
Serr. = Seringe.
Seub. = Seubert.
Sibth. = Sibthorp.
Sieb. = Sieber.
Sieb. = Siebold.
Sim. = Simmonds.
Sm. = Smith (J. E.)
Solan. = Solander.
Sowerby.
Spenn. = Spenn.
Spreng. = Sprengel.
Sternb. = Sternberg.
Steud. = Steudel.
Stev. = Steven.
Stocks = Stocks.
Sull. = Sullivant.
Sw. = Swartz.
Sw. = Sweet (R.)
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## DICTIONARY

### OF

### THE ECONOMIC PRODUCTS OF INDIA.

<table>
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<tr>
<th>The Abelia</th>
<th>ABELMOSCHUS</th>
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<td>Abaca, a name in the Philippine Islands for Manilla Hemp—Musa textilea, which see.</td>
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**Abele,** the Dutch name for the White Poplar, see *Populus alba.*

**ABELIA, R. Br.; Gen. Pl.,* Vol. II., 4.**

A genus of shrubs (belonging to the Natural Order Caprifoliaceae), containing in all only five species; distributed from Kashmir to China and Japan. They are characterised by having opposite ex-stipulate leaves. Calyx adnate to the ovary, lobes elongate. Corolla regular or nearly so, funnel-shaped, with five short, rounded teeth. Style long. Stigma capitate. Ovary 3-celled, two cells being many-ovuled but early aborted, the other developing. Fruit elongated, coriaceous, 1-seeded.

This genus was named by R. Brown after the Chinese explorer, Mr. Clarke Abell. The species belonging to it are more objects of ornament than of utility. *A. floribunda* from Mexico has purple-red flowers, and *A. rupestris* from China has pale rose-coloured flowers.

There is only one species met with in India.

**Abelia triflora, R. Brown; Fl. Br. Ind.,† III., 9.**

Vernacular Names used in different parts of India.—Adi, paktamar, Pushro (Trans-Indus); Cheta bâla, Jehlum Valley; Ban bakhara, salamber, Chenab Valley; Dalâng, kât sâi, Ravi Valley; Zhang, mâtshang, peni, Sutlej Valley; Munri, goyatî, Kumaon.

Habitat.—A large shrub, met with in Safedkoh and the Suliman Range, North-West Himalaya, between 4,000 and 10,000 feet; also from Kashmir to Kumaon.

Properties and Uses—

Structure of the Wood.—Hard, close, and even-grained. Weight 65 lbs. per cubic foot.

Not used, except for walking-sticks.

**ABELMOSCHUS, Medik.; Gen. Pl., I., 208.**

A generic name formerly given to a group of species now referred to the genus Hibiscus. They are characterised by having an elongated, spathaceous calyx. The word Abelmoschus is derived from the Arabic signifying musk-seeded, in allusion to the odour possessed by the seeds of Hibiscus.

* By Gen. Pl. is meant Bentham and Hooker’s Genera Plantarum.
† Fl. Br. Ind. means Sir J. D. Hooker’s Flora of British India.
ABIES excelsa.

Indian Hemlock Spruce and the Fir.

Syn. used by old authors for Hibiscus esculentus, Linn., which see.

A. ficulneus, W. & A. (as in Drury).
Syn. for Hibiscus ficulneus, Linn., which see.

A. moschatus, Marsh.
Syn. used by old authors for Hibiscus Abelmoschus, Linn., which see.

A. strictus (as in Voigt).
Syn. for Hibiscus ficulneus, L., which see.


A genus of lofty evergreen monocious trees, belonging to the Natural Order Coniferae, containing some 18 species, widely distributed throughout the colder temperate regions. Leaves single, spirally arranged, or in two rows, needle-shaped or narrow, linear. Male—stamens single, in the axils of the leaves; anther-cells two. Oreses inverted, in pairs at the base of the carpillary scales. Cones ripening the same year, terminal or lateral, erect or pendulous. Seeds oily, winged.

The members of the genus Abies are popularly known as the Firs in contradistinction to the Pines (Pinus). Professor W. T. Thieslton Dyer has kindly drawn my attention to the fact that the genus Abies, as viewed by Indian authors, has, in the Genera Plantarum, been broken up into the following: Picea, Link, Tsuga, Carr., Pseudotsuga, Carr, and Abies, Juss. It was found impossible, however, to effect the rearrangement which this necessitates, owing to the Genera Plantarum having only reached my hands after a great part of vol. I. was in type. The correct genera of the Indian species will be found indicated under each.

In India there are three important species:

Abies dumosa, Loudon; (in Gen. Pl. referred to Tsuga).

The Indian Hemlock Spruce.

Verne.—Changehadi dhápa, thingia, thingiá síla (Gamble) or tingári-sália (Atkinson), Nepal; Tangishing or tungsing, Bhutia; Dóma, Kumaon; Tangking, Sarnim, N. E. Kumaon (Duthie); Semudung (Gamble) or semudung (Atkinson), chemistry, Lepcha.

References.—Brandis, For. Fl., 52; Gamble, Mon. Timb., 498.

Habitat.—A large tree met with in North-East Kumaon, Nepal, and Sikkim, between 8,000 and 10,500 feet. In Kumaon 3,650 acres are under this tree.

Botanic Diagnosis.—Cones 1 inch long, occurring on the ends of the branches. Leaves white underneath.

Properties and Uses—

Resin.—Little or nothing is known regarding its resinous properties.

Structure of the Wood.—Soft, with a slight pinkish tinge. Weight 27 to 29 lbs. per cubic foot.

Used in Sikkim for shingles. It is suitable for planking and rough furniture.

Domestic Uses.—The bark is used for roofing.

A. excelsa, DC.; (in Gen. Pl. referred to Picea excelsa, Link).

The Spruce Fir of Europe, Eng.; Poix de Bourgogne ou des Vosges, Fr.; Fichtenharz, Tannenharp, Ger.

Habitat.—A noble tree found in the mountains of Central Europe, in Norway, Sweden, and Russia; introduced into India.

A. 10
Resin, Turpentine, Oil of Turpentine, and Burgundy Pitch.

Botanic Diagnosis.—This species much resembles the Himālayan A. Smithiana.

Properties and Uses—

Description of the Resin.—A yellowish-brown, opaque substance, which naturally exudes from the bark, hard and brittle when cold, strongly adhesive, has an agreeable, aromatic odour, especially when heated.

Chemical Composition.—The resins obtained from the Coniferæ, according to Malay, are all similar. The oleo-resinous exudations known as Turpentine consist of an amorphous resin C\(^{11}\)H\(^{30}\)O\(^{4}\) mixed with an essential oil or hydrocarbon of the composition C\(^{11}\)H\(^{8}\). Burgundy Pitch is obtained from Picea excelsa; it has been deprived more or less of its essential oil by evaporation, but it is not a turpentine. The so-called Turpentina possess their essential oil; they are obtained from Pinus Pinaster (in France) and Pinus australis (in America). If exposed to water or moisture the amorphous resin contained in the turpentines combines chemically to a certain extent with the water and becomes opaque and crystalline, being transformed into a substance having the character of an acid. When crude, soft turpentine is distilled, nearly the whole of the oil of Turpentine passes over while the resin (rosin or colophony) remains. If this substance still contains a little water it is known as yellow rosin; if completely deprived of water, it is transparent rosin; and by a continued application of heat it becomes black rosin. The crude turpentine which concretes upon the stem is termed in France galipot or barras. The American concrete crude turpentine is known in trade as common Frankincense or gum Thas. Oil of Turpentine is distilled from the liquid crude turpentine, collected in boxes or artificial cavities cut on the trunk of the tree. This liquid substance is technically called Dip. The first year’s flow from a new tree is called Virgin Dip; this yields the best quality of turpentine oil and of rosin. From the wood of Coniferæ a crystalline glucoside Coniferin has been isolated by Rube.

The essential oils of the various coniferous resins vary considerably. Of the turpentines the two most important varieties commercially are the French and the American; that chiefly used in England being the American. Canada Balsam and Strassburg Turpentine are also well-known coniferous products. Hydro-carbons similar to those obtained from the Coniferæ are also derived from Rutaceæ, Myristiceæ, Lauraceæ, Umbellifæra, and even from some Labiateæ.” (Surgeon C. J. H. Warden, Prof. Chemistry, Medical College Hospital, Calcutta.)

Medicine.—The resinous exudation from the stem of Picea excelsa is official in the Pharmacopœia of India, and is used as a stimulant and rubefacient; always applied in the form of plaster. It is known to English writers as Burgundy Pitch, although that term, as used by French authors and popularly in many English works, has a wider significance, being applied to the turpentines of other Coniferæ.

Abies Smithiana, Forbes; (in Genl. Pl. referred to Picea? Morinda, Link.).

The Himālayan Spruce.

Vern.—Wesha, bařār, Afg.; Kachal, kacham, Hazara, Kashmir; Rewari, rāi, han lādar, sangal, salla, sattie, sari, bāuli, rāi, rāig, rāo, bang rē, krik, Pt. Himalaya generally; To, ravī; Rau, raing, rāi, Sutlaj; Kār, Jauhnar; Kondre, rāi, rāi, rāi, bhāntra (Brahuis)

§ Information specially contributed to this work by the authors whose names follow each paragraph.
Abies Webbiana

The Silver Fir yields

and Gamble) or kudrau (Atkinson), ridia or rái dāl, rāgha, morinda, koi, kātkāchāli, kilm, gahrwal, kumaon; rainyang, kahanwar; sēh,

Ladār, amandar, names used at timber depots.


Habitat.—A lofty tree met with in the North-West Himalaya between 7,000 and 11,000 feet; in Sikkim and Bhutan in the inner valleys between 7,000 and 10,000 feet; and in the mountains of Afghanistan, Kaffristan, and Gilgit.

Botanic Diagnosis.—Cones 4-6 inches long, occurring at the ends of the branches, drooping, pale green when young; scales persistent. Leaves stiff, sharp, 4-sided, green, spirally arranged; when young, crowded into pendulous, tail-like twigs.

An elegant tree, growing rapidly in moist localities where not under too much shade.

Resin.—It yields a resin, of no importance.

Structure of the Wood.—White, with a reddish or brown tinge, a little harder than that of A. Webbiana. The inner belt of annual rings soft and spongy. Weight, on an average, 30 lbs. per cubic foot.

The wood is extensively used locally, e.g., in Simla, for packaging-cases, rough furniture, and planking, and sometimes for shingles. It cracks and sends out sparks in burning, and is consumed very quickly, but it is in much demand for charcoal.

Domestic Uses.—The bark is used for roofing shepherds' huts, and the leaves are collected by the hill-people as a manure, and they are also stored for winter use as a litter for cattle.

Abies Webbiana, Lindl.; (in Gen. Pl. referred to Picea Webbiana, Loud.).

The Himalayan Silver Fir.

Syn.—Abies Webbiana, Lindley; A. spectabilis, Schach; Abies densa, Griffé; Pinus Tintoria, Wall; P. Webbiana, Wall.

Var. Pindrow, Loudon: the flat horizontal branches of this Western form give it a very distinctive effect from the variety Webbiana proper met with in Sikkim and Bhutan.

Ver.—Palakdar, remeri, jehralam; Bidar, bidar, pang, kashmir; Dhinga, rage, rai, pe, re, sale, sara, Chambe; Ta, Kulü; Spun, pun, kroh, kairei, kahanwar; Bharda, thanera, Shale; Bura, pinandra, pinandra, Hattu; Kdiram, Matiyana; Bural, bera, bidu, Bhaiji; Kairai, satrai, chur, Kotkai; Roko, row, chilrow, shulama, Chor; Morinda, jaunsar; Bang, dodhama rāgha, kliya or chili rāgha, South-Eastern Gahrwal; Chiruo, Central Gahrwal; Morinda, North-West Gahrwal; Kānlā or rāi sālā, Kosi River; Rāgha, rāi rāgha, ransala, ransala, Kumaon; Wūman, mumūrung (Mr. Duthie), Byans; Gobria talāh, Nēpal; Dumziling, Bhutia.


Habitat.—A lofty, evergreen tree, met with in the Himalaya, from the Indus to Bhutan; in the North-West Himalaya, between 7,000 and 13,000 feet; in the inner ranges of Sikkim and Bhutan, between 9,000 and 13,000 feet; in the outer ranges not below 10,000 feet.

Botanic Diagnosis.—Cones lateral, erect, 4-6 inches long, solitary or clustered, dark blue when young; scales deciduous. Leaves flat, narrow, linear, spirally arranged, but spreading in one plane so as to appear distinguishable.

Resin.—It yields a white resin, which is sometimes used medicinally in India.

"Hakims affirm that the resin of Abies Webbiana, mixed with oil of..."
Resin, Dye, Medicine, Food, and Timber.

**ABIES Webbiana.**

**DYE.**

Young Cones. 24

**MEDICINE.**

Leaves. 25

- Dye.—Mr. Duthie, Superintendent of the Botanic Garden, Saharanpur, has drawn my attention to the fact that Veitch, in his *Manual of Conifera*, states that "a beautiful violet dye is extracted from the young cones" of this plant. It is remarkable that neither Stewart, Brandis, nor Gamble alludes to this dye, while in *Gordon’s Pinetum* occurs the following: "It is called *Rai-sulla* (fragrant fir) and *Gobrea-sulla* (fragrant or indigo fir) by the Gorkhais on account of an indigo or purple pigment being exuding from the young cones." It would be well worth investigating to have this dye properly confirmed by fresh information, and specimens of the dye-stuff and cloths dyed by this process, also information as to the extent this curious dye is actually used by the hill tribes of India.

- Medicine.—The dried leaves of this plant (*Tallispatra*, HIND. and BENG., *Tallispatra*, SANS.) are regarded as carminative, expectorant, stomachic, tonic, and are beneficial in phthisis, asthma, bronchitis, and catarrh of the bladder. The powdered leaves are often given along with the juice of *Adhatoda Vasic* and honey, and a confecion called *tallisadya churna* is prepared from the *tallispatra* along with pepper, ginger, bamboo manna, cardamoms, cinnamon, and sugar. The *tallispatra* also enters into the preparation of numerous complex prescriptions. (U. C. Dutt’s *Hind. Med.*)

In Ainslie and the earlier writers on Indian Economic Botany, *tallispatra*, *tallispatra*, DEK. and HIND., and *tallisha*, SWAD, SANS., are the vernacular names for the dried leaves and twigs of *Flacourtia Cataphracta*, the paniyala of Bengal. (Ainslie, II, 407.)

In his *Manual of Indian Timbers*, p. 17, Mr. Gamble gives *tallispatra* as the Hindi name for *Flacourtia Cataphracta*, Roxb., and this is also the name given by Babu T. N. Mukharji in his *Amsterdam Catalogue*. Surgeon U. C. Dutt informs me that he is of opinion *Abies Webbiana* is the *tallispatra* of the ancient Sanskrit writers, and that specimens of the drug which he submitted to Dr. King were found to be the leaves and twigs of this plant. It seems difficult to accept, however, for a man of Dr. Ainslie’s ability mistaking the ovate leaf of a *Flacourtia* for the needle-shaped leaves of a Fir, and, having few or no authors to compile from, he must have personally identified the plants of which he wrote, and ascertained locally that *Flacourtia* was the *tallisha* of the shops of South India.

The Hindú Doctors of Behar, according to Dr. F. Hamilton, use an infusion of *tallispatra* in the treatment of hoarseness. It is probable that, in different parts of India, the dried leaves of various plants receive the name of *tallispatra*, provided they are found useful in the treatment of coughs. It seems likely, however, that the leaves of *Abies Webbiana* are the original or true *tallispatra*.

Dr. Dymock states that the *tallispatra* of the Bombay shops (also called Barms) consists of the leaves and young shoots of *Taxus baccata*, Linn. While admitting that the *tallispatra* of the ancients has not been identified for certain, he quotes under *Taxus* the properties and mode of prescribing the *tallispatra* as given by Surgeon U. C. Dutt, an author who refers it to *Abies*. The importance of this observation lies in the fact that the therapeutic properties of *Abies* and *Taxus* are widely distinct, and therefore these distinct plants, one would imagine, could not possibly be used for the same purposes. (See *Taxus.*) Since writing the above, however, I have seen in Calcutta a specimen of a drug called *tallispatra*, which I believe to be the leaves of *Taxus*, and Mr. Woodrow says that it is the leaves of that plant which are sold in Poona as the *tallispatra*. The whole subject is thus exceedingly obscure.

A. 25
The description of the *tālīsaptra* in some of the older books on Indian medicinal plants would agree very well with the leaves of a *Cinnamomum*,—much better, in fact, than with those of an Abies. Surgeon Mooden Sheriff gives *tālīsahapatra* as the Tamil and Telegu names for *C. Tamala, Nees* and also the Arabic and Persian for the leaves of that plant. He may be quite right in this opinion, modern usage having appropriated the name to *Abies* and *Taxus*. But one only of the plants referred to in this critical note can be the true *tālīsaptra* since they have such distinct properties. It seems clear, however, that in different parts of the country different plants are prescribed as *tālīsaptra*, and it is quite probable that none of them are the true *tālīsaptra* of the Sanskrit writers.

Special Opinions.—"*Tālīsapatra* (leaves of Abies Webbiana) are sold in all *Baniakā* shops in Bengal, Behar, and the N.-W. Provinces. I do not think any other leaf is used in these provinces under the name of *Tālīsapatra*." (Surgeon U. C. Dutt, Serampur.) "The *Tālīsapatra* of the Bombay shops, also called *Barmi*, consists of the leaves and young shoots of *Taxus baccata*. Many of the shoots bear the male flowers of that plant. If this is the source of the *Tālīsapatra* of Sanskrit writers, we ought to have a Sanskrit name *Talis* for the tree, and the Hindi name would probably be similar." (Surgeon-Major W. Dymock, Bombay.) "The same argument is equally against *Taxus baccata*, since in no Indian language is the tree called *tālīsha*, nor by any name that could be called a derivative from that word." (G. Watt.) "The Bhuj Hakim uses the dried leaves when a carminative action is needed, dose half to one drachm internally." (Surgeon W. Barren, Bhuj, Cutch, Bombay.)

"The juice of the fresh leaves is used as a family medicine in fevers, acting as an antiperiodic, for infants dose 5-10 drops in water or mother's milk. It is also prescribed in affections of the chest and during diphtheria. In Bengal it is given as a tonic after parturition." (Surgeon J. McConaghey, Shahjahanpur.)

Fodder.—In tracts near the Jhelum the twigs and leaves are cut and stored for winter use as fodder and litter for cattle. (Brandis.) That cattle could eat the dried leaves of this plant seems incredible and at strange variance with their reputed medicinal properties.

Structure of the Wood.—White, soft. The inner zone of each annual ring is soft and spongy. Weight about 20 lbs. per cubic foot.

The wood is not durable when exposed to the weather, but seems to last well as shingles in Sikkim, whence it is sometimes exported to Thibet for roofing. At Murree, shingles are said to last eight to ten years, and in Kulu three to six. In Kanawar and Laboul it is much used for construction. Very little information exists regarding the rate of growth.

Domestic Uses.—The bark is used for roofing shepherds' huts, and it is also made into troughs for the salt given to the sheep grazing on the higher Himalaya.

**ABIR.**

Abir (sometimes called *Phāk*, Beng., or *Phāku*, Ass.), or the white perfumed powder which is mixed with the red *Guldī* powder and used at the Holi festival.

Dr. McCann, in his *Dyes and Tans*, publishes, from the records of the Bengal Economic Museum, as the practice adopted in Mymensing, the following description:—

1st.—"*The shatī* is washed and pounded in a *dhēnki*. The powder is then put into an earthen vessel full of water and allowed to rot. The water is afterwards poured off, and the powder dried. It is then mixed with the juice extracted from *bakram* wood. This turns it red, and it is then called *Abir* or *Holi* powder. *Shatī* is gathered for this purpose in the
month of Poos (December-January).” There is no mention of alum in the
above, but without that substance the colour could not be produced.

The practice which seems to prevail in most other parts of India is to
prepare the two powders quite distinct from each other, and to mix them as
required.

2nd.—The Bengal Holi powder is prepared from Curcuma Zedoaria,
Rosoe (or common flour or arrow-root), Sappan-wood, and alum. “In
Bengal aniline magenta is now largely used to colour the flour obtained
from Zedoaria, and being cheaper has almost superseded the older pre-
parations.” (Mr. T. N. Mukherji, Calcutta.) Dr. Buchanan Hamilton says
that in some parts of Bengal the yellow dye obtained from Bixa Orellana
is used as a gulal.

Dr. Dymock has favoured me with the following list (Nos. 3 to 7) of
Abir powders:—

3rd.—“The Bombay Holi powder or Gulal is made of flour coloured
with Sappan-wood and alum.” (Surgeon-Major W. Dymock, Bombay.)

4th.—A whitish Abhir made from the following:—

Andropogon muricatus.
Santalum album.

5th.—The buff-coloured Hindi Gulal, known as Ghisi, contains, in
addition to the above, the following:—

Cerasus (Prunus) Mahaleb.
Artemisia Sieversiana (imported).
Cedrus Deodara.
Cardamom.

6th.—Deccan Abhir or Bukkan is of a black colour, and in addition to
all the above contains the following:—

Aquilaria Agallocha.

Costus Root (Saussurea Lappa, C.B.C., formerly Aucklandia
Costus, Pale); Jatamansi; Liquid Storax.

7th.—The Abhir of the Jains is of a pale yellow colour. It is called
Vasakhep; it is made of—

Santalum album.
Saffron; Camphor (Borneo); Musk.

8th.—Voigt in his Hortus Sub. Calc., states that Trapa bisinosa (the
Singara nut) is used as an Abhir. “During the Holi festival a red
dye is made of it mixed with the yellow dye procured from the flowers of
Butea frondosa.” Drury apparently quotes this paragraph. I pre-
sume the flour of the Singara nut is simply used in place of rice or wheat
flour and coloured with the gulal. My friend Major Pitcher informs
me, however, that in Oudh the flour from the Singara nut is used during
the Holi.

Professor W. T. Thistleton Dyer also writes me that a speci-
men of Abhir, composed of Singara-nut flour, coloured with Butea frondosa,
was received by the Kew authorities from the late Indian Museum. It
would thus appear that the use of Singara-nut flour is more general than
was thought. What peculiar merit it is supposed to possess I have been
unable to discover. The use of Butea frondosa as Gulal is, however,
referred to by several authors. See Butea.

Absorbent—(L. ab, from; sorbo, I suck up). Applied adj. and subs-
to anything which absorbs acidity in the intestinal canal, or blood and
other fluids, from any part of the body. For list of Indian Absorbents,
see “Drugs.”

**ABROMA.** *faebr.; Gen. Pl., I., 224.*

A genus of trees or shrubs (belonging to the Natural Order Sperculia-
ceae.), containing in all two or at most three species, natives of tropical Asia.

Leaves cordate, angled. Petals purple-coloured, concave at the base, with
Dictionary of the Economic

Abroma augusta.

An Important Fibre.


The word Abroma is derived from α and βράμα — unfit for food.


Abrome, Fr.; Abrome, Ger.

Verum.—Kalakhand, Beng., Hind., and Cutch.


Habitat.—A small bush, widely distributed (native or cultivated) throughout the hotter parts of India.

Botanic Diagnosis.—A large spreading shrub, with leaves and branches softly hairy. *Sepals* lanceolate, almost free to the base, and nearly as long as the petals; *fruit* becoming more than twice the length of the persistent *calyx*. It flowers most profusely during the rains, and the seeds ripen in the cold season.

Properties and Uses—

Fibre.—The bark of the twigs yields a much-valued fibre, which deserves to be more generally known. It might be used with advantage as a substitute for silk. The plant yields three crops a year. Roxburgh says of this plant: “The bark abounds with strong, white fibres, which make a very good substitute for hemp, and as the plant grows so quickly as to yield two, three, or even four crops of cuttings annually fit for peeling” it may with advantage be cultivated for its fibre. It is a large and more easily cultivated plant than jute or *sunn*, and is a perennial, while the produce is as great if not greater, and the fibre as easily separated. With all these facts to recommend it, it seems remarkable that we should have had to urge the claims of this fibre for over 50 years without its having attained the high commercial rank which its great beauty, softness, cheapness, and durability deserve. There are many purposes to which jute is put nowadays, which Abroma could meet with greater acceptance, and which it most certainly would, by this time, have supplied but for the unparalleled early success of jute. The future seems likely to raise Abroma, however, to a position of great importance.

To separate the root-bark from the shoots, maceration in stagnant water, from four to eight days, answers well during the warmer parts of the year, while three times as much is scarce sufficient during the cold season: indeed, the process is scarcely practicable then; besides, the fibres are generally weakened by prolonged maceration. The fibres being naturally very white and clean, they do not require to be cleansed. Dr. Roxburgh states that, in its native state, without being dressed in any way, it is about one tenth part stronger than *sunn*, and in that state much more durable in water. A cord of its fibre bore 74 lbs., when *sunn* broke with 68 lbs.” (Royse’s *Fibrous Plants of India*, p. 267.)

There can be no doubt that sooner or later the trade in jute, having lost the enormous profits obtained during its early history, will subside into an old and established industry. The demand for some new fibre to give life to the progressive textile industries will then turn to Abroma, Agave, Yuca, Abutilon, and a few others; but to the owners of jute mills and jute machinery, Abroma seems the most likely to prove the new outlet for enterprise.

Medicine.—The bark of the root is an emmenagogue, which does not appear to have received the attention it deserves. In the *Indian Medical Gazette* for 1872, Mr. Bhoobun Mohun Sircar gives an account

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Indian Liquorice.

of the uses of this drug, specially recommending it in the treatment of dysmenorrhœa. It seems to be the fresh viscous sap from the root-bark which possesses the properties attributed to this plant. Half a drachm is given at a dose. (Am. Jour Med. Science, July 1873, p. 276.)

Dr. Kirkton, in a correspondence with the Home Department, Government of India, says: "Fresh root, beat into paste with water, dose 1 drachm in dysmenorrhœa."

Special Opinions.—§ "Is a valuable medicine in dysmenorrhœa. The way in which it is usually given is, the fresh root of the plant made into a paste with black pepper. The medicine is given about a week before the menstruation begins and is continued till it commences. I have seen it prove very efficacious in some cases; especially the congestive form of the disease. (Surgeon R. Macleod, M.D., Gya.) "Two ounces of dried bark boiled in one pint of water will make a good decoction. An ounce thrice daily acts well in cases of dysmenorrhœa." (Surgeon R. L. Dutt, M.D., Pabna.) "I have never used it as an emmenagogue, but the infusion of fresh leaves and stems in cold water is demulcent and very efficacious in gonorrhœa." (Surgeon C. J. W. Meadows, Burrisal.) "A well-known emmenagogue in Bengal: said by some native doctors to possess antispasmodic properties." (Surgeon J. McConaghey, Shalikhanpur.) "Useful in dysmenorrhœa." (Surgeon J. Anderson, Bijnor.)

"The slender roots of this plant are useful in the congestive and neuralgic varieties of dysmenorrhœa. It regulates the menstrual flow and acts as a uterine tonic. It should be given during menstruation. 10 drs. of the fresh root for a dose, with black pepper, the latter acting as a stomachic and carminative." (Brigade Surgeon J. H. Thornton, Monghyr.) "I have tried the green tender roots and also the bark of roots in two-drachm doses with a few grains of pepper just to cover the bland taste of it in congestive dysmenorrhœa with excellent results. It is to be given as soon as the vague sense of discomfort and weight in the loins begins and should be continued till the flow appears." (Assistant Surgeon Deenadh Nath Roy, Sealdah, Calcutta.)

"I used the root-bark in three cases of dysmenorrhœa, in which it was wanted as a specific, but without any effect." (Surgeon Shib Chunder Bhattachary, Chanda, Central Provinces.) "Babu B. M. Sarkar of Calcutta is selling pills made of this as a successful remedy for dysmenorrhœa, and I have heard of good effects from it. Requires a trial." (Surgeon K. D. Ghose, Khuilna.) "Action tonic." (Surgeon W. Barren, Bhuj, Cutch, Bombay.) "Has never failed in my hands in speedily relieving painful dysmenorrhœa." (Surgeon B. Evens, M.D., Wardha.) "In my personal experience, I know the root is very efficacious in cases of amenorrhœa as an emmenagogue." (Assistant Surgeon Shib Chunder Basu, Bankipur.) "Reported to be an emmenagogue; said to remove sterility in cases depending on dysmenorrhœa, but it has failed in two cases in my hand." (Assistant Surgeon Bolly Chand Sen, Sealdah, Calcutta.)

ABRUS, Linn. ; Gen. Pl. I., 527.

A genus of climbing shrubs (belonging to the Sub-Order Papilionaceae, of the Natural Order Leguminosae) comprising 5 species, cosmopolitan in the tropics. Leaves equally pinnate; leaflets numerous and deciduous. Calyx campanulate, teeth short. Corolla much exerted, standard adhering below to the staminal tube. Stamens 9, united into one bundle, the uppermost and tenth one being abortive. Pod dehiscent (exposing the red shining seeds), not jointed.

The word Abrus is derived from the Gr. ἀβρος, graceful, either in allusion to the graceful, delicate leaves, or elegant, shining seeds.
Dictionary of the Economic

ABRUS precatorius. Indian Wild Liquorice.

48
A. precatorius, Linn. Pod oblong, turbid, 3-5 seeded.
A. pulchellus, Wall. Pod linear, flat, incurved, 9-12 seeded.
A. fruticosus, Wall. Pod linear, oblong, flatish, 4-6 seeded.

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Abrus precatorius, Linn.; Fl. Br. Ind., II., 175.

INDIAN OF WILD LIQUORICE ROOT, Eng.; Liane à réglisse, RÉGLISSE D'AMÉRIQUE, Fr.

Vern.—Gaungchi, rati, chirmi, Hind.; Ratak, labri, Pr.; Gunja, ghung- chi, Bom.; Gumchi, Duk.; Chandni, Gu.; Rati, Cutch; Maspati, Nepal; Kuch, gunch, chun-khati, Beng.; Kowre; Sattai; Lohumani, Ass.; Gunja, gunjā, kriśhna, kabakhichi, Sans.; Aainu-dulta, Aban.; Chashahkuri, Pers.; Gundunumi, Tam.; Ghurieghéna, Tel.; Yaw-

References.—Key, Fl. Ind., Ed. C.B.C., 544; Drury’s U. P., p. 3; Brandis, For. Fl., 139; Gamble, Man. Timb., 121; C. I. H. Ward, in Year Book Ph., 1882, p. 811; Flüder, and Hamb, Pharmacop., 2nd ed., 188; Bentl. and Trim., Med. Fl., 95; Dymock’s Drugs of W. Ind., p. 183; Stewart’s Ph. Fl., p. 50; Atkinson, Gaz., N.-W.P., X., pp. 74, 75.

Habitat.—A beautiful climber, met with all along the Himalaya ascending to altitude 3,000 feet, and spreading through the plains of India to Ceylon and Siam.

Botanic Diagnosis.—There are three principal varieties under this species described by Roxburgh:
1st.—With rose-coloured flowers and red seed, with black eye.
2nd.—With dark-coloured flowers and black seed, with white eye.
3rd.—With white flowers, white seed.

§“The white variety as seen here has no black eye.” (Dr. Dymock, Bombay.)

Properties and Uses—

Medicine.—The root, Ainslie and O’Shaughnessy say, “is a perfect substitute for liquorice in every way.” Modern authors differ from them in this opinion. According to Sanskrit writers it is emetic and useful in poisoning. Dr. Bidie says: “The Abrus root has little or no saccharine taste, and would form a very indifferent substitute for liquorice.” Liquorice root is largely imported into India and extensively used in native medicine, and is probably often sold under the same vernacular name as that given to the Abrus root. Dr. Dymock, speaking on this subject, says: “I consider the root to bear very little resemblance to liquorice, either as regards appearance or qualities; as pointed out by Dr. Mooden Sheriff, the leaves are by far the sweetest part of the plant, and from them a tolerable extract may be made.” An alkaline ash is prepared from the plant.

§ Special Opinions.—“The root of the third variety, as described by Roxburgh, is used for gonorrhœa. A quantity equal to a drachm in weight is pounded, and the expressed juice mixed with sugar-candy.” (Surgeon H. McCalmim, M.D., Bombay.) “At Poona Safed Gunja is considered the best variety, and accordingly under this name Glycyrrhiza glabra is sold in the bazaars. The root of Abrus precatorius appears to have fallen much out of use of late.” (G. M. Woodrow, Prof., College of Science, Poona.) “An infusion of the roots is used for procuring abortion in Hoshiarpur District, Panjāb.” (W. C. Coldstream, Esq., Commissioner, Hissar.)

“Further experience confirms the view that the root of this plant is not a substitute for liquorice, and that the article sold in the bazaars as ‘Indian liquorice’ is not the root of Abrus precatorius. I would therefore strike out everything connecting liquorice with Abrus.” (Deputy Sur. A. 54
Opinions of Medical Officers.

ABRUS precatorius.

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**ABRUS precatorius.**

“Not equal to liquorice, but a fair substitute; used chiefly in the form of infusion, 1/4 oz. of the root-bark to 10 oz. water: dose one to two ounces.” (Apothecary Thomas Ward, Madanapalle, Cuddapah.) “I often use a decoction of bazar liquorice in cough mixtures, and find it very useful, especially in the bronchitis of children.” (Surgeon-Major J. F. L. Ratton, M.D., Salem.)

**The leaves.**—“If the leaves are steeped in warm mustard oil, and applied over the seat of pain in rheumatism, much benefit will be derived.” (Surgeon W. Wilson, Bhopal.)

“The leaves, warmed over the fire, are applied to painful swellings, over which a little warm castor-oil is first smeared. In this way they are said to be inflammatory in their action.” (Hon. Surgeon P. Kinsley, Chicacole, Ganjam, Madras.) “Juice of fresh leaves, mixed with some bland oil, and applied externally, seems to relieve local pain.” (Surgeon-Major Bunker Bhai Gupt, Perk.)

**The seeds.**—In his Sanskrit Materia Medica Surgeon U. O. Dutt says the seeds are “used internally in affections of the nervous system and externally in skin diseases, ulcers, affections of the hair.” They are pounded and made up with mercury, sulphur, nim seeds, hemp leaves, and cotton seeds, &c.

“Half the seeds are used as a purgative, but in large doses are an acrid poison, giving rise to symptoms resembling those of cholera. The poisonous property is generally believed to be in the red covering of the seed.” (Surgeon-Major A. S. G. Fayyakar, Arabia.)

“When boiled with milk it is said to have a very powerful tonic action on the nervous system. Dose of the powder boiled with milk, one to three grains. The powder, when administered internally, uncooked, acts as a strong purgative and emetic.” (Surgeon W. Barren, Bhuj, Cutch, Bombay.)

“The white seeds are made into confection with several other drugs and used as tonic. A Vaid tells me that the roots are similarly used.” (Surgeon-Major J. Robb, Ahmedabad.) “Used in granular chronic conjunctivitis causes slight inflammation and absorption of the granulation.” (Surgeon H. D. Masani, Karachi.)

“If the colour of the seeds is sufficient to constitute a variety, there are more than 10 varieties of A. precatorius; some seeds are entirely black, white, yellow or rosy, and such seeds are more used in medicine than those described by Dr. Roxburgh as having an eye of a different colour. Taken internally by women, the seeds of A. precatorius disturb the uterine functions and prevent conception. For the latter purpose, 4 to 6 seeds are swallowed every day in 2 doses for several days after each menstruation. The white and black seeds are preferable to those of other colours.” I am aware of one successful case under this treatment. The white seeds, again, are considered debilatory or repellant. Rubbed up with water and applied to swellings, they succeed in some slight cases.” (Hon. Surgeon Moodow Sheriff, Khan Bahadur, Madras.)

“I presume that this plant is the one referred to by Major Ramsay, of the Bengal Police, in his book, Detective Foot-prints, Bengal, 1874-51, London, Army and Navy Co-operative Society, 1892. He calls the plant Kogani; his description at page 44 agrees. The seed is used for killing cattle. Consult the reference.” (Surgeon L. Cameron, Nudden.) “The powdered seeds are taken as snuff in cases of violent headache arising from cold.” (Mr. T. N. Mukharji, Cutch.) “The boiled seeds are
Opinions regarding the Gunja.

CHEMISTRY.

said to possess powerful aphrodisiac properties." (Surgeon-Major J. M. Honston, Travancore, and Civil Apothecary John Gomes, Travantrum.)

"The seeds rubbed down with a small quantity of water (paste) is used for contusions, &c., to reduce the inflammation." (Surgeon W. A. Lee, Mangalore.)

"The root is a good substitute for imported liquorice. The seeds are poisonous and used by the chamars for poisoning cattle; they are poisonous when mixed with the blood, but not so when taken internally. I treated a case at the Bankipore Hospital who died with symptoms of nervous excitement. On post mortem examination no trace of the drug could be detected, only there was a suppurative spot with inflammation all around it, and the brain was highly congested." (Asst. Surgeon Bolly Chand Sen, Calcutta.)

"Prescribed as a general tonic, and, mixed with milk and cardamoms, natives use it as an aphrodisiac. In large doses it is emetic. A mixture consisting of vinegar 2 parts, sugar 3 parts, and lime-juice 1 part, acts as an antidote to the poison—dose 67 grains." (Surgeon J. McConaghey, Shahjahanpur.) "The seeds, mixed with the roots and coconuts milk, are given in hemorrhoids according to Rheede." (Surgeon H. W. Hill, Mahrattah.)

"The seeds, when decorticated and finely ground, are used for treatment of pannus cornea and for granular lids with good effect. They cause a true purulent ophthalmia, and in cases where too vigorously used in diphtheritic exudation on the conjunctiva. In mild cases of pannus and granular lids the treatment need not be carried beyond the purulent stage. But in severe cases diphtheritic exudation must be caused before good results are procured. A 3 per cent. solution, prepared by steeping the decorticated seeds in cold water for 24 hours, brushed over the reversed lids three times a day, will cause purulent ophthalmia. In bad cases a 5 per cent. infusion is required. Moderate ulceration of the cornea is not a contra-indication for the use of this remedy; on the other hand the ulceration speedily improves." (By a Surgeon.)

Off. Preparation.—An extract of Abrus root is regarded as officinal in the Indian Pharmacopoeia, dose ad libitum.

Description.—The root is woody, tortuous, and much-branched, about \( \frac{1}{4} \) inch in thickness. Section not broken up by medullary rays into wedge-shaped blocks as in the true liquorice. Dark thin, reddish brown; wood yellowish white. Odour, when broken, peculiar and disagreeable. Taste at first bitter, then sweet.

Chemical Composition.—In 1882, Dr. de Wecker directed attention to the fact that the Abrus precatorius seeds, used in the form of a lotion, were capable of producing purulent inflammation of the conjunctiva. He advanced the theory that this was due to the presence of a bacillus, and stated that if an infusion of the seeds be sterilized, it is no longer capable of exciting inflammation: if the bacillus be cultivated separately, it will set up the factitious ophthalmia. That when inoculations were carried very far, a transmission to the lymphatic glands took place, causing suppuration and erysipelatous symptoms, as well as a distinctly febrile condition. (Jour. Ph. Soc.)

It has been observed by Dr. Nicholson that Abrus seeds are sometimes found on prisoners in jail. Sudden attacks of ophthalmia in jails may perhaps often be factitious. The action of the Abrus seeds in establishing purulent inflammation is at all events well known. According to Dr. de Wecker, the ophthalmia set up by Abrus seeds disappears in ten days or a fortnight without any therapeutic intervention or danger to the cornea, and he therefore recommends a lotion, prepared from 155 grains of the decorti-
Rati Poison.

ABRUS precatorius.

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The seeds are powdered and made into a little cylinder called suj, almost exactly resembling a silver nitrate point. A puncture is made in the skin and the suj pushed in. The animal soon becomes uneasy, and if discovered and the suj cut out, the animal may live." (Surgeon-Major C. W. Csathrop, M. D., Morar.) 

"The powdered seed is made up into a paste and formed into short sharp pieces (called suj or needles) used by cattle-poisoners. The suj is inserted under the skin of the animal, causing inflammation and death." (W. C. Coldstream, Esq., Commissioner, Hissar, Panjab.) 

"The pulp of the seed, made into small needles called sujar, is used for poisoning cattle in Behar. I gave evidence in a case of this nature before the Sessions Judge of Patna." (Surgeon Surgeon Shib Chunder Basu, Bankipur.)

Domestic Uses.—The small, shining, red seeds, rati or gungche, are largely used by the Indian goldsmiths as weights, each weighing about 1.75 grains; in the Panjab they are regarded as of correct weight when
ABUTILON

asiaticum.

The Abutilon, or Indian Mallow.

equal to about eight grains of bamsami rice (Mr. Coldstream). It is stated that the famous Koh-i-núr diamond was first weighed by the rati, a word which, by some authors, is supposed to have given origin to the jewellers' carat (kárdát, Aráb.). The carat is the twenty-fourth part of an ounce or 3½ grains; this approximately would be equal to two rati seeds. The climber, with its open, withered fruits, exposing the scarlet rati (or crab's eye) seeds, is twisted round leafy boughs to simulate the holly at Christmas time in English stations.

The rati are also extensively used for necklaces, ornaments for the ears, and to decorate small boxes, baskets, &c. The fact of their being used as rosaries doubtless suggested the specific name precatorius.

Abrus precatorius, Linn., var. melanopseum, L. (as in Voigt's Hort. Sub. Calc., p. 228.)

Syn. for A. pulchellus, Wall., which see under generic note.

Absinthe—An intoxicating liquor, largely consumed by the French, prepared in Europe from one or two species of Wormwood, but chiefly from Artemisia Absinthium, Linn., which see.

Absertgent—A term applied in Pharmacy to a substance such as Fuller's earth, which has a cleansing property. The Soap-nut (Sapindus Mukorossi, Gurtin.) is an excellent absergent or detergent, and so also are the pods of Acacia concinna. See under "Soap Substitutes" for other natural absergents.

ABUTA, Aubl.


Said by O'Shaughnessy to be considered Ceylon as an excellent stomachic, and used for the same purpose as Cissampelos. The plant is a native of Cayenne and Guiana, and if used in Ceylon must be imported.

ABUTILON, Gurtin.; Gen. Pl., I., 204.

A genus of herbs or under-shrubs (belonging to the Natural Order MALVACEAE), containing about 70 species, all inhabitants of the tropical or sub-tropical regions. Leaves softly tomentose, cordate, angled, or palmately lobed. Bracteoles none. Staminal-tube divided at the apex into numerous filaments. Carpels 5 or more, entire (i.e., not divided by a false partition), when ripe separating from the axis. Styles as many as the carpels.

The word Abutilon is said by some authors to be an ancient Greek name for the Mulberry tree, and to be given to this genus in allusion to the resemblance of the foliage. Dr. Rice writes me, however, that the word does not occur in old Greek authors, but appears to have been first used by Avicenna. The members of this genus are annual or perennial low bushes, growing gregariously and forming clumps in the jungles. There are 10 or 12 Indian species, most of which are very abundant in the plains, and yield beautiful white fibres. The flowers of A. esculentum, a Brazilian species, are edible. The leaves of all contain a large quantity of mucilage, and are used in the same manner as the Marshmallow of Europe.

The allied genera are readily separated from Abutilon by the number and position of the ovules. In Althaea they are solitary, ascending; in Sida solitary, pendulous; while in Abutilon there are two or more ovules in each carpel, one ascending and another pendulous from the top and bottom of the carpel.

The following are the most important Indian species of Abutilon:

Abutilon asiaticum, G. Don, and A. indicum, G. Don, MALVACEAE, are two species so nearly allied botanically, that from an economic point
Important Fibres, worthy of attention.

Abutilon Avicennæ.

of view they may be regarded as one and the same. The former is characterised by having the upper surface of the leaf rugose, the under velvety, with the carpels scarcely longer than the calyx. The latter, by the leaves being covered on both surfaces with closely-felted white down, the carpels being also longer than the calyx.

**Abutilon asiaticum**, G. Don; Fl. Br. Ind., I., 326.

**Country Mallow.**

**Syn.—**Sida asiatica, Linn., belongs to the former species.

**Vern.—**Kangaki, or kangi, jhampi, Hind.; Petari, Beng.; Kangori, charra-bhenda, Petari, Mar.; Tuti or tuti hari, perun-tuti, Tam.; Tututura-bhenda, nugu-bhenda cettu, Tel.

**A. asiaticum**, G. Don, is chiefly met with in Western India and Ceylon, while **A. indicum**, G. Don, is widely distributed throughout tropical India, to Prome, Pegu, and Ava (wanting in Malacca). They are annual or perennial bushes, frequenting roadsides, banks of rivers, &c., especially in the vicinity of villages. Their curious fruit, consisting of a whorl of pretty carpels, has apparently suggested many of the designs in jewellery made in Eastern India. They blossom and seed all the year, and when not insect-eaten, their graceful velvety leaves contrast elegantly with their yellow flowers.

**Fibre.**—The stems contain a good fibre, suitable for cordage. (See remarks under **A. Avicennæ**.) These exceedingly abundant wild plants deserve attention as paper-yielding fibres.

For further particulars see **A. indicum**.


**Indian Mallow; American Jute.**

**Syn.—**Sida abutilon, Willd. in Roxb. Fl.


**Habitat.**—A native of North-West India, Sind, Kashmir, and distributed to North Asia and westward to South Europe and North America.

It is said to be also met with in Bengal, but Roxburgh first reared it from seeds received from China under the name of King-ma. In Bengal it would therefore seem to be introduced or met with in cultivation only.

**Botanic Diagnosis.**—Leaves orbicular, cordate, with a long point. Petioles solitary, auxiliary shorter than the petiole. Sepals free or nearly so. Petals yellow, hardly exceeding the sepals. Carpels 15-20, becoming ultimately divergent, and much exceeding the sepals.

**Properties and Uses.**—

**Fibre.**—Considerable attention has of late years been directed to the fibre produced from this species, in the United States vast quantities are being prepared over the region from Ohio to Missouri. “It is pronounced superior to Indian jute and firmer than Manilla hemp. It takes readily any colour, and its natural lustre displays more in the aniline dye than in any other—a great advantage over Indian jute, which is antagonistic to cheap bleaching and dyeing.” “It is stated that an acre of ground will produce 5 tons of Abutilon stalks, and about 20 per cent. of pure fibre is obtained after preparation. Considered superior to jute fibre as imported; the long fibre is fully equal in value to Calcutta prime jute, and Philadelphia rope-manufacturers have already offered to buy any quantity at the highest market price for jute,” (Christy.) This is exceedingly important, and points to the advisability of a thorough examination of this and other Indian species with special reference to their fibres. It is recom-

Syn.—Sida graveolens, Rosh.; Sida hirta, Lam., DC. Prod.

Vern.—Barkanghi, Hind. and Beng.

References.—Rosh., Fl. Ind., Ed. C.B.C., 518.

Habitat.—North-West Provinces, Sindh, Nilgiri Hills, and Ceylon; distributed to Beluchistan, Java, tropical Africa, and Australia.

Botanic Diagnosis.—Whole plant covered with clammy pubescence and spreading hairs. Leaves orbicular, cordate, acuminate. Peduncles as long as the petals. Carpels 20 or more, rounded and hairy, not awned.

The whole plant has an unpleasant smell.

Properties and Uses—

This is chiefly a native of the North-West Provinces and Sind, extending along the western side of India to the Nilgiri Hills and Ceylon. Kurz says it is also met with in Pegu, frequenting uncultivated places. This species was first obtained by Dr. Roxburgh from seeds sent him from Cawnpore. From its prevalence in the North-West Provinces, and the fact that it contains a much larger proportion of mucilage than any of the preceding species, this is probably the plant which yields the Kangai medicine used in these Provinces. It may be employed for the same purposes as the preceding, the stems yielding fibre, the leaves, roots, and seeds medicine.

A. indicum, G. Don; Fl. Br. Ind., I., 326.; Wight, Ic., t. 12.


Vern.—Kanghi, kanghi, shampi, Hind.; Poteri, Beng.; Miru baha, Santal, Mashi-ul-khoul, deisbar, Arab.; Darakhht-shahah, Pers.; etéri, Pmadi, Kangori, kango, chakra-bhenda, Bomb. and Durb.; Dabali, Guj.; Balbji, Cutch; Khapato, Sind; Poteri, tip-badi, Goa; Tattia, uarcm, Malat; Shrimudrigada, Kan.; Tutt, berun-tutt, Tam.; Tututa-benda, ngu-benda, tutiri-chettu, Tel.; Anoda-gah, Singh.; Bom-bhe, bon-bhoye, tha-ma-chok, Borm. The seeds are known as balbji, Borm.

References.—Drury’s U. P., 4; Rosh., Fl. Ind., Ed. C.B.C., 518; Atkinson’s N.W. P. Gaz., X., 725-791; Stewart’s Ph. Pl., p. 21; Dalm. and Gib.’s Bomb. Fl., 18.

Habitat.—A small shrub, common throughout the hotter parts of India.

Botanic Diagnosis.—Leaves cordate, entire or toothed, closely felted with white down on both surfaces. Sepals ovate, acute. Carpels 15-20, when ripe longer than the calyx, glabrescent, truncate, or shortly awned, awns spreading. Flowers yellow, opening in the evening. Peduncles longer than the petals, joined near the top.

Properties and Uses—

Fibre.—The stems contain a good fibre, suitable for cordage. (See remarks under A. Africana.)

Medicine.—The leaves yield a mucilaginous extract, used as a demulcent.

From the roots an infusion is prepared and given in fevers as a cooling remedy; said also to be useful in the treatment of leprosy.

The seeds are considered laxative and demulcent, and are given in the treatment of coughs. They are generally known by the name of Balbji, especially in Western India; they cost about 86 per maund. The bark is astringent and valuable as a diuretic. The bark, roots,
leaves, and seeds are used in native medicine, and said to be useful in
chest affections. An infusion of the leaves or of the roots is prescribed in
fevers as a cooling medicine (Ainslie). The seeds are used as a laxative
in piles. In Bombay, they are supposed to be laxative and demulcent,
as like the leaves, are very mucilaginous. A. indicum and A. asiaticum
are used indiscriminately, if not also one or two other species. A decoction
of the bark, leaves, and seeds together has been long used by the
Hindus on account of its mucilaginous and diuretic properties, much in
the same way as the Marsh-mallow of Europe. (Dymock, Mut. Med.,
Western India.)

§ A decoction is used as a mouth-wash in cases of toothache and
tender gums. Boiled milk, whisked with the fibrous twigs, coagulates; the
fluid obtained on decantation is by hakims regarded as efficacious in hemorr-
hoids when given internally." (Surgeon G. A. Emerson, Calculia.)

"The seeds are reckoned aphrodisiac. The leaves are cooked and
eaten in cases of bleeding piles. The infusion of root is useful in stran-
gury and hematuria." (Surgeon-Major D. R. Thompson, M.D., C.I.E.,
Madras.) "Dose, half to 2 drachms, laxative and demulcent, invariably
used in combination with other purge medicines." (Surgeon W. R.
Barren, Bluf, Cutch, Bombay.) "A decoction of the leaves is used in
gonorrhoea and chronic bronchitis." (J. Norman, Chatrapore, Ganjamb.)
"A mucilaginous decoction used in gonorrhoea and inflammation of the
bladder." (Surgeon J. Anderson, Bijnor.) "The seeds are burned on
charcoal and the recta of children affected with thread-worm are exposed
to the smoke. It is said to be a very rapid and certain cure, but I have
never tried it myself." (Surgeon-Major C. W. Calhrop, Morar.)

Abutilon muticum, G. Don.; Fl. Br. Ind., I., 327.
Syn.—Sida tomentosa, Roxb., Fl. Ind., Ed. C.B.C., 518; Dals. & Gh.'s
Bomb. Fl., 16.
Habitat.—An erect annual, native of rubbish heaps, road-sides, hedges,
Scx., where the soil is good; met with in the North-West Provinces
and Western Peninsula.
Fibre.—Yields a fibre.

A. polyandrum, Schlecht.; Fl. Br. Ind., I., 325; Atkinson, Gaz.,
N.-W. P., X., 791; Dals. and Gh.'s, Bomb. Fl., 17.
Syn.—Sida polyandra, Roxb.; Fl. Ind., Ed. C.B.C., 516.
Vern.—Veli-s-thutthi, Tam.?
Habitat.—A native of the North-West Provinces, tropical Himálayas,
up to altitude 3,000 to 4,000 feet, Western Peninsula, Nilgiris, and Ceylon.
Fibre.—It yields a long, silky fibre, resembling hemp.


A genus of spiny or prickly shrubs or trees belonging to the Natural Order
Leguminosae and constituting the most characteristic group of the Sub-
Order Mimoseae. It comprises in all some 430 species, of which the foliifer-
ous are cosmopolitan to the tropics, and the phyllodinous (comprising two
thirds of the genus) almost restricted to Australia. The genus is charac-
terised by having small flowers aggregated into rounded or elongated heads.
Each flower or rather floret has its calyx and corolla regular and valvate.
The stamens are indefinite and free.

In India there are 18 species, chiefly distributed throughout the plains,
two species ascending the hills to altitude 5,000 feet. The following are
those of economic interest.
<table>
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<th>ACACIA arabica.</th>
<th>Indian Gum Arabic.</th>
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<tbody>
<tr>
<td><strong>Acacia arabica</strong>, Wild. ; Fl. Br. Ind., II., 293, Leguminosae.</td>
<td><strong>Indian Gum Arabic Tree.</strong></td>
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</tbody>
</table>

**Syn.** — Mimosa arabica, Lamk.; Acacia vera, Willd.; A. Nil; Defr.

**Vern.** — Babul, babar, bahle, khan, Hind., Beng., Pl.; Vahbila, bah Sars. (Dr. Rice says these are doubtfully Sanskrit words or Sanskritized); Umaghilian, Arab.; Khiru-mughalin, Pers.; veleum, kah-saylam, kar-saila (by Clegborn), Tam.; Zama, nallatunuma kara (by Clegborn), Tel.; Gobli, karri-fiula, Mybore; Kan.; Babhila, koli-kikar, rama-boli, Bomb.; Baval, Guj.; B. babhila, koli-kikar, Sind.; Behli, C. P.; Bahur, Santal.; Baholna, (S. P.); Huan-lon-kyating; Burma. (Contributed by A. M. Bucha Sant, Africa.) In kanarese, mara (tree), chuukle (bark), chipa (leaves are often given as pot-trees; jhill-maras = jhill-tree.


**Habitat.** — Panjab to Behar, Western Peninsula, and Ceylon. Cultivated throughout the greater part of India save in the moist humid regions on the coast and in the extreme north-west beyond the Jhelum. One of the commonest plants of the Deccan, but, except where planted, it is found in the Panch Mahals; it covers most parts of Surat and Gujarát. It is common in the Upper Godaveri, and is the most abundant plant of the Chittoor district, Ind. An experiment to introduce the tree into Kashmir failed. It is also absent from Assam and the greater part of the warm districts of Eastern Bengal, British Burma, and Mânipur. It becomes smaller in stature on approaching the coast, attaining its greatest valence and most prolific condition in lower and middle Sind. It is indigenous to the Panjab, although plentiful, attaining a girth of 8 feet in the submontane districts; nor is it indigenous to Madras, although it grows plentifully near villages and on waste lands, especially on cotton soil. Very common in East and South Mysore. It prefers a soil to a moist soil, and seems to avoid the influence of the sea. There is never leafless, but the fresh foliage appears in February to April (Brandis; Stewart).

**Botanic Diagnosis.** — An erect shrub or tree, with straight stem. Leaves composed of from 6-12 pins and 20 to 40 leaflets. Flowers rounded heads, axillary; supported upon short peduncles with the flowers above the middle. Pod stalked, straight, sub-indescent, persisting grey-downy, with suturets deeply indented between the seeds; seeds yellow.

This species belongs to the series Gummifera globifera or arborea, and is one of the Acacias with globular, axillary flower-heads, and straight long seeds. This series contains the following species:—

A. arabica, A. eburnea, A. Farnesiana, A. Jacquemontii, A. phloea, and A. planifrons, which compare.

For series Gummifera spicatae see A. Catechu, and for series Vulsee A. concinna.

**Properties and Uses.**

**Synopsis of Products and Economic Parts of the Plant.**

1. It yields a Gum, in India used by the calico-printer and for other medicinal purposes; as a medicine by the natives, and to a certain extent as an indifferent substitute for true gum arabic. In times of scarcity it also constitutes an important article of food.

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2. The Bark is largely used by the Indian tanners in the preparation of leather, and also as a dye. It is a valuable astringent medicine, extensively used by the natives, and in Indian European medical practice as a substitute for oak bark. It is also used to flavour native spirits.

3. The Pod has recently attracted much attention as a tanning material, containing a high percentage of tannin, and imparting a good and uniform colour to the leather. From the immature pods, by expression and inspissation, an extract was formerly prepared. This was known to the ancients as Acacia vera success, and was highly prized by the Greek medicinal writers. From them the virtues of this Acacia extract passed doubtless to the Arabs, and, at the present day, a drug known as akaka or akasia (or acacia) is regularly imported into Bombay from Turkey and Persia, and kept by all Mahomedan druggists in India.

4. The Leaves are used as a tan and dye; they are often eaten; and constitute an important fodder in times of scarcity.

5. The Timber is highly valued because of its hardness and durability. One of the principal trees in the Panjāb for the rearing of lac insects (see "Lac").

THE GUM.

Vern.—Babul-ki-gond, kikar (or kikar) ki-gond, Hind.; Bāblā-āṭhī, bāblā-gond, Beng.; Kālī-kikar-ki-gond, Duk.; in Tam. pittin, and in Tel. and Mal. pakhā are added to the respective vernacular terms for the tree to denote the gum. According to Mooden Sheriff, kula barbāra-nirvīśam is the Sanskrit for this substance. Samghul, Hind., Arab. Dr. Rice writes that kula barbāra nirvīśam is only a modern attempt to render in Sanskrit. It means the juice of the black barbāra, whatever the latter may be.

Dr. Dymock says: “There appears to be no mention of Gum Arabic in Sanskrit works.” The Arabic and Persian name Samgh-i-Arabi given to this gum is more correctly the name for the True Gum Arabic than for the Indian Gum Arabic, which is sometimes called babul-gond. Commercially the gum from A. arabica is known as Morocco or Brown Barbary Gum or Mogador Gum—Gum Gattie according to Atkinson. The name Indian Gum Arabic must be carefully distinguished from the commercial term East Indian Gum Arabic. Many authors use these incorrectly as synonyms.

This gum is a tolerable substitute for the True Gum Arabic, but the mucilage is weak, and the red colour often objectionable. It exudes chiefly in March and April, each tree yielding about 2 lbs. In the beans it occurs in the form of irregular and broken tears, agglutinated in masses, each tear about half an inch in size, and of a brown or red to light straw colour.

For the chemical composition of Gum Arabic, see A. Senegal.

Trade and Commerce.

External.—The subject of the identification of the true Gum Arabic of Europe is one still involved in considerable obscurity. The term Gum Arabic is of course incorrect, little or no gum ever having come from Arabia. Several species of Acacia yield gums, belonging to the Arabic series, and these, mixed together or distinct from each other, but more or less adulterated with foreign matter, reach Europe, and are by the dealers classified into geographical varieties, to which, according to their purity, are attributed certain commercial values. The principal English supply is from Egypt; France obtaining its gum from Senegal. The so-called East Indian gum, which is exported from Bombay to England, to the continent of Europe, and to America, is first imported into Bombay from the Red Sea ports. Except as adulterating this so-called East Indian gum, it is doubtful if
ACACIA arabica. | Manufacture and preparation of the Babûl.

any Arabic gum of Indian origin ever finds its way to Europe. The impurities of the East Indian gum are said to be chiefly a substance resembling Bassora (readily distinguished by its insolubility in water), and a resinous substance belonging to the turpentine series. It would seem that the subject of our Arabic gums has not hitherto obtained the attention which it deserves. The various species of Acacia, wild or under cultivation, should be critically examined and their respective gums carefully collected; the area under each, and the present and prospective supply of gum, accurately recorded. It would, of course, be of little importance to attempt to calculate the probable number of trees scattered here and there over the country near villages—the forest tracts or areas where gum-yielding trees form the prevailing feature are those of importance. Were this to be done, and a report published and forwarded to Europe along with a complete set of samples, a future trade would, for certain, develop—"a trade which would soon check the anomalous importation of African gum, and become a new source of revenue to India and her people. When it is recollected that all the Egyptian and African species which yield the true Gum Arabic of European commerce are either wild by India or are extensively cultivated or naturalised, it is remarkable that no effort should have been made on the part of India to compete with Egypt and Africa. The commercial gums known as Moroc, Mogador, or Brown Barbary gums are derived from A. arabica, Willd. They are described as consisting of tears or broken pieces of a light dusty-brown tint. When dry they are permeated by cracks and are very brittle. They are perfectly soluble in water. (For further information consult A. Catechu and True Gum Arabic under A. Senegal.)

Internal.—While our Indian gums are little if at all exported to Europe, babûl-gônd constitutes an important article of internal trade. But even in this trade there is a great deal of uncertainty, which a little careful investigation might easily enough remove. It seems probable that the finer qualities of babûl-gônd sold in our bazars may prove to be Senegal gum or white sennar (the true commercial Gum Arabic), the confusion in calling babûl gum Gum Arabic having arisen in all probability from the fact of the scientific name Acacia arabica having been given to this species. The babûl-gônd or khär-gônd of the bazars is rarely pure, being mixed with mechanical impurities, and adulterated with other gums. The following are the gums generally mixed with each other and sold as babûl-gônd: the true Gum Arabic obtained in Sind from A. Senegal (the khòr, Sind, or kuma, Rajputana), A. Catechu gum (the khûr), A. Farnesiana (the Cassie or Vilayati-babûl), A. Lenticularis (khûr), A. Modesta, (phulâta), and several gums obtained from various species of Albusia.

Manufactures and Preparations.

Babûl-gônd is extensively used by the calico-printers. For certain colours a mixture of this gum, with that obtained from Anogeissus latifolia, the dhawa, is regarded as most serviceable, and this mixture is likewise used to stiffen dyed fabrics and to give them a polish. It is also said to be used extensively in precipitating the indigo fecula. With turmeric (hûlûti) dye the Dhawa-gônd is used alone, while with madder the babûl-gônd is regarded as most efficacious.

(For the "medicinal" uses and properties of this gum and for its value as an article of "food," see the remarks under those sections.)

THE TAN.

The bark (babûl-bi-chhâl, Hind., or kas or sîk in N.-W. P.) is a powerful astringent, and is one of the tanning substances most extensively used in India. There seems no reason why this might not
The Babul—A Tan of much value.

It is obtained by felling the trees 8-10 years old, and cutting them up into pieces $2\frac{1}{2}$ by 3 feet in length, the bark being removed when green. To do this the logs are beaten until the bark is removable, the wood being sold as fuel. The bark in appearance consists of reddish-brown slabs, hard and rough, with longitudinal fissures, the inner surface being smooth and fibrous. Recent experiments made by Mr. W. Evans, one of the best practical authorities upon tanning, in his laboratory at Taunton, have shown this bark to contain 18.05% of a beautiful cream-coloured tannin, when precipitated with gelatin. There is at present no exportation of babul bark to speak of, but there seems every chance of a future trade developing. Mr. Christy, in his New Commercial Plants, suggests that the bark, pods, and twigs should be used in the preparation of a tanning extract which apparently he recommends should be prepared in India, and in that condition, instead of as bark, the babul tan should be exported. In a correspondence with the Provincial Agricultural Department the Government of India obtained much new information regarding the prospects of a future trade in this bark. In that correspondence Mr. J. S. Gamble, Conservator of Forests, Northern Division, Madras, suggested that if grown for its bark, *Acacia arabica* "would probably be found most profitable," if treated "in coppice and cut over every 8 to 10 years." "It would therefore require to be planted close, say, 100 x 100', or, still better, propagated by broadcast sowing": "the wood could, at the time of cutting, be also easily sold at good rates in any locality away from the large forests where babul is grown."

The pods (babul-sengri) are also used as a tan, imparting a buff colour to the leather. If it is desired to cultivate the tree on account of its pods, Mr. Gamble recommends that it should be planted at first 15 feet apart and thinned out to 30 feet. A proper amount of air and sunshine is essentially necessary for the full development of the fruit. This would give about 48 trees an acre.

An enquiry has recently been received by the Revenue and Agricultural Department of the Government of India from the Berlin Leather Trades Association, through Messrs. Fischer & Co., of Bombay, regarding what appears to be the babul pods. The Association writes that a small pod known under the name of *bablab* (? babla, the Bengali for *Acacia arabica*) formerly imported from the East Indies and partly also from the African coast, has of late years entirely dropped out of the market. On being boiled it gave a dull decoction of a light grey-yellowish colour. This colour became evenly diffused, and was specially serviceable for sheep-skin. "It is earnestly desired to recover again this tan and dye-stuff." I have taken the liberty to publish the substance of this correspondence, since by doing so this may lead to the resuscitation desired. There seems little doubt that the so-called *bablab* referred to by the Berlin Leather Trades Association is the pods of the common babul. It is chiefly as a leather dye-stuff that the Berlin Association wishes to recover the pods. Speaking of these pods Mr. Christy, in a letter to the *Tropical Agriculturist*, Vol. 3, p. 90, states that they had been submitted to a chemical examination and were found to contain 60 per cent. of tannin. The seeds are worthless and should be rejected. He also adds that by means of this tanning agent a beautiful light-coloured leather was produced. Valonia yields only 25½ per cent. of tannin and sells for £18 per ton. When once the babul pods come into the market as a recognised tan, Mr. Christy anticipates they will fetch £40 a ton. If this statement be correct it is remarkable that a large trade does not already exist in it.
ACACIA arabica. The Babul—Dye, Fibre, Medicine.

should not already exist in babul pods, and still more so that such a apparently did exist but has now died out. Mr. Buck, in his Dye Plants of the North-West Provinces, says: “The babul pods are used in tanning in the villages of the Cawnpore district, and when nothing else is obtainable the leaves are employed as a make-shift.” But of the he says “it is the commonest and most effective tanning agent” used these Provinces.

The leaves alone are, in some parts of the country, used as but chiefly as a substitute for the bark. By the native tanners in the bark is regarded as a much more powerful tan than the pods fact somewhat at variance with Mr. Christy’s anticipations.

THE DYE.

As a dye-stuff the boiled pods are often used, especially in the North-West Provinces, constituting the black colour known as siyah-di this, with a subsequent application of a solution of sulphate changes the black into shades of grey ranging to dark brown, giving to the colour known as Agrai-khaki. Both colours are fast but the most objectionable. In combination with the barks of Acacia Catech Butea frondosa rich brown colours are also produced. The pods and with alum as the mordant, yield dark brown shades approaching to In Upper India the pods are largely used by the dyers both as a resource of colour and as an accelerator to other dyes. In addition local supply, which, in the warm, dry regions of the central and north tracts of India, is very considerable, large quantities are brought forests, Kumaon alone sending some 30 cwt., valued at Rs. 400. price in Calcutta of the dried pods is from 2 to 3 annas a lb.

§ “The bark furnishes a dye largely used by the natives.” (Sur S. H. Browne, M.D., Hoshiarpur, Central Provinces.)

THE FIBRE.

The bark of the slender twigs yields a fibre, which is used Panjáb for the manufacture of paper. It is also made into coarse rope.

MEDICINAL PRODUCTS.

The true Gum Acacia is used in the preparation of the much the Pharm. Ind. says that the gum of Feronia Elephantum, a better substitute for this than the gum from A. arabica. Gum is as a demulcent, and along with water as a vehicle for bismuth, of zinc, or other insoluble substance and also in lozenges.

§ “I do not agree with this remark; the gum of Feronia Elephantum is much inferior in various respects to that of A. arabica.” (Deputy Sur General G. B. Sidle, M.B., C.I.E., Madras.) “Gum Acacia is also adminto recently-delivered women as a tonic.” (Surgeon H. Mcllman, Bombay.) “The gum is largely used in the form of a mucilage in diarrhea and dysentery.” (Bhagwan Das, Rawal Pindé.) “Some native asy the gum is very useful in diabetes mellitus, as the gums not con into sugar. The bark and seeds burnt and powdered are used as powder.” (Surgeon Emerson, Calcutta.) “The powdered gum is combined with quinine, in fever cases complicated with diarrhoea dysentery.” (Brigade Surgeon Shereur, Moorthabad.) “The mucilage in its simple form used as an injection has been found to allay the irrit of gonorrhoea, and to lessen the discharge. It has also been found rectal irritation in the diarrhoea and dysentery of children, when as an injection.” (Peter Anderson, Gunur, Madras Presidency.)

“Acacia arabica” mucilage I have used in cases of cystitis with effect.” (Surgeon-Major J. J. L. Ratton, M.D., Salem.) “An in A. 109
or decoction of the bark is used as gargle for sore-throat and stomatitis. The juice of the tender leaves is dropped into the eye for epiphora and conjunctivitis. The gum is fried in ghū and made into sweetmeat for the use of women in childbirth.” (Surgeon-Major J. Robb, Ahmedabad.)

"Decoction of bark useful in chronic dysentery and diarrhoea as an astringent enemata. Useful gargle in spongy, bleeding gums and mercurial salivation. Excellent mucilage from gum used in gastro-intestinal irritation.” (Surgeon Shib Chunder Bhattacharji, Chando, Centl. Proc.)

The bark is a powerful astringent; recommended to be made officinal. It occurs in coarse, fibrous pieces of a deep reddish colour. It may be used in external applications as a substitute for oak-galls. It has been found a valuable remedy in prolapsus ani, as an external applicant in leucorrhoea, and has been recommended as a poultice for ulcers attended with sinuous discharge. (Pharm. Ind.) As a substitute for oak-bark, babul is now issued to the Government hospitals and dispensaries in India. I am informed that the powdered dry bark dusted over sores or ulcers on the lips of horses is one of the best cures for these troublesome affections. A similar powder is used in the treatment of snake-bite.

§ "I have frequently used the decoction of Babla bark as a substitute for oak-bark for vaginal injections. It might take the place of imported oak-bark.” (Surgeon C.H. Joubert, Darjiling.)

"In addition to the ordinary uses of the gum and the bark, I have frequently used the decoction of the bark as an astringent injection in different forms of leucorrhoea and found it to be more efficacious and less irritating than the alum and zinc injection generally used.” (Doyal Chunder Stone.) "Useful as a gargle in relaxed sore-throat.” (Surgeon J. Anderson, Bijnor.) "The infusion is useful as an injection in whites.” (Surgeon-Major G. Y. Hunter, Karachi.)

"Babul Bark Mango Water...

1½ oz. each.

20 oz.

Boil for half an hour, filter, and make a gargle: said to be used in mercurial salivation.” (Surgeon J. Parker, M.D., Poona.) "A decoction of the bark is used by women in menorrhagia and leucorrhoea, and is said to be efficient. The decoction is also used in caries of the teeth as a mouth-wash. The young leaves in doses of 2 drachms are used in gonorrhoea with good effect.” (Narain Misser, Hoshangabad, Central Provinces.)

"The bark of the *Acacia arabica*, combined with the bark of the Banyan tree (*Ficus bengalensis*), after being infused, has been frequently used by me as a gargle in relaxed sore-throat with excellent effect. Strong infusion of the above barks has also been used locally in cases of excessive bleeding from hemorrhoids with very good effect. The dissolved gum with bismuth is very effectual in checking diarrhoea arising from intestinal irritation.” (Honorary Surgeon Easton Alfred Morris, Naga-

Pods

The dried pods reduced to a powder are sometimes given internally as an astringent.

"The powder of the tender legumes of *A. arabica* is astringent and demulcent, and has a beneficial influence over diarrhoea and dysentery. Its usefulness is much enhanced by the combination of some preparation of opium. It is generally more useful for children than adults.” (Honorary Surgeon Moeedan Sheriff, Khan Bahadur, Madras.)

An extract prepared from the young pods of this and allied species constituted the famous *Akhania* of the ancient Greeks. This extract was at one time much extolled, and its virtues were doubtless ultimately made

A. II5
ACACIA arabica.

The Babīl—Opinions of Medical Officers.

Known to India through the Arabs. At the present day it is largely imported into India from Turkey and Persia, and under the name akaka or akakia or akhdakhiyā (acacia) is sold by all Mahomedan druggists. According to Dymock “it should be heavy, hard, and have an agreeable colour; small fragments held between the eye and the light should be of a bottle-green colour; when seen in bulk it appears black. It is considered to be cold and dry, astringent, styptic, and tonic, and is used internally and externally in relaxed conditions of the mucous membranes; also as a collyrium in purulent conjunctivitis and chronic congestion of the vessels of the conjunctiva. Applied as a lotion, it is said to improve the complexion. With the white of an egg it is applied to burns and scalds. Powdered it arrests hemorrhage; in short, it is used in all cases in which an astringent is applicable.”

A decoction of the bark mixed with milk, according to Mr. Baden Powell (Punjab Products, Vol. I, p. 345), is in Delhi and Lahore evaporated into the akakia juice. The term akakia is apparently incorrectly applied to this decoction, but the preparation is nevertheless an interesting adaptation of the ancient akakia or akhdakhiyā. It is said to be made into dark flat cakes with a sweet astringent taste. It is regarded as acting as a demulcent and astringent, and is said to be prescribed in coughs. There is probably some mistake regarding the source of these cakes. It is difficult to see how they could be sweet if prepared from the bark, unless sweetened through some action upon the milk.

I have often used the decoction of the bark as an injection in chronic dysentery with relaxed state of the rectum, when, with tolerably healthy motions, a little mucus is passed. The injection reduces the quantity of the mucus, sothes the irritability, and gives tone to the mucous membrane. I have also used the decoction in acute congestion of throat with success.” (Surgeon D. Basu, Faridpur.) “The bark contains a large quantity of tannin; a decoction of it, as a local application, is most useful in cases of prolapsus uteri and of prolapsus ani, and in other uterine and vaginal affections of an asthmatic nature.” (Brigade Surgeon S. M. Shirecore, Moorshedabad.) “The decoction of the bark is used as an astringent in diarrhoea and dysentery, also as an injection in gleet and leucorrhoea, and as a wash for hemorrhagic ulcers, also as a gargle in affections of the mouth and throat. The tender leaves are sometimes used in dysentery as well as in diarrhoea.” (Brigade Surgeon J. H. Thornton, B.A., M.B., Monghyr.) “A decoction of the bark is used as an astringent gargle in ulcers of the mouth. The tender growing tops rubbed into a paste with a little sugar and water is given morning and evening as a demulcent to allay irritation in acute gonorrhoea.” (Surgeon-Major Bankabehari Gupta, Pilibhi.)

Leaves.

The tender leaves beaten into a pulp are given in diarrhoea as an astringent (U. C. Dutt). Mixed with the leaves of the pomegranate this pulp is also given in gonorrhoea.

§ “The young leaves are beaten up with black pepper and sugar, and given in haematemesis.” (Surgeon-Major C. W. Calthorp, M.D., Morar.) “The powdered gum is lightly fried in ghū and used as an aphrodisiac. The tender leaves, fried in ghū, are used as a poultice over the eyelid to remove chronic congestion of the conjunctiva. The bark is said to possess antisyphilitic properties.” (Surgeon-Major D. R. Thompson, M.D., C.I.E., Madras.) “The tender leaves, bruised and mixed with human milk, is used in conjunctivitis as a poultice, or the juice mixed with milk is dropped into the eye. The burnt bark mixed with salt and burnt almond shell is used as a tooth-powder in Southern India.” (Surgeon-Major John Lancaster, M.B., Chittore.)
The Babül—Food, Fodder, Timber.

FOOD.

The gum is highly nutritious, and to a limited extent forms an article of food, largely so in times of scarcity; in fact, there are few trees more valuable to the cultivator than the babül. It yields his most valuable timber while luxuriating on the poorest waste lands, and even in seasons of drought it is evergreen. Its bark forms a useful domestic medicine, and along with the leaves and pods it is also used in dyeing and tanning. The leaves are a never-failing source of fodder, and the gum an article of food; each tree yielding about 2 lbs. In times of scarcity even the ground bark mixed with the seeds of the *Seamum orientale* may be used for food.

FODDER.

The green pods with tender shoots and leaves are given as fodder to cattle, sheep, goats, and camels; and are specially valuable for this purpose during a season of drought when other fodder fails. In the drought of 1877-78 the road-side trees in the North-West Provinces were denuded of leaves for this purpose, and this resource saved numbers of cattle. In ordinary seasons goats are largely fed upon the pods; hence, in all probability, the rapidity with which the plant becomes diffused over the country, springing up self-sown on the banks of tanks, rubbish heaps, and walls. It is remarkable that sheep and goats not only eat but eat greedily a substance which is stated to contain so much of tannin. Balfour in his *Cyclopaedia*, however, says it is only the seed that is given to sheep, but his statement is at variance with that of all other authors, the whole pod being given.

THE TIMBER.

Structure of the Wood.—Sapwood large, whitish; heartwood pinkish-white, turning reddish-brown on exposure, hard, mottled with dark streaks. It consists of darker and lighter coloured bands of an equal width. Weight about 54 lbs.

It is very durable if well seasoned. Used extensively for wheels, wheel-barrows, sugar and oil presses, rice-pounders, ploughshares, agricultural implements, and tool handles; in fact, for all purposes for which a bent hard wood is required. In Sind it is largely used for boat-building, rafters, and for fuel; also, occasionally, for railway sleepers. One of the most valuable timbers for tent-peggs.

The lighter-coloured sapwood of this tree is subject to be attacked by whiteants, the heartwood much less so if properly seasoned. A good tree will sell in the Panjáb for as much as Rs.30 or more; one of the best trees for broad-cast sowings in the reclamation of waste lands, because independent of rain. It is said that seasoned wood will only float for a few days. The Sind and the Madras Railway Companies refuse to use babül as a fuel from an idea that the pyrolygenous acid injures the boilers. It is, however, largely used for this purpose by railways in other parts of India.

DOMESTIC USES.

The bark of the roots is used to flavour native spirits and to assist the fermentation of the sugar. The bark is also stated to be used as a substitute for soap. The green pods are made into ink. The young thorny twigs are universally used for temporary dry fences to protect certain crops, and large bundles of the boughs are used by the fishermen as decoys. In the rivers of Assam these decoys end in cone-shaped baskets placed on the margins of the streams sloping down water. Every now and then they are raised from the water, and the fish, unable to escape through the decay in time, are caught in the basket or amongst the
### Dictionary of the Economic

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<tr>
<td>Fish Decoys.</td>
<td>Thorny twigs. In the tanks and lakes of Bengal similar decoys are submerged, and alongside of these, or imbedded between passages in the decoy, traps of various forms are placed. The sharp spines are made into the common fishing-hook used in Bengal. A portion of the twig is removed along with the spine, the string being tied to the hook so that the spine points upwards. Young fresh twigs are in Bengal used as tooth-brushes.</td>
</tr>
<tr>
<td>131 Fishing-hooks.</td>
<td>§ “The bark is extensively used in the preparation of country liquor.” (Bhagwan Das, Rawal Pindi.)</td>
</tr>
<tr>
<td>132 Tooth-brushes.</td>
<td>“The bark is largely used for the distillation of rum. Before distillation takes place it is steeped in water with molasses for a few days. For loose teeth and tender gums, the young stems are used largely by the natives for rinsing the teeth daily.” (Assistant Surgeon S. N. Dey, Jeypore.)</td>
</tr>
<tr>
<td>133</td>
<td>CULTIVATION AND RE-AFFORESTATION.</td>
</tr>
<tr>
<td>134</td>
<td>The extended cultivation of this species and of the allied gum-yielding Acacias cannot but be attended with the most beneficial results to the country. As an agent to improve sterile tracts of country, or to arrest the destructive development of the efflorescence known as red, the most sanguine expectations may be entertained. It should not be cultivated longer than has been found necessary to neutralise the soil, because babul is an exhaustive crop. In fact, the moment babul has taken a hold of the soil the improvement may be regarded as established, and should the soil be desired for other purposes the babul should be early removed. There are extensive tracts of country highly suited for the cultivation of the gum Acacias, and tracts, too, where this crop would prove far more productive than the futile efforts which are now being spent upon them. The extended cultivation of the babul as a hedge to protect the fields and roads would greatly help to avert the dangers of a season of temporary scarcity both to men and cattle. Oleghorn says “it is of rapid growth, and requires no water, flourishing in dry arid plains, and especially in black cotton soil, where other trees are rarely met with.”</td>
</tr>
<tr>
<td>Improvement of waste lands.</td>
<td>§ “One of the best subjects for planting in poor soils or exposed situations. During long periods of intense drought it continues to flourish.” (J. Cameron, Esq., Bangalore.)</td>
</tr>
<tr>
<td>A. 134</td>
<td>“It is said that the seed collected from the litter of goats germinates more freely, and such seed is sometimes collected for sowings. If sown thick in a road, well, or ditch in the rains, it will, under favourable circumstances, come up as a wood-hedge. It is one of the most useful trees for broadcast sowings; the seed germinates so easily, and it is so hardy and independent of rain. In the drier districts it should be planted as a thick belt along all roads to form a roadside avenue. There would then be a vast supply of fodder available when rain failed. This is being attended to in this division.” (W. C. Coldstream, Esq., C.S., Hisar, Panjâb.)</td>
</tr>
</tbody>
</table>
| The seed is gathered in April, and by the native cultivator it is coated with cow-dung and kept in that condition until July, when it is sown at once into the spot where it is intended the tree should be allowed to grow. It requires no further care except to protect the young seedling from being browsed upon by animals. Stewart states that in the upper parts of the Gangetic Dûsb it is raised by cuttings. Major Pitcher, Agricultural Secretary to the Chief Commissioner of Oudh, writes me that the best mode of propagating babul is to fold sheep previously fed on babul seed on the field where it is desired to plant the trees; or to carry the dung to the field and plough it in, when the plants will spring up like corn. He also informs me that Dr. Bonavia tried an experiment with a number of trees to discover which could withstand repeated swamping. All died except the babul, which continues to flourish on the banks of the Guûnt, where
they are annually flooded. The bahál would, therefore, prove most useful upon embankments to break the force of water in storms or during floods.

Gamble writes that it is an extremely useful tree in the re-afforestation of waste lands, being associated with Albizia Lebbek, Balanites aegyptiaca, Parkinsonia aculeata, the tamarind, margosa, and wood-apple. These plants constitute the most prevalent association of trees met with in the warmer parts of India. The bahál is ready for barking in eight to ten years. It is then cut down and renewed by fresh seedlings, or the ground, after this season of repose and leaf-manuring, is brought under other forms of cultivation. A full-sized tree, eight to ten years old, will yield half a ton of bark. The gum-yielding property increases with age, the gum exuding naturally from the bark, or accelerated by artificial scars. Stewards of a tree at a Mussulman shrine close to Lahore is said to be over 100 years old, which is popularly reputed to have shed blood when sacrilegiously cut by the Sikhs.

Acacia Catechu, Willd.; Fl. Br. Ind., II., 295; Roxb., Cor. Pl., t. 175.

This is the plant which yields—

Catechu, Cutch, Catechu Negrum, Pegu Catechu, Eng.; Cachor, Cachou, Fr.; Katechu, Germ.; Catechu, Catein, Caltó, It.; Catecu, Sp.; Cutch, Port.

Sometimes called Terra Japonica, a name which more correctly means Gambier.

§ "Perhaps it would be better not to call this the true catechu, as the C. pallidum is now the official variety in British Pharmacy."

(Deputy-Surgeon General George Bidie, M.B., C.I.E., Madras.) "The name Catechu pallidum has always been given to Gambier, and the word Catechu was originally applied to Cutch, which is official in America." (G. W.)

Syn.—Mimosae Catechuoides, Roxb.; Acacia Catechuoides, Wall.; A. Polyacantha, Willd.; A. Sundara, Bedd.

Vern.—Khair, or khair-hadó, kotka, Hind., Duk.; Khayer, kath, Beng.; Khair, Santal.; Khoira, koir, kat, Ass.; Vidalam, vadalal, karan-gali, bág, vadalior, wadhalale (by Clegborn); & kasku bátti, wothalay, Tam.; Pendana-manu, kavíri sandra, nallaandra, Tel.; Khadiria, Sans.; Khoira, Sriya; Kajli, kogali, tare (in Myser.), Kan.; Khaderi, khaira, khera, Bom., Mar.; Kher, Surat, Baroda, Guj.; Khair, C. P.; Rothkiri, Singh.; Sh., Burm.

"The khadira tree is mentioned in the Vedas, where it is used as a simile for 'strength,' &c. (Dr. Ch. Rice, New York.)


Habitat.—Common in most parts of India and Burma, extending in the Sub-Himalayan tract westward to the Indus and eastward to Sikkim, attaining to altitude 5,000 feet. Mr. J. W. Oliver reports that trees 70 to 80 feet high, with a girth of 8 to 9 feet, are not uncommon in the North Tharrawaddy Reserves. In Burma it grows in the dry forests all over the plains of Pegu; rare in the savannah forests; common in the northern part of the Irrawaddy (Burm. Gaz., I., 128). In the Central Provinces it is plentiful in the forests of Bilaspur, Chanda, and Raipur. It is remarkable that in Raipur the natives seem to be ignorant of its value, no attempt, as far as is known, having ever been made to extract the Catechu

A. 135
ACACIA

Catechu Gum.

(C. P. Gas., 219). In Gonda, Oudh, it is abundant, also in the forests of the Upper Godavery, spreading through the forests of Chutia Nagpur to the North-West Provinces. In the Bombay Presidency it is most abundant in the forests of Ahmedabad, Broach, the Panch Mahals, Surat, and Baroda. In Madras the tree is by no means uncommon, but the natives appear to know nothing of its properties. It is also met with in some parts of Mysore, where it is even common.

Botanic Diagnosis.—A moderate-sized, deciduous tree, with dark brown, much-cracked bark, and short-hooked spines in pairs. Leaves composed of from 40 to 80 pinnae and 60 to 100 leaflets. Flowers white or pale yellow, peduncled, spikes in the axils of leaves; rachis downy. Corolla 2 to 3 times the tomentose calyx. Pod straight, strap-shaped, narrow, thin, dark brown.

This belongs to the series Gummierea spicata or arborescent Acacias, with spiked flower-heads and short recurved spines (except Latronum):—

A. Catechu, A. ferrugines, A. Latronum, A. lenticularis, A. modesta, A. Senegal, A. Suma, and A. Sundra, which see and compare with above diagnostic characters.

For series Vulgares see A. concina.

THE GUM.

This plant yields a pale-yellow gum, often occurring in tears one inch in diameter, generally less than half an inch in size. It is sweet to the taste and soluble in water; it forms a strong mucilage, and is a better substitute for true gum arabic than babul gum, with which it is generally mixed and sold as babul gond. The tears are mostly bright coloured, varying to dark amber. They occur chiefly in broken pieces, very much resembling large brown sugar, the fragments being cracked and granular.

A pure sample of Khar gond was, in 1873 sent from Chanda in the Central Provinces to London for report and valuation. It was pronounced as ordinary gum arabic and valued at 20s. to 25s. a cwt. The Deputy Commissioner, in sending the sample, remarked that by a little care on the part of the merchant, a large supply of gum, equal in purity to the sample supplied, might easily enough be procured, and that the ordinary mixed gum arabic of Chanda sold for about 25s. 4d. a cwt. landed in Bombay. The cost of collecting the gum in the forests was put down at £2-3 a maund (80 lb), carriage from forest to Bombay £1-4 a maund, and this gum might easily realise in London 20s., i.e., twice what it cost landed at Bombay. In the Ahmedabad district and Gujarát this gum is largely collected, as also babul gum, by the Bihils and sold either for grain or money or eaten by the poorer classes (Bomb. Gaz., IV., 24).

History of Catechu Gum.—No fresh effort appears to have been made to bring this gum to the notice of Europe, nor so to organise its collection that comparatively pure consignments might continuously find their way into the market. It is reported to be much superior to babul gum, and it would seem a large trade might easily enough be established; confidence in the supply, however, must be created before any extended trade is possible. Indian gums hold so low a position, at present, in the commercial world, that they require to be freed from an undeserved stigma. To accomplish this the most likely course would be to collect authentic samples as types upon which, in Europe and in India, all experiments, reports, and administrative assistance or encouragement might be based. It must be borne in mind, however, that vernacular names of bazar products are most untrustworthy, far more so than the knowledge which every uneducated native of India possesses in the plants of his district. Adulteration and substitution is practised very largely in India; and in different districts, still more so in different provinces, widely dissimilar products are
sold under the same vernacular names. The type samples require, therefore, to be collected from the individual plants and carefully examined both as to their physical appearance and chemical properties. So little is actually known regarding the subject of gums (even in Europe) that at present it is next to impossible to determine the botanical origin of a sample not accompanied with its geographical history, and even then a mere commercial approximation is all that can be arrived at. To remove this ignorance the greatest care is necessary, and it would be advisable to collect the type samples of each species of gum from one individual tree, and, if possible, say, during each of the great climatic seasons of the district—cold season, hot season, and during the rains. Such collections would enable questions of specific variation to be determined. It would also remove all doubt as to identity were a flowering twig of the tree to be dried and preserved so as to admit of botanical determination, together with a branch or log of the tree with gum exuding from it. The latter is necessary to afford some data by which the actual source or formation of each gum might be determined, for it is possible that the same tree may yield more than one gum.

Within the past few years the plants which yield the true commercial gum arabic have been pretty well determined, and it is important to note that all these are either wild or cultivated in India. To enable India to come into the field of competition with Egypt and Africa, the merits of the Indian gums must first be made known by some accurate and reliable mode such as has been indicated. When the gums obtained from Indian trees have been chemically and botanically examined and commercially tested, those most deserving of encouragement would be discovered, and we should be able to indicate to the merchant the provinces and districts where these were most easily and plentifully procurable. We should be able also to supply the merchant with the tests by which he could protect himself against adulteration and admixture. The possession of such a knowledge would, in time, check fraudulent action, and it would also act as the most powerful impulse to future progress, for, when freed of impurities, there does not seem any reason why a large trade should not be established in Indian gums. Nothing is so fatal to the development of such a trade, however, as adulteration and admixture, and it would seem that it is this that has prevented India from taking an important position as a gum-supplying country. Dr. Cooke, in his report on gums produced in India, says: "It is scarcely necessary to add that the gum must be unmixed. Two gums—it even may be that both are soluble—might not dissolve equally in rate or freely coalesce; this would be a disadvantage; but when two or more gums are mixed, of which one is insoluble in whole or in part, the whole sample is greatly deteriorated and reduced to almost the rate of the insoluble admixture. Hence then, commercially, it is of importance that gum should be (1) entirely derived from the same species of tree, (2) as light and uniform in colour as possible, and (3) free from all foreign admixture." In our Indian forests it frequently happens that two or more gum-yielding trees are found growing together, and the gums from these are indiscriminately collected together, the mixture being often reduced to a powder and sold in that condition with the object of preventing detection of the admixture and adulteration with sand or other non-gummy substances.

THE EXTRACT CATECHU OR CUTCH.

Veru.—Kat or Katth, kathā, Hind.; Kót, Mar.; Kátho, Guz.; Káshkattu, kášhu, Tam.; Káncchu, Tel.; Káthi, kášhi-káti, Mal.; Káchu, Kan.; Káipu, Cingh.

History of Catechu.—At the present day, by far the most important
The Extract Catechu or Cutch.

Product of Acacia Catechu is the resinous extract (Catechu) obtained by boiling down a decoction obtained from chips of the heartwood. The practice of preparing this extract has been handed down from remote periods. The Sanskrit authors mention the drug, and Barbosa, in his description of the East Indies, published in 1514, mentions what is, in all probability, this drug under the name Cacho. He states that it was at that time exported from Cambay to Malacca. Cacho is apparently the Kanarese word Kachu now applied to it. It is in fact probable that the word Catechu is a modern Latin derivative from the South Indian name, and that from South India the product was first exported. Some authors, however, say that it is derived from the Cochin Chinese word Cayca. One of the Tamil names for the plant is Katt, Kuti, or Cate, and the second half of the word may have been derived from Chunu, to drop or distil. Whatever may be the origin of the word Catechu, it would save much ambiguity if it could be restricted to the extract from Acacia Catechu instead of being made popularly to include one or two other substances such as Gambier, a word of Malay origin signifying bitter, and applied to a purely Malayan product (see Uncaria Gambier). It is quite true that both these astringents contain the same chemical properties, but they are obtained from widely different plants and manufactured in countries separated from each other. In our Trade and Navigation Returns the exportation appears as “Cutch and Gambier,” from which one would naturally infer that both Cutch (or Catechu) and Gambier were exported from India, the relative proportions of which had not been determined. I am informed, however, by my friend Mr. J. E. O’Conor that this practice is a remnant of the time when the Straits Settlements returns were published with those of India. At present, therefore, by “Cutch and Gambier” is meant in all probability chiefly Catechu; a small amount only of Gambier is re-exported.

From the time of Barbosa wrote in 1514 we have no further mention of this substance until 1574, when Garcia de Orta gave a complete account of the plant and the process of preparation of the extract, describing it under its Tamil name Cate (Kati or Kuth). It was not, however, until the 17th century that Catechu attracted the attention of Europe. It was then supposed to be a natural earth, and as it reached Europe by way of Japan (being simply re-exported from that island) it received the name of Terra Japonica. At this period, or shortly after, Gambier also found its way to Europe, and was indiscriminately with Catechu called Terra Japonica. Clever exploded the mineral notion regarding Catechu, and in 1685 republished Garcia de Orta’s account of the preparation of the extract, and declared it to be of Indian origin, the best quality coming from Pegu and other sorts from Surat, Malabar, Bengal, and Ceylon. Catechu (from Acacia Catechu) was received as an official drug into the London Pharmacopoeia of 1721. It was official in the British Pharmacopoeia of 1864, but has since been discarded and Gambier retained, both in Great Britain and India, as the official form of the drug Catechu. In the United States Pharmacopoeia Catechu (from A. Catechu) is retained, however, as official and Gambier discarded.

Interesting Ethnological Facts connected with the Catechu Industry.—

Before passing to discuss the chemical properties and modes of preparation of Cutch (Kutch) and Káth, the digression may be regarded as not altogether inappropriate to say something of the race of people who, from time immemorial, have made it their sole occupation to prepare this extract. A brief history of this nature it is thought may help to throw some light upon questions connected with the early history of the drug, and may prove interesting to those who have not the opportunity of consulting the voluminous gazetteers and official records from which it is extracted. In his Himalayan Districts (which constitutes Vol. X. of N. W. P. Case-
Ethnological Facts connected with the Catechu Industry.

Mr. Atkinson says: "The men employed are of the Dom caste, and are called Khairis, from the vernacular name of the tree."

In the Bombay Gazetteer, Vol. XIII., an interesting account of the Kathkaris is given, of which the following synopsis contains the most interesting features. It is stated that the Kathkaris, or makers of kath, are believed to have entered the district of Thana from the north and to have been originally settled in the Gujarat Athiavist, the present district of Surat. According to their story, they are descended from the monkeys which the god Ram took with him in his expedition against the demon king of Ceylon. They are darker and slimmer than other forest tribes. They have no peculiar language of their own, but in conversation they have a tendency to reduce words and shorten speech, and uniformly endeavour to get rid of the personal, not the tense, inflections of the verbs. The women are strong and healthy, and pass through childbirth with little trouble or pain. They are said, sometimes when at work in the fields during the rains, to retire behind a rice-bank and give birth to a child, and, after washing it in the cold water, to put it under a tea-leaf rain-shade and go back to their work. They are divided into two sections—Sons or Marathas and Dhors. The former do not eat cow's flesh, and are accordingly allowed to draw water from the village wells. They are also more or less a settled tribe. Some of them still make kath or catechu, but from the increase of forest conservancy the manufacture is nearly confined to private Inam villages and to forests in Native States. When they go to the forests to make Catechu, they hold their encampment sacred, and let no one come near without giving warning. Before they begin their wood-cutting, they choose a tree, smear it with red-lead, offer it a coconut, and, bowing before it, ask it to bless their work. The Catechu is made by boiling the heart-juice of the khair tree, straining the water, and letting the juice harden into cakes. The Kathkaris will never go in for regular cultivation; they eat rats and monkeys, and live chiefly upon jungle produce, or by theft, stealing from fields and barns.

In the tenth volume of the Bombay Gazetteer, p. 48, it is further stated that the Kathkaris, a wild forest tribe in the Ratnagiri District, who subsist almost entirely by hunting, now that their more legitimate occupation of preparing Catechu, kath, has been interfered with, habitually kill and eat monkeys, shooting them with bows and arrows. In order to approach within range, they are obliged to have recourse to stratagem, as the monkeys at once recognise them in their ordinary costume. The ruse usually adopted is for one of the best shots to put on a woman's robe, sari, under the ample folds of which he conceals his murderous weapons. Approaching the tree on which the monkeys are seated, the disguised Kathari affects the utmost unconcern, and busies himself with the innocent occupation of picking up twigs and leaves. Thus disarming suspicion, he is enabled to get a sufficiently close shot to render success a certainty."

"In the villages of Navagam, about 7 miles north-east, Gangadia, 11 miles south, and Nelsa, about 9 miles south-west of Dohad, every year on the day after Holi (April) a ceremony called the chul or hearth takes place. In a trench seven feet by three and about three deep, kher (Mimosa Catechu) logs are carefully and closely packed till they stand in a heap about two feet above ground. The pile is then set on fire and allowed to burn to the level of the ground. The village Bhanga or sweeper breaks a coconut, kills a couple of fowls, and sprinkles a little liquor near the pile. Then after washing their feet, the sweeper and the village headman walk barefoot hurriedly across the fire. After this strangers come to fulfill vows, and giving one anna and a half coconut to the sweeper and the other half coconut to the headman, wash their feet, and, turning to the left, walk over the pile; the fire seems to cause none of A. 138
Preparation and forms of Catechu.

them any pain.” (Bombay Gazeteer, III., 310) At the village of Chosala about 7 miles north of Dohad, a stream runs into a cave, and on this spot an image of Mahādev, under the name of Kedāreshvar, has been set up. The place is sacred to the Bhils.

Many other similar ceremonies and sacred practices might be mentioned, showing that the preparation of Catechu dates back to the remotest antiquity. The tree is sacred to Mangala or Kārtikeya, one of the Hosts of Heaven. It receives special worship and is often mentioned in the Vedas.

FORMS OF THE CATECHU EXTRACT.

There are three substances, all very similar in chemical composition, derived from this plant: (1) Dark Catechu or Cutch used for industrial purposes; (2) Indian Pale Catechu or Kath, a crystalline substance sometimes in pān or used medicinally by the Hindūs, prepared from the decoction; (3) Keersal, a crystalline substance found imbedded in the wood.

1.—Preparation of Catechu or Cutch. The trees are regarded as mature when about a foot in diameter. They are then felled and cut up into blocks two to three feet in length. In some parts of the country the natives “test whether the tree will pay to cut by making a small notch in its heartwood. Trees between 25 and 30 years old are regarded as best suited for the manufacture, and are said to yield more or less k̄ath according to the number of the white lines in the heartwood.” (Bombay Gazeteer, VII., p. 35.) The bark and the outer white wood is removed and rejected. The red heartwood is then cut up into small chips (generally about a square inch in size). In Bārīya, Gujārāt, the trees are not felled, but the branches lopped and the extract prepared from them, and it is stated that in some parts of the country the unripe fruits and leaves are also used. The furnace in most frequent use is of a curious construction: it is built over, leaving a number of small openings into which the earthen pots are placed, in which the chips are boiled down into a decoction. The process is somewhat varied in different parts of the country, the departures, however, being in minor details. After being boiled, the red liquid obtained is poured over fresh chips and boiled again, and when a decoction of sufficient strength has been made, this is poured, either into larger earthen pots, or, as in Pegu, into iron bowls and boiled down into the consistency of a black paste.

In Baroda “the men, after removing all the sapwood and a little of the heartwood, cut it into thin chips about a square inch in size. These chips are boiled in small earthen pots with water. When sufficiently charged with k̄ath the water is poured into two pots and allowed to go on boiling. The infusion in the two pots is poured into a wooden trough one yard long and eighteen inches broad, and a woman strains it through a piece of blanket about a foot square. Sitting on the ground she dips the blanket into the infusion, stirs it about, and holding it as high as she can, wrings it into the trough. This process goes on for about two hours, after which the trough is covered with a lid of split bamboos and the sediment is allowed to subside. The water is then poured off and the k̄ath cut into small cakes and left to dry. On account of the destruction it causes to trees, k̄ath manufacture has been stopped in the Navsārī forests.” (Bombay Gaz., VII., p. 35.) In Bārīya, Gujārāt, during February and the three following months, k̄ath-making gives employment to a large number of Kolis and Nāīkādās. Branches stripped of their bark are cut into small, three or four-inch, pieces and boiled in earthen pots till only a thick sticky decoction remains. A narrow pit five or six feet deep is dug and a basketful of the extract placed over the pit’s mouth, the water soaks into the earth, and the refuse remains in the basket, leaving the k̄ath in the pit. The
the Extract Catechu.

Extrait is then taken out and dried on leaves in the sun." Bombay Gaz., Vol. 13.

In the British Burma Gazetteer the process is described as follows:

Three men generally work together, one cutting down the trees (sha or Acacia Catechu) and driving the buffaloes that drag them to the site of the furnace, one clearing off the sapwood and cutting the heartwood into chips, and the third attending to the fires. The chips are put into four-gallon cauldrons, which are filled up with water, and the whole is boiled for twelve hours. When the water is reduced to one half, the chips are taken out and the liquid placed in large iron pans and again boiled and stirred till it attains the consistency of syrup; the pans are then taken off the fire and the stirring continued till the mass is cool, when it is taken out and spread on the leaves, arranged in a wooden frame, and left for the night; in the morning it is dry and ready to be cut up into pieces for the market. The chips are boiled down twice, but there is not much extract by the second boiling. There was formerly no restriction on the felling of the trees and the supply was getting exhausted; now no tree can be felled without permission, and a fee of Rs 5 is charged for each cauldron used.

The following interesting correspondence, which has been obligingly placed at my disposal by Dr. Schlich, Inspector General of Forests, will be found to give important facts regarding the manufacture of Cutch as practised in Pegu. The Conservator of Forests in Oudh asks the Conservator of British Burma the following questions:

Enquiry.—"In my circle the season for manufacturing Cutch extends to only three months in the year, and the rates levied here from catechu-makers are 12 annas a pot, capable of holding about 3 gallons of water or liquid substance. The rate has been raised this year from 9 to 12 annas per earthen pot, which even seems to be a very low price compared with what you get in Pegu. I should feel much obliged if you would kindly give me the following information:

"(1) The length of the season during which cutch is manufactured in your circle;

"(2) The output per season per cauldron of 20 gallons;

"(3) The process of manufacturing as conducted in Pegu;

"(4) The price per maund of catechu on the spot;

"(5) The distance of the market from the forests where the cutch is sold to retail dealers and others;

"(6) What percentage of cutch is obtained from a maund of heartwood."

Answer.—"(1) Cutch is manufactured in this circle from 1st June to 31st March; but the months from December to March (inclusive) are those in which the manufacture is most energetically carried on. In April and May, and in the drier parts in March even, scarcity of water stops the work; while in the rainy season carts cannot ply, and boilers have difficulty in provisioning themselves and disposing of their cutch.

"(2) The output of a cauldron per season depends on such a variety of circumstances—the duration of the season, the quality of the trees, their proximity to the boiling-place, and, above all, the working days of the party—that an average cannot be struck. It may be 2,000 lbs. only, or it may reach, and even exceed, 6,000 lbs., for a cauldron of 20 gallons (those in use have a capacity of 12 gallons).

"(3) Mr. Carter, Deputy Conservator, Tharrawaddy, well describes the process of manufacture as follows:

"For the working of one cauldron three men are necessary; but if a larger number of cauldrons are employed, there is some saving of labour. Of the three men one man is employed in felling the trees and dragging
them, by means of cattle, to the cutch boiling-place. The second clears the logs of sapwood and cuts the heartwood into chips. The third attends to the fires and the boiling process. The chips are put into earthen pots, which are filled with as many chips as they will contain, then water is poured in until the pots are nearly full. The pots (which have a capacity of about 3 gallons) are then placed on the fire and boiled for about 12 hours, in which time the water is reduced to about one half the original quantity. For one cauldron, 20 to 25 of these earthen pots are employed. The cauldron is nearly filled from these pots; and when the extract in the cauldron is reduced to about one half, the cauldron is again filled from the pots, and this is repeated until the pots are emptied. The boiling process is generally accelerated by the employment of a large earthen pot, which is set up near the cauldron, and is filled at the same time as the cauldron and kept boiling, the extract from the small pots being constantly added as that in the larger pot is reduced. The cauldron is then filled from the large pot, instead of from the small ones. The Burmans call this large pot the yo-ni-o, or red-water pot. The extract from the pots having all found its way into the cauldron, the boiling is continued and the liquid is stirred until it attains the consistency of syrup, and fills only about one fifth of the cauldron. The cauldron is then removed from the fire and stirred with a piece of wood, shaped like a paddle, for 4 hours or more, by which time the mass has obtained a greater consistency and is cool enough to be handled. It is then placed in a mould, like a brick mould, and is left to cool. This generally happens at night, and by next morning the result is a brick-like mass of cutch weighing 36 to 44 lbs.

The stirring business, which takes place after the cauldron is removed from the fire, is more of a beating up, and I have never been able to ascertain what the object or effect of the process is. Cooks differ, too, in the amount of beating up that is desirable, some being satisfied with half an hour's application. The outturn of one cauldron of 12 gallons in 24 hours, when properly worked, is fairly constant at the figure given by Mr. Carter.

"(4) Cutch was worth, last year, Rs.38 to Rs.58 per maund (equivalent to 15 Rs. 20, and 25 per 100 viss), on the edge of the forest, according to the distance from the Irrawaddy river or the railway.

"(5) The above rates correspond to some 40, 25 and 15 miles from the markets on the railway and river, where the price was Rs.30 per 100 viss (30½ lbs.), or Rs.58 per maund.

"(6) Regarding the amount of cutch yielded by heartwood, no reliable data are available. The yield has been stated at from 3 to 10 per cent. in weight.

"For practical purposes, I believe a ton of timber in the round may be taken to yield 250 to 300 lbs. of cutch."

By whatever process the Catechu is prepared, the final drying and hardening takes place by exposure to the sun and atmosphere.

**Commercial Forms of Catechu.**—In the Dūn (North-West Provinces) it is then thrown (a) into moulds of clay, forming small squareish pieces, or (b) into moulds formed of leaves. In other parts of the country it is thrown upon a cloth covered with ashes of cow-dung, and (c) either allowed to harden into irregular slabs, or, when soft, it is cut (d) into blocks by means of a string. In Pago it is manufactured into (e) great masses a cwt. in weight. These blocks are composed of layer upon layer of catechu, of succeeding preparations separated by leaves. As the block form enters commerce it is generally broken into (f) pieces which may be readily distinguished from the other forms through the presence of the dried leaves.
the Extract Catechu.

<table>
<thead>
<tr>
<th>ACACIA Catechu</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUTCHE.</td>
</tr>
<tr>
<td>140 (g)</td>
</tr>
<tr>
<td>150 (h)</td>
</tr>
</tbody>
</table>

**Description of Commercial Catechu met with in Europe.** It occurs in great masses surrounded by leaves, or broken into small blocks, in balls, cubes, or irregular-shaped pieces. In colour it is externally of a rusty brown, internally a dirty orange to dark liver colour, in some cases almost black, in others port-wine coloured. It is inodorous, with an astringent and bitter taste, followed by a sense of sweetness. It is brittle and breaks with a fracture more or less resinous and shining. The pale form kath is grey-coloured, porous, and under the microscope is seen to be composed of agglutinated masses of needle-shaped crystals.

2.—**The Crystalline Substance known as Kath** (in some parts of the country (Bombay) pronounced Kāth) or the Pale Catechu of India.—Kath or Pale Catechu is the restricted name given in Northern India to a grey crystalline substance prepared from a concentrated decoction of A. Catechu wood by placing in it a few twigs and allowing the decoction to cool. The twigs are removed and the crystalline substance collected. Whether the liquid is rejected or afterwards boiled down to produce a poor quality of dark catechu or cutch has not been ascertained. As sold in the bazaars this crystalline substance occurs either in irregular pieces or in square blocks similar to the dark orange-brown homogeneous cubes of catechu. This is the substance eaten by the natives in their pānu, and which imparts with lime the red colour to the lips. It is apparently never exported to Europe; the name Kath, while chiefly applied to it, is in some parts of India erroneously applied to Cutch also. Kath and Cutch have by Europeans been mistaken for the same substance, but the former is much purer chemically than the latter, and it may be owing to the fact of Cutch being the form exported to Europe, that Catechu has lost the former position it held as an astringent medicine. It seems probable that the preparation of Kath may be a secondary process from the Cutch, since its direct preparation from the original decoction has only been observed at Kumaon, although the substance is universally used in pānu all over India. This subject deserves to be thoroughly investigated, and the merits of Kath and it’s process of preparation made known. The dark and the pale forms of Khadira were both well known to the Sanskrit writers, but in later times they seem to have been confused with each other.

The process of preparation of Kath or Kāth is described by Madden:

> "The portion of the Khadira is constantly employed in cutting down the best trees, and for these they have to search far in the jungles; only those with an abundance of red heartwood will answer. This is chopped into slices a few inches square. Under two large sheds are the furnaces,—shallow, and with a slight convex clay roof pierced for twenty ordinary-sized earthen pots. This operation takes place in about an hour and a half. The liquor resembles thin light port, and the kath crystallizes on leaves and twigs thrown into it for the purpose. Each pot yields about a seer of an ashy white colour. The work is carried on for twenty out of the twenty-four hours, by relays of men and women; the men merely preparing the wood, which, after being exhausted, is made use of as fuel."
ACACIA Catechu.

Cutch.

The Chemistry of Catechu.

Western Ind., 232) says of it: "Keersal or catechuic acid is obtained from cavities in the wood, and occurs in small irregular fragments like little bits of very pale catechu mixed with chips of reddish wood." "In the forests near Bāriya, Gujarāt, this substance is collected and is regarded as a valuable cure for coughs." (Bom. Gaz., VI., 15.)

§ "Cutch is in large, irregular cakes; the characteristic squares are Gambier. There are five kinds of Catechu in the Indian markets:

(a) Kath in irregular fragments, eaten with pān.
(b) Cutch of commerce, in large, irregular cakes, soft internally.
(c) Cutch from Singapore, in lozenges, almost colourless.
(d) Cutch in characteristic squares.
(e) Areca-nut cutch, rarely met with." (Surgeon-Major W. Dymock, Bombay.)

Chemical Composition.


§ "Catechu contains a variety of tannic acid called Mimotannic acid, which is soluble in water, and Catechu or Catechusic acid, which is insoluble. Mimotannic acid differs from tannic acid in yielding a greenish-grey precipitate with ferric chloride, and by not producing pyrogallie acid when heated. The destructive distillation of Cutch yields Fyrrocatechins. Quercetine is stated to be contained in Cutch. This principle is the yellow crystallizable substance to which the bark of Quercus tioctoria, Oliver, owes its colour." (Dr. C. J. Hislop Warden.)

The chemistry of the Catechu has occupied the attention of chemists for some time past, but as yet the views and conclusions arrived at are somewhat conflicting, and the subject may be regarded as still involved in considerable obscurity. The brief chemical note (above) which my friend Dr. Warden has supplied, may be regarded as an abstract of all that is known. In his "Science Papers" D. Hanbury suggests that the process by which the various kinds of Cutch, Catechu, and Gambier are obtained should be carefully studied by persons who have the opportunity of doing so on the spot, that the trees yielding each of the forms of these substances should be accurately recorded; for, he adds, "we wish to identify the trees with the respective extracts." It would seem that our ignorance upon these important points may have much to do with the conflicting chemical results which at present exist regarding the composition of Cutch. There are at least two or not three distinct products obtained from each of the Cutch-yielding trees, and it is just probable these may have been experimented upon indiscriminately by the chemists of Europe. It would be but in keeping with other instances of two or more species (still more so of members of different natural orders), yielding approximately the same product, to find that the trees which afford the Cutch of commerce produce substances chemically dissimilar. Some such explanation may be found in the future to account for a certain number of the conflicting opinions which at present exist regarding the chemical composition of Cutch and its derivatives. A similar example may be mentioned in the fact thataconitum
The Chemistry of Catechu.

Napellus yields a different alkaloid from A. ferox, although both species have hitherto been used in the preparation of Aconitum.

Pegu Catechu, "when immersed in cold water, turns whitish, softens, and disintegrates, a small proportion of it dissolving and forming a deep-brown solution. The insoluble part is Catechin in minute acicular crystals." (Fläck and Hanb., Pharmacogn., 245.) When the crude Cutch of commerce is subjected to a dry heat of 110°, or 100°, in an atmosphere of hydrogen, it fuses and becomes transparent, losing 4 to 5 per cent. of its weight. It melts at 140° without further loss of water. On ignition there is left 3 to 4 per cent. of ash. If pure it should be completely soluble in boiling water; the solution precipitating the insoluble crystals of catechu acid on cooling. Ether extracts from Cutch its catechin or catechuic acid, so that by precipitation from a hot solution, or by means of ether, this substance may be separated for chemical or industrial purposes.

In addition to catechu, Cutch contains, however, other two substances, viz., Mimotannic acid and a gummy extractive principle. Mimotannic acid is not about eight cold water, and by simple maceration may therefore be removed from Cutch. The solution will be observed to be of a thick chocolate colour. If heated to the boiling point it is rendered quite transparent, becoming turbid on cooling. With this solution ferric chloride gives a dark-green precipitate, which will immediately change into purple on the addition of cold water, or of an alkali.

Catechu and Mimotannic acids are present in Cutch in about equal proportions. The effect of heat upon Cutch and its compounds is most important, and, as pointed out by Etti, the chemical changes effected by heat afford the most likely explanation of the discordance of authors as to the formula for Catechin. According to Liebermann, confirmed by Etti's re-examination, the formula for Catechu acid is C₃₇ H₂₈ O₁₅. If a piece of Cutch be first heated in a crucible and then macerated it will be found to be completely soluble in cold water. This is explained by Etti as due to the formation of soluble anhydrides from Catechin, thus:

$$2 (C_{18}H_{19}O_{9}) = 2H_2O + C_{37}H_{28}O_{15}$$

The compound thus produced is known as Catechu-tannic acid, and is completely soluble in cold water. By a further loss of water at 190°-200° this becomes C₃₇H₂₈O₁₅. Under the influence of heat the anhydride that is first formed is C₃₇H₂₆O₁₅ an insoluble, brownish red, amorphous powder, a substance soluble in alcohol and precipitated in crystals by lime-water. These compounds, if formed, in varying proportions, in a piece of Catechu, would greatly tend to produce conflicting chemical formulæ in the results of different experiments, and a piece of Catechu, which is found to be completely soluble in cold water, should be regarded as inferior in quality (injured through heat) and most probably adulterated by the trader.

For some time Gautier regarded the Catechin of Gambier as quite distinct from that obtained from Catechu, but in his more recent publications he admits them as identical. He now corrects his formula, C₃₇H₂₈O₁₅ which he published as expressing Catechin (adopted in Fläck and Hanb. Pharmacogn.), into C₃₇H₃₂O₁₅ and suggests for this compound the name of Methylecatechin.

The soluble Catechu-tannic compounds constitute the active astringent principle of the drug and the tanning and dyeing property for which it justly holds so high a position for industrial purposes.

Preparation of Pure Catechin.—Etti directs that Catechu should be dissolved in about eight times its own weight of boiling water, and the liquid, after being strained through a cloth, should be set aside for some days until the insoluble Catechin subsides. This should then be collected and

**ACACIA Catechu.**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>C₃₇H₂₈O₁₅</td>
<td>155</td>
<td>156</td>
<td>157</td>
</tr>
<tr>
<td>158</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A. 159
placed under a screw-press, being thereafter dissolved in a sufficient amount of dilute alcohol and the filtered solution shaken up in ether. The ether is next removed by distillation, and the crystals obtained washed repeatedly in pure distilled cold water. It is then found to exist in the form of almost colourless crystals.

Adulteration and Detection of Catechu.—Meyer regards ether as the best reagent for this purpose. Whether it has been partially heated or not, the whole of the Catechu-tannic compounds may be abstracted from a given weight of pulverised Cutch by repeated treatment with ether, about 53 per cent. of the original weight being thus removed. The dried residue should thus weigh about 47 per cent., the excess over this being adulterants. The chief substances used for adulteration are sand, clay, sugar, starch, and dried blood. On ignition pure Cutch should leave a residue of 3 to 4 per cent. It should be completely soluble in boiling hot water; if soluble in cold water, it may be suspected of impurities or of having been injured by heat.

**Trade Forms of Cutch or Catechu.**

(a) Burma.—It is largely prepared at Pegu, in the districts of Prome and Thayetmo; it is in fact, next to teak wood, the most valuable product of the forests of Burma. Dr. Brandis, in his "Forest Administration Report for 1875-76," says that more than half of the Catechu exported comes from territories beyond the frontier of Assam and British Burma. The total number of trees felled during the year 1869-70 is stated to have been 234,108 in Pegu. The total earnings of a cutch-maker, in a good season, is about Rs. 70. The Pegu season is from November to March; very little is made from July to October, and hardly any from April to May. (Central Correspondence with the Government of India.) Pegu Catechu, as this form is commercially known, is in the London market regarded as the most valuable, and according to Spence's Encycl., p. 1083, it fetches 21s. to 42s. a cwt.; but, according to quotations published by the Tropical Agriculturist for 1882-83, the market value for it is 25s. to 37s. a cwt. The manufacture of Pegu Cutch in the year 1869-70 afforded, in the Prome and Thayetmo districts alone, employment for 4,000, and with their families, a total population of about 16,000 persons, yielding an article of commerce worth on the spot about three lakhs of rupees. (Indian Agriculturist, November 1882.)

(b) Next in importance is placed the so-called Bengal Catechu. This, with the exception of the supply from Chutia Nagpur, seems to come chiefly from Nepal, the Terai forests of the North-West Provinces, Oudh, and of Behar. The Kumaon form seems to be entirely Kath, while in the Dün forests and from the Keri Pass, Mr. Buck reports that Cutch is made in these forests into cubes and cakes. A most important trade exists in Cutch between Gonda and Calcutta. Dr. McCann, in his Dyes and Tans of Bengal, compiled from the correspondence and records of the Bengal Economic Museum, reports that about 4,000 maunds of Catechu is annually consigned from Hazaribagh in Chutia Nagpur to Calcutta, where it sells at from Rs. 8 to Rs. 12 a maund. He also states that the local price is from Rs. 5 to Rs. 7 a maund, while Dr. Schlich says: "It is sold in the bazars of Chutia Nagpur at Rs. 2-8 per maund." It may be here remarked that Dr. McCann seems to have attached too great importance to the consumption of Gambier, for he informs us that "the imports are nearly altogether Gambier, which is imported for making pân. None of this is re-exported, except a small quantity to the Mauritius, &c., for the pân of the Hindu coolies there." (Dyes and Tans of Bengal, p. 129.) The question of the
## Products of India.

### Commercial Forms of Catechu.

<table>
<thead>
<tr>
<th>ACACIA Catechu</th>
<th>CUTH.</th>
</tr>
</thead>
<tbody>
<tr>
<td>From Calcutta.</td>
<td>164 (a)</td>
</tr>
<tr>
<td>165 (b)</td>
<td></td>
</tr>
<tr>
<td>166 (c)</td>
<td></td>
</tr>
<tr>
<td>167 (d)</td>
<td></td>
</tr>
</tbody>
</table>

### Bombay.

| 168 |

### Dharwar.

| 169 |

### Konkan.

| 170 |

### Khandesh.

| 171 |

### Surat.

| 172 |

### Madras.

| 173 |

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imports and exports under the heading of “Cutch and Gambier” to and from Bengal is certainly obscure, but it is probable the exports, which are very considerable, relative to the entire industry, are chiefly Cutch. The imports include the Cutch coasting trade, principally from Burma (equal to more than half the entire industry), and a comparatively small quantity of Gambier imported from the Straits Settlements and consumed in India as the official form of the drug Catechu; “only a very small amount of this imported article is eaten in paan.” Nearly the whole of the Cutch imported into Calcutta from Rangoon is re-exported to the United States, where it is largely used as a brown dye and as a drug. It seems probable, also, that a considerable quantity of the imported Catechu is the product of Areca Catechu, re-exported as the true article. In the Calcutta bazaars four kinds are said to be sold: (a) Belguti, 6d. a pound; (b) Pegu, 6d. a pound; (c) Ganti, 5d. a pound; and (d) Janakpur, 5¿d. a pound (Amst. Exhib. Cat., T. N. Mukharji). Bengal or Calcutta Cutch fetches on an average from 20s. to 30s. in the London market. On application to Calcutta for samples of the above I received from Babu T. N. Mukharji, the following: 1st, Papri, a sample of Gambier in cubes; 2nd, Janakpur, apparently a sample of the so-called red Cutch of Upper Burma. This sample is pale pink-brown in irregular masses with fragments of wood. It has the colour and texture of Gambier, but does not exist in cubes. 3rd, Pegu, irregular pieces marked with leaves, dark glassy brown. This is unmistakably Cutch. 4th, Tele, irregular masses, yellow on the outside, glassy brown within—Cutch. 5th, Belguti, rounded pieces marked with leaves uniformly brown-black—Cutch. There would thus appear to be very considerable variations in the supply met with in the Calcutta market; but there seems no doubt that a certain amount of Gambier is regularly sold as Cutch; the sample called Papri is most distinctly Gambier, and appears to be the Singapore article; it occurs in the characteristic regular cubes.

(c) Bombay Cutch, in the U. S. Dispensatory, 15th Ed., is said to yield a higher percentage of tannin than Bengal Cutch, but it is commercially almost unknown outside the Presidency. Birdwood describes four forms of it:

1. Kauchdi of Dhawar—flat, round cakes, two inches in diameter and one thick; dark brown in colour, and preserved in bai/l husks.
2. South Konkan, covered with paddy husks.
4. Surat, in irregular lumps from the size of a hazel-nut to a walnut.

Dr. Dymock gives the local value of the Surat Cutch as 20 per maund of 37½ lbs. This is the fine kath used with paan supari; common kath is from 44 to 5 rupees a maund.

(d) The Cutch of Madras is in all probability purely the product of Areca Catechu. Dr. Moodeen Sheriff says that the natives of Madras do not know that Acacia Catechu yields Cutch, although the tree is common. Up to 5th August 1875 imported Cutch and Gambier was subject to a duty of 7½ per cent.; after that date the duty was reduced to 5 per cent., and on the 9th March 1882 removed altogether.

### Trade Returns of Catechu.

* Cutch is exported in mats, bags, or boxes; the following table gives

*This presumes that the exports which appear in the Trade and Navigation Returns under the heading of Cutch and Gambier mean chiefly Cutch.
ACACIA Catechu.

CUTCH.

The total exports of this important substance from India for the past five years:

<table>
<thead>
<tr>
<th>YEARS</th>
<th>Weight in Cwt.</th>
<th>Value in Rupees.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1879-80</td>
<td>222,123</td>
<td>28,103,994</td>
</tr>
<tr>
<td>1880-81</td>
<td>316,077</td>
<td>42,225,527</td>
</tr>
<tr>
<td>1881-82</td>
<td>198,897</td>
<td>25,808,490</td>
</tr>
<tr>
<td>1882-83</td>
<td>246,505</td>
<td>30,524,434</td>
</tr>
<tr>
<td>1883-84</td>
<td>302,302</td>
<td>35,320,000</td>
</tr>
</tbody>
</table>

Of these amounts the following are the exports from Bengal and British Burma respectively:

<table>
<thead>
<tr>
<th>YEARS</th>
<th>Bengal</th>
<th>British Burma</th>
</tr>
</thead>
<tbody>
<tr>
<td>1879-80</td>
<td>67,757</td>
<td>154,290</td>
</tr>
<tr>
<td>1880-81</td>
<td>99,153</td>
<td>216,678</td>
</tr>
<tr>
<td>1881-82</td>
<td>57,747</td>
<td>141,013</td>
</tr>
<tr>
<td>1882-83</td>
<td>12,131</td>
<td>200,780</td>
</tr>
<tr>
<td>1883-84</td>
<td>68,885</td>
<td>230,005</td>
</tr>
</tbody>
</table>

The following analysis of the exports of Cutch shows the Provinces from which shipped and the countries to which consigned for the year ending 31st March 1884:

<table>
<thead>
<tr>
<th>Presidency from which exported</th>
<th>Weight in Cwt.</th>
<th>Value in Rupees.</th>
<th>Country to which exported</th>
<th>Weight in Cwt.</th>
<th>Value in Rupees.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bengal</td>
<td>68,885</td>
<td>9,15,504</td>
<td>U. Kingdom</td>
<td>121,898</td>
<td>13,43,283</td>
</tr>
<tr>
<td>Bombay</td>
<td>3,363</td>
<td>33,582</td>
<td>Egypt</td>
<td>51,284</td>
<td>5,82,814</td>
</tr>
<tr>
<td>Madras</td>
<td>149</td>
<td>2,814</td>
<td>St. Helena</td>
<td>33,020</td>
<td>3,89,920</td>
</tr>
<tr>
<td>British Burma</td>
<td>230,005</td>
<td>35,50,100</td>
<td>U. States</td>
<td>67,406</td>
<td>9,01,513</td>
</tr>
<tr>
<td>Straits</td>
<td></td>
<td></td>
<td>O. Countries</td>
<td>6,047</td>
<td>80,461</td>
</tr>
<tr>
<td>Total</td>
<td>302,302</td>
<td>35,52,000</td>
<td>Total</td>
<td>302,302</td>
<td>35,52,000</td>
</tr>
</tbody>
</table>

THE DYE.

A solution of Catechu is, by the action of lime or of alum, changed into a dull red colour, which constitutes a fairly good dye, and is used for that purpose in some parts of India; the extract may be used or the heartwood broken up and boiled with the lime. With salts of copper and salammoniac, Catechu gives a permanent bronze brown, much

A. 175
Catechu as a Dye, Tan, Fibre.

<table>
<thead>
<tr>
<th>ACACIA Catechu</th>
<th>DYE.</th>
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<tbody>
<tr>
<td></td>
<td>176</td>
</tr>
</tbody>
</table>

used by the calico printers of India. This colour is deepened by the use of perchloride of tin, with the addition of copper nitrate. In Dinaipur the red expectoration from chewing the jhum is preserved and used as an auxiliary in dyeing eri silk. Dr. McOan, in his Dyes and Tans of Bengal, mentions a dye-combination, and Mr. Buck, in his Dyes of the North-West Provinces, adds several others in most of which lime constitutes the metallic agent. The rationale of these dyes lies in the fact that, under the influence of oxidising agents (chiefly metallic salts) the soluble Catechu compounds are converted into insoluble and thus permanent dyes. By the calico printers of Upper India 2 lbs. of Catechu are boiled in 3 gallons of water. To this solution is added 1 lb. of shell lime, and the mixture set aside for 12 hours. The surface coloured liquid is skimmed off and preserved as the printing "standard." In this case the oxidisation has taken place, or nearly so, before the colour is printed on the fabric. In Europe this is never done, the dye-solution containing soluble Catechin and Gum is printed on the fabric and the oxidisation accomplished within the tissue. This is a much more effectual and permanent process. The dyed fabric would in time become oxidised by exposure to the air, but the process is completed more rapidly by exposing the fabric to steam, or much more expeditiously by the still more modern process of passing it through a solution of bichromate of potash. The oxy-salts of copper along with sal ammoniac are also sometimes used for this purpose, and at one time enjoyed a high reputation. Milk of lime is selected as the oxy-salt when the colours employed in the prints, such as blue, are naturally fixed by that agent.

There are several "standards" adopted by the European calico-printer containing Catechu, of which the following are the more important:

**Brown Standard.**—Water 50 gallons, Catechu 200 lbs. Boil for six hours, add acetic acid 44 gallons, and make up to 50 gallons by adding water. Allow to stand for two days, there after decant the clear solution, heat to 54° C., and add sal ammoniac 96 lbs.; dissolve and allow to settle for 48 hours. Decant the clear portion and thicken with 4 lbs. of gum Senegal per gallon.

**Madder Brown Standard** to resist heavy purple colours.—Catechu 1 lb.; sal ammoniac, 1/2 lb.; lime-juice at 8° Tw., 1 quart; nitrate of copper at 8° Tw., 2 1/2 oz.; acetate of copper, 1 1/2 oz.; gum Senegal, 1 lb. (Spence's Encyc. 840).

THE TAN.

As a tan Catechu extract does not hold a very high position owing to the colour it imparts to the skin. It is said to contain from 45 to 55 per cent. of tannin, or about 10 per cent. less than divi-divi pods and 20 per cent. less than gall-nuts.

**FIBRE.**

The Kew Museum catalogue describes a sample of fibre said to be prepared from the bark of this plant. I can find no record of fibre being prepared in India from the Khair tree.

**THE MEDICINE CATECHU.**

**Vern.—Kath, katthi, Hind., Beng.; Kath, kach, P.; Köth, Bom., Mar., and Sind.; Kattakambu, kōku, kōku-kalī, Tam.; Kānču, Tel.; Katti, kathit-kalī, Mal.; Kāchu, Kān.; Kōkku, Cinghi; Kōku, Guj.; Katu, Swāhī; Khadira, khadirasā, Sams.**

### Medicinal Properties of Catechu

**Properties and Therapeutic Uses.**

**The Resinous Extract** is a powerful astringent, and may be used where most other astringents are indicated.

- **Internally** it is useful in diarrhoea with pyrosis, depending upon a relaxed state of the mucous membrane. (Pharm. Ind.) Recommended to be given to adults in the form of a simple powder along with honey, 15-20 grains, or for dysentery in larger doses up to one drachm. It holds the reputation of being useful in intermittent fevers and scurvy. "A small piece held in the mouth and allowed slowly to dissolve is an excellent remedy in restoration of the uvula and the irritation of the fauces and troublesome cough which depend upon it." (U. S. Disp.). The Hindú physicians recommend a piece of Catechu, rubbed with oil, to be kept in the mouth in hoarseness. (U. C. Dutt.) Catechu, boiled down in five times its weight of water, to one eighth, then flavoured with nutmeg, camphor, and betel-nut and made into balls of a convenient size, is directed to be kept in the mouth for affections of the gums, palate, tongue, and teeth.

Ainslie cautions the free use of Catechu in ordinary diarrhoea until the full extent of the complications with the liver have been ascertained.

- "Locally it holds a high reputation in pyralism, ulceration, and sponginess of the gums, relaxation of the uvula, hypertrophy of the tonsils, &c." (Pharm. Ind.) An injection of the aqueous solution is often used in leucorrhoea and atonic menorrhagia. "In obstinate gonorrhoea, gleet, and leucorrhoea we have found it highly beneficial." (U. S. Disp.). A useful injection for severe haemorrhage after confinement. By Hindú physicians it is much used both internally and externally in skin diseases: "a decoction of Catechu is used as a wash for inflamed parts and ulcers." (U. C. Dutt.) Stewart says it is used in the Panjáb externally "in ointment for itch, syphilis, and burns." Chronic ulcerations, attended by much febrile discharges, are frequently speedily benefited by the use of an ointment composed of the fine powder and lard; and in obstinate cases with the addition of sulphate of copper. In prolapsus ani and protruding piles, Catechu, with lard and opium, has been found of great service; bathing or fomenting with an infusion of Catechu is also beneficial." (Murray, p. 138). Recommended as a dentifrice in combination with powdered charcoal, peruvian bark, myrrh, areca-nut burned to charcoal, powdered almond shell, and many other combinations in which the Catechu exercises the chief influence.

**Opinions of Medical Officers.**—§ "As a styptic in haemorrhage the powdered extract has been found useful if sprinkled over the wound." (Civil Surgeon, Aligarh.) "Reported to be beneficial as a local application in primary syphilitic sores." (Dr. Parker, Poona.) "A useful application to sore nipples and as a preventive against the ill effects of nursing, may be used in infusion as a wash, for some weeks before confinement." (Surgeon-Major Hunter, Karachi.) "Mixed with aromatics it is used by natives in melancholia; powdered and mixed with water it is used in conjunctivitis. Hakims state that it will produce abortion, but that, at the same time, it is useful for women who are barren but are desirous of having offspring?" (Dr. Emerson, Calcutta.) "Powdered and rubbed up with sulphate of copper and yolk of eggs it is a common application to cancers in East Africa." (Surgeon-Major Robb, Bombay.) "A mixture of Catechu and Myrrh, called Kathbol, is very generally given to women after confinement as a tonic and to promote the secretion of milk." (Surgeon-Major W. Dymock, Bombay.)

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**ACACIA Catechu**

- **MEDICINE**
  - Extract
  - Injection
  - Ointment
  - Dentifrice
  - Powder

**MEDICINE**

- Madras at Paris Exhib., 1878, p. 6; Murray's Drugs of Sind, p. 138; Birdwood's Bomb. Prod., 25; Stewart's Ph. Pl., 52; Modern Sheriff's Sup. to Pharm. Ind., 20; Ainslie's Mat. Ind., 1, 63 and 559.

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Products of India.

Medicinal Properties of Catechu.

"It is used internally in congestion of the fauces, sore-throat, hemoptysis, diarrhoea, and dysentery. Externally, it is used as a wash in hemorrhagic ulcers, and with burnt areca-nut in soft chancrees. It is believed to be anaphrodisiac and to cause impotence when used in excess." (Brigade Surgeon F. H. Thornton, B.A., M.B., Monghra.) "It is a valuable astringent. Internally, the extract, with opium or other medicines, is preferable in a pellicular form; dose gr. 5 to 15 grains. The tincture is less efficacious. Externally as a gargle and as a wash it is very serviceable where an astringent is wanted. The tincture is a good application to sore or spongy gums." (Surgeon R. L. Dutt, M.D., Purna.) "A most efficient and useful astringent, largely used in Charitable Dispensaries and Hospitals." (Brigade Surgeon S. M. Shircore, Moorschabad.) "Much used in cleaning the tongue and the gums of infants, and is a preventive to the formation of ulcers." (Surgeon-Major F. M. Zorab, Balsore.)

"Astringent and tonic in diarrhoea, in combination with aromatics, such as cinnamon and nutmeg." (Surgeon C. M. Russell, Sarun.) "Pale catechu is also used in soft chancre, after it has been softened in water and made into a paste." (Surgeon Anund Chunder Mookherjee, Noskhally.) "The only fact worth recording about this well-known drug, is its supposed anaphrodisiac properties. It is taken in doses of from ten to twenty grains (the powder being simply mixed with water) by Hindú widows with a view of suppressing sexual desire." (Surgeon R. G. Mathew, Mossepur.) "Catechu, with areca-nut slightly toasted and pounded into an impalpable powder, is in common use by the natives for sponginess of the gums, but the prolonged use of it darkens the teeth." (Hon. Surgeon Easton Alfred Morris, Nagapattam.) "Combined with the seeds of Bombarea and with sulphate of iron it is used for strengthening the gums." (Surgeon-Major John Lancaster, M.B., Chittore.)

"Dose five to twenty grains as an astringent, one to four grains as an expectorant. It is used in bronchial affections with sugar-candy and turmeric. Frequently prescribed in diarrhea as an astringent, also as an astringent lotion in conjunctivitis and ulcers. It is supposed to have an analogous action to that possessed by ergot on the womb, when prescribed with myrrh. It increases the secretion of milk after delivery." (Surgeon W. Barren, Bhub, Cutch, Bombay.) "The powder is useful in otorrhoea; it is also made up into an ointment with ghi and applied to cancers." (Surgeon James McCloghey, Poona.)

OFF. PREPARATIONS.

"Infusion."—160 grains in 10 fl. ounces. Dose one to two fluid ounces.

"Tincture."—2½ ounces in 1 pint. Dose one and a half to two fluid drachms. A valuable adjunct to Mistura Creata and other astringent mixtures.

"Compound Powder."—Dose fifteen to thirty grains. A valuable aromatic astringent." (Pharm. Ind.)

KERSAL or KERSAL.—The crystalline form of Catechuic acid, found naturally in crevices of the wood, fetches a high price in India as a drug, and is regarded as a valuable cure for coughs. (See page 35.)

FOOD.

The chief product of this tree is Kath and Cutch, obtained by boiling down a decoction from the chopped wood, say for 20 hours continuously. In the preparation of kath twigs are placed in the boiling liquid and upon these crystals of the substance generally known as kath are deposited. Both Kath and Cutch are commercially designated Catechu, but the
The Soap-Acacia.

former is regarded as purer than the latter, and is largely used as an ingredient in the pan or the betel-leaf preparation which the natives of India are so fond of chewing. The Kath is reduced to a fine powder, a little of which is smeared on the pan leaf, together with some white lime and crushed betel-nuts. It is the Kath, in combination with the lime, which gives the teeth and lips the red colour so characteristic of Hindús. Continued use blackens the teeth. The people of Assam very seldom eat Kath with pan, as they consider it too rich for them. (Mr. Durrah, Assam.)

THE TIMBER.

Structure of the Wood.—Sapwood yellowish white; heartwood either dark or light red, extremely hard. The wood seasons well, takes a fine polish, and is extremely durable. Cleghorn says the wood of this plant is less hard and durable than that of other Acacias. It is not attacked by white-ants or by teredo.

It is used for rice-pestles, oil and sugarcane crushers, agricultural implements, bows, spear and sword handles, and wheelwrights' work. In Burma it is employed for house-posts, and very largely as firewood for the steamers of the Irrawaddy Flotilla. The felling of Cutch trees for the purpose of fuel should, however, be altogether prohibited, although the wood is greatly admired for its high heating powers. It is much valued in Broach for posts which have to be driven into the ground. The fuel of the dead khair is much valued by goldsmiths. In North India it is made into charcoal, and is one of the best woods for that purpose. It has been found good for railway sleepers, and it is probably only the smallness of the tree and the consequent waste in cutting up, that has prevented its more general use. A cubic foot of the wood weighs about 70 lbs.

Several other plants yield Catechu, such as A. Suma, Areca Catechu, and Uncaria Gambler,—see Catechu.

Acacia Campbellii, Arn.

Syn. for A. planifrons, W. & A.

A. chrysocoma, Miq.

Syn. for A. tomentosa, Willd.

A. concinna, DC.; Fl. Br. Ind., II., 296.


Vern.—Rithé, kochi, Hind.; Ban-rithé, Beng.; Toldong, Lepcha; Sapale, Sams.; Ato, rassanul, Oudh.; Sikha, skha, Bom., Sikkéth, Mar., Duk.; Shikà kàj, Mar.; Chëkkàt, Gyj.; Sikha, Tam.; Chikkeya, skhàya, gogu, Tel.; Sjé, sige (the unripe fruit being known as kaye), Kan.; Ken bmon, kindun, subkhwòd (or su-khaw-nwò or soo-nwòw), Burm.

Rita or wítha is the Hind. for the Soap-nut, Sapindus Mukorosi, Gauri. As this name is also given to the detergent legumes of Acacia concinna, DC., the two bazar products require to be carefully distinguished.

References.—Brandis, For. Fl., 423; Gamble, Man. Timb., 150.

Habitat.—A common, prickly, scendant bush, common in the tropical jungles throughout India; in Bengal flowering during the rains. Very common in East and Central Mysore planted as a hedge.

Botanic Diagnosis.—Prickles abundant, minute, hooked. Leaves with 12-16 pinnae and 30-50 leaflets; stipules and bracts cordate, ovate. Flowers in copiously panicled, globose, yellow heads; panicles with densely downy branches, the lower springing from the axis of the leaves, the upper

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subtended by copious, membranous, subpersistent bracts. Corolla a little longer than the calyx. Pod thick, succulent, strap-shaped, straight, 3-4 by \( \frac{1}{4} \) inches, depressed between the seeds, the broad sutures narrowed to a short stalk; when dry, shrivelled and rugose with slightly waved sutures, when young hairy.

This species belongs to the series Vulgares. Climbers with copious scattered prickles and flowers in globose heads forming panicles:—

A. concinna, A. Intia, and A. pennata.

Properties and Uses——

Dye.—Balfour says the bark is used for dyeing and tanning fishing-nets in South India.

§ "The bark is imported into Bombay from Kanara for this purpose."

(Surgeon-Major W. Dymock, Bombay.)

"Turmeric and the leaves of this acacia afford a beautiful green dye (Mason)." (J. N. Pickard, Esq., Burma For. Dept.)

Soap.—"A considerable trade is carried on in some parts of India with the saponaceous legumes of this species." (Rosburgh.) The thick fleshy pods are used for washing the hair (Gamble). The nut of the Shikalki is used in the Kolaba district, Bombay, instead of soap (Bombay Gaz., XI., 26). In Kanara they sell at R12 to 20 for 50 lbs; every other year comes a bumper crop (Bombay Gaz., XV., Part I, 60).

The legumes of several other species of Acacia are also used for this purpose, being regarded as efficacious in destroying vermin. To Ainslie must be attributed all our information regarding these pods, very little having been obtained regarding them since he wrote.

Medicine.—The pods are largely used by the natives of India externally as a detergent, and internally they are deobstant, and, according to Ainslie, are also expectorant. Ainslie recommends the drug to be prescribed in the form of an electuary, in a dose about the size of a small walnut, every morning for three successive days. Dr. Dymock gives the value in Bombay as R1 1/2 to R1 2/4 a maund of 37\( \frac{1}{2} \) lbs.

§ "In South India the pods and leaves are used as an aperient in bilious affections. (Ainslie)." (Surgeon-Major W. Dymock, Bombay.) "The pods of A. concinna are a mild cathartic, nauseant, and emetic. As a cathartic it is superior to senna, but it is rather nauseous and disagreeable in taste and smell. Like senna, it is not an efficient purgative when used alone, but a very good adjunct to other purgatives, as sulphate of magnesia. The pods are also a pretty good emetic in jaundice not depending upon obstruction." (Honorary Surgeon Moonen Sheriff, Khan Bahadur, Madras.) "A popular household remedy for promoting the growth of hair, and removing dandrift from the scalp, a decoction of pods (4 an ounce to the pint of water) being used as a hair-wash. In small doses the pods act as a tonic, but in large and repeated doses they have purgative and emetic properties assigned to them." (Surgeon-Major J. M. Houston, Travancore; and John Gomes, Medical Store-keeper, Travandum.)

"Very young leaves, ground up with a little salt, tamarind, and a few chilies, are used by the natives as a chutney with their food when they suffer from biliousness. I have seen it act as a laxative producing one or two copious motions, deeply tinged with bile; it is also a detergent." (Honorary Surgeon Easton Alfred Morris, Negapatam.) "Powdered leaves, in form of infusion, act as a mild laxative; can be used as a substitute for Senna indica, but less powerful in action. Tender leaves are used by natives in the form of chutney in bilious affections, with successful results. (Surgeon E. W. Savings, Rajamundry, Godavery District.) "The tender leaves made into a decoction are used as an aperient." (Surgeon-Major John Lancaster, M.B., Chittore.) "The

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tender leaves are subacid and make a good chutney. The pods are in
daily use for washing purposes.” (Native Surgeon Ruthnam T. Moodel-
liear, Chingleput, Madras.) “An infusion made from the pods is given to
check malarious fevers. The tender leaves made into infusion, or ground
down into a paste, are used to prevent flatulence, and to act as a mild
laxative.” (Dr. Lee, Mangalore.) “The pods of this species are largely
used for washing the hair in Madras.” (Deputy Surgeon-General G.
Billed, M.B., C.I.E., Madras.) “The pods are used in the form of an
ointment in skin diseases.” (Surgeon F. Parker, M.D., Firma.)
Food.—The leaves are pleasantly acid, and they are sometimes used
by the Hindús as a substitute for tamarind, and are made into chutney.
Domestic Uses.—The Hindús, according to Drury, use the (legumes)
pods to mark the forehead. This statement requires confirmation. They
are largely used as a substitute for soap, especially to wash the hair. “The
_tige kauyi_ or soap-nut is planted for village hedges in the East, but it grows
wild in Manjarabad and Belur.” (Mysore Gaz., 291.)

*Acacia dealbata*, Link; Fl. Br. Ind., II., 292.

*The Silver Wattle.*

References.—Brandis, _For. Fl._, 180; Gamble, _Man. Timb._, 155; Bent.,
Fl. Austr., II, 418; Mueller’s _Extra-Tropical Plants_, 4.

Habitat.—A tree, spreading rapidly by numerous root-suckers, indi-
genous in New South Wales, Victoria, and Tasmania, introduced on the
Nilgiris, and now naturalised since 1840. Experimentally cultivated in the
Panjáb.

Structure of the Wood.—The wood is moderately hard, light brown, but
warps considerably. It is extensively used in Australia for timber.

According to Mueller this is placed as a variety under *A. decurrens,*
_Wilda_, the Black Wattle. “It prefers for its habitation humid river-banks,
and attains there a height of sometimes 150 feet, supplying a clear and
tough timber, used by cooper and other artisans, but principally serving
as select fuel of great heating power.”

Timber, 210

_Tan._ The bark of this variety is much thinner and greatly inferior
to the Black Wattle in quality, yielding only about half the quantity of
tanning principle. It is chiefly employed for lighter leather. This
tree is distinguished from Black Wattle by the silvery or rather ash-
y hue of its young foliage; it flowers early in spring, ripening its seed in
about five months, while the Black Wattle blossoms late in spring or
at the beginning of summer, and its seeds do not mature before about 14
months.” (Baron von Mueller, _Select Extra-Tropical Plants_, 4.)

Introduced in the Nilgiris, where “A very curious fact has been ob-
served about the wattle tree. In 1845 and up to about 1850, the trees
flowered in October, which corresponded with the Australian flowering
time, but about 1860 they were observed to flower in September; in 1870
they flowered in August; in 1878 in July; and here this year, 1882,
they have begun to flower in June, this being the spring month here,
corresponding with October in Australia.” It is very curious that the
tree takes nearly 40 years “to regain its habit of flowering in the spring,”
_i.e._, to become perfectly acclimatised. (_Ind. For., VIII., 26._)

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*A. decurrens*, _Wilda_,

*The Black Wattle.*

_Habitat._—The eastern part of South Australia, through Victoria and
New South Wales to the southern part of Queensland.
The Black Wattle.

A small or middle-sized tree. The bark constitutes the tanner's wattle-bark. It is rich in tannin, and this fact, together with the many uses of the gum derived from the tree, make this one of Australia's most valuable plants.

TAN.—In England the price of wattle-bark runs from about £8 to £11; in Melbourne about £5 a ton. "It varies, so far as experiments made in my laboratory have shown, in its contents of tannin from 30 to 54 per cent. in bark artificially dried. In the mercantile bark the percentage is somewhat less, according to the state of its dryness; it retaining about 10 per cent. moisture; 1 lb. of black wattle-bark gives 1 lb. of leather, whereas 5 lbs. of English oak-bark are requisite for the same results, but the tannic principle of both is not absolutely identical. Melbourne tanners consider a ton of black wattle-bark sufficient to tan 25 to 30 hides; it is best adapted for sole leather and other so-called heavy goods. The leather is fully as durable as that tanned with oak-bark, and nearly as good in colour. Bark carefully stored for a season improves in tanning power 10 to 15 per cent. From experiments made under the author's direction it appears that no appreciable difference exists in the percentage of tannin in wattle-bark, whether obtained in the dry or in the wet season. The tannin of this Acacia yields a grey precipitate with the oxide salts of iron, and a violet colour with sub-oxide; it is completely thrown down from a strong aqueous solution by means of concentrated sulphuric acid. The bark improves by age and desiccation, and yields about 40 per cent. of Catechu, rather more than half of which is tannic acid. Bichromate of potash, added in a minute quantity to the boiling solution of Mimosa tannin, produces a ruby-red liquid, fit for dye purposes; and this solution gives with the salts of the full oxide of iron, red-brown dyes. As far back as 1843, a fluid extract of wattle-bark was shipped to London, fetching then the extraordinary price of £50 per ton, one ton of bark yielding 4 cwt. of extract of tar consistence (Simmons), thus saving much freight and carriage. For Cutch or Terra Japonica the infusion is carefully evaporated by gentle heat. The estimation of tannic acid in Acacia barks is effected most expeditiously by filtering the aqueous decocion of the bark after cooling, by evaporating and then re-dissolving the residue in alcohol and determining the weight of the tannic principle obtained by evaporating the filtered alcoholic solution to perfect dryness."

"The cultivation of the black wattle is extremely easy, being effected by sowing either broadcast or in rows. Seeds can be obtained in Melbourne at about 5s. per lb., which contains from 30,000 to 50,000 grains. They are known to retain their vitality for several years. Seeds should be soaked in warm water before sowing. Any bare, barren, unutilised place might most remuneratively be sown with this Wattle Acacia; the return would be in from five to ten years. Full-grown trees, which supply also the best quality, yield as much as 1 cwt of bark." I have taken the liberty to extract almost the entire article published by Baron von Mueller, K.O.M.G., in his exceedingly valuable work "Select Extra-Tropical Plants," thinking it was certain to prove most useful to persons experimenting in India with the cultivation of the wattle or with its most valuable tanning bark. The variety mollis (A. mollisima, Wild.) is the most plentiful form in Victoria, and this is also admitted to be the most powerful tanning agent. It grows rapidly, and in addition to the bark and gum which it affords, the timber is much valued, chiefly as fuel.

A fuller account of this plant and of the other trees yielding the commercial product will be found under the name WATTLE-BARK.

Acacia dumosa, W. & A.

Syn. A. Latronum, Wild.
ACACIA
Farnesianana.

215 Acacia eburnea, Willd.; Fl. Br. Ind., II., 293.
Syn.—Mimosa eburnea, Roxb., Fl. Ind., Ed. C.B.C., 421.
Vern.—Narmati, Mar.
References.—Brandis, For. Fl., 183; Gamble, Man. Timb., 151.
Habitat.—A short or small deciduous tree, met with in Sind, Suliman Range, Berar, Deccan, and South India.
Botanic Diagnosis.—General habit of A. arabica. Leaves with 4-10 pinnae and 12-16 leaflets. Flowers in rounded yellow heads in the axils of undeveloped leaves; peduncles densely grey downy, with involucre about the middle. Pod narrow linear, straight, rigidly coriaceous, decurrent, glabrous, with slightly repand sutures.
Compare with A. arabica and the other members of this series.
Properties and Uses—Structure of the Wood.—Hard, yellowish white; splits in drying. Weight 52 lbs. per cubic foot.
A. elata, Wall. Syn. for Albizzia procera, Benth., var. elata.
A. Farnesianana, Wall. Syn. for A. planifrons, W. & A.

217 A. Farnesianana, Willd.; Fl. Br. Ind., II., 292; Wight, Ic., t. 300.
The Cassie Flower, Eng.
Syn.—Mimosa Farnesianana, Linn.
Vern.—Vilayati kikar, vilayati bābūl, pāssi babūl, gā-kīkār, gand-bābūl, gā-kābūl. Hindi; Duk., Gāyā babūlā, Bham.; Gabur, Sāntal; Gu-bābūl, Mar.; Tākhānāl, Guj.; Knebānāl, Sind; Vedā vula, pā-vełam, Tām.; Kusturi, pīktēmā, oda sale, murki tumma, naga-tēmā, kamputēmā, Tel.; Jēlī, Kan.; Huanlōng yaing (or Huanlōngyaing), Yul-punk-yaing or Nam-longyaing, Burm.
Moodeen Sheriff seems to think that because the name Kasturī or kasturītumma, Tel., is inappropriate for this plant, it is incorrectly applied to it.
References.—Roxb., Fl. Ind., Ed. C.B.C., 421; Brandis, For. Fl., 183; Gamble, Man. Timb., 152; Baillon, Ii., 41; Mueller, Select Exot.-Tropical Plants, 41; Smith's Dict., 3; Pissar on Perfumery, 106; Hanbury's Science Papers, 151-152; Atkinson's Gums and Gum-Resins, 9.
Habitat.—The Flora of British India regards this small tree as indigenous to India, "cosmopolitan in the tropics, but often cultivated." It is common enough everywhere in India and Burma, growing freely by self-sowing. Its strong-scented, yellow flower-heads perfume the atmosphere very pleasantly. Cultivated in Europe and most successfully at Cannes. It is abundant in the valley of the Dead Sea, where it is covered with the scarlet flowers of the parasite Loranthus acacie, giving the effect as if on fire.
Botanic Diagnosis.—An erect shrub or low tree, with straight spines, flowering in the cold season. Flowers in rounded heads, axillary, fragrant, bright yellow; supported upon peduncles which are crowded in the nodes of the leaves, and having a whorl of bracts like an involucre at the apex. Pod thick, swollen or fleshy, cylindrical, more or less curved or hooked, glabrous, and having straight sutures. Seeds biserial.
Ailancha planifrons, W. & A., a tree of the Western Peninsula, with umbrella-like spreading branches and flower-heads in clusters in the axes of mature bracts. Compare with A. arabica.
Properties and Uses—Gum.—The gum is collected in Sind; Bomb. Gaz., XV., Part I., p. 60, says the gum exudes from the trunk in considerable quantities. Waring states that it is considered superior to gum arabic in the arts and as a medicine. Murray remarks that it is used to adulterate gum arabic. It is
very desirable that its peculiar properties should be investigated: adulteration has, in all probability, prevented it from becoming better known.

Mr. Baden Powell (Ph. Pr. 1. 345) describes it "as dark, conchoidal masses, translucent and transparent at the edges. Some pieces are much whiter."

§ "The distilled flowers yield a delicious perfume, and the gum is generally considered useful." (J. C. Harding, Esq., Rangoon.)

"A fair substitute for gum arabic. A decoction may be used internally in diarrhoea and externally where an astringent is required." (Surgeon R. L. Dutt, M.D., Purna.)

Dye and Tan.—Ohryst, in his New Commercial Plants, includes the bark of this tree among the Indian tans. It is not in much demand for this purpose in India, but is reported to be sometimes used in Dacca mixed with salts of iron. It gives an inky dye. The pods are also used in some parts of Bengal as a dye-stuff. (Dr. H. McCann.)

Perfumery.—The round yellow heads constitute the Cassie flowers so much used in European perfumery. With the development of the art of perfumery in India, this plant should prove a source of wealth. It grows freely without any care whatever, and should it ever be cultivated there cannot be a doubt but that it would prove a great success. Pissé says that the European practice is to sow the seeds in beds, the best plants being left and the doubtful ones removed. In the third year they are two to three feet in height, and are then planted out into the fields, each tree receiving about 12 square feet. Before planting into their final places the ground is recommended to be well ploughed and manured and dug to the depth of 4 to 6 feet. The locality chosen for cultivation should be exposed to the sun. After the third year the trees produce flowers. A full-grown tree is calculated to yield 2 lbs. weight of flowers, valued at from three to four pence a lb., the acre under Cassie cultivation in Europe giving £30 to £40. Hanbury, in his "Science Papers," gives the value of Cassie flowers in Cannes as "five to six francs the kilogramme."

The plant is wild in most parts of Bengal, and its cultivation might, if used as a hedge plant, or if scattered through the fields devoted to garden produce, be most profitable. The flowers are a certain source of wealth. The gum seems likely to hold in the future a much higher position than in the past. The pods yield dye, and the leaves, in times of scarcity, would prove an important addition to the fodder sources of the country. Pissé says: "I cannot leave Cassie without recommending it more specially to the notice of perfumers and druggists, as an article well adapted for the manufacture of essences for the handkerchief and pomades for the hair. When diluted with other odours, it imparts to the whole such a true flowery fragrance, that it is the admiration of all who smell it, and has not a little contributed to the great sale which certain proprietary articles have attained. The Cassie perfume retains its fragrance for a long time and is hence most useful for sachets. For this purpose a good combination is Cassie heads 1 lb., coris-root 1 lb." The perfume Cassie should not be confounded with Cassia or Cinnamon.

Medicine.—The bark is astringent, and is often used as a substitute for Acacia arabica bark. Mr. Baden Powell says: "the pods contain a balsamic liquid."

§ "It is used as an adjunct to aphrodisiacs in the treatment of spermatorrhoea." (Surgeon-Major C. W. Calthrop, M.D., Morar.) "The bark is used as an astringent in the form of a decoction, strength 1 to 10 of water. The tender leaves, bruised in a little water and swallowed, are said to be useful in gonorrhoea, dose ¼ ounce." (Surgeon James McCloughney, Poona.)

Structure of the Wood.—White, close-grained, hard and tough. Weight 49 lbs. per cubic foot.

Medicine. The Bark. 225

Leaves. 226

Timber. 227
<table>
<thead>
<tr>
<th>ACACIA</th>
<th>Dye, Soap substitute.</th>
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<tr>
<td>Intisia.</td>
<td>In the Panjâb usually grown as a fence, for which purpose it answers well.</td>
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**Domestic Uses.**—§ “The plant is supposed to be obnoxious to rats and snakes, and is accordingly planted as a protection against the injury caused by these animals burrowing in the embankments.” (Rev. A. Campbell, Santal Mission, Pachumba.)

**Acacia ferruginea, D.C.; Fl. Br. Ind., II., 295; Bedd., Fl. Sylv., t. 51.**

*Syn.*—Mimosa ferruginea, Roeb.; Fl. Ind., II., 581.

*Vern.*—Khour, Nepal; Kajper, Panch Mahals; Som khair, Berar; Kari. khair, Gond; Pandhara khair, Mar.; Tevrickhâir, Bhât; Basnâi, Kan.; Shamai-velvelam, shemi-velvel, Tâm.; Ana-sandra, wini, Tel.


**Habitat.**—Found in Northern Bengal, Central and South India, and Gujarât.

*Botanic Diagnosis.*—A large deciduous tree with brown bark; spines short hooked, in pairs; leaves composed of 6-12 pinnae and 20 to 40 leaflets. *Flowers* in peduncled spikes in the axis of the leaves; *rachis* glabrous; *corolla* 2-3 times the campanulate and glabrous *calyx*. *Pod* straight, strap-shaped, 2-4 inches long, veined, the upper suture winged, distinctly stalked, and 4-6-seeded.

*Compare with A. Catechu.*

*Properties and Uses—*

*Gum.*—It yields a good gum, similar to gum arabic.

*Medicine.*—The bark possesses astringent properties.

*Structure of the Wood.*—Sapwood large; heartwood olive-brown, extremely hard, harder than A. Catechu. *Weight* 70 lbs. per cubic foot. A fine timber, but little used. *Beddome* says it is used for building carts, and for agricultural implements.

**A. Hookeriana, Zipfel.**

*Syn.* for A. concinna, D.C.

**A. indica, Desv.**

*Syn.* for A. Farnesiana, Willd.

**A. Intisia, Willd.; Fl. Br. Ind., II., 297.**

*Syn.*—Mimosoâœæsia, Roeb.; M. Intisia, Linn.

*Vern.*—Arka-kha-bal, Sutlej; Katrar, Kumaon; Kondro-famum, Santal; Kundaru, Kol; Harrari, Nepal; Pâyiâr rib, neermu rib, Lepcha; Korintia, kôrendum, Tel.; Chidari, Mar.


**Habitat.**—A large climber found in the Sub-Himalayan tract from the Chenab eastward (ascending to 4,000 feet), throughout India and Burmah.

*Botanic Diagnosis.*—Prickles minute hooked. *Leaves* with 12-16 pinnae and 16-24 ligulate-oblong leaflets. *Flowers* in globose yellow heads, panicled; *bracts* minute, lanceolate. *Pod* dry, thin, straight, strap-shaped, glabrous, smooth, 4-6 inches long by 1/2 to 1/2 broad, cuneately narrow to a short stalk.

*Var. cœsia, W. & A.* Leaflets 40-60, not more than 1/2 to 1 inch broad, obtuse, with a minute point. Western Himalaya, 3,000 feet; Sikkim, 5,000 feet.

*Var. oxyphylla, Grah., sp.* Leaflets 40-50, more membranous than in the preceding, and acutely pointed.

**A. 233**
Dye, Medicine, Timber.

**Acacia Latronum.**

**Dye and Leaves.**

The bark or the fresh leaves of this plant are said to be used as an auxiliary or astringent in dyeing with morinda or lac, giving brightness. (McConn.) The bark is also used as a substitute for soap to wash the hair. (Gamble)

**Medicine.**

- "The flowers are used by Santal women in deranged courses." (Rev. A. Campbell, Santal Mission, Pachumpa.)
- "Structure of the Wood."—White, soft, porous.

**Acacia Jacquelmontii, Benth.; Brandis, For. Fl., 183.**

**Vern.**—Hawaab, Nej.; Kinkar, babul, babul, Pa.; Retobolol, Guj.

**References.**—Fl. Br. Ind., II., 293; Gamble, Man. Timb., 150.

**Habitat.**—A small bushy, thorny shrub, met with on the east flank of the Suliman Range, ascending to 2,500 and at times to 3,200 feet; on the outer Himalaya near the Jhelum to about the same elevation, on the Panjab plains, in Sind, and on the banks of the Nerbudda. Common in ravines and dry water-courses in Rajputana and North Gujrat. (Brandis.)

**Botanic Diagnosis.**—An elegant shrub with polished stems and straight, polished, and slender spines. Leaves composed of 6-8 pinnae and 12-16 leaflets. Flowers in rounded axillary heads, yellow, sweetly-scented. Pod thin, flat, broad, liggulate, dehiscent, glabrous, grey, with straight sutures; 5-6 inches long. Seeds 5-6.

Allied to A. eburnea, Willd., which has narrow pods, and to A. tenentosa, Willd., which has purple heads. Compare with A. arabica.

**Properties and Uses.**

- **Gum.**—"The var. buenli (Rajputana), a bush with straight slender branches, common in dry, sandy water-courses, yields a small quantity of gum resembling that from Acacia arabica." (E. A. Fraser, Rajputana.)

- **Tan.**—"The bark is used in tanning, and gives a brown or black colour." (E. A. Fraser, Rajputana.)

- **Spirts.**—The bark of the root is used in the distillation of spirits; the branches are lopped, and the leaves, thrashed out with sticks, are used as fodder. (Brandis.)

**Domestic Uses.**—The polished stems and thorns and the sweetly-scented yellow flowers make this bush an object of much beauty and interest (Rej. Gaz., 29). Might with advantage be extensively cultivated as a hedge plant and its flowers collected for perfumery purposes.

**A. Latronum, Willd.; Fl. Br. Ind., II., 296; Wight, Jc., t. 1117.**

**Vern.**—Bheo, Hind.; Denbabul, Mar.; Pakpuna, Tel.; Eum muliti-najal, Kan.; Hote-fal, Mysore.

**References.**—Brandis, For. Fl., 180; Gamble, Man. Timb., 149.

**Habitat.**—A thorny shrub found in South India, forming gregarious thickets.

**Botanic Diagnosis.**—A small tree with umbrella-like head and brown glabrous branches; spines in pairs, long, straight. Leaves composed of 6-10 pinnae and 20-30 leaflets. Flowers in pedunculate spikes, abundantly produced from the nodes of leafless branches; corolla \( \frac{1}{2} \) inch long and 3 or 4 times the minute campanulate and glabrous calyx. Pod oblong, thin, flat, somewhat recurved.

In the nature of its spines this species departs from the character of the series, having more the form of the spines of A. arabica (series Globifera). See A. Catechu.

E 1

A. 244
ACACIA
leucophloea.

Gum, Dye, Fibre, Medicine, Food.

FIBRE.
Bark.
245
TIMBER.
246

Properties and Uses—
Fibre.—It is said to yield a good fibre. Bark dark brown, dotte
white. (Brandis.)

Structure of the Wood.—Useful for tent-pegs. (Bomb. Gaz.
Part I., p. 60.)

Acacia lentulcaris, Ham.; Fl. Br. Ind., II., 296.

Vern.—Khin, Kumaon.

References.—Brandis, For. Fl., 186; Gamble, Man. Timb., 150.

Habitat.—A small tree of the Siwaliks and of Kumaon, extending
the Râjmahal Hills in Bengal, to Central and South India and Burm.

Botanic Diagnosis.—Spines in pairs, short, hooked or recurved,
with 4-9 pinnae and 12-16 leaflets. Spikes very dense, shortly peduncled
3-4 inches long. Corolla twice the length of the calyx, calyx,
straight, 6-8 inches long by 1/2 broad, thin, flat, opaque, venulose,
with sutures thickened and winged.

Compare with A. Catechu.

Gum.—Yields an Acacia gum.


Sym.—Mimosa leucophloea, Roxb.

Vern.—Sopher kikar, râo, raniâ, kasher, nimkar, rang, rînut, rohâni.

Hind.: Sopher-kâbâl, Beng.: Sharîb-kî, kîkur, hîvar, Dik.;

Urâ: Skheta-babara-vrikshaka, (modern) Sans.; Sopher kikar

Arinj, Kal.; Râmndra, ranjia, Banswarâ, Renujâ, Dikeyca,

Tumma, rânîja, rînut, Gond.; Rewar, C. F.; Mar.; Haribâl,

Hîvar, pânhrâyâ bhâlulîche jhâda, Mar.; Vel-selâm, vel-sel,

tam, Tam.; Tella-tuma, Tel.; Bilî-fâlî, bugrai naïbela, or na

(Gaa., Mysore), vel-selâm, kîjâli tâpî, Kâ.; Katu, velî u

andara, Singh.; Tanuang, Burm.

References.—Brandis, For. Fl., 184; Kura, Burm. For. Fl., I., 421

ble, Man. Timb., 152; Roxb., Fl. Ind., Ed. C. B. C., 421; Atkinson,

and Gum-resins, p. 6.

Habitat.—Found in the plains of the Panjâb from Lahore to

and in all forest tracts of Central and South India, Râjputana, and E

(in the dry forests of Prame). Seems indifferent to climactic condition.

Botanic Diagnosis.—A large, deciduous tree, with short, straight
white spines. Leaves composed of 12-24 pinnae and 30 to 60 le

Flowers in small, rounded, yellow heads, aggregated into terminal pan

which, when fully expanded, are a foot long and broad, and dense

mentone. Pod sessile, narrow ligulate-falcate, thin, flat tomentose,

straight sutures. The inoffensiveness of this species is its most characte

feature.

Compare with A. arabica.

Properties and Uses—

Gum.—The gum yielded by this plant is used in native medicine;
somewhat resembles gum-bassora, and received that name from Ure

Dye.—The leaves and bark are used in dyeing, and give a black co

The bark is also used for dyeing in Burm. and gives a red colour

mixed with other barks gives black. (Prof. Romans, Rangoon.)

Dr. Schlich (C. P. Forest Adm. Report, 1893, p. 43) says he found

bark of A. leucophloea being prepared for export, but he eases to have omit

note the economic use for which it was to be exported.

Fibre.—A coarse, tough fibre is prepared from the bark, much use

for fishing-nets and ropes (Bomb. Gaz., XI., 25; also XV., Part I., p

Dr. Brandis says by steeping the bark in water for four or five day

A. 252
The Australian Black-wood.

beating it, a tough fibre may be obtained, which is used for making nets and coarse cordage.

**Medicine.**—The bark partakes more or less of the astringent properties of *A. arabica*. In an official correspondence with the Government of India, it is recommended that this drug should be excluded from further trial.

**Food.**—Dr. Brandis says that the young pods and seeds are eaten, and even the bark in times of scarcity is ground and mixed with flour. The latter is used to assist in preparing spirits from sugar and palm-juice, to precipitate, by the tannin which it contains, the albuminous substances in the juice and to facilitate the fermentation. It flavours at the same time the spirits, and is supposed to increase the amount of alcohol.

"This fact was first ascertained and pointed out by Mr. Broughton, the Quinologon on the Nilgiris." (Deputy Surgeon-General G. Bidie, M.B., C.I.E., Madras.) The fruit is largely collected for fodder in the Panjáb.

§ "In the South Mahrratta Country the bark is used in the distillation of a spirit, in consequence of which the trees are farmed on account of Government." (Surgeon-Major W. Dymock.)

"The legumes are called Padia, which are pickled in Kathiawar." (Asst. Surgeon Sakharam Arjun Ravat, L.M., Girgaum, Bombay.)

**Structure of the Wood.**—Sapwood large; heartwood reddish brown, with lighter and darker streaks; extremely hard. It seasons well and takes a good polish; is strong and tough, but often eaten by insects. It is brittle, makes good posts, but bad planks. (Bomb. Gaz., XII, 25.) It makes an excellent fuel. When seasoned a cubic foot weighs about 55 lbs. (Bomb. Gaz., XV, Part I, p. 60.)

**Timber.**

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<td><em>Acacia megaladena</em>, Devo; Syn. for <em>A. pennata</em>, Willd.</td>
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**A melanoxylon, R. Br.**

**The Australian Black-wood.**

**References.**—Benth., Fl. Aust., II., 415; Mueller's Select Extra-Tropical Plants, 6; Brandis, For. Fl., 180; Gamble's Man. Timb., 155; Kew Museum Cat., p. 56.

**Habitat.**—A large tree met with in New South Wales, Victoria, Tasmania, and South Australia; introduced on the Nilgiris since 1840 and now completely naturalised. Also being grown in the hills of the Panjáb, Kumaon, and Sikkim.

**Botanic Diagnosis.**—Leaves seen only in young trees and then bipinate, generally abortive, and represented by phyllodia. Flowers in globose, compact heads, on short axillary racemes.

**Properties and Uses.**

**Structure of the Wood.**—Hard and durable; heartwood dark-brown, beautifully mottled, soft, shining, and even-grained. Weight 41 to 48 lbs. per cubic foot in Australia; 36 lbs. on the Nilgiris.

It is used in Australia for cabinet-work, coach-building, railway carriages, and agricultural implements; on the Nilgiris chiefly for firewood. Regarded as one of the best Australian woods, being easily cut into veneers. "It takes a fine polish, and is considered as almost equal to walnut." (Mueller.)

**Timber.**

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**Syn.**—*Mimosa dumosa*, Roxb., Fl. Ind., II., 559, and probably *M. obovata*, i.e., 261.

**Vern.**—Kántosariyo, Guj.; Palasa, Afg.; Phulahi, Pn.


**Habitat.**—Found in the Suliman and Salt ranges, Sub-Himálayan A. 261
ACACIA planifrons.  

The Umbrella Thorn.

tract between the Indus and the Sutlej, and in the northern part of the Panjáb plains. It is in fact one of the characteristic trees of the Punjab.

Botanic Diagnosis.—A moderate-sized tree; spines in pairs hooked. Leaves with 4-6 pinnæ and 6-8 leaflets. Flowers in pendent spikes 2-3 inches long, not very dense. Corolla greenish colour, 1 inch long, twice the length of the glabrous, glossy, venulose, straight strap-shaped, ed into a short peduncle.

Compare with A. Catechu.

Properties and Use—

Gum.—It yields a gum which occurs in the form of small, smooth, iridescent, and very characteristic tears. I found it to be this gum being used by the Lucknow calico-printer under the name of itabul. It is quite tasteless.

Medicine.—The gum, which is used in native medicine, is strong and durable. Weigh 70 lbs. (In Bomb. Gaz. VII, p. 31, it is stated to weigh only 50 lbs.) Valuable for cart-wheels, sugarcane Crushers, Persian water and agricultural implements.

Domestic Uses.—“The delicate green twigs are used by the inhabitants of the Punjab in the form of tooth-brushes. The bark, though unpleasant at first, imparts subsequently a pleasant and sweet taste.” (Aust. Surgeon Bhagwan Das, Rawal Pindi.)

Acacia paludosa, Miq.; Syn. for A. pennata, Wild.

A. pennata, Wild.; Fl. Br. Ind., II., 267; Bot. Mag., t. 13408.

Syn.—Mimosa pennata, Roxb.; M. toba, Roxb.; Acacia Megalosa, Desv.; A. pennata, Dols. & Gib.

Vern.—Agla, awal, Kumaon; Themi, Mar.; Bimbì, Hind.; K. K. K. K., Kukar, Kukharwar; Undara, Santal; Garewa, Mal. (Afeb, Nepal; Tod rib, Lepcha; Skyi, Burm.)

References.—Brandis, For. Fl., 189; Kera, Burma. For. Fl., I., 424; Man. Timb., 185.

Habitat.—A large, climbing shrub, found in Oudh, Kumaon, Eastern Bengal, Burma, and South India.

Botanic Diagnosis.—Prickles fewer and less hooked than in A. c., and A. intia. Leaves with 6-10 pinnæ and 80-100 leaflets, rigid, cecious, very narrow, densely crowded. Flowers in heads forming pendant bracts minute, lanceolate. Corolla 1 inch, slightly exceeding the calyx. Pod dry, thin, glabrous, dehuscent; 6-8 inches by 1 to 1½ inches, distinctly stalked. There are three or four varieties of this.

Compare with A. concinna.

Properties and Use—

Structure of the Wood.—Reddish, porous, moderately hard, with vessels and numerous medullary rays. (Gamble, List Darj.) 40 lbs. per cubic foot.

A. planifrons, W. & A.; Fl. Br. Ind., II., 293; Roxb., Cor. Pl., 269.

The Umbrella Thorn.

Vern.—Sali, sal, Tel.
Products of India.

The Golden Wattle.

References.—Brandis, For. Fl., 575; Gamble, Man. Timb., 150.

Habitat.—Western Peninsula.

Botanic Diagnosis.—A small, gregarious tree, with flat, umbrella-like spreading branches; branches glabrous, but with grey lenticular dots. Leaves with 10-16 pinnae and 16-24 leaflets. Flowers in globular heads in clusters from the axils of branchlets. Pod glabrous, narrow, ligulate, turbid, with straight sutures, indehiscent; distinguished from A. eburnea by being shorter and crooked. Compare with A. arabica.

Structure of the Wood.—Hard and strong; heartwood red, sapwood white.

Used for agricultural implements and as fuel.

Acacia pycnantha, Bith.

The Golden or Green Wattle.

Habitat.—Victoria and South Australia.

This tree, which attains a maximum height of about 30 feet, is second perhaps only to A. decurrens in importance for its yield of tanner’s bark; the quality of the latter is even sometimes superior to that of the Black wattle, but its yield is less, as the tree is smaller and the bark thinner. It is of rapid growth, content almost with any soil, but is generally found in poor, sandy ground, near the sea-coast, and thus is also important for binding rolling sand. Experiments instituted by me have proved the artificially dried bark to contain from 30 to 45 per cent. tanning principle, full-grown sound trees supplying the best quality. The aqueous infusion of the bark can be reduced by boiling to a dry extract which, in medicinal and other respects, is equal to the best Indian Catechu, as derived from Acacia catechu and A. Suma. It yields about 30 per cent., about half of which or more is Mimosa-tannic acid. This Catechu is also of great use for preserving against decay articles subject to exposure in water, such as ropes, nets, fishing-lines, &c.” “A. pycnantha is also important for its copious yield of gum.” “The wood, though not of large dimensions, is well adapted for staves, handles of various instruments, and articles of turnery, especially bobbins.” (Baron von Mueller, Extra-Tropical Plants.)

It is remarkable that the Catechu-like products of Australia are all apparently made from a deception of the bark instead of the heartwood, while in India the bark is rejected. It is probable that a combination of both practices would be more remunerative.

A. rupestris, Stockt, is by Fl. Br. Ind. reduced to A. Senegal, Willd., which see.


Syn.—A. rupestris, Stockt, as in Brandis, For. Fl., 185; A. Verck, Guill. et Perret; Mimosa Senegal, Linna.; M. Senegalensis, Lam.

Verre.—Khor, Sind; Kâmû, Raj.; Verck, in West, and Hashab in East Africa.

References.—Brandis, For. Fl., 185; Réjputana Gazetteer, 39; Fläch. and Hanb. Pharmacog., 1876, 223.

Habitat.—Chiefly found in Sind and Ajmere; abundant in West Africa, north of the River Senegal. It is also found in South Nubia, Kordofan, and in the region of Albury in East Africa.

Botanic Diagnosis.—A low tree with grey bark, flexuose and glucose branches; spines strong, short, sharp-hooked, often 3-nate, two lateral, and one below the petiole. Leaves with 6-10 pinnae and 16-28 small ligulate leaflets and finely downy rachises about one inch long, with a gland at the

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ACACIA

Senegol. The True Gum Arabic.

GUM.

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Senegal Gum.

275

Turkey Gum.

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base and between the upper pair of pinnae. Flowers in peduncled spikes; spikes 2-3 inches long, and not crowded. Corolla yellow, twice the length of the campanulate, glabrous, deeply-toothed calyx. Pod 3 by 4 inch, thin, grey, indehiscent, straight, strap-shaped, with a strong, fibrous, marginal midrib, and constricted between the seeds.

Compare with A. Catechu.

THE COMMERCIAL GUM ARABIC.

In Sind and Rajputana the gum from this tree is collected, but unfortunately it is sold in a mixed condition with the gums from other species of Acacia. This fact, in all probability, accounts for its superiority not having been recognised by the natives of India. It would be exceedingly interesting to have the gum carefully collected from Indian trees and chemically examined along with authentic samples from the African plant. The gum from the same species apparently varies considerably under diversified climatic conditions, for from Africa widely different gums are exported to Europe, and these meet the demands of distinct markets, but are apparently obtained from one and the same plant. Flückiger and Hanbury describe five or six African gums as regularly imported into Europe, of which the gum from A. Senegal is the most frequent, abundant, and valuable constituent.

1st.—Gum Senegal, or the Gum of A. Senegal, the Verck of the Negroes.—To the French colony of Senegal (on the west coast of Africa) this is a most important product. The trade was first established by the Dutch and Portuguese, but the French afterwards monopolised it, and planted the colony of Senegal, having St. Louis and Portendic as the chief ports for the exportation of the gum. The tree from which this gum is obtained was first accurately described by Adanson in 1788. It is collected by the Moors after the close of the rains in November (when the wind sets in from the desert) up till July. The gum is found to exude in greatest abundance during the dry desert winds, and most frequently at the bifurcations of the branches. Mr. M. C. Marius has also observed that the production of the gum is stimulated by the growth of the parasite Loranthus senegalensis. The principal supply is to the north of the River Senegal, or about 16° N. latitude. The gum is shipped chiefly to Bordeaux, the quantity annually imported into France being from 1 1/2 to 5 millions of kilogrammes. It is usually of a yellowish to reddish colour, occurring in larger lumps than Turkey gum, roundish or oval, or even elongated, pulverisable, and less brittle than Turkey gum. It is not very much used in England, and may be distinguished from Turkey or Kordofan gum by the absence of the numerous fissures so characteristic of the latter, the masses being in consequence firmer and less easily broken.

2nd.—Kordofan or Turkey Gum.—This is also ascertained to be a pure form of the gum from A. Senegal, the Hoshali of East-Central Africa. It comes from the mountainous tracts of Kordofan on the Upper Nile (between Nubia and Sennaar) and almost in the same latitude as Senegal, although across the vast continent of Africa to the north-eastern division. It is calculated that about 30,000 cwt.s. of this gum are annually collected in Kordofan. The most valuable kind of Kordofan gum comes from the province of Dejara and is known as Hoshali. This is generally conveyed down the Nile to Egypt and thence exported to Europe. It occurs in rounded lumps, often as large as a walnut, or in irregular broken pieces, pure white, very much fissured, specially upon the surface. This is the gum most frequently used for medicinal purposes, and may, in fact, be regarded as the true official Gum Arabic of England, India, and America. It is in fact the only gum which should be used for medicinal purposes. It
The True Gum Arabic.

is chiefly imported into Europe from Alexandria and the neighbouring ports, hence the commercial name Turkey gum.

Suakim Gum, in addition to the above, several inferior forms of gum obtained from North-East-Central, and North-East Africa, exported from Alexandria, and occasionally met with in the London marts. Amongst these may be mentioned the Sennār gum known as Ḥashāb-ell-Feṣūr ; the gum from the eastern territories of the Blue Nile and from the mountain tracts between Khartoum and Berber. From being exported from Suakim to Alexandria these are collectively known as Suakim gum, Talca or Talka gum. Suakim Gum is supposed to be obtained from A. Seyal, var. fistula, and A. stenocarpa. It generally exists in the form of a powder or in a semi-pulverulent state, owing to its being very brittle. It is a very inferior variety of gum.

4th.—Barbary or Moroccan or Mogador Gum.—This brown-coloured gum is obtained from Morocco and the northern provinces, or brought to Mogador from Fezzan, or by caravans from Timbuctu. It is now pretty well determined to be the produce of A. arabica, Willd. (A. Niloticus, Defr.). The tree is said to bear the vernacular name of attalek, and the gum is reported to be collected when the weather is hot and dry (July and August). It has a faint smell, and, when fresh, constantly produces a cracking noise. It is usually of a brownish colour and found in small angular or broken pieces.

5th.—East Indian Gum.—This is perhaps the most abundant gum in India and America, and is applied to industrial purposes. It is generally a mixture of gums, and chiefly from the following species: A. Senegal, Willd., A. Senegal var. Seyal, Willd., A. fistula, Schauer, and A. arabica, Willd. (= A. Niloticus, Defr.). It is imported into Bombay from the Red Sea ports, from Aden, and the east coast of Africa. It is re-exported to Europe from Bombay under the name of Indian or East Indian gum. Dr. Dymock, speaking of Bombay, says there are "two kinds met with in this market, viz., 'mabli', in large, round tears or verrucular pieces, white, yellow or reddish, much like gum Senegal, but more fissured (it derives its name from Makeela) and 'maulwai', in angular fragments and verrucular pieces, fissured, white, yellow, or reddish, which derives its name from the port of Masseo. Both of these are good, soluble gums, and if carefully sorted not much inferior to Kordofan gum." In the year 1872-73, Bombay imported 14,352 cwts. of East Indian gum valued at Rs. 29,067, and re-exported 4,653 cwts. valued at Rs. 7,898. Ten years later the imports into Bombay were only 869 cwts. valued at Rs. 1,13,028.

6th.—Cape Gum.—This is produced at the Cape Colony from A. horrida, Willd., the Dūrbūm or Wītesbūm of the Colonists—the commonest tree of South Africa. The gum is pale yellow or amber-brown, and is regarded as inferior.

7th.—Australian Gum or Wattle Gum.—This is chiefly derived from A. pycantha, Benth., and A. decurrens, Willd. It occurs in hard, elongated, or globular pieces, varying in colour from dark amber to pale yellow. It is very adhesive and is said not to be liable to crack. The bark is very astringent, and seems to impart this property to the gum.

From the preceding sketch of the commercial substances known as gum arabic, it will be seen that they vary very much, but that the Kordofan form of the gum from A. Senegal is the purest and most valuable, and is the Gum Arabic of Pharmacy.

History of Gum Arabic.

Gum arabic would appear not to have been known to the Sanskrit authors. The Persian and Arabic writers describe it under the name of Sangh-tarabī (Dymock). From the very remotest antiquity gum was

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ACACIA
Senegal.

The True Gum Arabic.

known to the Egyptians. It is frequently mentioned by the ancient writers, and there are numerous representations both of the plant and of the gum itself. The Egyptian fleet brought gum from Aden in the early part of the 17th century B.C. The word Komi is the original of the Greek Kóymu, whence, through the Latin gummi, the English word gum was derived. (Flücht. and Haub., Pharmacog.) Gum was used by the Arabian physicians, but in the 12th century it was apparently unknown in Europe; it first reached Europe in 1340 A.D., through Italian merchants trading with Egypt and Turkey, and by the Portuguese in 1449 it became a regular article of trade from the west coast of Africa.

CHEMICAL COMPOSITION.

Important Characters.—"Gum Acacia or Arabic is a type of gum found in the juice of various plants, and especially in the genus ACACIA. Chemically gum Acacia consists of Arabic Acid (C₁₅H₂₂O₁₁) in combination with lime, potash, and magnesia. By the action of dilute sulphuric acid Arabin is converted into Arabinose, a crystalline principle, which is sweet, and which has the same composition as grape-sugar. By the action of dilute nitric acid, mucic acid and saccharic acids are obtained. Gum arabic is soluble in water but insoluble in alcohol. Another variety of gum is known of which gum tragacanth may be mentioned as a type, which does not dissolve in water, but merely swells up to a soft gelatinous mass. Gums of this latter class contain a principle named Bassorin or Tragacanthine. Gums sometimes resemble resins physically, but are distinguished by dissolving or softening in water, and by being insoluble in alcohol, while resins are unaffected by cold water but are more or less completely soluble in alcohol." (Surgeon C. J. H. Warden, Prof. of Chemistry, Calcutta.)

Gum dissolves slowly in an equal weight of water, without affecting the thermometer, and forms a thick glutinous liquid which possesses a distinctly acid reaction. This property is but slightly accelerated at higher temperatures. Gum is insoluble in alcohol and most other liquids. An aqueous solution of gum, if poured into glycerine, becomes intimately mixed, and this mixture may be evaporated to a thick jelly without any separation taking place. Dry lumps of gum are, however, insoluble in glycerine. Gum undergoes no change by age if kept dry, but if prepared with warm water its disposition to sour is increased. The solution does not, however, ferment upon the addition of yeast, but chalk and cheese start in it a fermentation which gives origin to lactic acid and alcohol, but not to man- nite or glycerine.

To separate Arabic Acid or Arabin, acidulate slightly a solution of gum with hydrochloric acid, and add alcohol, when the Arabin will be precipitated. Calcium chloride, upon a dialyser, will also separate this substance from the acidulated solution. An Arabin solution differs from a solution of gum in not being precipitated by alcohol, but if the Arabin precipitate obtained from the acidulated solution be removed by means of a filter and dried, it will be found that it has lost its solubility and cannot be dissolved even in boiling water. It has by the action of heat been changed into meta-gummic acid, a substance identical with Carcin found in beet and in cherry gum, or in the series of the Tragacanth or Bassora gums.

Upon a chemical examination of the different kinds of commercial gum, Masing found that their botanical sources could not by that means be ascertained. He also observed that the value of a gum is better judged from its solubility than from its colour. He noted that the percentage of ash varied but little, while the degree of alkalinity varied considerably, being chiefly due to lime. Fremy first called the attention of chemists to the
peculiar relation between the organic substance of a gum and its mineral ash. The importance of his investigations lay in their physiological bearings upon the relation of the gum to the plant itself. If Arabin, which has by heat been rendered insoluble (converted into metagummic acid), be next subjected to the influence of an alkali, it is at once converted into a soluble gummy substance, which differs in no essential from natural gum. It is thus concluded that gum is a salt of lime, with Arabic acid or a mixture of such alkaline salts—magnesia and potash being frequently found in gum ash in addition to lime. Gum is thus viewed as a salt containing an overwhelmingly larger proportion of the organic acid than of the alkaline base, since 3 per cent. is about the largest proportion of lime detected. Although small, the percentage of alkali is, however, exceedingly constant—a fact which would seem to justify Fremy’s conclusion that the formation of gum by the plant depends upon an important function, and is not accidental, the product eliminated being most probably the organic acid, which, on escaping from the structure of the plant, obtains its alkalis from the cell wall, and is thus reduced to the saline condition.

Dr. Graeger found that gum dried in the air contains 85.25 per cent. of organic matter, 325 of ash, and 11.50 of water. The ash was found in three experiments to contain the average of 48 per cent. of lime, 18 of magnesia, and 34 of potash. It still remains to be explained why the Basseea group of gums merely swell, when placed in water, instead of being dissolved.

Detection of Gum.—“Neutral acetate of lead does not precipitate gum arabic mucilage; but the basic or sub-acetate forms, even in a very dilute solution, a precipitate of definite constitution.” (Fluck and Hamb. Pharmacog.) A gum solution is rendered turbid by silicates, borates, and boric salts, but it is unaffected by silver salts, mercuric chloride, and iodine. Acted upon by nitric acid, mucic acid is produced from gum, and also a little oxalic acid.

Killiani has recently shown that Arabinose, the sweet substance obtained from gum arabic by the prolonged action of dilute sulphuric acid, is identical with lactose obtained from milk sugar. Gum may be distinguished from dextrine by the following tests:

1st.—It contains no dextro-glucose, a substance present in dextrine and recognised by the copper test (Fehling’s solution).
2nd.—Gum contains a lime compound detected by the milky action of oxalic acid.
3rd.—Gum gives a yellow precipitate with ferric salts.

Substitutes and Adulterations.—The Indian Pharmacopoeia recommends the gum of Feronia Elephantum, Corr., as a good substitute. It forms small rounded tears, transparent, frequently stalactitic, colourless, yellow, or reddish. It is soluble in two parts of water, forming a tasteless mucilage and much stronger than a gum arabic solution of the same proportions. It is chemically, however, considerably different from true gum arabic. It is precipitated by neutral acetate of lead or caustic baryta, but not by potash; in this reaction it resembles Tragacanth, which, unlike gum arabic, yields an abundant precipitate with neutral acetate of lead.

The gum from Prosopis glandulosa, Torrey, a tree successfully introduced into the North-West Provinces by the Department of Agriculture and Commerce (nearly allied to the Panjab species, P. spicigera, Linn.), “yields a gum sometimes used in America as a substitute for gum arabic, and known there as Mexquit Gum.” (Dr. Charles Rice, New York.)

The adulterations are chiefly mixtures of other less valuable gums, and, indeed, so frequently is this the case that for pharmaceutical purposes it is desirable that the gum should be picked and assorted and...
### ACACIA Sundra.

<table>
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<tr>
<th>Catechu-yielding Species.</th>
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<td>each fragment cleansed from mechanical impurities. Flour or often mixed with powdered gums, but this may readily be done by the blue reaction with iodine. Dextrin is also often used as an adhesive but this may be at once detected by the tests already given. In other non-gummy substances are sometimes mixed to increase their taking advantage of the presumption that these will be viewed medically and accidentally.</td>
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### THE DYE.

Large quantities of gum Arabic are used for giving lustre and silk, and for thickening colours and mordants in calico-printing and suspending tannate of iron in the manufacture of ink and black.

### MEDICINAL USES.

The gum is used in medicine as a demulcent and emollient advantage of its viscosity it is used externally to cover inflamed such as burns, sore nipples, &c., and it blunts the acrimony of matters by being blended with them. The powdered gum has found useful in checking hemorrhage from leech-bites, and when up the nostrils it arrests severe epistaxis. Internally it has been useful in inflammations of the gastric and intestinal mucous membrane. If held in the mouth in the form of a special preparation, the gum is serviceable in allaying cough, thus affording relief. Its influence as a mulcent is supposed to extend even to the urinary organs. Gum Arabic has been recommended as a substitute for amylaceous food in diabetes, but it does not appear to have been used with any appreciable benefit.

### Acacia sirissa, Buch.; Syn. for Albizia Lebbeck, Benth.

**A. speciosa**, Willd.; Syn. for Albizia Lebbeck, Benth.

**A. Suma, Kurz, Ms. in Brandis’ For. Fl., 1871; Fl. Br. Ind., Bedd., Fl. Sylva., t. 49.**

**Syn.**—Mimosa Suma, Roxb.

**Vern.**—Sai-kanta, Beng.; Komita, Pertabgarh; Dhanu Kusum, Acacia; Banswara; Gorada, Mandevi; Sonkari, Danjol, sandra, Tel.; Mugalisopin (in Mysore), banni mara, muchu.

**Habitat.**—Common in Bengal, Behar, the Western Penins and Ceylon.

**Botanic Diagnosis.**—A medium-sized tree, with white bark at branchlets; spines in pairs, short-hooked. Leaves with 20-40 pairs, 60 to 100 leaflets; rachis ½ foot long, densely downy, with a lan- gland and several glands between the upper pinnax. Corolla nearly scarce exceeding the crenulate calyx. Pod 3-4 inches by ½ in thicker than in A. Catechu; veined, distinctly beaked, gradually narrowed suddenly into a stalk ½ to 1 inch long.

Compare with A. Catechu.

### CATECHU.

**Gum.**—The extract Catechu is said to be made from the bark of this tree (Brandis, 188).

**Tan.**—The bark is peeled off and used as a tan (Brandis).

**Structure of the Wood.**—The wood resembles that of Acacia but has smaller and more numerous pores, and finer and more medullary layers.

### A. Sundra, DC.; Fl. Br. Ind., II., 295; Bedd., Fl. Sylva., t.

**Vern.**—Lai khaire, Mar.; Kempu khairada, dhemi, Kan.; Mandra, sandra, darsancha, Tel.; Karangalli, bija, Tam.; Mysore, Kan.

A. 295
The Acalypha

<table>
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<th>ACALYPHA</th>
<th>brachystachya</th>
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**Habitat.**—Found in the Western Peninsula, Ceylon, and Upper Burma.

**Botanic Diagnosis.**—The *Flora of British India* remarks: “This is scarcely more than a variety of *A. Catechu*, from which it differs by its fewer leaflets and pinnate, and by the total absence of pubescence,” and in “the dark-brown colour of its branchlets.”

Compare with *A. Catechu*.

**Properties and Uses.**—

**Gum.**—It yields Catechu of good quality.

**Structure of the Wood.**—Dark red, rather close grained, durable, very heavy, not attacked by insects. Much like *A. Catechu*, and when seasoned weighs about 80 lbs. per cubic foot. *(Bomb. Gaz., XV., Part 1., p. 60.)*

**Oleghorn** says it is “used for posts and rice-pestles. The supply is rather large and abundant, but the wood is not generally to be obtained in the market in planks of any size. At Guzerat, Mr. Rohde states that posts 5 feet long are procurable at Rs.12 per 100. These are well suited for fencing, though the non-elastic nature of the wood is unfavourable to the holding of nails driven into it. The natives regard it as the most durable wood for posts in house-building.” *(Oleghorn’s For. and Gard. S. Ind., 213.)*

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<th>Acalypha tomentosa, Wild. ; Fl. Br. Ind. II., 294.</th>
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**Habitat.**—A small tree of the Western Peninsula and Ceylon; very common in the Panch Mahals and Gujarát, where it is known as *anjar*.


*A. vera*, Wild.; see *A. arabica*, Willd.; and for the true Gum Arabic, see *A. Senegal*, Willd.

*A. vera* may be described as the hypothetical species to which the true gum arabic was attributed before the plants which yielded that product were definitely determined.

**ACALYPHA, Linn.; Gen. Pl., III., 311.**

A genus of shrubs (belonging to the Natural Order EUPHORBIACEAE) having alternate, ovate, 3-5 or pinnivened leaves, with long pedicles; often in calation variously coloured or marked, chiefly in shades of yellow to dark red. Flowers in axillary simple racemes or spikes, apetalous and monoeious or dioecious. **Male calyx** usually 4-partite, valvate. **Stamens** indefinite (rarely 6), attached to an elevated receptacle; **filaments** free, compressed, attenuate at the apex; **anthers** inserted below the apex, cells often free. **Female flowers** in spikes, hid within the axils of bracts, solitary or 3-5, cymeose, sessile. **Bracts** much varied in form, usually dentate, variously evolute, and is most species accrescent, more or less covering the fruit. **Female calyx** 3-4-partite, subchavate. **Ovary** 3-locular, **cells** (two anterior) 1-celled. **Style** 3, distinct, or shortly connate at the base. **Capsules** 3, often echinate or rugose. (Compare with *Bauillon, V.*, 212.)

A large genus, comprising some 220 species, mostly American, but more or less distributed over all tropical and sub-tropical countries. In India there are some six or eight unimportant species. The name of the genus was originally *Acalypha*, from [ακάλυπτος], unpleasant; and [οὖ], touch, or [κυλώμα], the nettle.

**Acalypha brachystachya**, Horn, Hort. ; DC. Prod., XV., II., 870.


**Habitat.**—A small bush, little over a foot in height, met with on the Himalaya and the Nilgiri Hills.

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ACALYPHA indica.

The Birch-leaved Acalypha.

Botanic Diagnosis.—Leaves round, cordate, long-petioled, three-nerved. Spikes sessile, aggregated together; male flowers minute, purplish, forming a head within the exterior involucre; female flowers two or three within each involucre. Bracts crowded, sessile, proliferous.

Acalypha ciliata, Müll.-Arg.; DC. Prod., XV, II., 873; Roxb., Fl. Ind., Ed. C.B.C., 686.

Habitat.—A common annual plant, throughout the plains of India, most plentiful in the Western Peninsula, where it almost takes the place of A. indica, Linn., to which it is nearly allied.


The Birch-leaved Acalypha.

Vern.—Sinni-marum, Tam.; Chinni-kējhar, Duk.; Chinni-kā, chinni, Tel.

Habitat.—A bush, 4-8 feet high, leaf-shedding; met with in South India—Madras, Pondicherry, Mysore, and the Carnatic; Ceylon; Burma—frequent in the tropical forests of Pegu Yomah and Martaban up to 2,000 feet in altitude; Moluccas.

Botanic Diagnosis.—Leaves ovate-oblong, deeply serrate, acute to long acuminate, 3- or almost 5-nerved, tomentose beneath, on a long petiole. Flowers minute, green, clustered, sessile, forming slender puberulous spikes, occurring singly or in 2-3 above the scars of fallen leaves; the female flowers at the very base of the spike or on separate small axillary spikes. Styles simple, many-cleft, about 2-3 times longer than the floral bracts. Flowering time the beginning of the hot season.

Medicinal Properties and Uses.—The leaves “are much esteemed by the native practitioners, who prescribe them as a grateful stomachic in dyspeptic affections and in cholera; they are, besides, considered as attenuant and alterative, and are accordingly administered when it is necessary to correct the habit.” “The dose of the infusion of the leaves” as ordered by the Veddans, “is half a tea-cupful twice in the day.” (Ainslie, Mat. Ind., II., 388.)

A. indica, Linn.


Vern.—Kōppī, kōkālī, or kōlī, Hind., Bomb.; Kōkāli, kākāji, Mar. Vanchītī kānā, Guj.; Muktañjī, shetō buṣunā, murtānta, Beng. Indra-māriti, Ukiya; Aritamamajayi; Sans.; Kōppānimeni, Tam. Kōppa-chetta, murtamba-chetta or mārkāmāta (Godavari), pappam-tā marṣīnti, karīnta-manjī, Tel.; Chalmari, kōppī, Kanārā; The Cupament of Rheed, Mal., X., 161, t. 81, 83; Kāpameneo, Cingh.


Habitat.—A small annual shrub (1-2 feet in height) occurring as a troublesome weed in gardens and road-sides throughout the plains of India, flowering all the year.

Botanic Diagnosis.—Leaves scattered, ovate-cordate, 3-nerved, serrate, smooth, about 2 inches long and 1½ broad; petiole as long as the blade. Spikes axillary, generally single, peduncled, erect, as long as the leaves, many-flowered, crowned by a cross-shaped body, the base of which is surrounded with a three-leaved calyx. From the base of this cross-
shaped body issues a style having a stigmatic fringe. Male flowers numerous, crowded around the apex of the spike.

**Medicinal Properties and Uses.**—"The roots, leaves, and tender shoots are all used in medicine by the Hindues. The powder of the dry leaves is given to children in worm cases, also a decoction prepared from the leaves with the addition of a little garlic. The juice of the same part of the plant, together with that of the tender shoots, is occasionally mixed with a small portion of marga oil, and rubbed on the tongues of infants for the purpose of sickening them and clearing their stomachs of viscid phlegm. The hakims prescribe the koopamayees in consumption." (Ainslie, Mat. Ind., II., 162.) "The leaves with garlic are regarded as anthelmintic; mixed with common salt the leaves are applied externally in scabies, and the juice rubbed up with oil is used externally in rheumatism." (Balf. Cycl.) According to Rheede the root is used as a purgative on the Malabar Coast. (Hort. Mal., X., 165.) This property "is confirmed by Dr. H. E. Busteed, who has used it as a laxative for children." A contributor in Dacca informs me he uses it as a laxative, and in an official correspondence with the Government of India, Rai Kanai Lal De, Bahadur, includes the muktaajhuri amongst emetics. In Bombay "the plant had a reputation as an expectorant, hence the native name khokli (cough)." (Dymock, Mat. Med. W. Ind., 588.) "Dr. George Bidie furnishes the following remarks: 'The expressed juice of the leaves is in great repute, wherever the plant grows, as an emetic for children, and is safe, certain, and speedy in its action. Like Ipecacuanha, it seems to have little tendency to act on the bowels or to depress the vital powers, and it decidedly increases the secretion of the pulmonary organs. Probably an infusion of the dried leaves or an extract prepared from the green plant, would retain all its active properties. The dose of the expressed juice, for an infant, is a teaspoonful.'" (Pharm Ind.) A decoction of the leaves is given in tarache; a cataplasm of the leaves is applied as a local application to syphilitic ulcers, and as a means of relieving the pain of snake-bite. (Bunyi.) According to Nimmo the roots "attract cats quite as much as those of valerian." (Voigt, 165; Treasury of Botany.)

§ Much used by Mahomedan practitioners in treating cases of acute mania in early stage. The fresh juice (3i) with (6 gr.) chloride of sodium dissolved in it and dropped in both nostrils every morning, followed by cold shower-baths for three mornings regularly, proves highly successful. Thus it is supposed by them to act as a ‘brain purgee,’ so called probably owing to a quantity of mucus and other matter escaping from the nostrils immediately after the application of the above recipe. I have given it internally; it acts as an anthelmintic and laxative." (Surgeon E. W. Satter, Rajamundry, Godavery District.) "Juice of the fresh plantemetic, laxative; dose one to four drachms, according to age. Fresh leaves ground into a paste, made into a ball, to the size of a large marble and introduced into the rectum, very useful in relieving obstinate constipation of children." (Apothecary Thomas Ward, Madanapalle, Cuddapah.) "The juice or the bruised leaf is applied to the skin to allay the irritation caused by the bite of the centipede. (Surgeon Ruthnam T. Moolelliar, Chingleput, Madras Presidency.)

"The juice of the fresh leaves mixed with lime is applied topically in painful rheumatic affections." (Surgeon-Major John Lancaster, M.B., Chittrar.) "Used in scabies and ringworm, also internally as a carminative." (Surgeon-Major F. L. Ratton, M.D., Salem.) "The root possesses purgative properties; the leaf-juice is a safe, useful emetic, especially adapted for children." (Surgeon-Major F. M. Honston, Trivandrum, and John Gomez, Trivandrum.) "The juice of the fresh plant

A. 3ii
ACAMPE papillosa.

is given to children as an emetic in $\frac{1}{2}$ to $\frac{1}{3}$ doses." (Apothecary J. Norman, Chattrapur, Ganjam.)

"This plant is called in Kanara chalmaras as well as kūppī (the latter word means a 'heap,' the plant being found in waste places and rubbish heaps). The natives use it in congestive headaches: a piece of cotton is saturated with the expressed juice and inserted into each nostril, relieving the head symptoms by causing haemorrhage from the nose. The powder of the dry leaves is used in bed sores and wounds attacked by worms. In asthma and bronchitis I have employed it with benefit both in children and adults.

"Mode of preparation."—Macerate 3 oz. of the fresh leaves, stalks, and flowers, with a pint of spirits of wine, in a closed jar for 7 days, occasionally agitating the same. Strain, press, filter, and add sufficient spirits of ether to make one pint.

"Physiological effects."—In small doses it is expectorant and nauseant; in large doses emetic.

"Dose."—Minims 20 to 60, frequently repeated during the day in honey. (Surgeon-Major E. H. R. Langley, Bombay.) One drachm of the expressed juice of the fresh leaves is an easy and rapid emetic in children. The bruised leaves are useful as an application to maggot-eaten sores." (Surgeon W. D. Stewart, Cuttack.)

"The root, bruised in hot water, is employed as a cathartic, and the leaves as a laxative in decoction mixed with common salt. The leaves are used in scabies, and mixed with chunam in other cutaneous diseases (Urury)." (Surgeon H. W. Hill, Mānbhum.)


Acampe papillosa, Lindl.; Orchidez.

Syn.—Saccolarium papillosum, Lindl.


Medicine. This plant is said by U. O. Dutt to be used indiscriminately with the Vanda Roxburghii, the roots of both constituting rāsā, Beng. and Sans., also gandhanākūli. Acampe is a native of the coast of Burma and South India, and is not met with in Bengal. Acampe differs from Vanda in having small brittle flowers, with a lip adnate to the edges of the column, sepals and petals thick, concave; racemes short, rigid, crowded upon a short simple peduncle. Dr. Dymock includes both the above plants as yielding the rāsā, and says the barb drug comes from Kathiawar. The comparatively limited distribution of A. papillosa as compared with Vanda Roxburghii should assist in determining which of these plants is the true rāsā.

It seems probable that the roots of two or three distinct orchids are indiscriminately used as rāsā, — e.g., Acampe papillosa, Vanda Roxburghii, and Vanda Wightiana. U. O. Dutt gives as follows a popular prescription for rheumatism, in which rāsā is one of the ingredients: —

"Rāsā-pachakārī.—Take of rāsā, gulanchā, dundārī, ginger, and the root of the castor-oil plant in equal parts, and prepare a decoction in the usual way. This is apparently a popular prescription for rheumatism, being mentioned by most writers."

§ Special Opinions.—"This orchid is very common in the Konkan; its roots are considered to have cooling properties, and are used medicinally as Rāsā." (Surgeon-Major W. Dymock, Bombay.) "I found the Acampe papillosa in the mango-groves of Malda. It is a common parasite on the mango tree, and flowers in the rainy season, when it can readily be

A. 320
The Natural Order Acanthaceae.

ACANTHACEÆ.

distinguished from allied species." (U. C. Dutt, Civil Medical Officer, Serampore.)

"It is said to be a specific for acute rheumatism. It is invariably given internally as a substitute for Sarisparilla. There are three preparations in use. The first is called Rásná panchak, and is prepared by boiling together equal parts of rásná, demadára, ginger, garula and castor root, and water 8 oz. This decoction is prescribed extensively for cases of acute rheumatism. The second preparation, or Rásná supíraka, has seven ingredients, and is given to cases of lumbago, sciatica, and neuralgia. Prepared by boiling together equal quantities of rásná, gokhraru, castor root, demdára, punarnava, goivel, pulp of bahava, and ginger. The third preparation is named the great Rásná (Bará rásná) and is considered a specific remedy for rheumatic and nervous affections, paralysis, secondary syphilis, and uterine diseases. It has the peculiar power of preventing abortions and miscarriages. The ingredients of the decoction are rásná two parts, dhumasa, chiknamula one part, castor root one, demdára one, kusheera vejhanda one, adulasa one, ginger one, small hidā one, chuwak one, nagar-motha one, punarnava guivel one, vardhára one, budishép one, gokhraru asandha one, ativish one, pulp of bahava, sutwari one, pimple one, kolista one, coriander one, ringuee one, and moti ringuee one." (Surgeon W. Barrett, Bhuj, Cutch, Bombay.)

ACANTHACEÆ; CXXII. Gen. Pl.

The name of a large and important Natural Order of herbs and shrubs (rarely trees), comprising about 1,500 species, almost exclusively inhabitants of the tropical and warm-temperate regions of the Old World. Indeed, the monopetalous, sub-bushy or herbaceous under-vegetation of dense tropical forests or savannas are, in the temperate zones and none in the alpine or arctic regions. The name of this Natural Order belongs to the Cohort Personales or plants, having a monopetalous, hypogynous, and chelilī 2-labiato corolla; stamens generally 4, two long and two short (didynamous). Ovary 2-celled. Fruit capsular. In this cohort are placed the following Natural Orders: Scrophulariacea, Verbenaceae, Lentibus, Orobanchaceae, Gomphaceae, Bignoniaceae, Acanthaceae, and Pedalineæ.

Diagnostic characters of the Acanthaceae.—Leaves opposite, exstipulate. Flowers aggregated into compact, bracteate spikes (sometimes solitary in some Thunbergia). Corolla imbricate or twisted in development, bilabiato, rarely sub-regular. Stamens often reduced to two. Ovary 2-celled; ovules one or more in each cell, 1 to 2, seriate, anatropous. Capsule dehiscent, loculicid; valves often elastically recurving and carrying the seeds attached to the septum. Seeds 2-seriate along the septum, and each (except in Thunbergia) seated upon a sharp, up-curved, hook-like process from the placenta (called the retinaculum), ovoid or compressed; testa smooth or ridged, rarely hispid. Albumen none.

This Order has its nearest affinities in Scrophulariaceae, Bignonieae, and Verbenaceae. The bracteate spike, contorted zization, and the presence of the retinacula will unerringly separate it, however, from these Orders. Indeed, the dark-greenish blue, and more or less glabrous condition of the foliage, with many approximately parallel veins, when taken along with the bracteate spikes, will be found to possess something so characteristic and impressive, that if this feature be once carefully observed it is not again readily mistaken.

For the analysis and diagnostic characters of the genera and species of this Order reference should be made to the Flora of British India, Vol. IV., 388, from which the following classification into Tribes has been extracted for the convenience of the general reader:—

Tribe 1, Thunbergiaæ—Scendent or twining. Calyx minute, annular
ACANTHUS

ilicifolius.

ACANTHACEAE.

or 10-15-toothed. Corolla-lobes twisted in bud. Ovules 2 in each cell, collateral, capsule beaked; retinacula o.

Genus—Thunbergia.

**Tribe 2. Nelsoniæ.**—Corolla-lobes imbricate in bud. Ovules many, superimposed in two rows in each cell. Seeds small, seated on minute papilae, not on hard retinacula, obscurely albuminous.

Genera.—Elytraria, Nelsonia, Ebermaiera, Ophiarrhiziphyllum.

**Tribe 3. Ruelliae.**—Corolla-lobes twisted to the left in bud. Seeds on retinacula. Sepals 5 or 4, with one larger. Anthers usually 2-celled; cells parallel or one a little below the other. Style 2-fid, one lobe often suppressed.

Sub-tribe 1, Polyspermeæ.—Ovules 3 to 12 in each cell. Capsule normally 6 or more seeded.

Genera.—Cardanthera, Hygrophila, Nomaphila, Ruellia, Echinanthus, Æchmanthera, Hemigraphis, Stenosiphonium.

Sub-tribe 2, Tetraspermeæ.—Ovule 2 in each cell. Capsule 4 or fewer seeded.

Genera.—Strobilanthes, Calacanthus, Calopanes, Dzedalacanthus, Phaviopsis, Petalidium.


Genera.—Blepharis, Acanthus.

**Tribe 5. Justicieæ.**—Corolla-lobes imbricate in bud. Retinacula curved, hardened. Anthers 2-1-celled; cells often spurred at the base, one frequently placed much above the other. Style shortly equal 2-fid or sub-entire.

Sub-tribe 1, Andrographideæ.—Ovules 3-10 in each cell. Capsule normally 6 or more seeded.

Genera.—Andrographis, Haplanthus, Gymnostachyum, Phlogacanthus, Cystacanthus, Diotacanthus.

Sub-tribe 2, Barlerieæ.—Ovules 2-1 in each cell. Corolla-lobes 5, sub-equal. Stamens 4, of which 2 are small or obsolete, or 4-1-celled.

Genera.—Barleria, Neuraacanthus, Crossandra.

Sub-tribe 3, Asystasieæ.—Ovules 2 in each cell. Corolla-lobes 5, sub-equal. Sepals 5, small, sub-equal. Stamens 4 or 2; anther-cells 2, sub-equal, parallel, muticus.

Genera.—Asystasia, Eranthemum, Codonacanthus.

Sub-tribe 4, Eustaliceæ.—Ovules 2 in each cell. Corolla distinctly 2-lipped.

Genera.—Lepidagathis, Phialacanthus, Monothecium, Clinacanthus, Hypcestes, Rungia, Dicliptera, Peristerophyllum, Justicia, Adhatoda, Rhinacanthus, Dianthera, Hyptis, Phyllostis, Spincactanthes, Ecbolium, Graptoiphyllum.

**ACANTHUS, Linn. ; Gen. Pl., II., 1090.**

A genus of herbs belonging to the Acanthaceæ; characterised by having the upper lip of the corolla obsolete, lower 3-lobed. Anterior filaments without an excurrent process. Ovules 2 in each cell.

It contains 7 Indian species, none of which are of any great economic value; all are confined to the warm forests of the Eastern Peninsula. spinosus is found in Italy, Spain, and the south of France, and is supposed to have suggested the idea of the decoration of columns in the style known as Corinthian architecture.

**Acanthus ilicifolius, Linn. ; Fl. Br. Ind., IV., 481; Wight, Ic. t. 455.**

Vern.—Haruccu kanta, Beng.; Harikusan, Sans.; Kaya, Bum.

Habitat.—A common plant, growing everywhere near the coast, frozen.
the Sunderbuns to Malacca, and one of the most characteristic plants in that region. It makes its appearance in the swamps around Calcutta, Dum-Dum, &c.

It does not appear to be put to any economic purpose, although it covers many miles of country.

ACER.

A genus of trees with opposite, simple, or palmately lobed, exstipulate leaves (belonging to the Natural Order Sapindaceae). Flowers regular, polygamous, formed into terminal and lateral racemes or corymbs. Calyx usually 4-partite, imbricate, deciduous. Petals of the same numberings of the sepals, or absent, shortly clawed, and without scales. Stamens 4-12, usually 8, inserted on the glabrous disk; generally shorter in the hermaphrodite than in the male flowers. Ovary laterally compressed, 2- (rarely 3-) lobed and celled; cells ovate. Fruit an indehiscent double samara. Seeds exalbuminous.

A genus containing about 40 to 50 species, found in Europe, Asia, and North America, chiefly in the temperate zones. The name Acer is derived from the Latin Acer, sharp or pointed (aigu, Fr.; acute, eager, Eng.). A name applied in all probability by the Latin people to the members of this genus in allusion to the form of the leaves. This is the genus of the maple, the sycamore, and the plane-tree of English authors. A. Pseudo-platanus is a native of Germany, Switzerland, Austria, and Italy, now largely cultivated in England; it is the greater maple, sycamore, or plane-tree. A. campestre of England is the common maple. A. saccharum, Wang, is the common sugar-maple of the Northern United States and of Canada. In addition to yielding sugar, A. rubrum, the Swamp maple of Pennsylvania, gives from its bark a dark-blue dye made into ink.

MAPLE-SUGAR (a form of Cane-sugar).


It would appear that either none of our Indian species of Acer yield maple-sugar, or that this property is quite unknown to the natives of our hill tracts, where various species of maple are plentiful. This subject seems worthy of a little attention, for there does not seem the slightest reason why the sugar-yielding species could not be introduced into India. If they were found to take naturally to the soil and climate of Indian sub-alpine regions, they might supply the poor hill tribes with the little-known luxury of sugar; they are, however, of no commercial value. Speaking of maple-sugar, Spons' Encycl., says: "In sections of the United States where it has not been exterminated, the manufacture of sugar and syrup from it is a remunerative adjunct to other farming industries, occupying a period in which little other farm work can be pursued. The apparatus for collecting the sap and manufacturing the sugar involves a very small investment; the fuel consumed usually consists of the prunings of the maple grove, which is benefited thereby; and at least 90 per cent. of the gross return is net profit."

The census of Pennsylvania for 1870 gives the following figures for maple-sugar as manufactured in that State: 1850, 2,376,525 lbs.; 1860, 2,768,995 lbs.; and in 1870, 1,545,917 lbs.; and the United States as a whole are said to manufacture about 40,000,000 lbs. annually, the Indians manufacturing some 30,000,000 lbs. in addition for their own consumption. Of this amount Vermont yields about 10,000,000 lbs. and New York
a somewhat larger quantity. Canada manufactures about 10,000,000 lbs. annually.

In addition to the manufacture of sugar a large quantity of maple sap is consumed in the form of molasses.

In Nebraska an equally good saccharine product is obtained from

**A. Negundo, L. (Negundo aceroïdes, Manch.)** From some investigations made in Illinois, with reference to the value of this tree as a supply of sugar, it was found that trees 5 years old commence to yield, and that an ordinary tree will yield more than one of equal size of the true maple-sugar tree; (2) that the sap is richer in sugar, the yield being 2-8% per cent. to the weight of sap; (3) that the sugar produced is whiter than that from the sugar-maple. These facts should recommend themselves to planters, and it is probable this tree would succeed better in India than any of the preceding species.

There are 13 species of Acer met with in India, grouped into the following sections by the *Flora of British India*:

[Note.—Those marked * will be found described further on.]

**SECTION I.—Leaves undivided.**

† Leaves with 3 basal nerves.

*1. A. oblongum, Wall.—Kashmir, Sikkim, Bhutan.
2. A. niveum, Blume.—Leaves quite entire, white, glaucous beneath. Clymen lax, flowered, glabrous, cell not angular.—Assam, Moumein, Sumatra.

*3. A. lavatatum, Wall.—Simla, Sikkim, Khásia Hills, &c.

†† Leaves with 5 basal nerves.

*4. A. sikkimensis, Miq.—Sikkim, Bután.
*5. A. Hookeri, Miq.—Sikkim, Bhután.

**SECTION II.—Leaves 3-lobed.**

7. A. isolumb, Kurz.—Leaves deeply 3-lobed and nervet, glabrous, shining, acutely serrate, lobes lanceolate, acuminate.—Pegu.

8. A. pentaportic, L. Stewart.—Leaves 3-lobed, with tufts of hairs in the axils of the 3-5 nervet lobes, ovate, obtusely serrate. Peduncles fascicled.—Kashmir to Kumaon.

**SECTION III.—Leaves 5-lobed and nervet (except 3-lobed form under A. villosum var. Thomsonii).**


* Var. Thomsonii, Miq., Sp.—Bhután to Mánipour.

11. A. caudatum, Wall.—Chumba to Sikkim.

**SECTION IV.—Leaves 7- to 5-lobed and nervet.**


13. A. pictum, Thumb.—Kashmir to Bhután.

**Acer caesium, Wall. ; Fl. Br. Ind., I., 695 ; Sapindaceæ.**

**The Indian Maple.**

Vern.—Trekhan, tarkhana, tilpattar, mandar, kawi, kalindra, salina, kunam, Pd.; Kanshik, THIBET; Jerimu, shumantra, SIMLA; Kiu, kaisraing, KUMAO.

**References.**—Brandis, For. Fl., 111 ; Gamble, Men. Timb., 100.

**Habitat.**—A large, deciduous tree, found in the North-West Himalaya from the Indus to Nepal, between 7,000 and 11,000 feet.
Maple Timber.

Botanic Diagnosis.—Leaves palmately 5-lobed, pale, glaucose beneath and almost quite glabrous, except a few short hairs on the veins. Cymes corymbose, appearing after the leaves and becoming nearly as long. Fruit black and quite glabrous, carpels 1½ to 2 in. long, wings venose, somewhat diverging; cells angular, black.

A large tree, often 80 feet in height; twigs red or bluish, laterally compressed, flowering in April, and the fruit ripening in October.

Structure of the Wood.—White or pale cream-coloured, with brown bands, porous, close-grained, less mortelled than that of A. caudatum, soft to moderately hard; annual rings distinct. Weight about 40 lbs. per cubic foot.

Serrately used. Drinking-cups are sometimes made of it by the Thibetans.


Vern.—Kabashi, Nepal; Daom, yatli, Lepcha; Kilob, Bhutia.

Habitat.—A large deciduous tree, found in the Sikkim Himalaya, above 7,000 feet in altitude. This is the chief Maple of the North-East Himalaya.

Botanic Diagnosis.—Leaves beautifully green, 5-7-lobed, sub-membranous, glabrescent, except in the axils of the 5-7 nerves, petioles red, Cymes pyramidal or elongated, sub-glabrous, appearing with the leaves.

Structure of the Wood.—Greyish white, moderately hard, shining, close-grained. Annual rings marked by a thin line. Weight 38 lbs. per cubic foot.

It is extensively used for planking and for tea-boxes. It reproduces freely either by seed or by coppice, and plays an important part in the regeneration of the hill forests.


Vern.—Kusala, kanjara, kanjara, Simla; Khansing, kabashi, Nepal; Yaliskin, Bhutia.

References.—Brandis, For. Fl., 112; Gamble, Man. Timb., 100.

Habitat.—A moderate-sized, deciduous tree, with dark-brown bark, flowering in March and April; met with in the Himalaya from the Chenab to Bhutan, between 7,000 to 11,000 feet.

Botanic Diagnosis.—Leaves 5-lobed, serrate, nearly glabrescent except in the axils of the nerves; lobes caudate, the two basal ones small. Racemes short. Carpels ½ to 1½ inch long. Fruit nearly glabrous; wings pink, or at length ferruginous, front sinuous, crenulate.

Structure of the Wood.—White, with a faint pink tinge, shiny, compact, moderately hard, sometimes with small masses of heartwood near the centre. Annual rings distinct. Weight 43 lbs. per cubic foot.

A. cultratum, Wall.

A Synonym used by Baden Powell, Pb., Prod., I., 566. See A. pictum, Thunb.


Vern.—Laikabashi, Nepal; Pale, Lepcha.


Habitat.—A deciduous tree, found in Sikkim and Bhutan, above 7,000 feet. Plants with copper-coloured foliage are not uncommon about Darjeeling.

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Acer pictum.

Botanic Diagnosis.—Leaves undivided, finely duplicate-serrate, caudate-acuminate, base 5-nerved, coriaceous, both sides green and glabrous. Racemes puberulent, simple, nearly equal and appearing in pairs. Fruit glabrous; carpels 1/4 to 1/2 inch long; wings venose, yellow, above and divergent, back slightly curved.

Structure of the Wood.—Grey. Weight 37 lbs. per cubic foot.

Acer ilexigatum, Wall.; Fl. Br. Ind., I., 693.

Vern. — Saslend, cherawal, thali kabishi, Nepal; Tungnyok, Lisu.


Habitat.—A deciduous tree, found in the Himalaya from the Siwalik eastward to Bhutan, between 5,000 and 9,000 feet; in the Khanpur and in Tenasserim.

Botanic Diagnosis.—Leaves undivided, quite entire or minutely serrate when young ovate-oblong acuminate, glabrous, penninerved, green on both surfaces, base rounded three-nerved. Cymes glabrous, appearing with the leaves. Fruit glabrous; carpels 1/4 inch long; wings venose, slightly diverging, widened above, back curved. A handsome tree with broad, oval crown, flowering in April, bearing its fruit in July and August. Bark smooth, yellowish, or sometimes spotted.

Structure of the Wood.—White, shiny, hard, close-grained. Weight 43 lbs. per cubic foot. Used for planking and tea-boxes. Much used in Nepal for building purposes.

A. oblongum, Wall.; Fl. Br. Ind., I., 693.

Vern. — Mark, Pn.; Mharendala, patangala, hirmoli, N-W. P.; bushimpal, Nepal.


Habitat.—A moderate-sized, deciduous tree, found in the mountains from the Jhelum eastward to Bhutan, up to 6,000 feet in altitude.

Botanic Diagnosis.—Leaves undivided, quite entire, obtuse acuminate, penninerved, silvery glaucous beneath, base obtuse, ovate or obovate. Cymes panicked, appearing with the leaves. Fruit glabrous; carpels 1/4 inch long; wings venose, diverging, contracted below, back nearly rounded. A handsome tree with broad, oval crown, flowering in April, bearing its fruit in July and August. Used for agricultural implements and drinking-cups.

Structure of the Wood.—Light reddish-brown, moderately hard, close-grained. Annual rings faintly marked. Weight 45 lbs. per cubic foot. Used for agricultural implements and drinking-cups.


Vern. — Tilpat, trekkhan, tarkhana, kakkru, kannau, kannau, taur, Pn.; Tukândo o tükandh, Murree; Mandal, manu, trekkhan, hazara; Tiam, kanawar; Kanchi, N-W. P.; Simla.


Habitat.—A beautiful, moderate-sized tree, met with in the Himalaya from Kashmir to altitudes of 4,000 to 6,000 feet, to Bhutan.

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Products of India.

Maple Timber.

Acer Thomsonii.

9,000 feet. A widely diffused species, being distributed to Japan, China, the Caucasus, Armenia, and North Persia; the type in these widely different countries constantly preserving itself. It is the most abundant Maple in the Himalaya, flowering in April, and the fruit ripening in July and August.

Botanic Diagnosis. Leaves 5-7-lobed, glabrescent, except hairy tufts on the axes of the basal nerves, cordate, lobes lanceolate cuneate, entire, green on both sides. Cymes corymbose, appearing with the leaves. Fruit glabrous; carpels 14 to 16 inch long, diverging almost in one line; wings sinuous, venose, back arcuate; cells compressed.

Properties and Uses—

Medicine.—The knots on the stem are made into the curious water-bags supposed by some of the hill tribes to have a medicinal influence over the water. The leaves are said to yield an acrid juice in Kanawar, which blisters the hands; but in most other parts of the Himalaya they are lopped off as fodder.

Fodder.—The branches are lopped for fodder.

Structure of the Wood.—Pinkish white, soft to moderately hard, close-grained, fairly strong and elastic. Weight 41 lbs. per cubic foot. It is used for the construction of ploughs, bedsteads, and poles to carry loads. Thibetan drinking-cups are made of the knotty excrescences; in fact this is the species most frequently used for this purpose.


Vern.—Pategnyok, Lepcha.


Habitat.—A small tree, found in the hills in Sikkim and in Bhutan, from 7,000 to 9,000 feet, and in the Mishmi mountains.

Botanic Diagnosis. Leaves undivided, minutely serrate, ovate, cuspidate, cordate, pinninerved, with 5 basal nerves, sub-coriaceous, glabrous, green on both sides. Racemes spicate and glabrate, appearing with the leaves. Fruit glabrous; carpels 8 to 14 inch long; wings venose, diverging, widened above; back straight or slightly curved; cells not angular.

Structure of the Wood.—Shining, grey; annual rings distinct. Weight 37 lbs.

A. Thomsonii, Miq.; Fl. Br. Ind., I., 695.


Vern.—Kakashi, Nepal.

References.—Brandis, For. Fl., 109.

Habitat.—A large tree, often 150 feet in height, found in the hills in Sikkim and in Bhutan, altitude 4,000 feet.

Botanic Diagnosis. By the Flora of British India, this is reduced to a mere variety under A. villosæm. In Manipur I compared this with A. villosæm carefully, side by side, and I regard Thomsonii as a distinct and well-marked species, which should be placed in the section with undivided leaves having 5 basal nerves. Leaves ovate, cordate, acute, entire or 5-angled on the apex, but never 5-lobed or even 3-angled; a foot or more long, thick, coarse, glabrous.

Structure of the Wood.—Greyish white, soft, and very brittle. A tree, 150 feet in height, hewn down by me in the Koupra forest, Manipur, having a stem 80 feet without branches, was shattered to pieces by the fall. Weight 44 lbs. per cubic foot.

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### ACETUM

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| **Botanic Name:** A. villosum  
**Vern.:** Karendera, Simul  
**References:** Brandis, Pfl.  
**Habitat:** A. villosum is found in North-West Himalaya from 5,000 to 9,000 feet, and in Manipur (one species).  
**Botanic Diagnosis:** Leaves lanceolate, serrate or repand, tomentose below (the latter case), exposed condition upon the young pubescent; appearing a little being hairy. Carpels 1½ to 2½ inches long, divided nulate; back rather curved; cellate.  
**A handsome tree with the leaves appearing in March, the leaves appearing in March.**  
**Fodder:** Leaves lopped for fodder.  
**Structure of the Wood:** White, finely mottled and shining; annuals 1 cubic foot. Not used. |

### ACETUM

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<td><strong>Acetum.</strong></td>
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| **VINEGAR:** Eng.; VINAIGRE: Fr.  
**Vinchre:** Sp.  
**Vern.:** Khall, Arab.; Sirkah, Pers.  
**Vern.:** SANS.  
**References:** Spons' Enycl., 202; Foods, 253; Balfour's Cyc., V., 304; Prod., I., 373; Pharm. Ind., 26; 35, 376; 1875, 156, 129, 174; 1884.  
**References:** O'Donoghue's Dictionary of Botany; Smith's Dictionary of Chemistry.  
**Vinegar** is an acid liquid, prepared by the action of certain substances on certain organic substances. It is produced (a) by the fermentation of malt and unmalted grain, and (b) by the oxidation of white or red wine.  
**Chemically:** Vinegar is a mixture of certain organic substances and water. It is derived from the fermentation of the sugar must and the oxidation of the alcohol. The first stage is the production of 15 parts of glacial acetic acid to 1 part of water and one part of alcohol.  
**After being diluted with water (6 parts of diluted acetic acid to 1 part of water),** the mixture should be boiled for several days, followed by the mixture being boiled for several weeks. The mixture should then be left in a cool place.  
**Vinegar** is used in the preparation of certain dishes.  
**Rice vinegar** is also used in the preparation of certain dishes. |
Wine-Vinegar.

As acetic fermentation. In the same way vinegar is made, so is the wine-vinegar, casks capable of holding 100 gallons are filled at the temperature of 75° to 85°, with the top to allow free access of air. A small quantity of wine is added to each cask, and every eight or ten days the casks are two-thirds full. After 10 to 14 days the fermentation is complete. A few gallons of vinegar are drawn and wine added, and so the process is carried on. The older casks a crop of the mother-of-vinegar plant when once established this greatly accelerates the fermentation and to always contain a little aldehyde. It is nearly pure malt vinegar.

The vinegar should have the sp. gr. of 1.017 to 1.019. Sometimes the case in wine-vinegar), its presence is detected by Trommer's test, for having, like glucose, the red sub-oxide of copper will be precipitated, the solution proving the presence of aldehyde. The metals are copper, lead, and even tin, derived through the apparatus used. These metals will at once be precipitated thrown down in the vinegar on the addition of hydrogen gas, and by no precipitate being formed on the addition of sodium salt. Vinegar should also be devoid of turbidity of a 10% solution of chloride of baryum when added to the vinegar, and the resulting precipitate (if any) is added to the further addition of the baryum solution. If the amount of sulphuric acid former is present. It must not, however, be overlooked, not only throw down sulphuric acid (if present) but also which might exist in the vinegar. The degree of free sulphuric acid may be conveniently tested by a piece of white paper or of loaf-sugar with the vinegar, the paper or sugar will become black. (For charred tests, see Year-Book of Pharmacy, in Journal de Pharmacie, d'Anvers). A very interesting mode of detecting mineral acids is to add a drop of gurjun oil and 25 drops of glacial acetic acid to the vinegar, and after agitation, four to five minutes. No reaction takes place if the oil is yellow but if these be present, a violet colour is produced on the addition of alcohol.

The degree of vinegar is determined by the number of cubic centimeters of 1% solution of acetic acid required to neutralize 1 fluid ounce. In the U.S. America carbonate of potash may be accurately determined by the weight of potash, one fluid ounce of the carbonate of potash. After 30 minutes of the solution of the carbonate of potash. After that it may be quite free from acidity; if the solution of the carbonate of potash. After that it may be quite free from acidity; if the solution of the carbonate of potash. After that it may be quite free from acidity; if the solution of the carbonate of potash. After that it may be quite free from acidity; if the solution of the carbonate of potash. After that it may be quite free from acidity; if the solution of the carbonate of potash. After that it may be quite free from acidity; if the solution of the carbonate of potash. After that it may be quite free from acidity; if the solution of the carbonate of potash. After that it may be quite free from acidity; if the solution of the carbonate of potash.
Dictionary of the Economic

ACETUM.

Malt Vinegar.

(or alcohol dehydrogen). By the absorption of an atom of oxygen from the air this compound is next formed into acetic acid 1—

\[ C_2H_4O + O = C_2H_4O + H_2O \]

\[ C_2H_4O + O = C_2H_4O_2 \]

The whole process of making malt vinegar occupies about two months, after which time it is stored in vats for the purpose of cleansing, colouring, &c.

The French Process.

According to Pasteur the process of aceticification is not spontaneous oxidation, caused through the simple exposure of an alcoholic liquid to the complete influence of the oxygen of the air, but is due to the oxidising influence of the growth of a mycioderm closely allied to dry rot (see Vinegar Plant) within the vinegar generator. The chemical actions indicated are quite correct, but the initial or starting agent in these changes is the growth of the vinegar plant upon the oxidising apparatus. In support of this theory, it may be stated that, in the absence of light, both fermentation and aceticification is greatly retarded, light being necessary for the growth of the yeast and vinegar plants.

Vinegar may be clarified by throwing about a tumbling of boiling milk into fifty gallons of the liquid and stirring the mixture. This operation has the effect at the same time of rendering red vinegar pale. At one time it was thought necessary to add free sulphuric acid to vinegar in order to stop further chemical changes and to destroy the mycioderm which might still be surviving within the liquid. The law formerly authorised 1 part of acid in 1,000 of vinegar. The necessity for acid is the confession of defective preparation, chiefly due to the whole of the glucose not having been changed into alcohol, or to too much diastase having been formed in the wort. According to the "Food and Drug Adulteration Act," the addition of sulphuric acid, in however small a proportion, constitutes an adulterant. Accordingly, Pasteur recommended that the mycioderm should be systematically sowed and the alcoholic liquid carefully added, until complete aceticification be accomplished. The mycioderm exists in two forms (which may be distinct species), both of which have the power of aceticification. In the one it consists of extremely small globules (micrococi), arranged and adhering together in contiguous rows (sometimes in addition, enveloped in a glue-like mass). In the other the mycioderm is made up of rod-like forms (bacilli).

This has been called the French Process, and it was originally applied practically in 1869 by Beton-Laugier, and more recently perfected by Mr. Emanuel Warin.

The Quick German Process.

This is chiefly practised on the Continent, and consists in taking alcohol and water instead of malt. Alcohol being free of duty (on the Continent) this can be done at a price which admits of competition with the ordinary malt vinegar. The pleasant aromatic odour of the malt vinegar obtained by mixing a small quantity of the brewed wort with the alcohol and water.

Wine-Vinegar or Acetum Gallicum.—This is made from either white or red wine giving origin to white and red wine vinegar. This is chiefly prepared from wines which have shown a tendency to become sour. The sugar present in the wine which acts as the ferment, when win...
Wine-Vinegar.

| ACETUM. |  
|--------|--------|
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naturally undergoes acetous fermentation. In the same way vinegar is made from ciders molasses, &c.

To prepare wine-vinegar, casks capable of holding 100 gallons are arranged in rows in a shed kept at the temperature of 75° to 85°. The casks are open at the top to allow free access of air. A small quantity of boiling vinegar is added to each cask, and every eight or ten days a few gallons are added until the casks are two-thirds full. After 10 to 14 days the acetous fermentation is complete. A few gallons of vinegar are withdrawn from each and wine added, and so the process is carried on. Upon the inside of the older casks a crop of the mother-of-vinegar plant will be found, and when once established this greatly accelerates the fermentation.

Wine-vinegar is said to always contain a little aldehyde. It is nearly one-sixth stronger than pure malt vinegar.

**Chemical Tests.**—Vinegar should have the sp. gr. of 1'017 to 1'019. If aldehyde be present (sometimes the case in wine-vinegar), its presence may be at once detected by Trommer's test; for having, like glucose, the power of absorbing oxygen, the red sub-oxide of copper will be precipitated from Fehling's test solution proving the presence of aldehyde. The most dangerous impurities are copper, lead, and even tin, derived through carelessness from the apparatus used. These metals will at once be detected through the black precipitate thrown down in the vinegar on the addition of sulphuretted hydrogen gas, and by no precipitate being formed on being boiled with common salt. Vinegar should also be devoid of free sulphuric acid. If 10 minims of a 10% solution of chloride of barium be added to one fluid ounce of vinegar, and the resulting precipitate (if any) removed by filtration, the further addition of the barium solution would give no further precipitation if the amount of sulphuric acid formerly authorised (1 in 1,000) were present. It must not, however, be overlooked that this test would not only throw down sulphuric acid (if present), but also any sulphate which might exist in the vinegar. The presence or absence in vinegar of free sulphuric acid may be conveniently demonstrated by saturating a piece of white paper or of loaf-sugar with the vinegar. On evaporating the vinegar, the paper or sugar will become charred should the acid be present. (For charring tests, see *Year-Book of Pharm.*, 1878, 174.)

**Dr. A. Jorissen** in *Journ. de Pharm., d'Anvers 1882, 233* describes a new and interesting mode of detecting mineral acids in vinegar. To a mixture of one drop of gurjun oil and 25 drops of glacial acetic acid, one drop of vinegar is added, and after agitation, four to six drops of ordinary acetic acid is added. No reaction takes place if the vinegar be free from mineral acids, but if these be present, a violet colour is produced, which does not disappear on the addition of alcohol.

In commerce the strength of vinegar is determined by the number of grains of dry carbonate of soda required to neutralise 1 fluid ounce. This is the practice in England, but in the U. S. America carbonate of potash is used. The strength of vinegar may be accurately determined by means of a standard solution of bicarbonate of potash, one fluid ounce of vinegar becoming saturated with 35 grains of the potash salt. After filtration the remaining liquid should now be quite free from acidity; if not, this would prove the presence in the vinegar of other acid substances, the presence of which was disguised by the acetic acid.

**Vohl** in *Ber. der deutsch. Chem., Ges., November 1877* has designed a simple contrivance to determine the amount of acetic acid in vinegar, consisting of a flask provided with a CaCl₂ tube, closed by a stopper, through which passes a glass rod terminating in a platinum hook, and supporting a tube of sodium bicarbonate. The

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Indian Vinegar.

§ "The acidity of vinegar is due to the presence of acetic acid, which impure variety, pyrolygenic acid, is a product of the destruction of wood. Glacial acetic acid, the variety which crystallises below 63° Fahr., is obtained by converting the crude acid into a distillation of the purified and dried acetate with concentrated sulfuric acid. Acetic acid is also largely obtained by the oxidation of alcohol. An aqueous solution of pure alcohol will not yield acetic acid on exposure to air, but when mixed with certain easily changeable organic compounds it undergoes the so-called acetic fermentation. But this oxidisation also takes place by inorganic oxidising agents. According to Pasteur the first described variety of fermentative action due to the presence of a mycogerm, the Mycoderma aceti, which, when developed in a large quantity, is commonly called the "mother of vinegar." The fermentation of wines thus yields "white" and "red" wine vinegar, while malt infusions produce the "brown" malt vinegar of commerce. When solutions of malt or saccharine substances are used for the production of vinegar, the sugar is first converted into alcohol by yeast, then on exposing the so-formed dilute alcohol to air, oxidation and alcohol occurs with the formation of acetic acid. As a rule, vinegar contains about 5 per cent. of acetic acid.

"In India, vinegar is made from toddy, the fresh juice of the flabelliformis and Cocos nucifera, and also from the insipid jaggery, by dissolving it in water and exposing the solution to air in earthen jars. The dried flowers of the Bassia latifolia, mahonie, are powdered in water, also yield a saccharine liquid which readily undergoes acetic fermentation, and produces an excellent vinegar. According to Dr. Lyon's experiments, the amount of acetic acid ought to be at least from 4 to 5 per cent. toddy vinegar. Many samples have, however, been found to contain less than 3 per cent., and in one case the acidity was as low as one and a half per cent." (Surgeon C. J. H. Warden, Calcutta.)

The manufacture of vinegar may almost be said to be common in all the Mahomedan centres of India. In the east, vinegar is little except as medicine. The alcoholic liquid is placed in earthen jars half imbedded in the soil and left until the acetic fermentation has been accomplished. The article produced is very inferior in colour and flavour to European vinegar, and is entirely consumed within the country, and largely used in the preparation of pickles, &c.

Mr. Baden Powell.
"The vinegar obtained from sugar-cane juice is generally a poor stuff, and does not contain more than 2 per cent. acetic acid; but at some places it is made well, especially at Delhi. A large number of bottles of vinegar sold in the country, with the ticket and capsule of 'Crosse and Blackwell,' are in reality bottles which once contained the real article, but when emptied, are refilled with country vinegar, and sold a little cheaper under the above name. I have seen, however, really excellent vinegar from Peshawar which was made from grapes; it was quite fit for table use." There appears to be no export trade in vinegar, and the extent of the import trade cannot be determined, since it is included under the heading of Oilman's Stores.

MEDICINAL USES OF VINEGAR.

§ "In India, vinegar is made from rice, sugar, various fruits, &c., and is largely used by hakims as a medicinal agent. In the pure state it is escharotic. Applied externally, mixed with sweet oil or water, it is largely used for congestive headaches, and in sunstroke. In catarrh it is used like smelling-salts. As a vapour bath it is useful in reducing the high temperature of fevers. It is extensively made use of by hakims for the destruction of ectozoa and entozoa. The vapour of vinegar applied to the ear is beneficial in earache and deafness. In dyspepsia with foul breath the natives use it internally mixed with salt, and this same mixture, combined with alum, is employed as a dentifrice and astringent for bleeding gums. For sore-throat it is used as a gargle mixed with hot water. Diluted solutions are given as cooling draughts and to quench thirst. Highly prized by natives for reducing obesity. The vinegar made from grapes, mixed with salt, is a local application to the bites of mad dogs; it is also a much-prized remedy for ringworm. A weak solution is applied to burns and scalds. Combined with sulphur it is said to be beneficial in chronic rheumatism and gout. Mixed with sweet oil it is applied locally over rheumatic and stiff joints. If used for any length of time it is an aphrodisiac." (Surgeon G. A. Emerson, Calcutta.)

"Vinegar (a wine glassful) is recommended by Dr. Grigg in cases of post partum haemorrhage, but its action is so rapid that he refrains from using it or permitting its use before the placenta is expelled, for fear of causing a retention of that body and making its removal difficult. (See British Medical Journal, January 12, 1884, p. 56.)" (Brigade Surgeon W. H. Morgan, Cochin.)

"I have found it effectual (as recently suggested in Br. Med. Journal) in post partum haemorrhage, in dose of a W. F. wine-glassful." (Surgeon Major W. Forquhar, M.D., Ootacamund.) "A solution of borax in vinegar is much used for ringworm in dispensary practice." (Asst. Surgeon Jasswant Rai, Multan.)

"Vinegar, prepared from toddy obtained from the Palmyra palm fermentation, is very effectual in checking troublesome hiccough; a diluted solution of vinegar has been frequently used by me to check the intolerable itching in some forms of herpes and with very good effect." (Hon. Surgeon Easton Alfred Morris, Negapatam.)

"Mahwa vinegar is particularly useful as a diaphoretic, especially when neutralised by carbonate of ammonia, a cheap and valuable kind of Liquor Ammoniae Acetatis." (A Contributor.) "Also used in cases of cholera, diluted with water, in the form of a drink; and for this purpose, it is prepared from sugar-cane juice by keeping it exposed to the sun.

* Physician to Queen Charlotte's Hospital.
ACHILLEA millefolium. The Yarrow or Milfoil.

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A genus of pubescent herbs (belonging to the Tribe Anthemideae, Natural Order Compositae), comprising some 50 species, distributed in the north temperate regions of the globe, one species being met with in Himalaya from Kashmir to Kumaon. Leaves alternate, narrow, in pinnatisect. Flower-heads small, corymbose, heterogamous and disciform (or rayless). Ray-flowers few, male, rare ligulate, short, white, pinkish or yellow. Disk-flowers hermaphro-
terete or compressed and 2-winged, base often produced over the achene, limb 5-fd. Involucre bracts few, seriate, appressed; receptacle elevated, pellucidous. Anther-cells obtuse at the base (not pro-
tails). Pappus absent. Achenes oblong or obovoid, dorsally co-
glabrous, with two cartilaginous wings.

The name Achillea is given because of its being supposed by the ancients the aromatic plant used for this purpose, and is derived from Achilles, the hero of the Iliad.


MILFOIL OF YARROW, ENG.; HERBE AUX CHEVEUX MILLEFOUILLE, FR.; SCHAFFGARBE, SCHAFFRIPPE, MILEFOGIL, IT.; YERBA DE SAN JUAN, S.

By the older English writers, this plant received the name of Nose-bleed, because the leaves, if inserted in the nostrils, were reputed to cause bleeding to take place.

Vern. — Rajmar, BOMB.; Biranjusif, Cutch. Stewart said the plants sold in the bazaars under the names Komidr, Kashir; Búi mérdan, AFG.


Habitat. — A native of North Asia, Europe, and America, Western Himalaya, from Kashmir to Kumaon; altitude 6 feet. Common on the hills a little to the north of Simla.

Botanical Diagnosis. — A small, herbaceous plant, ½ to 1½ feet glabrous or pubescent, with leaves 2-6 inches long. Leaf segments lanceolate, 3-pinnatisect, minutely divided into linear, dentate segments. Flower-heads corymbose ovoid, shortly pedunculated, shining.

Properties and Uses.

Medicine. — The leaves and flower-heads are used medi-

cine:

Leaves. 368

Flower-

heads. 369

Aromatic stimulant (see Artemisia vulgaris). They are also tonic, and in medicated vapour baths for fever.

In Scotland at the present day a warm decoction of the leaves is regarded as a family specific against the colds and other infe-
dictions common to childhood. This plant once held a creditable posi-
tion among the British drugs, and its recent introduction into the American Pharmacopoeia may have the effect of reviving its use in England. It might, with advantage, be added to our list of Indian indigenous drugs.

was much used in England as "a vulnerary, and was given in the suppression of hemorrhages and of profuse mucous discharges." (Assistant Surgeon Anand Chau,- berji, Nasakally). "The efficacy of vinegar gargle in sore-throats is considerably increased by the addition of a few grains of powdered (Brigade Surgeon S. M. Shircore, Moorshedabad.)
was employed also in intermitents and as an antispasmodic in flatulent colic and nervous afflictions. Its hot infusion is used as an emmenagogue in France, and also in suppression of the lochia; it is sometimes employed in low exanthematic fevers with difficult eruption. In these cases it probably acts as a stimulant sudorific, as do most aromatic herbs. In some parts of Sweden it is employed as a substitute for hops in the preparation of beer, which it is thought to render more intoxicating.” (U.S. Dispens., Ed. 15th, 1560.) (For this curious property compare remarks under Absinthe and Artemisia Absinthium, Linn.)

§ “Carmine, dose 5 to 30 grains. (Surgeon W. Barren, Bluzy, Cloth.)

Chemical Composition.—Von Planta-Reichenau found in this species as also in A. moschata (the Joe of Europe), a bitter, aromatic, bluish-green, volatile oil, Isomol (xCH H O), a substance faintly resembling oil of peppermint and a peculiar nitrogenous principle Moschatin (C H NO) (Ann. Chem. Pharm., CLV., 145). The aromatic property is strongest in the flowers and the astringency in the leaves. Zanon found in addition to the volatile oil and moschatin, a third substance which has been called Achillein, a compound which has been determined to be composed of C H N O (Ann. Chem. Pharm., LVIII., 21, and CLV., 1870), a bitter principle soluble in water, but with difficulty in absolute alcohol. S. de Luca, experimenting with A. Ageratum, has found similar results. This plant, when rubbed between the hands, gives out an aromatic camphoraceous odour, and if distilled in a current of steam, furnishes an essential oil, the composition of which has been found to be C H O (Year-Book, Pharm., 1876, 43; 1881, 159).

Dr. Dymock says that the flowers of A. Santolina, Stocks (? Linn.), are used in the Bombay Presidency, and are known as biranjas, bu-mid-eran Pers. This plant is apparently imported into Bombay from Persia, where it is called dervench, or vulgarly varek or yoshen. It is not a native of Egypt.

Domestic Uses.—A large number of species and cultivated forms of Achillea are met with in gardens in Europe, many of them forming highly ornamental foliage clumps for border and bed cultivation. They are propagated by root divisions, cuttings, and seeds.

Achilleinum—A spirit, distilled from Achilles millefolium, is used by the Italians in intermittent fever.


A genus of elegant, villose herbs (belonging to the Natural Order Gonneraceae). They are all favourites of the modern gardener, and his art has perhaps done more to multiply the cultivated forms of this than any other genus of similar size. They are occasionally met with in our Indian orchid houses, but require great care: they are natives of tropical America. The Natural Order Gonneraceae is sub-divided into three great sections or sub-orders. The Indian indigenous examples belong to the Cyrtandrae (characterised by having ex-albuminous seeds contained within a contorted capsule or berry). The Achimenes belong to the sub-order characteristic of America, viz., Gonneraceae, recognised by having albuminous seeds, contained within a capsular fruit, semi-inferior or inferior.

In Achimenes the flowers are large, axillary, variously coloured. Corolla tubular, straight or curved, often obliquely dilated at the mouth. Anther in fours, connivent or coherent, included within the corolla, the filaments being attached to the base of the tube. Disk annular, entire or split. Ovary inferior, cohering to the base of the calyx; style elongated; stigma dilated and concave or sometimes distinctly 2-lipped. Chiefly

Ornamental foliage.

Ornamental plants.

Ornamental spirit.
ACHRAS
Sapota.

The Sapodilla Plum.

tomentose herbs with spherical rhizomes, from which they are readily propagated.

By some authors the genus has been broken up into various genera, of which perhaps Tyzza is the most deserving of an independent position. The following may be mentioned as a few of the more important species generally met with in cultivation: A. cocinea, especially var. major; A. Escherit; A. floribunda elegans; A. formosa; A. grandiflora; A. Jayii; A. longiflora; A. Mountfordii; A. petens; A. pedunculata; &c. They are perennials, the leaves dying annually. When the old rhizomes commence to give off-shoots, these should be collected and planted six in a pot in a soil composed of equal parts of loam, leaf-mould, and sand.


A genus comprising only one or two species (belonging to the Natural Order Sapotaceae). By De Candolle's Prodromus this genus was reduced to Sapota, but Bentham and Hooker in their Genera Plantarum have restored it. The genus may be briefly defined as having the flowers clustered in the axils of the leaves, 6-merous, with leafy staminodes inserted upon the lower part of the corolla, and nearly as large as the petals. Stamens 6; filaments connate; the anthers free, opposite the petals. Fruit superior, 8-10 celled, with one large, erect, albuminous seed in each cell.


The Sapodilla Plum of the West Indies; the Bully Tree, or Neesberry.

Syn.—Mimusops Manipurara; Don.

Vern.—Sapota, Hind. and Beng.; Chakali, Bomr.; Shimai-eluphai, Tam.; Sima-ippa, Tel.; Kumpole, Kanara; Chakshakdi-kashur, Duk.; Twinte-pat, Burm.

The Tamil name should not be confused with the names applied to Mimusops and to Bassia.

Habitat.—Introduced from America, and now cultivated throughout India. Roxburgh speaks of the Chinese specimens not flowering in the Calcutta Botanic Gardens, while the West Indian plants growing alongside of them were doing so. It would thus appear that the plant apparently reached India by way of China as well as direct from the West Indies.

An evergreen tree, with dome of dark-green shining leaves. The fruit is about the size of a hen's egg, and much of the same shape, dark brown, with a sort of mealy surface. Pulp greenish brown, with generally 2 or 3 seeds developed. When ripe, and just before it becomes over-ripe, the fruit is often very pleasant, although little eaten by Europeans in India. Commonly sold in the streets of Calcutta, about the beginning of the hot season, under the name of Mangosteen, a fruit which, at first sight, it somewhat resembles. The absence of the sessile peltate stigma, so characteristic of the apex of the Mangosteen fruit, will at once remove the delusion, and expose the impostor, who makes a large profit by selling his fruit under a false name. "A fine evergreen tree, producing delicious fruit." (Baron Von Mueller.)

Medicine.—The bark was formerly regarded as a good and useful substitute for Cinchona.

Structure of the Wood.—Kurz says: "Wood uniformly brown, close-grained, rather light, hard; valued in South America for the shingles of corn-houses." Wood "reddish brown, hard, heavy, and very durable (Bulbul or Bully-wood of Central America and the West Indies.)" (Brandis). "Wood is dull red, short, but straight in the grain and very dense." (Bomb. Gaz., XV., Part I., 61, Kanara.)

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A genus of herbs or small shrubs (belonging to the Natural Order Amaranthaceae), found in the tropical and sub-tropical regions of the Old World. Leaves opposite, petiolate, ovate, oblong or lanceolate, entire. Flowers hermaphrodite, deflexed and compressed to the rachis, arranged in elongated, loose, terminal, simple or panicle spikes, white or coloured. Bracts 5, the central large, in contact with the flower, the lateral spreading, spiny. Perianth of 4 to 5, green, rigid coriaceous; sepals sub-equal, subulate-lanceolate, aristate-acuminate, glabrous or pilose. Stamens 5, rarely 2 or 4; filaments subulate above the base, membranous, united into a cup; anthers oblong, 2-locular. Ovary oblong, sub-compressed, glabrous; style filiform; stigma capitate; ovule one, suspended. Seeds inverted, oblong; testa thin, coriaceous; arilis absent; albumen farinaceous, radical, erect.

The name Achyranthes is derived from ἀχροός, chaff, and ἄνθος, a flower or blossom, in allusion to the appearance of the flowers. There are in all about 12 species in the world.

Achyranthes alternifolia, Linn.; Amaranthaceae.

Syn. for Digera muricata, Mart., which see.

A. aquatica, Roxb., by Wallich formed into the genus Centrostachys, but by Genera Plantarum has been again reduced to Achyranthes.

A. aspera, Linn.

The Prickly Chaff-Flower.


Habitat.—A shrub, 3-4 feet high; found all over India, ascending to 3,000 feet in altitude. A troublesome weed in gardens.

Botanic Diagnosis.—Stem erect, striated. Leaves ovate-obtuse, acuminate, base cuneate, petiole short, pubescent from a coat of long simple hairs.

Properties and Uses—

The Ash as a Mordant.—The ashes of this plant are used as an alkali in dyeing.

Medicine.—The whole plant has astringent and diuretic properties assigned to it. Of the former property little is known for certain, but it is said to be successfully used in native practice in the treatment of merothragia and diarrhoea. It is reported to be used by the women of Bengal to cause abortion, and holds a high reputation for this purpose, but it must probably acts mechanically, the prickly flowering spikes being inserted into the uterus. A correspondent informs me that if the juice of the plant be injected into the os uterus labour pains will be set up rapidly. On the other hand a decoction of the plant is highly spoken of as “a laxative and promoter of secretions; it is used in combination with other medicines of its class in ascites and anasarca.” (U. C. Dutt, Civil Medical Officer, Serampore.) Dr. Bidie says: “Various English practitioners agree as to its marked diuretic properties in the form of a decoction.” Dr. Cornish reports favourably, having found it efficacious in the treatment of dropsy. It possesses valuable medicinal properties as a pungent
Achyranthes aspera. The Prickly Chaff-flower.

and laxative, and is considered useful in dropsey, piles, boils, eruptions of the skin, &c. The seeds and leaves are considered emetic, and are useful in hydrophobia and snake-bites. (T. N. Mukharji’s Amsterdam Catalogue.)

As a powder the dried plant is given to children for colic, and also as an astringent in gonorrhoea (Stewart's Panjab Plants).

Major Madden says that the flowering spikes are regarded as a protective against scorpions, the insects being paralysed through the presence of a twig. Dr. Shortt reports on its use as an external applicant in the treatment of the bites of insects, and Mr. Turner calls attention to it as a remedy in snake-bite (Pharm. Indica).

The ash yields a large quantity of potash, rendering it useful in the arts as well as in medicine. Mixed with opium it is used externally in the treatment of ulcers, and of warts on the body (U. C. Dutt, Civil Medical Officer, Serampore). Sesameum oil and the ash (apamarga taila) are used in the treatment of disease of the ear, being poured into the meatus. As an ash, however, there seems no reason to think it possesses any virtues other than those of the simple alkali of our shops.

The seeds are given in cases of hydrophobia and snake-bite, the juice of the flowering spikes for scorpion-bite, and the ashes of the plant have been successfully used in dropsey. (Bomb. Gaz., VI, 14.) "In Western India the juice is applied to relieve toothache." (Surgeon-Major W. Dymock, Bombay.)

The drug is best administered in the form of a decoction prepared by boiling two ounces of the fresh plant in a pint and a half of water till reduced to one pint, then straining. Of this the dose is two fluid ounces or more, should the diuretic operation be desired.

Special Opinions.—4 "The seeds and also leaves relieve the pain of scorpion-bites and allay the irritation of boils and of pleurodynia. The juice of the leaves is useful in snake-bite. The dried leaves are smoked in asthma, and they are also used internally in dropsey: dose 4 grains." (Surgeon J. McConaghey, Shahjahanpur.) "Is found highly useful in the treatment of general dysentery. (Pharm. Ind., 184.)" (Surgeon H. McCallum, M.D., Bombay.)

"No protection against scorpions. I have tried the flowering spikes, the root and branches, but the paralysing effect did not follow; the insects ran busily so soon as the pressure of the twig or root, &c., was removed." (Surgeon B. Evers, M.D., Wardha.)

"This is found useful as a diuretic in dropspital affections, and has been freely used in the hospital here in combination with other diuretics and tonics. "Preparations: Take of root with stems and leaves one ounce, water ten ounces, boil for fifteen minutes in a covered vessel and strain. Dose—from one and a half to two fluid ounces twice or thrice a day." (Apothecary J. G. Ashworth, Kumbakonum.) "The fresh leaves bruised into a paste and mixed with black pepper and garlic are used as an anti-periodic in the form of pills. It is given before the attack comes on." (Surgeon-Major John Lacaster, M.B., Chittore.) "Decoction of the entire plant is useful as a diuretic in dropspital affections; rubbed into a paste with a little water it forms a favourite application to stings of wasps, bees, and other insects." (Assistant Surgeon Shit Chunder Bhattacharji—Chanda, Central Provinces.)

"In simple anasarca I have found it of marked benefit." (Surgeon-General William Robert Cornish, F.R.C.S., Madras.) "The tender leaves ground into a paste with a little sugar and candied, and with the addition of a little butter fried to a proper consistence it is useful in the early stage of dysentery." (Surgeon-Major D. R. Thompson, M.D., C.I.E., Madras.)

"The extract is used in cases of dropsey and gonorrhoea mixed with..."
the extract of white rati." (Surgeon W. Barren, Bhuj, Cutch.) "The seeds are supposed to impair appetite and are given in the form of congee for excessive hunger." (Surgeon-Major T. Robb, Ahmadabad.)

"It is useless in snake-bite." (Surgeon V. Richards, Goalundo, Bengal.) "I have tried this largely in the shape of a strong decoction in two-ounce doses in dropsy, especially of malarial origin, and found good results as a diuretic." (Assistant Surgeon Debendro Nath Roy, Sealdah, Calcutta.)

"If the bark of the root is mixed with an equal quantity (say five grains) of black pepper, it may be given in cases of intermittent fever with good results." (Surgeon W. Wilson, Bogra.) "The fresh juice of the leaves thickened into an extract by exposure to the sun and then mixed with a little opium, may be beneficially applied to primary syphilitic sores." (Surgeon-Major Bankabehari Gupta, Puri.)

"Several Native practitioners use the decoction as a diuretic in gonorrhoea and dropsical affections." (Surgeon-Major R. L. Dutt, M.D., Patna.)

Achryanthes ferruginea, Roxb.; Syn. for Psilotrichum ferrugineum, Endl. A. incana, Roxb.; Syn. for Aserua javanica, Juss., which see.

A. lanata, Linn.; Syn. for Aserua lanata, Forsk., which see.

A. lappacea, Linn.; Syn. for Desmocheta atropurpurea, DC., but by the Genera Plantarum it has been reduced to the genus Papalia, which see.

A. nodiflora, Linn.; Syn. for Allmannia nodiflora, R. Br., which see.

A. prostrata, Linn.; Syn. for Papalia prostrata, Mart., which see.

A. scandens, Roxb.; Syn. for Aserua scandens, Mart., which see.

A. triandra, Roxb.; Syn. for Alternanthera sessilis, R. Br., which see.

**ACID.**

Acids are chemical compounds of two or more elements, of which Hydrogen is generally one. A few compounds are known as acids, however, which do not contain Hydrogen, such as Silicic Acid (SiO₄) and CO₂, popularly known as Carbonic Acid. They are referred to two great sections—acids which contain oxygen and hydrogen in combination with one or more elements, and acids which do not contain oxygen. They generally possess an acid taste, turn blue litmus into red, and neutralise the basic oxides, forming salts. When basic oxides form with water soluble hydroxides, these compounds are alkaline in their reactions and antagonistic to acids; they transform the acid red of litmus into the alkaline blue. An acid may be defined as a hydrogen compound, which has the power of combining with basic oxides to form salts by the partial or complete displacement of its hydrogen. In the commoner salts the basic principle is a metallic oxide. Conversely, salts are binary compounds or compounds composed of two principles, e.g. a basic oxide and an acid.

The reader is referred to works on chemistry for an account of the properties and uses of acids, a good many of which are now being prepared in India, and a large import trade exists in others.

**ACIPENSER.**

*Acipenser huso*, *Linn.*; *Pisces.*

**THE SOURCE OF ISINGLASS.**

VERN. — Macchaki-bhā-sirah, Hind., Duk.; Ghirriya-sanak, Arab.; Shesham-mahi, Pers.; Mina-vajaram, Tam.; Chupa-sajra ma, Tel.

The name of the fish is Sek moh; isinglass is Sertishom—Sek mohr. (In C. Russ, New York.)

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ACONITUM.  The Aconites

A sturgeon inhabiting the Caspian and Black Seas.

The swimming bladder or sound is cut up into shreds Isinglass of commerce. This is insoluble in cold water, but it is completely soluble, and on cooling forms a beautiful crystal grains of Isinglass are sufficient to form a consistence to make a water.

**Medicine.**—It is demulcent and nutritive. It is also used to distinguish gallic from tannic acid, the latter becoming yellow in the presence of tannic acid.

Gracilaria lichenoides

A very extensive trade is done from India in what is known as Trade and Navigation Returns, as “Fish Maws and Shark-fins.” The year 1883-84, the exports under this head amounted to 1,6 valued at ₹1,23,234. How much of this could be said to be impossible to ascertain. The imports are chiefly from Asia, but the bulk of the exports are to China. The finer qualities of fish, less find their way into the isinglass market.

For further information see under “Fish Maws.”

§ “Indian isinglass, which is of very good quality, is got from Polyenmus. (See Royce’s pamphlet and Day’s Fishes. Surgeon-General G. Bidde, Madras.) “In the last July sale Lane 380 packages of East Indian isinglass were offered, cc cases Penang, 127 cases Bombay and Kurrahnee, and 61 c Bombay tongue, good to fine, fetched from 3s. 5d. to 3s. 11d. showing that the isinglass of commerce is practically Indian (at any rate as far as the London market is concerned) are sometimes over 500 packages at one sale. In the Indian Tongue isinglass is entered as “Fish Maws;” it is obtained from the large fish. The trade names depend upon the shape of Russian and Brazilian isinglass would seem to have fixed.” (Surgeon-Major W. Dymock, Bombay.)


A genus of perennial herbs (belonging to the Natural Order Ranunculaceae) comprising about 180 species, chiefly of the northern temperate zones, some seven species being known as the Himalaya.

Leaves alternate, palmate-divided, rarely entire. Flowers irregular blue, purple, white, or yellow. Sepals 5-petaloid, the helmet or petal convex or vaulted, the others flat, the two anterior ones being near the lateral, Prisus 2-5, the two posterior ones stalked, (clawed) and formed somewhat in the shape of a hammer, concealed in the helmet; the three lower (or anterior petals) small or obsolete. Stamen Filament 3-5, sessile. Seeds many, with a spongy, rugose, or wrinkled surface.

The word Aconitum is derived from the classical Greek name most probably from ἄκοντος, a dart, from its having been used to refer to the subject with the poison used by the title of the poison used by the title.

In connection with the subject of the poison used by the title, I had recently some correspondence with Dr. Warden, Professor of Chemistry, Calcutta. The roots of the poison were identified by me as those of a species of Aconitum, probably indigenous to the mountains bordering on Assam; words, they were not the Nepal Aconite which finds its greater part of India. In the case of the Akas as an antidote against aconite poisoning proved to be the classical Costus root. In a private correspondence, I received a note on this subject with Dr. Dymock of Bombay, I received a note on this subject with Dr. Dymock of Bombay.
letter drawing my attention to the numerous references to this same property having been attributed to the Costus root (Saussurea Lappa).
I take the liberty to extract a passage from this correspondence:—

"Regarding Costus, it was regarded by the Greeks, Romans, and Muhammadans, as an antidote to poisons generally. Dioscorides says of it, πανόμενος εἰς ἄγγελας βελάθης, ἵπποιδέος βοηθή; and again, μιγνωρι
εὶς καὶ μελάγγας καὶ διάτησε.\) Celsus 523, de antidotis has three re-
ceipts, in all of which Costus is an ingredient.

Mir Muhammad Hossein in the Mokheen says:—

يكمثل آن بآ خمر وآستنيين تويان سحوم وساحب آنها يض من جلده الجلد وحده
i.e., 'one miskal of it, with wine and wormwood, is an antidote to poisons and draws them to the surface of the skin. It is useful to counteract the poison of the viper, scorpion, and tarantula, and other deadly poisons.' Practically, the antidotes for aconite are diffusible stimulants; costus is a stimulant, and is given as such in cholera by the natives."

The subject of Aconite seemed deserving of a thorough investigation, both with the view of establishing a trustworthy supply of uniform quality for medicinal purposes, and, if possible, of checking the indiscriminate way in which the drug is placed within the reach of persons desiring to use it for criminal purposes. Accordingly, I recently addressed the Government of India, in the Department of Revenue and Agriculture, on this subject, submitting, along with some of the more interesting facts brought to light in connection with the Aka arrow poison, a suggestion to form a Commis-

sion of Enquiry. I take the liberty to republish a few passages from that communication:—

"The genus of plants which yields aconite belongs to the poisonous Natural Order Ranunculaceae. The members of that genus are exclusively confined, as far as India is concerned, to the alpine and subalpine regions, chiefly occurring on the Himalaya from Nepal westward to Kashmir. There are in all seven Indian species known to botanists, with two or three varieties under two of these species. One contains no aconitia, \(A.\) heterophyllum, and is largely eaten as a vegetable or mild tonic. This species is perfectly well known. Of the other species, some are poisonous, others not, and even some of the varieties of one species are poisonous, while other varieties are not. The poisonous forms have never been accurately identified, and the result is, that of a given weight of the root sold in our druggists' shops, a certain percentage frequently con-

ains no aconitia whatever; indeed, an entire consignment may be perfectly inert. This uncertainty renders the use of aconite objectionable, its action not being constant; while it is for many diseases, such as cer-

tain forms of malarial fever, and all skin diseases, the most valuable drug known. It is very much to be regretted that so valuable a medicine should thus suffer in consequence of ignorance, and I would, therefore, strongly recommend that a Commission of Enquiry be instituted with the object of determining the following points:—

"1st.—The scientific determination of the various species of Aconitum.
Dried specimens of each species in flower should, for this purpose, be collected, with their roots attached, so that the characters of the roots of each individual species or variety may be determined and clearly described. Were this done, it might be possible to recognise the various forms of aconite sold in the bazaars.

"2nd.—To chemically determine the average amount of aconitia in each
species, and perform a series of experiments in the cultivation of the various species with the object of ascertaining if there is a fixed average percentage, or whether different alkaloids or different proportions of alkaloids are characteristic of certain species. In other words, ascertain whether the presence or absence of aconitum is a specific peculiarity or a formation which may or may not take place within the tissue of an individual plant.

"3rd.—To endeavour to ascertain whether the percentage of aconitum can be increased by cultivation; and, if possible, to establish some source from which a constant supply might be obtained. I am not aware whether the Medical Store Department imports its aconite or not; but there does not seem the slightest reason why India might not supply the world with this most valuable medicine, and supply it in such a manner as to do away with the uncertainty which centres around the use of the drug at the present day. Perhaps it might be that the exterminators of many forms from the higher limited parts of the Himalaya would be all that might be necessary, allowing thereby the aconita-yielding forms to naturally become more prevalent. All the species are exceedingly plentiful on the alpine Himalaya from Nepal westward to Kashmir, one or two species finding their way eastward to Assam through Sikkim and Bhutan.

"4th.—To ascertain the areas and statistics of production of the different aconite roots at the present time and the chief centres of exportation.

"In support of these recommendations, I beg to quote one or two of the numerous appeals which have appeared in European medical publications. Dr. Cook, in the Year-Book of Pharmacy for 1873, page 21, writes as follows: "In this instance of an important drug involved in mystery, we see the necessity for some official medium through which to prosecute inquiry. Individual effort is insufficient, and the only effectual mode should emanate from the Government of India, to ascertain the areas and statistics of production of the different aconite roots in the Himalaya, their value commercially on the spot, the native names applied to the different kinds, and the plants producing them properly and satisfactorily identified. Then, as a consequence, the different varieties will be analysed, and the value of each determined according to the amount of alkaloid present. This is but one out of scores, perhaps hundreds, of instances, in which information is required of a special character on the products of our vast Indian Empire, and which no private effort is capable of obtaining." Dr. E. R. Squibb also writes in the same volume: "Although but few drugs are apparently more cheaply and easily obtained than aconite root, yet perhaps in no other is there so great an amount of uncertainty, many parcels having been found to be comparatively worthless in a medical point of view."

In the Admiralty Manual of Scientific Inquiry (and republished in Hanbury’s Science Papers, 1871) occurs the following significant interrogation, which, strange to say, remains unanswered: "Aconite root has been imported in considerable quantities from India. In what district is it collected, and from what species of Aconitum?" This admission of want of definite information regarding the source of Indian aconite was made in 1871 by Professor Oliver, and the late distinguished scholar and pharmacologist Daniel Hanbury, and it has still to be answered before we can said to possess any trustworthy data upon which to base a definite and accurate knowledge of what may be justly called India’s most valuable indigenous drug.

The following are the principal Indian species with the information.
which can be gathered regarding each from works on Indian Economic Science:


INDIAN ACONITE.

Vern.—Bish, (bīsh), bis, (derived from the Sanskrit Viṣa), bacheha, mitha-zahar, singyā-bis, singyā, teliya-bis, bachchāgū, HIND; Kāt bish, or simply bish, BENG; Bish, ARR; Viṣa, vatsanākha, SANS,; Bish, ARAB; Bishnāg, PER; Bachnāg, MAR; Vachnāg or vachanāg, GUJ; Bachnāgra, COTCH; Vacha nāri, TAM; Vasanākha, nābhi, TEL; Vatsanākha, MAL; Vasanākha, KAN; Vachanākha, CINGH.

It is probable that, under the above vernacular names, the majority of the poisonous forms of aconite are sold by our native druggists. Most authors, however, persist in regarding these as more properly belonging to this species.

Dr. Woodeen Sheriff regards jāndav as the only safe generic name for the species of medicinal aconite. The names Singyā or singyā-bis and mitha-zahar are applied to two forms of Aconite generally referred to this species. (See below.)


Habitat.—Temperate sub-alpine Himalaya, from Sikkim to Garwhal, altitude 10,000 to 14,000 feet.

Botanic Diagnosis.—Stem erect, 3-6 feet high, simple below. Leaves 3-6 inches, rounded, palmately 5-fid, cut into irregularly indented lobes. Inflorescence a terminal dense-flowered raceme, with only one or two branches below; bracts at the base of the peduncle leaf-like, smaller upwards, cut or lobed, two small ones usually about half way up the pedicle. Flowers on long erect stalks thickened above and glandularly pubescent, large, pale dirty-blue. Helmet about twice as long as high, vaulted, with a short sharp beak. Follicles 5 erect, usually densely villous and transversely wrinkled. Seeds having the testa pitted or plicated.

Diffrers from A. Napellus chiefly in the less divided leaves, denser flowered racemes, and shorter beak to the helmet.

MEDICINAL PROPERTIES.

Medicine.—The mass of the root sold in Indian druggists' shops as Aconite is derived from this species, but several others are no doubt used as substitutes or adulterants. Dr. Bibi says the root of Mitha-zahar is used as an adulterant in Madras.

Description of the Root.—Fusiform, 2-5 inches long and ½ to 1½ broad at the top. As sold in the bazars of India, it is often broken through the middle as if from carelessness in digging up, shrivelled longitudinally, and marked here and there with the scars of small detached rootlets. The colour of the dry root is sold by druggists is blackish brown; when broken the fractured surface is compact, hard, horny, somewhat translucant, and of various shades of brown. In the rainy season it becomes moist, and when handled stains the fingers brown. This is the Singyā or singyā-bis (hairy poison) of the Hindus, the śringi poison of the Sanskrit authors.

Dr. Dymock (as also most other writers) has described another form of Indian aconite attributed to this species, in A., with white spongy roots, and
ACONITUM ferox.

Indian Aconite.

Chemistry.

Known in Bombay as "Lahore Bachnāb." This is the mitha poison of the older writers. It is generally 1 to 1.5 inches long, compressed, rough and wrinkled. Brown externally, much more than the preceding. This form is said by some authors to resemble aconitum and the brown hirsute variety; by others it is regarded as inferior in strength. It is also devoid of the pungent odor which resembles hyraceum or castor. It seems that this smell, as also the peculiarity of staining the fingers, is due to some mode of drying and rendering the root prone to attacks of insects, rather than a specific property of the root. For this purpose the roots are often dried over a fire, boiled in milk, preserved in oil, &c. A similar practice prevails in the roots of the aconite are said to be preserved in child's urine.

The specific identity of these two forms appears open to question, and, indeed, the chemical nature, structural configuration, and the association with Lahore would seem to suggest that the spongy root was much more likely to be obtained from A. Lycococcus, species plentiful on the north-west Himalayas from Kumaon to the A. ferox. The latter is the characteristic species of the eastern Himalayas, and nowhere occurs west of Garwhal. The temperate plant, the "Lahore Bachnāb" most probably from Kashmir and the surrounding mountains (where A. Lycococcus occurs), and A. Napellus at 10,000 to 15,000 feet, are indeed, the latter species is one of the commonest plants on the eastern Himalayas, but is not met with in A. ferox—the eastern Himalayas.

In European commerce all the Indian forms of aconite are forms of A. ferox. This seems an unfortunate mistake, the mode of preparation is by no means the most plentiful, and certainly not the most accurate. It may be quite wrong to limit the dark-coloured form to it seems only natural to expect that, should the suggestion to mission of Enquiry into Indian aconite be acted upon, we shall refer the numerous forms met with in commerce to distinct species. We shall very likely discover that A. Napellus supplies a proportion of our Indian Aconite than we had any idea of before.

Chemical Composition.

The roots of this species contain, relatively to the roots of other species of aconite, a much larger amount of Pseudo-aconitine (or Nepalin), a much smaller quantity of Aconitine (C₆H₆NO₅), an amorphous alkaloid analogous to, but not identical with, A. Napellus. This alkaloid is non-crystalline, and yields no salts. Wright considers pseudo-aconitine as nearly related to the alkaloids narceine, narcotine, and oxy-narcoine, which, like aconitine, all give rise to derivatives of dimethyl-proto-catechuic acid (or Nepalin, or pseudo-aconitine) was discovered originally in 1857. It is a white powder, in the form of transparent crystals, with a bitter burning taste, having a strong alkaline forming with difficulty crystallizable salts. It is readily soluble in alcohol, or chloroform, but insoluble in ether. According to older the most characteristic features of pseudo-aconitine, different from Aconitine proper, is the absence of bitterness and solubility in water. The physiological properties of this alkaloid carefully investigated by Kehm and Ewars, who state that it has entered largely into the composition of English counsel.
Products of India.

Its Medicinal Properties.

ACONITUM ferox.

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| A. ferox. Dr. Royle, in his Materia Medica (Ed. J. Harley), says : "Dr. Headland found in several experiments, the results of which were uniform, that while from 54 to 56 grains of aconitia could be obtained from one pound of the horny root, 88 to 96 grains were extracted from a pound of the friable root."

MEDICINAL USES.

The root is commonly regarded as much more powerful than that obtained from A. Napellus. On this account it is chiefly recommended in the manufacture of preparations to be used externally. Experimenting with the poisonous properties of the aconites, EWERS discovered that the root of A. ferox is much more virulent than A. Napellus. By the natives of India the bish (as sold in the bazars) is used extensively, both externally and internally, but owing to the want of definite knowledge regarding the species which afford this drug, much of what has been written by the older authors, or, indeed, can at present be written regarding it, may have to be rearranged and placed under other species.

It is a very effective medicine in various diseases, acting as a narcotic sedative, regarded as heating and stimulant, useful in fever, cephalalgia, affections of the throat, dyspepsia, and rheumatism. Bish appears to have been known to the Hindú doctors from the earliest ages. It is much used as an external application, the root being formed into a paste (dhp) and spread upon the skin in neuralgia, boils, &c. Internally, it is chiefly used in the treatment of chronic intermittent fevers (Dymock). Europeans use it as a substitute for true aconite. In a recent correspondence between the leading members of the Indian Medical Department and the Government of India, several Provincial Committees and distinguished officers recommended that this root should be substituted for A. Napellus in the official preparations. The Bombay Committee recommended that this should be done chiefly with external remedies, adding that "it must not be used for internal administration in the same doses, the alkaloid Nepalin being much more powerful than the aconite of A. Napellus." Its therapeutic uses are also defined "externally to relieve neuralgia, rheumatism, gout, &c.; internally, to control the action of the heart when increased by disease, and to relieve pain in rheumatism. In native practice Bishanága is used in combination with cinabar, sulphur, borax, and saromatics, in extremely small, almost homoeopathic, doses, in intermittent fevers and common coughs, with considerable success." (Brigade Surgeon H. V. Carter, President, and Surgeon-Major W. Dymock and Assistant Surgeon Sakhárám Arjun, Members of Committee, Bombay, 20th May 1879.) Before, however, the bazar aconite is substituted for the aconite of European commerce, it seems highly desirable that the identity of the Indian forms be thoroughly established, and, if possible, some arrangement made by which a full and uniform supply of the best Indian article may be ensured.

Special Opinions.—§ "The root is very useful in the form of liniment in cases of neuralgia and muscular rheumatism." (Surgeon S. H. Browne, M.D., Hoshangabad, Central Provinces.) "Tonic and antiperiodic (dose 5 to 15 grain). Used by hakims in the form of pills called anand A. 400
ACONITUM ferox.

Chairrawa, which are made up of sulphide of mercury, huchnag, tankana, khar, pimpllee, and mucilage (gum). (Surgeon W. Barren, Bhuj, Cutch.)

"I have tried it and found it utterly useless in cobra poisoning. Indeed, without having any influence whatever upon the lethal effects of cobra poison, in fact it certainly very much increased the severity of one of the most marked symptoms of cobra poisoning, viz., salivation. It would appear to be an aphrodisiac of some power. I believe it to be a very poor substitute for true aconite." (Surgeon V. Richards, Goalundo, Bengal.)

"An oil is extracted from the root and used for rheumatism as an external application." (Surgeon-Major J. Rieh, Ahmedabad.)

"Used by natives in fevers attended with constipation; it enters in the composition of purgative pills, containing cinnabar and Indian calomel, otherwise called Rasapuram." (Surgeon-Major J. F. Fitzpatrick, M.D., Coimbatore.)

"The fresh root is given in small quantities internally in gonorrhea." (Surgeon-Major D. R. Thompson, M.D., CIE, Madras.)

"Found growing wild in Kalahandi on hilly places, used by the Khonds to poison their arrows." (Assistant Surgeon Sibchunder Bhattarcharji, Chanda, Central Provinces.)

"Aconitum ferox."—There are several varieties of aconite root met with in Southern India, the most common of which are those which, according to their colour or taste, are known as the white or sufed-bachndeg, the reddish brown or lal-bachndeg, the black or kala-bachndeg, and the sweet or mitth-zahar. The white and reddish-brown varieties can be used internally. They are very useful as sedative, nervine, and alterative tonics in medicinal doses, but a virulent poison in large ones. A few years ago I took the white variety myself in small quantities, and found that its internal use is not attended with more danger than that of the European drug (A. Napellus). Since that period I have employed it very extensively in my practice, and do not hesitate in saying that it is one of the most useful medicines in India. Its beneficial influence over diabetes is very remarkable, the immoderate flow of urine beginning to diminish from the very day of its use, with a proportionate decrease in the saccharine matter. Its control over spermatorrhoea and incontinence of urine is equally great. It has lately been found useful in some cases of paralysis and leprosy. The advantages of this drug over all other varieties of the Indian Aconite root are that it is not only much milder but also more certain and uniform in its actions. The white and hard variety which I am speaking of is quite different from the white and spongy variety mentioned in some books. I have also used the reddish-brown variety pretty extensively, and with almost the same results. The above roots are best used in the form of powder with some inert or farinaceous substance, as follows: Take of the white or the red variety of the aconite root in powder, one ounce; arrowroot or wheat-flour, seven ounces. Mix them thoroughly, pass the powder through a fine sieve and rub it lightly in a mortar and keep it in a bottle. The roots can also be employed in the form of tincture, but the powder I have just described was so convenient and cheap, and proved so successful, that I did not think it necessary to resort to any other form. The dose of the powder is from two to six grains, gradually increased, three times in the twenty-four hours; the average and usual dose being four grains." (Honorary Surgeon Modoon Sheriff, Khan Bahadur, Madras.)

"Said by hakims to be useful in large doses, along with stimulants, in cases of snake-bite and scorpion-stings; it is aperientic. Very useful for reducing the temperature in fevers." (Surgeon G. A. Emerson, Calcutta.)

"Antiperiodic, alterative, and expectorant, used as a nervine tonic in cases of paralysis. Used as an external application to chronic sores.

A. 400
Atis Aconite.

Natives prepare it by boiling the root in milk for half an hour, repeating this process seven times, and afterwards pulverise. This process is said to reduce the poisonous effects of the drug. Dose 4 to 5 of a grain. (Surgeon F. McConaghey, Shahjahanpur.) "A very useful anodyne inmiment is prepared by boiling an ounce of coarsely-powdered aconite root in half a seer of finkel seed oil." (Assistant Surgeon Mokund Lal, Agra.) "Said to be used in bronchiitis and asthma; no personal experience." (Surgeon J. Parker, Poona.)

"While serving at Buxa, Bhután, a woman attempted to poison her husband by means of the root given in a curry. The symptoms were well marked, but he recovered." (Surgeon L. Cameron, Nudda.) "A tincture of this drug acts like the true aconite, hence it is admissible in inflammations and fevers like the European drug." (Surgeon-Major R. L. Dutt, M.D., Pubna.) "Useful not only in chronic but in acute intermittent fever, during the hot stage, also in continued fever, as well as in all neuralgic affections. (Brigade Surgeon S. M. Shrievor, Moorschedabady.)


Syn.—A. cordatum, Royle; A. aters, Royle.

Vern.—Atis, ativah, Hindi; Bomh.; Ataicha, ativah, Sans.; Vajjutari, Pers.; Ati-valayam, Tam.; Ativa, Tel.; "Mohanavati" safed, hong-i-afed, Kasmir; Ativa, Bhot. (Dr. Aitchison); Sukhivari, chittari, paith, or patth, bang, Pus.; Ativah-kali, ativah or ativah, Guj.; Ativish, Mar. (Assistant Surgeon Sakharam Arjun Kesar, Bombay); Ativisha, Cutn.

Moodeen Sheriff cautions the use of the term atti-visha (atti, great, and visha, a poison) as applied to this plant, and thinks that it should be restricted to the poisonous forms. The Telugu name Ati-vasa (atti, great, and vasa, the sweet-flag) is given in allusion to its supposed resemblance to the rhizome of Acorus Calamus. The Arabic word Saudir is the only safe one in ordering the non-poisonous forms of aconite, much safer than the Hindustani Nirbisi (Nir, tree from, bisi, poison), because of the latter having been applied by modern usage to many other things (conf. Curcuma.)

References.—Royle's Ill., 56, 1, 13; Beud. & Trim. Med. Pl., 7; Fluck. and Hanb., Pharmacog., 144; Pharm. of Ind., 45; O'Shaughnessy's Beng. Disp., 167; Dymsock's Mat. Med., W. Ind., 4; Alder Wright, in Year-Book Pharm., 1857, 422; Agri.-Hort. Soc. of Ind. (1857), XVI., Sec. L., p. 231.

This is apparently Catha Nirbisa, Hum., and Nirbisa Hamilton, Don; it is most probably the species of Aconite to which the vernacular Nirbisa belongs. Hamilton says it is in Nepal called Nirbishi or Nirbechi. (See the concluding para. upon adulteration.)

Habitat.—West temperate Himalaya, from Kumaon to Hasara, altitudes 5,000 to 15,000 feet, very plentiful in the neighbourhood of Simla; very common on the Sach Pass, Chumbia, along with A. Napellus. Altitude 7,000 to 15,000 feet.

Botanic Diagnosis.—Stem erect, leafy, 1-3 feet, simple or branched from base, glabrous below, puberulous above. Leaves 2-4 inches, broad ovate orbicular-cordate, more or less lobed and toothed (nicose-crenate), ciliate or obtuse; upper shortly stalked or sessile, not lobed, amplexicul- l, bright green, pale beneath, lower long-petioled. Racemes often nodicled, many-flowered. Flowers on long rufous-pubescent peduncles, more than an inch long, bright blue or yellow-greenish with purple veins; helmet shortly beaked, half as high as long. Follicles 5, downy, angled but with a smooth testa. In form of leaf it varies considerably, hence the specific name heterophyllum.

Description of the Root.—Ovoid-conical, tapering to a point from ½ to 1½ long, and ½ to ¾ or more thick. Externally light ash-coloured, wrinkled and marked with the scars of the fallen rootlets, with a rosette of scaly
ACONITUM heterophyllum

Medicinal uses of Atis Aconite.

rudimentary leaves on the top. A transverse section shows the centre by from 4 to 7 concentrically arranged yellow corresponding to the ends of the fibro-vascular bundles which the root longitudinally. In taste the root is simply bitter with no. It has no odour, and may be distinguished from other roots by its bitterness and absence of tingling sensation when a small portion is

CHEMICAL COMPOSITION.

The composition of this root has not by any means been established, but it may be stated that Broughton first separated what appears to be its active principle, *cis*, the alkaloid to which he gave the name Aconitine and assigned the formula H$_8$N$_2$O$_7$. The exact composition of this alkaloid cannot, however, be determined as yet, and in the Year-Book of Pharmacognosy 1879, Wright suggests a correction upon Broughton’s formula as it is not likely to be established. He percolated a powdered dry root with containing a little tartaric acid, and evaporating the percolate, he obtained a crystalline dichloride CaH$_8$NO$_7$, HCl, AuCl, from which he suggests the N O$_7$, may prove nearer the correct formula for atisine than that by Broughton.

Aconitine has not been found in the *atis* root, or only in very quantities, and atisine is not poisonous; it tastes intensely bitter and has the slightest tendency to produce the tingling characteristic of the alkaloids. Wasowicz states that it contains the following: (1) a mixture of oleic, palmitic, and steaic glycerides; (2) an acid related to tannic acid; (3) an acid related to tannic acid; (4) cane-sugar; (5) vegetable pectose substances; (6) starch. It contains 1 per cent. of atisine.

MEDICINAL USES.

The root is pleasantly bitter, and is regarded as a valuable, periodic, aphrodisiac, and tonic, checking diarrhoea. It may be administered internally with safety owing to the absence of Aconite poisonous properties. It is especially useful in convalescence and as a tonic the dose is 5 to 10 grains, three times daily, *ante* period. From 20 to 30 grains of the powdered root every three

Special Opinions.—“The white or common variety of the heterophyllum is a very useful antiperiodic and antipyretic, but its best effects it is required to be administered in its full medicinal powers which are, according to my own experience, from one to two grains. It is quite safe up to two drachms and a half. In smaller doses (up to forty grains) it is a good tonic, but its action as an antiperiodic is feeble.” (Honorary Surgeon Moosheen Sheriff, Khan Bahadur, Bombay.)

This drug has never produced any substantial benefit in my practice. I am satisfied it possesses no curative value. I have abandoned it. Any benefit derived while was used might with equal accuracy be ascribed to time and the vis mericatris naturae, of which I have evidence in my practice.” (Brigade Surgeon W. R. Rice, M.D., Central Provinces.)

I have found atis an uncertain antiperiodic, although of some cases, especially in mild agues. It requires to be given in large doses, frequently repeated, during the intervals of fever.
"Formerly was largely used in Hyderabad (Deccan) as an antiperiodic in mild fevers." (Deputy Surgeon-General G. Bidie, C.I.E., Madras)

"I used this in Government out-door dispensaries in large doses (20 to 40 grains) as an antiperiodic in simple intermittent fever, but cannot speak very favourably of it." (Assistant Surgeon Debendra Nath Roy, Saldah, Calcutta.)

"Valuable antiperiodic, formerly largely used in out-door dispensary in intermittent fevers. Dose of powdered root half a drachm." (Assistant Surgeon Shub Chander Bhattarcharji, Chanda, Central Provinces.) "Antiperiodic and tonic, dose 1 to 5 grains of the powder." (Surgeon W. Barren, Bhyj, Cutch.) "I have largely used it in ten-grain doses as an antiperiodic in intermittent fevers and as a febrifuge in five-grain doses in slight cases of fevers with benefit, but I could not depend on it in cases of remittent fever." (Assistant Surgeon Bollye Chand Sen, Teacher of Medicine.) "White atis, if from 1 to 2 grains of ipecacuanha is added to each dose, is useful as a febrifuge." (Surgeon-Major John North, Bangalore.) "Aris powder used as an antiperiodic. It does not cause sickness." (Surgeon J. Efrench Mullen, M.D., Saidpur.)

"Used in chronic diarrhea and dysentery, with other astringents." (Surgeon-Major J. J. L. Ratten, M.D., Salem.) "Given internally it is said to be useful in boils." (Surgeon G. A. Emerson, Calcutta.) "Is a fairly good febrifuge, can be obtained in the bazaars, and may be used when other bitter drugs are not available." (Assistant Surgeon Nehal Singh, Saharanpur.) "This is a good febrifuge and obtainable in the bazaars of Umballa, Panjab." (Brigade Surgeon R. Bateson, Umballa.)

"Appears to be efficacious in mild intermittent fever, but less so than the chincona alkaloids." (Assistant Surgeon Torsam Rat, Mooltan.)

"Febrifuge and tonic, used as a substitute for quinine. Dose of the powder 10 grs. with 3 grs. of Heera kus (Ferri. sulph.)." (Surgeon C. M. Kanell, Saran.) "An indifferent antiperiodic, used in dispersary practice on account of its cheapness; very much inferior to chincona preparations." (Surgeon G. Price, Shahabad.) "In mild fever 5 to 10 grain doses of the powdered root have been found antiperiodic. In convalescence it may be given with advantage, in combination with iron, ginger, &c. The infusion of root has been tried, but not found so efficacious as the powder." (Surgeon E. S. Brande, Rungpur.) "I tried this medicine extensively in the epidemic fever of Burdwan and elsewhere. It certainly possesses antiperiodic virtues in larger doses, 30 to 40 grains. It can only be used in mild intermittent fevers when chincona alkaloids or arsenic are not procurable." (Surgeon-Major R. L. Dutt, M.D., Pubna.) "Very efficacious in the acute stage of dysentery, with febrile symptoms. Good for ordinary malarious fever in doses of 10 grains, given every three hours, during the remission." (Dr. Forsyth, Civil Medical Officer, Dinaapore.) "Atis, in doses of gr. xxx, three times a day, is a useful antiperiodic in intermittent and other periodic fevers. It is also a valuable tonic in cases of debility." (Brigade Surgeon J. H. Thornton, B.A., M.B., Monghyr.)

The numerous opinions received regarding this drug are fairly represented by those published above. The remainder are so uniformly to the same purpose, if not exactly in the same words, that it has not been considered necessary to publish more than the selection given.

Adulteration and Substitution.—The root is said by O'Shaughnessy to be adulterated with that of Asparagus sativus (satanil). Two kinds of the root are met with in the market—(a) grey, shrivelled tubers, larger and longer than (b) white, the daughter off-shoots broken from the former. The latter fetch the best price. They are slightly scarred from the abrasion of rootlets, are generally 2 inches long, with a thin tap-like extremity, often bifurcated. They should break with a short, starchy

[Page 93] Products of India.

Medicinal uses of Atis Aconite. ACONITUM heterophyllum. MEDICINE.

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Adulterants.
ACONITUM
Lycocotonum.

Japanese Aconite.

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fracture, presenting a white surface (Dymock). The atis is eaten fresh by the hillmen of Kandwar as a mild tonic.

Dr. Buchanan, who first made known the various forms of Aconite, referred them to the genus Caitha, but Don early corrected this mistake by forming them into a new genus to which he gave the unhappy name Nirbisia (the antidote) in honour of the vernacular name Nirbisia applied to one of Dr. Buchanan’s plants. Wallich subsequently referred these plants to their correct genus, Aconitum. Much confusion still exists as to the true Nirbisia, for it is by no means clear that it is a pure synonym for Jadavir, the generic name for the non-poisonous forms of the Aconite root.

The following plants have been also mentioned as bearing the vernacular name Nirbisia: Curcuma aromatica, Salis., C. Zedoaria, Roxb., which Colebrooke regarded as the Zedoary of the ancients from its synonyms being Fedora and Zedanor. Dr. Royle states that the roots of Delphinium demudatum, Wall. (D. puciflorum, Royle), bear the name Nirbisia. In Dr. Dymock’s Glossary of the Bombay Plants and Drugs, Nirbisee is given as the Deccan name for Cissampelos Pareira. Dr. Dymock has, however, drawn my attention to the fact that Prof. Rudolph Roth, the distinguished Sanskrit scholar, has identified the roots of Kyllingia monocantha, Linn., as the Nirvisha of the Sanskrit writers. This agrees with Roxburgh’s remark under Kyllingia, where he gives the Bengali name of this plant as Svetagothuți, remarking that Nirvishe, its fragrant aromatic root, is accounted an antidote to poison. Dr. Mooden Sheriff, Khan Bahadur, distinguishes between the words Nir-bis (a synonym for Jadavir) and the Sanskrit expression Nir-visham or Nirvisha, which expression he says means antidote. He concludes his remarks by urging that great care should be shown in prescribing the forms of Aconite under their vernacular names, and he regards Jadavir as the only name which can with safety be used for the non-poisonous forms.

Dr. Atchrison, in a note published under A. palmatum, says that the word Nirbisia is in the Panjab applied to a poisonous form of aconite root. By most authors it is applied to A. heterophyllum only; by others (as it would appear with more correctness) to the non-poisonous forms of aconite (A. heterophyllum is known as atis), the non-poisonous forms being regarded as antidotes to poisons generally, hence the name Nir-bisia. It seems probable, however, that this name has become associated with many antidotes, and may, indeed, have originally been applied to a quite distinct plant, such as the roots of Kyllingia. (Conf. with non-poisonous forms of A. Napoleon).


Habitat.—Sikkim, altitude 14,000 feet.

Botanic Diagnosis.—STEM erect, simple. Leaves palmately 5-fid below, the middle segments cuneate-ovate, 3-fid, coarsely crenate. Racemes ½ to 1 foot, simple, pedicels short. Flowers dull red; helmet with a long, straight beak, and broad, dome-like, dorsal prominence. Seed with a smooth testa. No information regarding the economic uses of this species.


Habitat.—The temperate Western Himalaya from Kashmir to Kumaon, altitude 7,000 to 10,000 feet. Distrib.—Europe and North Asia.

Botanic Diagnosis.—STEM erect, much-branched, 3-6 feet, glabrous pubescent. Leaves 6 to 10 inches diameter, palmately and deeply 5-lobed; lobes cuneate-ovate, sharply cut, lower on long peduncles, upper sessile. Racemes long-branched, tomentose; bracts minute. Flowers pale yellow or dull purple, variable in size; helmet with a short beak and long...
Products of India.

Monks'-hood Aconite.

ACONITUM Napellus.


This is the true Monks'-hood or Wolves'-bane Aconite.


References.—Pharm. Ind., 1; Flück. and Ham., Pharm., 8; Bentl. & Trim., Med. Pl., 6; U.S. Diagnes., Ed. 15th, 126; Bentley in Pharm. Journ., XV., 16 Ser., 449; Royle, Mat. Med., Ed. Harley, 773; Grimes, Year-Book of Pharm., 1873, 500; 1874, 507; Wright’s Reports on his experiments with Aconite, Year-Book of Pharm., 1875, 514; 1876, 531; 1877, 444; 1878, 43; 1879, 417; 1880, 455; 1881, 24; 1882, 233.

Habitat.—Temperate alpine Himālaya, from 10,000 to 15,000 feet (Sach Pass, Chamba, Watt), ascending in stunted alpine forms to the highest limit of vegetation in the North-West Provinces. Distrib.—Temperate and Arctic Europe, Asia, and America.

Botanic Diagnosis.—A herbaceous perennial with short fleshy roots. Stem erect, simple, 2-3 feet high, smooth, green, slightly hairy above. Leaves variable in size, on long petioles, spreading, deeply, palmately, cut into 5 or 7 segments; segments linear, deeply and irregularly multifid, dark green above, pale beneath. Racemes simple, few or many flowered, sometimes with one or two smaller racemes at the base; bracts entire or 3-5. Flowers large (2 to 1 inch), stalked, erect; pedicels downy, thickened at the end with two small bracts on the apex close to each flower, bright rose or dull greenish-blue. Helmet shallow, 3 times as long as high, tapering to a slender beak. Follicles 3-5, generally hairy. Seeds with a smooth poisonous form.

The Flora of British India refers the forms of this species to four varieties, as follows,—

Var. i, Napellus proper: Stem 2-3 feet, leafy; raceme dense-flowered.

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Medicine.

Japanese Aconite.

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ACONITUM Napellus.  

Monk's-hood Aconite.

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<td>415</td>
<td>Var. 2, rigidum: Stem 2-3 feet, few-leaved; leaves firm, sub-coriaceous with spreading, falcate, sharp teeth; racemes lax, few-flowered, tomentose. <em>A poisonous form.</em> &lt;br&gt;<strong>Syn.</strong>—<em>A. dissectum</em>, Don. Prod. Nepal, 197; <em>Reyol</em>, Ill., 54; <em>A. ferox Wall.</em>, Plant. As. Rat., t. 41.</td>
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<td>Var. 3, multifidum: Stem 6-12-inch, erect or decumbent, few-leaved leaves 1 to 2 inches in diameter, many-lobed to the base; lobes cut into linear segments; racemes lax, few or many flowered. <em>Eaten by Bhotias.</em> &lt;br&gt;<strong>Syn.</strong>—<em>A. multifidum</em>, Reyol, Ill., 56; <em>A. oliganthemum</em>, Kern.</td>
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<td>Var. 4, rotundifolium: Like var. 3, but leaves not divided to the base <em>Eaten by the Bhotias.</em> &lt;br&gt;<strong>Syn.</strong>—<em>A. rotundifolium</em>, Kar.; <em>A. Tienschanicum</em>, Oak. &amp; Rupr.</td>
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**Bikhma.**  
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**Nirbail.**  
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**Description of the European Medicinal Root.**—Usually from 2 to 4 inches long and 4 to 1 inch thick at the top, tapering, shrivelled longitudinally, and beset with the prominent scars of fallen rootlets; external blackish brown, internally composed of a whitish, farinaceous substance. It breaks with a short fracture, is sometimes hollow in the centre. The transverse section of a sound root shows a pure white central pith, many-sided, with a fibro-vascular bundle at each of its angles. The fibro-vascular tissue is devoid of true ligneous cells, its tissue being chiefly composed of uniform parenchyma, loaded with starch granules. A minute portion chewed causes prolonged tingling and numbness of the lips and tongue. It tastes at first sweet, but soon becomes alarmingly acid.

In the fresh state the root has the odour of the radish, a peculiar odour which disappears on drying. It has been mistaken for horse-radish, and it is said to have caused the death of many persons who have eaten it by mistake for that root. This accident could only occur in winter when the leaves have faded and the roots been dug up leafless. But even then there should be no mistake. The root-stock of the horse-radish is much larger than the Monk's-hood; it does not taper like the latter plant, is pale-yellow coloured, and the crown marked by transverse scars indicating the position of the old leaves. The aconite has not the sharp pungency of the horse-radish, and the scrapings will be observed to turn rapidly red, while the tingling sensation of the lips on biting the root should prevent its accidental use.

It has been found by experiment that the proper season to dig up the root for medicinal purposes is in autumn when the plant is leafless. Two new roots occur on either side of the old one. The tincture is the principal medicinal preparations used in European practice are prepared from the root.

A. 420
Leaves and Herb.—In European practice the fresh leaves, and, indeed, the whole herb, are also used as medicine. The inspissated juice forms the Extract of Aconite of our European druggists. This preparation, which is somewhat uncertain in its action, is sometimes prescribed to relieve the pains in rheumatism, inflammatory and febrile affections, neuralgia, and heart-disease. Aconite herb was introduced into the London Pharmacopoeia in 1788.

Chemical Composition.—Under A. ferox and A. heterophyllum a good deal has been already said regarding the results of recent chemical analyses of the various aconites. It may be stated that we are on the eve of dispensing with the aconite drugs now in use, which, owing to the uncertainty of the root used in their preparation, could never be depended upon. The chemical constituents of the more important aconites have recently been finally determined and their active principles or alkaloids extracted in a definite and crystalline form. The official aconite preparations of the future may be expected to contain a chemically fixed amount of the alkaloid, and their reactions will thus be perfectly trustworthy. For this invaluable result we are mainly indebted, in the first instance, to Groves and Duquesnel, perfected by Alder—Wright and his collaborators.

Formerly, by means of rectified spirit, water, ammonia, ether, and sulphuric acid, an amorphous powder was extracted from the roots of A. napellus, known as Aconitia. But as the result of the researches of the distinguished chemists whose names are associated with this subject, it has been shown that the substance extracted from A. napellus consists of two distinct compounds, *viz.,* Aconitine (proper) — a crystallizable alkaloid — and two non-crystalline bases, of which Picroaconitine may be mentioned.

Aconitine or Aconitia, C$_{30}$H$_{49}$NO$_{13}$.—This compound crystallizes in an anhydrous condition; melts at 183° C. It is dehydrated by heating with acids, more particularly with tartaric acid, forming Apo-aconitine C$_{30}$H$_{49}$NO$_{11}$. On saponification with alkali it splits up into benzoic acid and the base Aconitine C$_{30}$H$_{49}$NO$_{13}$.

One of the most important features of the chemistry of aconite is, that unless the amount of aconitine present in the root be relatively to the picroaconitine very considerable, it is impossible to obtain the crystalline form of aconitine. Even when it is possible to produce the crystallization, a certain amount of aconitine is always held in solution through the agency of the amorphous base, much as alkaline salts prevent the complete crystallization of sugar. It is also important to add that, after repeated crystallisation, aconitine always retains mechanically a certain amount of the amorphous base. This can be completely got rid of by transforming the aconitine into a salt and by regenerating the alkaloid from this salt after being thoroughly freed from the mother liquor. In this way chemically pure and crystalline aconitine may be obtained. The purity may be determined by the melting point being 183° to 185° C., or by allowing an acidulated and ethereal solution, to which carbonate of soda has been added, to slowly evaporate. If the entire mass crystallizes, it is pure, but if the last drop dries into a varnish, picroaconitine must have been present.

Dr. Wright concludes his most valuable report on the aconites by saying: “The questions now remaining to be solved are essentially a pharmaceutical and manufacturing nature, and as such somewhat out of the province of the scientific chemical investigator; these questions being simply the determination of the circumstances (as to soil, climate, age of plants, &c.) which influence the relative proportions between the crystallizable aconitine and the non-crystalline bases naturally accompanying it; so that the plants most suitable for the extraction of the alkaloids may be known; and the elaboration of the best method of separating the
crystallizable from the amorphous substances on a large scale." (Year-Book of Pharm., 1881, p. 27.)

Medicinal Preparations.—It is not necessary to enter into the properties of the aconite of European commerce. It is too well known to require to be treated of here, and no definite information can be obtained regarding the A. Napellus of Indian origin. It is enough to have briefly indicated the modern advances which have been made, and alongside of these to show the part which India must play before its aconite can either attain a larger commercial position or take the place, in Indian medical practice, of the imported article. It is more than likely that a large proportion of the aconite found in the so-called A. ferox of India may be due to the exports of that drug having consisted of the roots of at least four species—A. ferox, A. Lycocotonum, A. Napellus, and A. palmatum—indiscriminately mixed together.

§ “I have found Aconitum Napellus an invaluable drug in the reduction of the temperature of sun-stroke and pneumonia. As an external application, I have found it to be a most useful anodyne in facial neuralgia.” (Surgeon J. Parker, Poona.)


Habitat.—A perennial herb, chiefly of the eastern temperate Himalaya, extending from Garhwal to Sikkim, the Mishing Hills, and along the north-eastern lofty ranges forming the frontier of Assam, to Mânpur, and to the higher peaks of the Nâgâ Hills, extending into Northern Burma.

Botanic Diagnosis.—Stem leafy, erect, simple, 2-5 feet high, glabrous. Leaves reniform, deeply 5-lobed, 4-6 inches in diameter, sinuses shallow; segments cuneate-ovate, deeply and sharply cut; petioles long. Panicles few-flowered. Flowers large, greenish blue, on long pedicels; helmet much vaulted, shortly beaked, rather higher than broad. Follicles 5, 1-1½ inches long, glabrous. Seeds with a plaited testa.

Medicine.—No definite information can at present be given regarding the roots of this plant. It was found plentiful on the lofty peaks north of Mânpur, where its roots are said to be poisonous. Samples of the roots sent from the Aka country (on the frontier of Assam), as those said to afford the arrow poison used by these wild hill tribes, seemed to agree with roots from Mânpur; and from the imperfect descriptions which could be obtained from other sources, it is probable that they are the roots of A. palmatum. The Aka roots on being chemically analysed by Dr. Warden were found to be poisonous.

§ “Gudwâr-khatât is the name in Leh for the root of an aconit (probably A. ferox) that is imported from Nepal vâi Lhassa. It is called in the Panjâb nirbâr, by Bhotias in Leh Bonâ, and by the Yarkand Fârf: it is poisonous. It is administered in cases of poisoning and severe illness such as cholera, and is carried as a talisman among people.” (Surgeon-Major F. E. T. Aitkison, Simla.) It is probable that the above remark, written by Dr. Aitkison on the proof copy of his work under A. palmatum, has little reference to that species; but, from most other facts regarding Indian aconites, it is quite impossible to determine the species referred to. Dr. Aitkison may probably be correct in attributing it to A. ferox, but the Panjâb name nirbâr (Nir, free from, and bâr poison) is somewhat at variance with its being poisonous. Dr. Dymock (Mat. Med., West. Ind.) suspects the Bikhâ, bish-mu, Hind., Wakhma, Bom., to be the root of A. palmatum, which would therefore be a non-poisonous species. The root is very bitter and contains a well-defined bitter alkaloid; it has no poisonous properties.”

A. 428
The Sweet-flag.

In Sikkim the natives consider the root of A. Palmatum as not poisonous. (Surgeon-Major G. King, Calcutta.)

ACORUS, Linn. ; Gen. Pl., III., 999.

A genus of aquatic herbaceous perennials (belonging to the Natural Order ARALES), comprising a number of forms which may, with advantage, be reduced to two species. Spike not enclosed by a spathe—the spathe forming a leaf appearing to continue the growth of the axis like a long ordinary leaf, so that the spike seems to arise upon the side of a leaf and near the middle. Flowers all hermaphrodite, composed of six green perianth leaves; six stamens opposite the perianth segments; and a three-celled ovary with sessile stigma.

Acorus Calamus, Linn. ; Roxb., Fl. Ind., Ed. C.B.C., 296.

THE SWEET-FLAG.

Vern.—Bach, ghor or gor. bach, Hind. ; Bach, Beng., Ass. ; Vekhand, gandhslouv, gadé waj, Guj. ; Vekhand, Mar. ; Vekhand, Cutch. ; Gand-á-takr, vach, Dák. ; Vahí wgeri gandhrá, shahgráhné, Sank. ; Vati, Arak. ; Agrés-vuk, Pers. ; Barháj, maróch, Pn. ; Vahí, Kash. ; Vashambu, Tam. ; Vasa, wasa, vadójí, Tel. ; Vashampa, Mal. ; Bejí, Kan. ; Linhe, Birm.

In connection with the Telugu name Vasa, it may be noted (on the authority of Moodeen Sheriff) that the word Atri-sasa, which means greater Vasa, is applied to the root of Aconitum heterophyllum, and that Atri-cícha, or greater poison, is the name for A. ferox. These two names must not therefore be confounded with Vasa. Acorus Calamus.

Habitat.—A semi-aquatic perennial, with indefinitely branched rhizomes; a native of Europe (?) and North America. Cultivated in damp, marshy places in India and Burma, altitude 3,000 to 6,000 feet; exceedingly common in Mánipur and the Nagá hills, often a weed of cultivation spreading apparently from the walls dividing the fields. Originally a native of Asia and probably introduced into Europe. Some difference of opinion prevails as to whether this is the Calamus Aromaticus of the Greeks which Roylе regards as an Andropogon, but it seems probable that this was the plant.

Botanic Diagnosis.—Rhizome indefinitely branched, creeping in mud, with stout joints and large-leaf scars, cylindrical or somewhat compressed, about ½ inch in diameter, smooth, pinkish or pale green, the leaf-scars brown, white and spongy within. Gives off below numerous straight rosettes. Leaves few, distichously alternate, forming erect tufts at the extremities of the rhizome, tapering into long acute points, entire, smooth; scapes arising from the outer leaves. All parts, but especially the rhizome, aromatic.

Properties and Use—

Oil and Perfumery.—An essential oil is obtained from the leaves, which is used in England by perfumers in the manufacture of hair-powder. From the rhizome a pale or dark-yellow oil, with the strong penetrating odour of the root, and an aromatic, bitter, burning, camphoraceous flavour (due to the presence of a glucoside known as Acorin) is obtained by distillation.

The volatile oil and acorin may be said to be the two substances to which Sweet-flag owes its properties.

Medicine.—The aromatic rhizome or root-stock is considered emetic in large doses, and stomachic and carminative in smaller doses. (U. C. Dutt, Civil Medical Officer, Serampore.) It is a simple useful remedy for flatulence, colic, or dyspepsia, and a pleasant adjunct to tonic or purgative medicines. It is also used in remittent fevers andague by the native doctors, and is held in high esteem as an insectifuge, especially for fleas. In Voig't's Hortus Suburbanus Calcuttensis occurs the
Opinions regarding the Sweet-flag.

following (taken from Thomson's *Mat. Med.*); "The root has been employed in medicine since the time of Hippocrates. By the ancients it is successfully used in intermittent fevers, even after bark has failed, and it is certainly a very useful addition to cinchona. It is also an adjunct to bitter and stomachic infusions." In European practice medicine is not much if at all used. The rhizome is sold to chemists in England, and in Scotland it is regarded as a tonsil stimulant to clear the throat before taking part in any public performance. In this purpose a small piece is chewed for a few minutes. It holds a very important position amongst the drugs regularly prescribed by doctors. The Sweet-flag is the only plant which can be said to be taken by the Nagas as medicine, and it is also much valued by the Manipuris, especially in the treatment of coughs or sore-throat.

**Opinions of Medical Officers.---** "In Meerut the rhizome, with and without the outer skin, is powdered and used as a fumigating powder for pains and piles." (Surgeon-Major W. Moir and Assistant Surgeon Chose, Meerut.) "I found the root extremely useful in the dyspepsia of children, and also in bronchitic affections—*vide Ind. Med. Gaz.* February 1875, page 39, for further particulars." (Surgeon R. M.D., Wardha.)

"Aromatic, bitter, stimulant; useful as an expectorant in bronchitis. As a stomachic in flatulence in the form of infusion.

- **Bruised root**
- **Boiling water**

1 oz.
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"Dose: 1 ounce and a half thrice daily." (Surgeon C. M. Sarun.)

"The root, rubbed up with water or spirit, is used as a counter-irritant to the chest in the catarrh of children. It is generally supposed to smell is disliked by the cobra, on which it produces a narcotic effect. This, therefore, is cultivated near dwellings and chewed by snake-catchers. (Surgeon H. McColman, M.D., Ratnagiri, Bombay.)" "Each is used to allay distressing cough. I use it much for this purpose, and obtain excellent results. A small piece of the dried root-stalk kept in the mouth and a beneficial flow of saliva." (Surgeon-Major R. P. M.D., Purna.) "Used as a tonic and stomachic. Combined with cinchona it is used by natives for intermittent fever, also in dysentery (especially native children)." (Surgeon H. W. Hill, Mánábhum.) "In small doses taken internally with warm milk, allays the sensation of the throat in catarrhal sore-throat," (Assistant Surgeon Devendro Nath Roy, Calcutta.) "I have myself used it in coughs and sore-throats with some success. It seems to stimulate the mucous membrane and the salivary glands, the result being an increased saliva and relief of dryness of throat and harassing dry cough. I used a small piece now and again." (Surgeon D. Basu, Faridpur.) "In dysentery, a decoction is made from the bruised root. Dose one and a half." (Dr. W. Forsyth, Civil Medical Officer, Dinajpur.)

"A tonic and stomachic, useful in cases of dyspepsia, loss of appetite, debility." (Brigade Surgeon J. H. Thornton, Mungbyr.)

"The rhizome is emetic, nauseant, antispasmodic, carminative, stomachic, stimulant, and insecticide. As an emetic it is more nauseous than Ipecacuanha, and it is therefore useful in most diseases in which the latter is indicated, including dysentery. It is the two vegetable drugs in this country which act efficiently as an emetic; in so small a dose as 30 grains. It should not be used in more than 35 grains, and in 40 grains its action is very violent and obstruc-
Opinions regarding the Sweet-flag. (Acorus Calamus.

**MEDICINE.**

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**ACORUS CALAMUS.**

**436**

in Madras a flea-powder and is very effective. (Deputy G. Bidie, C.I.E., Madras.) "A time-honoured domestic remedy in asthma, to relieve which, it should be first used in large or nauseant doses (15 to 20 grains) and then repeated every hours in smaller or expectorant doses (10 grains) till relieved. of other diseases which are most benefited by this drug are bronchial hystera, neuralgia, and some forms of dyspepsia. The rhizome is used in Madras as a flea-powder and is very effective. (Deputy General G. Bidie, C.I.E., Madras.) "A time-honoured domestic remedy for cough and fever, especially in children, even of the tenderest age, gained into a paste, with the milk of the mother. It has been used here in the form of an infusion (1 in 20) in bronchial catarrh and febris. In the disease its efficacy is increased in combination with infusion of root (1 in 20). It is also supposed to destroy fleas, for which an infusion of the root is used." (Surgeon-V. Trichinopoly.) "Useful as an external application on the abdomen of children suffering from flatulent colic. The root is burnt to cinder, either with coconuts or castor oil and smeared over the abdomen. (Surgeon Peter Anderson, Guntur, Madras Presidency.) "A carminative, tonic, and insecticidal. The root is slightly burnt and powdered, 2 to 10 grains for a dose. An infusion sprinkled in infected places drives vermin. (Surgeon-Major A. F. Dodson, Bangalore.) "Used by the natives in the flatulent colic of infants. The rhizome is burnt to charcoal, then pulverised: 10 grains of this powder mixed with water is given to counteract the effects of croton. It is considered an antidote in cases of croton-poisoning. (Surgeon W. A. Lee, Mangalore.) "Rhizome powder, dose 20 to 30 grains; infusion (1 oz. to 10 oz. boiling water), dose 1 to 2 oz. (Pharm. Stomachic and carminative, insecticide." (Apothecary Thomas Madanapalle, Cuddapah.) "Is common in Southern India; it is a carminative and carminative, often used for children, also applied externally on the abdomen to expel flatus. It is used to keep moths of cloths, fleas from rooms, &c." (Surgeon Mark Robinson, "Used internally in the shape of decoction for children, as a stimulant; doses 2 grains; also externally in the form of paste applied to the abdomen in tympanitis." (Surgeon-Major F. J. L. Ratton, M.D.) "Is given internally by first burning the end of the root and applying it down in milk (as a vehicle) for flatulence, &c. It is also applied externally on the abdomen for flatulence in infants." (Surgeon-Major Bosch, Cocosandra.)" he root acts as an astrigent in infantile diarrhea:" (Assistent Surgeon Ruthnam T. Moodelliar, Chingleput, Madras Presidency, 2 grains doses it is very effectual in relieving the colic of small children." (Surgeon-Major John North, Bangalore.)

The rhizome is largely used in North Bengal in coughs and sore throats; a few thin slices are given to chew, having been slightly warmed the fire; it is more efficacious than cough lozenges in relieving the pain of the throat. It is also used as a carminative in dyspepsia. In western India it is used externally as an application on bruises and contusions rubbed up with the spirits made from the Cashew-nut fruit." (Surgeon-Major C. T. Peters, South Afghanistan.)
ACROSTICHUM scandens.  

The Red Cedar.

"Stimulant 1 to 5 grs., emetic one to two scruples. It is used in cases of colic and dyspepsia; when applied externally in the form of a paste over the head it relieves headache; when rubbed over the nose, it arrests the progress of influenza and bronchial catarrh." (Surgeon W. Barron, Bhuj, Cutch, Bombay.) "A small piece kept in the mouth and its juice swallowed relieves cough and tickling of the throat; it produces salivation and an agreeable warmth." (Assistant Surgeon Shib Chunder Bhutta-charji, Chanda, Central Provinces.)

Chemical Composition.—§ "The dried rhizome yields, according to the editors of the Pharmacographia, 1% per cent, of a neutral yellowish essential oil, of an agreeable odour, which Curratow has shown contains Tepene. Faust has isolated a bitter semi-fluid, nitrogenous glucoside, acorin, while Fluckiger and Hanbury have obtained a very bitter crystalline principle." (Surgeon C. J. Hislop Warden, Prof. of Chemistry, Calcutta.)

Spirit.  

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Vinegar.  

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Trade.—Dr. Dymock remarks that the drug imported into Bombay comes chiefly from the Persian Gulf; it brings about Rs a maund of 37½ seers. There is a very considerable trade in this article done in Calcutta.

ACROCARPUS, W. & A.; Gent Pl.

A genus containing only a single species (belonging to the sub-order Mimosae, of the Natural Order Leguminoseae).

Acrocarpus fraxinifolius, Wight; Fl. Br. Ind., II., 292; Wight, Ic., t. 254.

RED OR PINK CEDAR (of tea-planters).

Vein.—Mandania, Nepal; Mad ling, Lepcha; Malei-kone, Timmar; velly; Kulanji, Nilghiris; Kuling, Burghers; Haintse, hauvilge, Kan.

Habitat.—A lofty, deciduous tree, found in the Eastern Himalayas and lower hills down to Chittagong, ascending to 4,000 feet; also in South India and Burma.

Structure of the Wood.—Sapwood white; heartwood light red, moderately hard. Weight 39 lbs. per cubic foot.

Used by planters in Darjiling for tea-boxes and planking, in the Wynaad for building and furniture, and in Coorg for shingles.

In the Tropical Agriculturist for May 1883, some interesting information is given regarding wood for tea-boxes. Mr. Bruce writes: "I have used this timber more perhaps than any other for tea-boxes and tea-heap furniture in general, and if it has been well seasoned it is as good a wood as could be procured for the purpose."

ACROSTICHUM, L.; Syn. Fil., 399.

Acrostichum (Stenochlaena) scandens, Willd.; Filices.

A common fern in the warmer parts of Ceylon.

Fibre.—Dr. Trimen informs me that ropes are made in Ceylon from this plant.

A. 443

A genus of herbaceous perennials (belonging to the Natural Order Ranunculaceœ), comprising only two species, inhabiting the cold temperate regions of Europe, North Asia, and North America.

Leaves alternate, ternately compound. Flowers small, regular, in short crowded racemes. Sepals 3-5, unequal, petaloid. Petals 4-10, small, spathulate or wanting. Stamens many, slender. Carpels 1, many-ovuled; stigma sessile, dilated. Fruit a many-seeded berry.

(Compare with the allied genus Cimicifuga, which will be found to differ chiefly in the longer racemes (3-8 inch), and dry, dehiscence capsule, instead of a succulent berry.)


The Baneberry.


Habitat.—Temperate Himañáya, from Bhútán to Hazára. Dist.—Europe, North Asia, North America.

Botanic Diagnosis.—Leaflets ½-2 inches, ovate-lanceolate, entire or 3-lobed, acutely serrate. Flowers ½ inch diameter, white. Berry black in the European and Himañáya form; white and red in the American. The two American forms are in popular scientific works treated as distinct species—A. alba and A. rubra. The berries are very poisonous.

Properties and Uses—

Medicine.—The drug which in Europe and America is prescribed under the name of Tinctura Actaea racemosa is prepared from Cimicifuga racemosa and not from a species of Actaea. Stewart remarks regarding Actaea spicata: “I have found no trace of its being used or dreaded by the hill people on the Panjáb Himañáya. It would be interesting to know whether this be correct; for it is curious that so useful a plant should have escaped the notice of the natives of India. Canadian doctors administer the root in snake-bite; and it is said to be attended with much success in the treatment of nervous diseases, rheumatic fever, chorea, and lumbago. Mr. Frederick Stearns describes the root as violently purgative. The berries were formerly used internally for asthma and scrofula, and externally for skin complaints. Baneberry Root is largely exported into Europe and used to adulterate the root of Helleborus niger, but the former may readily be distinguished on section by the presence of radiating medullary bands, while Helleborus has an entire or unidivided substance. An infusion of Actaea root is changed into black on adding a solution of persulphate of iron acting upon the tannic acid of the Actaea. No such change is effected upon an infusion of Helleborus.

§ “Actaea racemosa.—A tincture of the root is a powerful nerve sedative, and will often relieve severe neuralgia when all other drugs fail.” (Dr. S. Westcott.)

“It would be tincture while to try this drug as a substitute for Actaea racemosa, which I find very serviceable in chronic rheumatism and uterine disorders.” (Surgeon-Major R. L. Dutt, M.D., Pubna.)

It seems probable that by Actaea racemosa is meant Cimicifuga racemosa, and in that case the above medical opinions should be transferred to the latter species. See Cimicifuga and Helleborus.

ACTINOPTERIS, Link.; Syn. Fil., 246.

A genus of ferns (Filices) belonging to the tribe Asplenieæ. Sori linear, elongated, submarginal; indusium the same shape as the sorus and folded over; placed one on each side of the narrow segments of the frond and opening towards the midrib.

A. 447
ADAMIA versicolor.

Actiniopteris dichotoma, Bedd.; Clarke’s Ferns, N. Ind., i Lin. Soc., 1880.

Syn.—A. radiata, Link.; Acrostichum dichotomum, Forsk.

Vern.—Mor-pankhi, mor-pach, N.-W. P.; Majpurika, Bomb.

Habitat.—Common throughout India on the lower hills of the plains of India, occurring, as at Agri and Moradabad, in crevices of rocks and in old masonry.

Botanic Diagnosis.—An exceedingly pretty fern, like a miniature Fronds fan-shaped, 1 to 1½ inches in breadth, composed of dichotomous segments.

Medicine.—Used as an anthelmintic (Atkinson).

§ "Very common on old walls in the Deccan; used as a medicine (Surgeon-Major W. Dymock, Bombay.)

ACTINODAPHENE, Nees; Gen. Pl., III., 160.

A genus of trees or bushes (belonging to the Natural Order Laurales) comprising 50 species, of which 9 or 10 are Indian, inhabiting the warm, forested parts of the lower hills.

Leaves sub-opposite or clustered at the ramifications and tips of branches, thick coriaceous, marginate. Flowers dioecious, sessile clusters of small flowers, in bud encased by imbricate caducous scales. Perianth short tube broken into 6 sub-equal leaves. Male flowers with 9 perfect stamens arranged in three rows of three each, the innermost having a gland on one side of the filament; anthers all introrse, 4-lobeate. Ovary immersed in cup-shaped tube of the calyx; style tapering; stigma dilated. Fruit a capsule placed in the disk or cup of the perianth.

Very little of importance can be said regarding the Indian species of this genus. The following are those best known:

Actinodaphne angustifolia, Nees; Wight’s J. L., 1841.

Syn.—Litsea angustifolia, Bl.

Vern.—Samkoh, Ass.; Boltonaro, Gário; Tabongieing, Magh.; Sinalingie, Burm.

Habitat.—An evergreen tree, with the leaves rusty-tomentose, met with in Eastern Bengal, South India, and Burma.

A. Hookeri, Meissn.

Syn.—A. lanceolata, Dale.

Vern.—Pisa, Bomb.

Habitat.—A small tree or shrub of Sikkim, and of the East-Western Ghats of South India and in Kanarah and Sattara, and perhaps at Mahabaleshwar.

Medicine.—"A cold infusion of the leaves is mucilaginous, used in urinary disorders and in diabetes. The oil of the seeds, is used as an external application to sprains; it is of a reddish oil, has a fatty odour." (Surgeon-Major Dymock, Med. M., 554.)

A. obovata, Hook. f.

Vern.—Muslini, Nep.; Pokor, Lepcha; Laihauach, Mech.; Tingya, Ass.

Habitat.—A tall tree (with large 3-nerved leaves) occurring on the outer Sikkim Himálaya, Assam, Khásia Hills, and Sylhet.

Adamia versicolor, Fortune; A. cyanes, Wall., and A. chinensis, Synonyms for Dichroa febrifuga, Laur., which see.

A. 453
Adam's Apple—A name sometimes applied to the Lime or Lemon.

Adam's Needle, see Yucca gloriosa.


A genus (belonging to the Natural Order Malvaceæ and the Tribe Bombaceæ), containing in all only two species, one met with in tropical Africa, the other in Australia; the former is cultivated in India. Leaves digitate, Calyx 5-cleft, leathery. Petals 5, exceeding the sepals, adnate below to the stamens. Style divided into 5-10 branches; stigmas radiating. Fruit oblong, woody, indehiscent.

A genus named after Adanson, a celebrated French traveller, who lived in Senegal from 1749 to 1754.


The Baobab Tree; the Sour Gourd, or the Monkey Bread

Tree of Africa.

Vern.—Garakchinchka or garakh chinta, choyari chinch (The horse's tamarind, garakha-amli), Bom.; Gar-amli chora, garak-amli, or garakha-amli, Hind.; Garaka-amli, bukha, Guj.; Gorakh chinch, Cutch; Kalpibishk, or kalirickh, Ajmere, Delhi; Hāthī khatyān (the plant), Duk.; Vilayet-imli, Mewar; Anas-puli, poparapuli (the plant, anas-pulim-marram), Yām.; Huja'd, Arab.

Dr. Dymock says the Bombay name Gorakh is derived from the name of a celebrated Hindu ascetic, who probably taught his disciples under this tree. Gorgkh and his disciple Machindar were well-known Sadius.

Habitat.—This is one of the largest and longest-lived trees in the world. Trunk short, thick, often found 30 feet in diameter; branches spreading.

Cultivated, to a small extent, in some parts of India, but deserves to be extended; originally introduced by Arab traders, who call it Hābbāhā. It is chiefly met with in Bombay, being plentiful on the coast. "Four or five venerable specimens are in the Puttehpoore district." The aban
doned capital, Mandoo, near Indore, is overrun with Adansonias as other ruins are with the pīpāl. (R. T. H., Morar.) "Pretty common about Madras; at one time it was proposed to cultivate it on account of the fibrous material in its bark." (Deputy Surgeon-General G. Bidis, Madras.) "Specimens are to be seen at Lucknow and at Allahabad." (Brigade Surgeon G. A. Watson, Allahabad.) It is also being experimentally cultivated in the Sunderbuns. There is a good specimen in the Barrackpole Park, and a small one on the Calcutta Maidan, a little beyond the Cathedral. In Africa it is said to extend through the continent from Senegal to Abyssinia. It has also been introduced into the West Indies.

Humboldt speaks of this tree as "the tree of a thousand years," "the oldest organic monument of our planet." Adanson made a calculation to show that a tree 30 feet in diameter was over 5,000 years of age. He saw two trees 5 to 6 feet in diameter, on the bark of which were cut European names, one dated in the 14th and another in the 15th century.

Livingstone says: "I would back a true Memana (the name given to this tree in the neighbourhood of Lake Ngami) against a dozen floods, provided you do not boil it in salt water, but I cannot believe that any of those now alive had a chance of being subjected to the experiment of even the Noachian deluge."

Properties and Uses—

Gum.—§ "The bark when wounded yields a large quantity of white semi-fluid gum, which is odourless and tasteless, and has an acid reaction, A. 456
ADANSONIA

digitata.

The Baobab.

Under the microscope, in addition to amorphous matter, a considerable number of minute bodies, with sharp projecting rays, are visible. The ash contains a large quantity of lime. Gum Baobab is insoluble in water, and appears to be allied to gum tragacanth.” (Surgeon C. J. H. Warden, Prof. of Chemistry, Calcutta.)

Fibre.—The bark yields a strong, useful fibre.

In Senegal it is made into ropes and woven into cloth. The hard outer bark is first chopped away, and the inner bark stripped off in large sheets. These are beaten with sticks to remove the pithy matter. The fibre is then sun-dried and pressed into bales. Small trees yield finer and softer fibre than large ones. The Africans use the fibre for making rope, twine, and sacking; in India, elephant saddles are made from it. The fibre imported into England from Portuguese West Africa readily sold at £9 to £15 a ton. It produces an exceedingly strong paper, suitable for bank-notes, and has received much attention. The slow growth of the tree, and the careful cultivation and shading it requires while young, renders it, however, a precarious source of paper fibre. (Spons’ Encycl.)

Chemical Composition.—§ “From the bark Walz extracted a non-nitrogenous principle, which crystallizes in needles and prisms, and which he named Adansonia. The root contains a red colouring matter, soluble in water and in absolute alcohol. From its aqueous solution it is deposited as a red powder.” (Surgeon C. J. H. Warden, Prof. of Chemistry, Calcutta.)

Medicine.—The fruit has a mucilaginous pulp, having a pleasant, cool, subacid taste, like cream of tartar; “a good refrigerant in fever.” (Bomb. Gaz., VI., 14.) Used in Africa in dysentery. Leaves dried and powdered constitute the “Lalo” of Africans, used to check excessive perspiration. The bark is antiparalytic. “A useful substitute for quinine in low fever.” (Bomb. Gaz., VI., 14.)

The pulp is used in Bombay with butter-milk in diarrhoea and dysentery.

“The wood is said to possess antiseptic properties.” (Bomb. Gaz., XIII., Part I., 24.) The seeds are said to possess lebrifugal properties.

In a recent correspondence with the Government of India regarding the desirability of producing a revised edition of the Indian Pharmacopoeia, it was proposed this plant should be excluded from the new edition. The U. S. Dispensatory, Ed. 15th, says of it, however, that “the leaves and the bark abound in mucilage.” “Dr. Duchassaing, of Guadaloupe, West Indies, and M. Pierre, of France, commend the bark highly as an antiparalytic. It is said to be acceptable to the stomach, and to produce no other observable physiological effect than increase of appetite, increase of perspiration, and perhaps diminished frequency of pulse. An ounce may be boiled in a pint and a half of water to a pint, and the whole taken in day.” (U.S. Disp., Ed. 15th, 1561; Jour. de Pharm. se Ser. XIII., 4 and 24.)

In the Pharm. India it is stated that, according to Dr. R. F. Hutchinson, its action is not due to any astringent property which it possesses, but to its virtues as a refrigerant and diuretic. Dr. Gibson hints that properties of this tree are well deserving of attention.

§ “The pulp is said to be a useful external application in skin diseases.—no personal experience.” (Surgeon J. Parker, Poona.) “Useful as an astringent in diarrhoea and dysentery, dose 1 to 20 grains.” (Surgeon Barren, Bhuj, Cutch, Bombay.) “Decoction used in bilious headaches.” (Surgeon-Major J. J. L. Ratton, M.D., Salem.)

Food.—The fruit, which varies in size and shape, is frequently 12 in. long, or only as large as a lemon, and resembles a gourd; contains many brown seeds, is somewhat acid, and makes a cooling and refreshing drink.

A. 463
Red Wood.  

ADENANTHERA pavanina.

It is also eaten by the natives. Major Pedley, in his expedition in search of Mungo Park, lived almost exclusively on it for twelve days. In Gujarat the fishermen eat the leaves with their food, and consider them cooling. In Senegal the negroes use the bark and leaves powdered as a condiment.

Structure of the Wood.—Light, soft, and porous, made into rafts to support fishermen in tanks. It is readily attacked by fungi.

Domestic Uses.—Owing to the softness of the wood the stems of the Baobab trees are often excavated into living houses. Livingstone describes one of these excavated trunks as sufficient to allow 30 men to lie down. The bodies of men denied the honour of a burial are often in Africa suspended within these houses and soon become perfectly dry and converted into mummies without the necessity of being embalmed. The ash of the fruit and bark boiled in oil is used as soap by the negroes. The dry fruits are used as floats by the Indian fishermen.

ADELIA.

Adelia castanicarpa, Roxb. Syn. for Chaetocarpus castaneocarpus, Euphorbiaceae, which see.

A. cordifolia, Roxb. Syn. for Macaranga cordifolia, Mill.-Arg., which see.

A. neriifolia, Roxb. Syn. for Homonoya riparia, Lour., which see.


A genus of trees or shrubs, without prickles (belonging to the Natural Order Leguminos&, sub-order Mimos&,) comprising in all some 4 species, spread throughout the tropics of the Old World, 2 being natives of India.

Leaves bipinnate. Flowers in spikes, minute, white, hermaphrodite. Calyx campanulate, equally toothed. Petals valvate, cohering only at the very base. Stamens 10, all free, equaling the corolla. Seeds scarlet.

The wood Adenanthera is derived from the Gr. 'adēn, an acorn or gland, and thēnon, a flower.

Adenanthera aculeata, Roxb., see Prosopis spicigera, Linn.; Leguminosae.

A. pavanina, Linn.; Fl. Br. Ind., II., 287; Wight, Ill., t. 84 (80).

Red Wood (sometimes called Red Sandal Wood).

Vern.—Raktu_kunchan, raktu-kimal, ranjana (sometimes also called Raktu-chandan, a name more correctly applied to Pterocarpus santalinus), Beng.; Chandan, Ass.; Bir-mungara, Santal; Anai-gandumâni, Tam.; Bandi guvarana, sêd-da-guriginga, Tel.; Manjati, Mal.; Va, shirigumâni, Mar.; Bari-gumchik, hâli-gumchik, Duk., Guj.; Manjati, Kan.; Madateyâ, Cingh.; Gung, Magh.; Yawggya, or yawggy, Burm.; Recessi, AND.

Habitat.—A large, deciduous tree, met with in Bengal, South India, and Burma.

Botanic Diagnosis.—Leaves compound, with 8-12 pinnae and 12-18 obtuse leaflets. Racemes short, peduncled, 2-6 inches long; seeds bright scarlet.

In Ceylon a nearly allied species occurs known as A. bicolor, with 6-8 pinnae, and leaflets acute. Seeds half black, half red.

Properties and Uses—

Gum.—Spons' Encyclopaedia mentions a gum obtained from this plant and known as madatia.

Dye.—The wood is sometimes used as a dye, but chiefly as a substitute for the true red sandal wood.

A. 473
ADHATODA.  

OIL,  
MEDICINE.  
Seeds.  
475

Oil.—The seeds yield an oil.

MEDICINE.—The powder made from the seeds is said to be a useful external application, hastening suppuration. § "A grateful application over boils, soothing the burning pain and hastening recovery. It is also used to cure prickly heat." (R. N. Gupta.) "The emulsion, made by rubbing the seeds on a stone with water, forms a cooling external application useful in headache and in the early stages of inflammation." (Surgeon J. Anderson, Bijnor.) "Yala powder mixed with honey is used in colic—no personal experience." (Surgeon-Major R. L. Dutt, M.D., Purna.) "A decoction is used by Kobirages in rheumatic affections. The powdered seed rubbed with water is used to disperse boils." (Surgeon J. Parker, Poona.) "Hakims use the powder in gonorrhoea." (Surgeon-Major W. Moir and Assistant Surgeon T. N. Ghose, Meerut.)

A decoction is made from the leaves in South India, and given as a remedy for chronic rheumatism and gout. If used for any length of time it is said to be an aphrodisiac. It is regarded as useful in hemorraghe from the bowels and haeematuria.

§ "The decoction is very useful as an astringent and tonic in atomic diarrhoea and dysentery." (Assistant Surgeon Bhagwan Das, Rawal Pindi.) "The wood, powdered and mixed with water, is said to be useful when applied to the forehead in cases of headache from over-exertion or exposure." (Surgeon-Major C. W. Calhoun, Morar.) "The red wood rubbed on stone with a little water and applied to the body is a certain temporary cure for prickly heat." (Surgeon-Major Henry David Cooke, Calicut, Malabar.) "Used as a emetic, in 60-grain doses, in warm water." (Surgeon-Major J. J. L. Ratton, M.D., Salem.) "It is used as an external application in orchitis." (Surgeon-Major J. F. Fitzpatrick, M.D., Coimbatore.)

FOOD.  
478

Food.—The seeds are sometimes eaten as an article of food.

TIMBER.  
479

Structure of the Wood.—Heartwood red, hard, close-grained, durable, and strong.

The timber is used in South India for house-building and cabinet-making purposes.

§ "This is sometimes confounded with the Pterocarpus santalinus; but the latter yields the red sandal-wood of commerce, which is largely exported from South India." (Deputy Surgeon-General G. Bidie, Madras.)

DOMESTIC USES.  
The seeds as weights.  
480
As Necklaces.  
481
Forming Cement.  
482
Tilak Paste.  
483

Domestic Uses.—The bright scarlet seeds are used as weights, each being about 4 grains; they are also strung and made into necklaces. Powdered and beaten up with bhirax, they give a good cement. The red paste (tilak) made by rubbing the wood upon a moist stone is used by the Brahmins to colour the forehead after bathing.

ADHATODA, Nies; Gen. Pl., II., 1112.

A genus of sub-herbaceous bushes (belonging to the Natural Order Acant-thaceae, and the tribe Justicieae), comprising in all some six species, distributed through tropical India, south tropical Africa, and Brazil.

Leaves opposite, entire, arising from swollen nodes. Flowers purple or white, crowded into a bracteated spike, sub-sessile, each flower having three bracts, the outer largest and persistent. Calyx campanulate, 5-fld, lobes lanceolate. Corolla tube short; limb 2-labiate, the posterior lip erect, the anterior broad recurved, 3-fld. Stamens 2, each with a large diverging anther-cells, one much higher than the other. Ovules 2 in each cell, placenta not rising elastically from the base of the capsule.

The word Adhatoda is derived from the Tamil name for the India species.
Adhatoda Vasica, Nees; Fl. Br. Ind., IV.

Syn. — Justicia Adhatoda, Linn.
Vern. — Ārāk, aráshı, ādālāš, ∅duḷās, ∅duḷās, āṭḍā, HIND.; Bombay; ∅ekār, ∅eśaka, BENG.; Ādulasa, MAR.; ∅awō, GUJ.; ∅rāḍā, DUR.; ∅hekkār, Ģheḷum; Baudī, Bāsā; Bākār, SALT-BANGE; Tora bājja, TRANS-INDUS; Bāsāngārās, KUMAON; Arus, vāsaka, vaṭḍāntakāhaka atarūṣa, SĀN.; Kā, OUDH; Banang, URIPA; Adhatodosai, TAM.; Ādāsara, or adasār, TEL.; Ajaṭṭakām, MAL.; Teeka, NAGA; Kath, alesi, NEPAL.
Bānsa, vāsā, bākikāi, (?) HIND., in Baden Powell’s Ph. Prod., I., 369; he also gives the vernacular names ∅ekikār, ∅ekekār, p. 505.

Habitat. — A small, sub-herbaceous bush, often gregarious, found everywhere in Bengal and in the Sub-Himalayan tracts, ascending to 4,000 feet in altitude.

Properties and Use—

Dye. — A yellow dye, obtained from the leaves by boiling, is used for dyeing coarse cloth. It gives a greenish-blue when combined with indigo. This property is not apparently known to the Nagās, who cultivate the plant to shade the approaches to their villages. I repeatedly asked if they prepared a dye from it, and was told that they did not, but that they used the stems for divining.

Medicine. — The leaves and root of this plant are considered a very efficacious remedy for all sorts of coughs, being administered along with ginger. “The medicine was considered so serviceable in phthisis that it was said no man suffering from this disease need despair as long as the vāsaka plant exists.” (U. C. Dutta, Civil Medical Officer, Serampore.) It is often administered along with honey, the fresh juice or a decoction with pepper being made into a cough mixture. Dr. Irvine gives the dose as ½ oz. to 1 oz. of the decoction, and states that the price of the drug in Patna was 1 anna per lb. in the year 1848. The Pharm. India states that strong testimony has been given in favour of the remedial properties of this plant drawn from personal experience, in the treatment of chronic bronchitis, asthma, &c., when not attended with febrile action. The flowers and the fruit are bitter, aromatic, and antispasmodic. The fresh flowers are bound over the eyes in cases of ophthalmia. “The flowers, leaves, and root, but especially the flowers, are supposed to possess antispasmodic qualities.” “They are bitterish and sub-aromatic, and are administered in infusion and electuary.” (Aiustie.) “The leaves are used as a cattle medicine.” (Gamble.)

Special Opinions.—“Leaves recently dried are also smoked in cases of asthma; they produce very beneficial effects.” Hospital Assistant Gopal Chunder Gangooly, of the Noakhally Dispensary, who is subject to asthma, has used the leaves in this form and testifies to their property. (Assistant Surgeon Anund Chunder Mukerji, Noakhally.) “The leaves made into cigarettes are used in asthma; they act as an antispasmodic.” (Brigade Surgeon J. H. Thornton, Monghyr.) “Decoction of fresh leaves was found to be very useful in bronchial catarrh.” (Surgeon C. F. W. Meadows, Barreksal.) “The dried bark, when smoked, relieves asthmatic fits; strong decoction of it in subacute bronchitis did not produce, in my hand, much benefit as an expectorant.” (Assistant Surgeon Devendro Nath Roy, Calcutta.) “There are two varieties, one with red and the other with white flowers. The first is medicinally much more important. An infusion is used in bronchitis and consumption. A fluid extract of the leaves and flowers would be a desirable preparation for trial.” (Surgeon-Major R. L. Dutt, M.D., Pubna.)

“Excellent expectorant, dose 1 to 20 grains in chronic bronchitis and asthma.” (Surgeon W. Barren, Bhuj, Cutch, Bombay.) “A fomentation

A. 491
ADIANUM
Capillus-Veneris.

The Maiden-hair Fern.

MEDICINE.

with a strong decoction of the leaves is considered efficacious in rheumatic pains, and in neuralgia. Also useful in reducing swellings." (Hony. Surgeon P. Kinsley, Chitasee, Gonojam Dist., Madras Presidency.) "This shrub is very common in Mysore, and the powdered root is used by native doctors in cases of malarial fever." (Surgeon-Major John North, Bangalore.) "The juice of the leaves has been used as an excellent expectorant when combined with some native medicines; also used by native doctors as a diuretic in dropsical affections attended with anaemia." (Surgeon-Major J. P. Fitzpatrick, M.D., Coimbatore.) "Decoction is used to quench thirst in fever." (Surgeon-Major J. J. L. Ratton, M.D., Salem.) "The juice of the leaves is used for diarrhoea and dysentery. It is considered especially useful in haemoptysis and bleeding in dysentery." (Surgeon-Major J. Robb, Ahmadabad.) "Is a useful refrigerant in fever, given as decoction." (Surgeon-Major John Lancaster, Chittora.)

FODDER.—Not browsed by any animals, except occasionally by goats.

Structure of the Wood.—White, moderately hard.

DOMESTIC USES.

494

The timber of the thicker stems is used for gunpowder-charcoal and as a fuel for brick-burning.

§ "Though only a shrub, it is valuable, as yielding a good charcoal for gunpowder. Specimens of the wood may be got an inch in diameter. It is quite the characteristic plant of the lower hills." (Baden Powell, Ph. Prod., I. 565.)

497

Domestic Uses.—The stems are used in the Nagâ Hills for divining and to foretell omens. The twig is held in the left hand and rapidly cut into thin slices, an incantation being repeated all the while; the prognostications are based upon the number of times the heart-shaped, dark, central wood turns towards or away from the operator. The idea of medicine seems scarcely to have occurred to the Nagâ, and he does not appear to attribute to this plant any virtues other than those described.

"The rei is extensively employed in the construction of the fascinate-like supports of mud wells. The smaller branches are exceedingly plant and are worked round and round in a sort of neat triple plait. The leaf is held to possess high qualities as a manure, and is scattered over the fields just before the rainy season commences. It is then worked into the soil with the plough, and left to decay with the moisture and form mould. As fuel it is almost exclusively used in the process of boiling down the cane-juice, and is collected into large heaps some days prior to the cutting down of the sugar-cane." (Oudh Gaz., III., 72.)

ADIANUM, Linn.; Syn. Fil., 113.

A genus of Ferns belonging to the Tribe Pteridées, recognizable from all the other Ferns (except some LINDSAYI) by the texture and one-sidedness of their segments; veins bifurcating but not anastomosing (except in the small section HEMARRHIA). Sorf marginal, varying in shape from globose to linear, sometimes confluent. Indusium of the same shape as the sorus, being a modification of the margin of the leaf thrown over the sorus; it is free from the frond except at the edge. Capsules attached to the under-surface of the indusium.

A large genus, having its head-quarters in tropical America, comprising some 80 species, 9 of which are met with in India.

ADIANUM Capillus-Veneris, Linn.; Syn. Fil., 123.

THE MAIDEN-HAIR FERN.

Vern.—Dânt-lî (Kashmir); Kirantisî (hijâbi). Trans-Indus; Parâwarsha (a corruption of para-yâshâ, Mooden Sherif) Salpargo (Stewart); Mubârak-s, Kuamn (Atkinson); Parshâ, kârsî.
Maiden-hair Ferns.

ADIAN'TUM caudatum.

Habitat.—A graceful, delicate fern of damp places, in rocks, walls, or wells, found chiefly in the Western Himalaya, ascending to altitude 8,000
feet, but found also far to the east in the valley of Mânipur, extending
to the mountains of the Burma-Mânipur frontier and to Chittagong.
It is common in the Panjâb, descending even to the plains, where it is
found in wells and damp places. “This plant is quite common in South
India—see Beddome’s Ferns.” (Deputy Surgeon-General G. Bidie, C.I.E.,
Madras.) Mr. C. B. Clarke, in his Ferns of Northern India, gives its
distribution as “Malabar, Bombay to Ceylon (rare); from Kabul to
England and Morocco; in tropical and temperate Africa and America;
Queensland.”

Botanic Diagnosis.—Frons usually 2-pinnate; segments 1–1 inch broad,
the base cuneate, the outer edge rounded, deeply lobed from the circumference
onwards towards the centre, the lobes often again bluntly crenate; petiole
near the centre. Sori roundish or oblongiform.

Properties and Uses.—
Smith’s Economic Dictionary (1882) states that this is the plant used
in the preparation of the so-called Sirope de Capillaire of Europe. This
 syrup is largely used in Italy and Greece in the treatment of chest compla-
ts. A. pedatum, Linn., is also extensively used for this purpose,
being exported from Canada. Dr. Dymcock draws my attention to the
fact that A. pedatum is the French official plant, and that A. Capillus-
Veneris is allowed as a substitute only. The former is a common North-
West Himalayan plant. Sirope de Capillaire is imported into India, but
might be prepared in the country to an unlimited extent, since at least four
species of Adiantum are exceedingly common plants, especially A. caudatum.

Medicine.—It is more than likely that the bulk of Adiantum sold medi-
cinally in India is the true maiden-hair fern, A. Capillus-Veneris, although
most writers on Indian drugs attribute this to A. venustum.

Dr. Irvine says: “Hans Raj, shair-ul-jin, Venus’s hair, grows
at Purna, but brought from Nepal; used as heating and febrifuge.
Dose 20 to 30 grains, price 5 annas per lb.” In the Panjâb the leaves,
along with pepper, are administered as a febrifuge, and in South India,
when prepared with honey, they are used in catarhal affections.
It is probable, however, that the official root sold in the Panjâb bazaars
under the name of Baisiâj is a species of Polypodium, which see.

Adiantum caudatum, Linn.; Syn. Fil., 115.

Vern.—Adhaura-kajari, banghâi? gunkirî, Pn.; Mayrashikshâ, SANS.;
Mayrashikshâ, Cotch; Mykehonâi? TAM.

Habitat.—An exceedingly common plant in many parts of India,
Bengal, N.-W. Provinces, the Panjâb, Madras, Bombay, &c., covering
many old wall in shady places, fronds rooting at the tip and thus
forming new plants.

Botanic Diagnosis.—Frons simply pinnate, tomentose, often elongated
in a tail which generally roots at the tip. Segments (or pinnae) 1/2–1 inch
long by 1 inch broad, dimidiate, nearly sessile, the lower edge straight and
horizontal, the upper rounded, more or less cut. Sori roundish.

Properties and Uses.—Ainslie says that in the Island of Bourbon the fronds of this species,
as also of the preceding, are used in the preparation of Sirope de Capillaire.
Mr. Baden Powell (Pb. Prod., I., 384) associates this with A. venus-
tum and other species, and gives them the vernacular names par-i-siyd-
A. 502

Sirope de Capillaire.

499

MEDICINE.

Frons.

500

A. 502

501
ADIAN'TUM lunulatum. Maiden-hair Ferns.

wäsân and hânusrâj. He adds: "An astringent and aromatic; said to be emetic in large doses; also tonic and febrifuge. This is the fern which is used in making 'Capillaire' Syrup." It would be interesting to know if a syrup was actually prepared in the Pânjâb from this plant, or if Mr. Baden Powell has simply associated the Pânjâb plants with the European drug. (See A. Capillus-Veneris and A. pedatum, the plants used in the manufacture of the Sirop de Capillaire.)

Medicine.—§ “Used externally as a remedy for skin diseases.” (Surgeon W. Barren, Bhuj, Cutch, Bombay.) Said to be useful in diabetes.” (Surgeon-Major D. R. Thompson, M.D., C.I.E., Madras.)

Adiantum flabellulatum, Linn.; Syn. Fil., 126.

Habitat.—Is very common in some parts of India. It was found plentiful in the oak and mixed forests of Mânipur.

Botanic Diagnosis.—Nearly allied to A. pedatum, smaller in size, but much thicker or coriaceous. Scales on the rhizome long, linear, chestnut-coloured; râchis often hairy, repeatedly dichotomous; segments glabrous, more or less rounded and toothed, the lower edge nearly straight; sorî ½ inch broad.

Medicine.—At Chuttuck I was told by a Mânipuri sepoj that the root was used medicinally.

A. lunulatum, Burm.; Syn. Fil., 114; Hk., Ir. Pl., t. 191.

Vern.—Kîlî-jihânt, Beng., Hind.; Mubarak, râjâhâns or hansrâj, hânusrâj, Bome; Hansrâj, Guj.; Ghotkâhârî, Mar. (Horse's hoof, on account of the shape of the leaflets and the arrangement of the spores on under side like the horse-shoe.—Surgeon-Major W. Dymock, Bombay.)

Habitat.—This is unquestionably the commonest and most widely-spread Adiantum in India. In Bengal, every hedgerow and old brick-wall is covered with it, also the rocks and banks of the lower hills throughout the greater part of India; ascends to 4,000 feet; in damp glades it often becomes 2 feet in length, rooting as in A. caudatum, Linn.

Botanic Diagnosis.—Frond simply pinnate (in this respect allied to A. caudatum). Rachis naked, polished, dark brown. Segments glabrous, ½ inch long by ½ to 1 inch broad, subdeterminate, the lower edge nearly a line with or oblique to the petiole, the upper edge rounded and usual more or less lobed.

Properties and Uses—

While this and the preceding species are plentiful everywhere throughout Bengal, they do not seem to be collected for medicinal purposes and it is probable that the fern root (hansrâj) to be had in Calcutta native druggists' shops is imported and not procured locally. Dr. Dymock (Med. Med., W. Ind., p. 780) seems to regard this as one of the species used medicinally in Bombay. (See under A. venustum.)

Dye.—This and the preceding ferns, and probably also several other species, form ingredients in certain dye recipes.

Medicine.—§ “In Gujarât this is known as Kûlo-Hansrâj. It is extensively used in the treatment of children for febrile affections. The leaves are rubbed with water and given with sugar. It is worked up with cîchh and applied locally for erysipelous affections. It is called Kûlo Hansrâj, probably on account of the black colour of the stalks.” (Surgeon-Major J. Robb, Ahmedabad.)

“Demulcent, dose of the decoction one to two ounces. Used externally as a cooling lotion in cases of erysipelas.” (Surgeon W. Barren, Bhuj, Cutch, Bombay.) “Very common in Madras, but not, so far as I know, used in native medicine.” (Deputy Surgeon-General G. Bôtà, C.I.E., Madras.)
Products of India

Maiden-hair Ferns.

Adiantum pedatum, Linn.; Syn. Fil., 125.

Habitat.—North-West Himalaya from Garhwal to Sikkim; nowhere very plentiful.

Botanic Diagnosis.—Frond herbaceous glaucous and glabrous, with shining naked rachis once dichotomous, main divisions flagellately branched and somewhat scorioid on either side, central pinnae 0.9 inches long and 1 to 1½ in. broad.

Properties and Uses—

This is the French official species used in the preparation of the Sirop de Capillaire. The United States Dispensatory says of it: "An indigenous fern, the leaves of which are bitterish and aromatic, and have been supposed to be useful in chronic catarrhs and other pectoral affections. A European species, known by the vulgar name, is the A. Capillus-Veneris, which has similar properties, though feebler."

A. venustum, Don; Syn. Fil., 125.

Vern.—Par-va-iyil, wachón, hansraj, Pers. (in the Bazar); Shirul-fjan, shirul-jhali, Arab. The Mahseer gives Kali-chand or Ghant as the Hindi name of this plant. In Bombay it is chiefly known as musaruk. Mayisikkí, Tam.

Habitat.—A fern found in the Himalaya up to 8,000 feet in altitude, and chiefly in the North-West, extending to Afghanistan; exceedingly plentiful in the forest north of Simla, often forming for miles the most characteristic under-vegetation.

Botanic Diagnosis.—Fronds 3 to 4 times pinnate. Rachis slender, polished, naked; segments rigid, prominently veined and toothed, upper edge rounded, lower cuneate into the petiole; sori 1 to 3, large, roundish, placed in a distinct hollow on the upper edge.

Properties and Uses—

Medicine.—It possesses astringent and aromatic properties, is emetic in large doses; it is also tonic, febrifuge, and expectorant. This remark is given by Mr. Baden Powell in his Panjab Products under A. caudatum. A. venustum, and other species, and it is probable that if all the preceding are not actually used indiscriminately, or as substitutes for each other, in different districts, they might easily be so, since they seem all to possess the same properties. Stewart says that "in Chumba it is pounded and applied to bruises, &c., and the plant appears to supply in the Panjab most of the official hansraj which is administered as an anodyne in bronchitis, and is considered diuretic and emmenagogue."

Dr. Dymock describes the drug obtained from Adiantum under the joint names of A. venustum, Don, and A. lunulatum, Spr. The former plant is confined, however, to the North-West Himalaya, never descending below 2,000 feet in altitude, and is in fact much more temperate in its likings than any of the other supposed medicinal Adiantums. It has never been collected in Bombay, while the latter is plentiful, and, indeed, is one of the most abundant ferns in India, but is almost confined to the plains, or warm moist valleys of the lower hills. There can be no mistaking these two species,—the simply pinnate fronds of A. lunulatum, with segments (or pinnae) sometimes as much as one inch in breadth, is quite unlike the typical frond of A. venustum, with its rounded, deltoid, and cuneate-toothed and strongly-veined segments. There should be no difficulty in separating these two plants, but it would seem more than probable that they are never sold mixed together, although they may, in different parts of India, be substituted for each other. A. Capillus-Veneris is much more likely to be mixed with A. venustum, since it is very plentiful in most parts of India (as, for example, in the Panjab plains, in wells) and very much
ADINA cordifolia. Karam Timber.

resembles A. venustum. Speaking of these two species co-
Dymock, however, says: "The Native physicians consider them
to be deobstruant and resolvent, useful for clearing the pris-
ade bile, and phlegm, also pectoral, expectorant, diuretic,
logue. Used as a plaster it is considered to be discutient, and
chronic tumours of various kinds. The Persian name is p-
In Arabic it has many names; the best known are Shir-ul-
ul-jibah (fairy's hair or mountain hair)." (Dymock's Mat. Med. 5)
"This is imported into Bombay from Persia as Parijat, the
people here often call it Mubaraka and Hansraj. Natu-
Materia Medica do not distinguish between the species. The
Mabereen gives Kalol-jhan as the Hindi for Parijat.
(Surgeon-Major W. Dymock, Bombay.)

"It is recommended by Hakims for hydrophobia. It is also
is used for the prevention of hair from falling. For in-
given in the form of a syrup." (Assistant Surgeon F. N. D.

"A vapour bath medicated by a decoction from this plant
is useful in fever." (Surgeon G. A. Emerson, Calcutta.) "Very
mild tonic, especially during convalescence from fever."
(Anderson, Bijnor.)

ADINA, Salib.; Gm. Pl., II., 30.

A genus of trees or shrubs (belonging to the Natural Order Rut-
comprising in all some six species, distributed through tropical As-
cia, four being met with in India. Adina is referred to the Tribe
having the flowers collected into dense globose heads. Corolla tu-
its simple. It is placed in the section of the Tribe said to have
free or nearly so.

The genus may be diagnosed thus: Leaves having large caducous
Flowers bracteate, densely crowded in solitary or panicled heads;
tube angled, 5-lobed. Corolla funnel-shaped, with a long tube; three
lobes 5-valvate. Stamens 5, on the mouth of the corolla; filaments
Ovary 2-celled; style bilobed; stigma capitated; ovules innum-
irbicated upon a pendulous placenta in each cell. Capsule 3-cocci,
many-seeded.


Syn.—Nuclea cordifolia, Roxb., Fl. Ind., Ed. C.B.C.;
Vern.—Haldhu, hardhu, kademu, karam, Hind.; Bangko, baka,
puria, da-kim, Beng.; Hardua, hardu (haldi in Guj
Kuramba, komba sanho, Kol.; Karam, Santal.; Bara
(S. P.); Karam, Nepal; Tikka, Bahriach and Go
paspuri, kurmi, Gond.; Holanda, Urity; Shangdong, C
koi-hadam, Ass.; Manjhabadhe, Tam.; Daduuga, betta
daru, dudaga, paspu hendi, paspu kudini, Tel.; Aruna
Hedddo, yettiga-yettgga, arunanetga, yettada, akuru,
Mar.; Haladhyanu, Guj.; Kolong, Cinga.; Thaing, Ma
damba, Sams.; Ikaw or knawung, nkepoen or nihm be

Habitat.—A large, deciduous tree, found in the Sub-Hi-
from the Jumna eastward, ascending to 3,000 feet in altitude
throughout the moister regions of India, Burma, and Ceylon;
mon in the Western Peninsula, especially in the forests of
and Thaná Districts of the Konkan, and in the forests of Ba-
Baroda, in Gujarat; from thence it extends south into th
Mysore, is plentiful in the forests of the Upper Godavari a
dara in the Central Provinces. It is common in the mixed I
forests all over BurmA from Chittagong and Ava to Pegu an
Botanic Diagnosis.—Leaves with petiole 2 to 3 inches long.
Adul Oil

cordate, abruptly acuminate, pubescent beneath; stipules orbicular or oblong. Peduncles 1 to 3 axillary and one-headed. Heads of flowers \( \frac{1}{2} \) to 1 inch diameter; bracts small towards the apex; flowers yellow.

**Medicine.**—The small buds ground with round pepper are sniffed into the nose in severe headache. *(Rev. A. Campbell, Santal Mission, Poohumba.)* "Roots used as a medicine in Assam." *(H. Z. Durrah, Esq., Assam.)*

**Structure of the Wood.**—Yellow, moderately hard, even-grained. No heartwood, no annual rings. It seasons well, takes a good polish, and is durable, but somewhat liable to warp and crack. Weight 40 to 50 lbs.

*It is good for turning, and is extensively employed in construction, for furniture, agricultural implements, opium boxes, writing-tablets, gunstocks, combs, and occasionally for dug-out canoes.*

*The Bomb. Gas. XIII., Part I., 24, says: 'this is a large, handsome tree; logs often more than 30 feet long; from durability in water they are much prized for fishing-stakes.' In the Mynore Gas. I., p. 48, occurs the following regarding this plant: 'Wood like that of the box-tree; very close-grained, light and durable, but soon decays if exposed to wet.'*

**Adina Griffithii, Hook. f.; Fl. Br. Ind., III., 24.**

**Habitat.**—Khāśia Mountains, altitude 3,000 feet.

**Botanic Diagnosis.**—Leaves shortly petioled, elliptic-oblong or obovate, shortly-acuminate. Heads \( \frac{1}{4} \) inch diameter; corolla glabrous; bracteoles short, stiff, conical spines.

**Adul Oil of Travancore.**

Was forwarded to the Great Exhibition of 1851. The oil is medicinal, but the botanical name of the plant from which it is obtained has not as yet been discovered.

**Adonis, Linn.; Gen. Pl., I., 5.**

A genus of herbaceous annuals or perennials, found chiefly as weeds of cultivation in the temperate regions; they belong to the Natural Order Ranunculaceae. There are in all only three or four species, of which three are met with on the western alpine Himalaya from Kumaon to Kashmir. None are found east of that region. They are botanically interesting as belonging to the tribe Anemoneæ, although they

**Adonis.**

**Medicine.**

**Timber.**

**A. 523**
ÆGICERAS _majus._ Cloth made from the tomentum of _Æchmanthera._

possess a distinct calyx and corolla, the latter having 5 to 15 non-
ferous petals. They are not known to be of any economic value,
that they are often met with in cultivation in Europe.

ÆCHMANThERA, _Nees;_ Gen. Pl., II., 1088.

A small genus of hairy shrubs (belonging to the Natural Order ACAN-
DICEAE and the Tribe RUELLIEAE), containing in all only two species, one
with on the Himalaya and the other in the Khāsia Hills.

Leaves broad elliptic, acute, crenate, often viscid. Clusters of flowers are
scattered on the branches of the trichotomous cyme. _Corolla_ tubular con-
ose, nearly straight, widened suddenly near the middle, glabrous but
both hairy lines on the palate within; _segments_ 5, sub-equal, rounded, to
the left in bud, pale violet or purplish. _Stamens_ 4, didynamous, incl
longer filaments hairy; _anthers_ two-celled, cells muticose; _connective_
current at the tip or not. _Ovary_ densely hairy at the apex; _stigma_ simple; _ovules_ 4–6 in each cell. _Fruit_ seeded to the bottom (a char
which at once separates this genus from RUELLIA).

Æchmanthera leiostepma, _Clarke;_ Fl. Br. Ind., IV., 429.

Habitat.—Jointia and Khāsia Hills, altitude 3,000 feet.

Mr. C. B. Clarke, in the _Flora of British India_, says of this plant that,
except that the seeds are glabrous, and when wetted not
the plant is hardly distinguishable from _Æ. tomentosa_.

No information regarding its economic uses.

Æ. _tomentosa, Nees;_ var. _Wallichii;_ Fl. Br. Ind., IV., 428.

_Syn._—Æ. _Wallichii, Nees;_ _Æ. gossypina, Nees._

_Vern._—Patrang, ban marā, _CHUMBA._

Habitat.—A small shrub, met with in the temperate Himālaya,
Kashmir to Bhutān, altitude 3,000 to 5,000 feet.

Botanic Diagnosis.—Leaves hairy, elliptic, acute; _petiole_ 1½
long. _Anthers_ oblong, connective, not excurrent. _Seeds_ densely hair
hairs starting out when wetted.

Fibre.—In Dr. Stewart’s _Panjib Plants_ occurs the following
regarding this plant: “Madden states that bees are particularly
its flowers, and _Jameson_ mentions that a kind of cloth is made from
the tomentum of the leaf.”


Ægialitis annulata, _R. Br.;_ PLUMBAGINACEAE.

_Syn._—Æ. _rotundifolia, Roxb.,_ Fl. Ind., Ed. C.B.C., 273; _Æ. and
Kurs, in Journ., As. Soc.; Æ. _rotundifolia, Presl, Bot. &
Habitat.—A small, evergreen treelet, with pale yellow, sessile flo
found in the tidal forests of the Sunderbans, Chittagong, Arakan, a
and the Andaman Islands.

Structure of the Wood.—Very curious, resembling that of the
cotyledons. It consists of a soft pithy substance, with scattered
pore-bearing wood, resembling fibro-vascular bundles, but quite dis
character.


Ægiceras _majus, Gartn.;_ Fl. Br. Ind., III., 533; _Wight, Ill._

_MYRSINACE._

_Vern._—Halai, halatki, _BENG.;_ Bātøyet, _Burm.;_ Kūndš, _MAR._

_Habitat._—A small, evergreen tree, met with in the coast forest.
Products of India.

The Bael Fruit.

**AEGLE**

Tidal creeks of the Western Coast, Bengal, Burma, and the Andaman Islands.

**Structure of the Wood.**—Hard, close-grained. No annual rings. Used for firewood and in Jessore in the construction of native huts.

**AEGLE, Corr.; Gen. Pl., I., 306.**

A genus (belonging to the Natural Order Rutaceae) comprising two or three trees inhabiting tropical Asia and Africa.

Leaves alternate, pinnately lobed; leaflets membranous, subcordate. Flowers large, white, in axillary panicles. Stamens 30 to 60, inserted round an inconspicuous disk; filaments short, subulate; anthers elongated, erect. Ovary ovoid from a broad axis; cells 8-20, peripheral; ovules many in each cell, 2-serial.

Fruit large, globose, 5-15-celled, to many-seeded, rind woody. Seeds within membranous layers, buried in the aromatic pulp, oblong compressed; testa woolly and mucous; cotyledons thick, fleshy; radicle pointing away from the hilum.

The name *Aegle* is in allusion to one of the Hesperides, whose orchard bore golden fruit. *Marmelos* is the Portuguese for quince. By the medieval writers this was called "Marmelos de Bengalua," or Bengal Quince.

**Aegle Marmelos, Corr.; Fl. Br. Ind., I., 526; Wight, Lc., I. 46.**

**The Bael or Bel Fruit Tree; The Bengal Quince.**

**Syn.**—Crataeva Marmelos, Linn.; C. religiosa, Ainslie.

**Vern.**—Bél, d-hal, sirphal, Hind.; Bél, bel, vilva, Beng.; Bel, Ass.; Bela, Billa, Bombay.; Bel, Mar.; Bel, Cey.; Billa, koto, Sind.; Sirphal, billa, malura, bilvaphalam, balva, Sars.; Safarjal-i-kindu, skil, Arab.; Pehs.; Lohagati, Kol.; Auratpang, Magh.; Vitasa-pasham, Tam.; Maridu, maluramu, bilvapandu, patir, Tml.; Maika, mahaka, Gond.; Kivalop-pasham, Mal.; Cortalum, bela, Kurru; Bilipatri, or Belpatri, Kan.; Oskhil, ushitben, Burm.; Béli, Singh.

The Billa, malura, or matura, of the ancients. Roxburgh says a small variety is called Shripula in Bengal.


**Habitat.**—A tree, found in cultivation all over India, often curiously sending up off-shoots from the roots, which in time become trees. Wild in Sub-Himalayan forests from the Jhelum eastward, in Central and South India, and in Burma.

**Botanic Diagnosis.**—A small, deciduous, glabrous tree, with strong, axillary spines. Leaves pale green, of three leaflets; lateral leaflets sessile, ovate-lanceolate, 3-5 inches long, terminal long petioled. Flowers an inch in diameter, greenish white, sweetly scented. This tree has its nearest affinity to the elephant-apple or wood-apple, but the imparipinnate leaves, 1-celled fruit, and few stamens of the latter, at once remove it from the Bél. The *Flora of British India* remarks that there is a form in Burma with oblong fruits, of which no definite information exists, and it is not known whether this is a distinct species or only a local variety. In most bazaars of India there are two kinds—the small or wild form, and the large or cultivated. In a correspondence with the Home Department, Government of India, communicated by Honorary Surgeon Mooden Sheriff, Khan Bahadur, and forwarded by the Government of Madras, these two forms are carefully compared and contrasted.

A. 534
AEGLE
Marmelos

Gum, Dye, Medicine.

Dr. Moolook Sherifff says the cultivated form is generally free from gum, although in fragmentary pieces resembling coarse brown sugar. From the stems a gum is obtained, occurring in tears like gum arabic, and from the seed fluid a mucus secreted within the cell of the fruit which hardens into a transparent, tasteless, gummy substance. Roxburgh, who rarely overlooked any facts connected with the plant, had the opportunity of examining, clearly described this substance by modern authors it has apparently been confused with the yellowish pulp. Roxburgh says: "Berry large, sub-spherical, with a hard shell, from 10 to 15-celled; the cells contain, besides the seeds, a large quantity of an exceedingly tenacious, tranparent matter, which, on drying, becomes very hard, but continues transparent; within it may be drawn out into threads of one or two yards in length, and so as to be scarcely perceptible to the naked eye, before it breaks. The mucus of the seed is for some purposes a very good cement." (Fl. Ind., Ed. C.B.C., p. 429.)

§ "The seeds and the mucus are encased in a rough, opaque membrane in the form of a white bean—the carpels or cells of the fruit. From 15 of these bean-shaped cells, with the gluten and seeds inside, are found in each fruit. They are embedded vertically in the yellowish oval skin of the fruit. As stated by Dr. Roxburgh, the mucus is transparent and very tenacious. It has the appearance of an exceedingly pure white, and is almost tasteless. I am not aware of any use to which it is put, but with lime it acts as a very good cement for mending porcelain."

THE DYE.

A yellow dye is obtained from the rind of the fruit; the unripe fruit is also used along with myrobalans in calico-printing.

THE MEDICINAL PROPERTIES OF BEL.

No drug has been longer and better known nor more appreciated by the inhabitants of India than bel; but the descriptions given by writers are very ambiguous. The unripe fruit acts as an astringent; the ripe fruit, taken in the fresh state, is laxative, but the dried ripe fruit is only mildly astringent. By some authors the astrigency is denied; by others the astrigency is maintained. That the fruit contains tannin, while others again deny that this is not the case. The drug used in India, for diarrhoea, dysentery, is the roasted or sun-dried unripe fruit cut up into slices.
The Bael Fruit.

Synopsis of the parts of the plant as used medicinally.

(a) The unripe fruit is cut up and sun-dried, and in this form is sold in the bazaars in whole or broken slices. It is regarded as astringent, digestive, and stomachic, and is prescribed in diarrhoea and dysentery with debility of the mucous membrane, often proving effectual in chronic cases after all other medicines have failed. It seems specially useful in chronic diarrhoea; a simple change of the hours of meals and an alteration in the ordinary diet, combined with bêl fruit, will almost universally succeed.

(b) The ripe fruit is sweet, aromatic, and cooling; made into a morning sherbet, cooled with ice, it is pleasantly laxative and a good simple cure for dyspepsia and is useful in febrile affections. The dried ripe pulp is mildly astringent and may be used in dysentery. A useful popular preparation, made in India, is the Bêl-marmalade, which may be taken like jam at the breakfast table in convalescence from chronic dysentery or diarrhoea.

(c) The root (and sometimes the stem) bark is made into a decoction which is used in the treatment of intermittent fever. It constitutes an ingredient in the dasamul or ten roots. It is given in hypochondriasis and palpitation of the heart.

(d) The leaves are made into poultice, used in the treatment of ophthalmia. The fresh juice is bitter and pungent, and diluted with water is praised as a remedy in catarrhs and feverishness.

(e) The astringent rind of the ripe fruit is employed in dyeing and tanning. It is also sometimes used medicinally.

§ “Sections of the dried rind are sometimes used as receptacles for medicines.” (Assistant Surgeon Bhagwan Das, Ravel Pindi.)

(f) The flowers are deemed fragrant by the Native physicians.

The difference between the appearance and properties of fresh ripe fruit, and of the dried slices of unripe fruit sold in the druggists' shops and exported to Europe, must not be overlooked. The ripe pulp is of a pale orange or flesh colour, is deliciously fragrant, and yields with water a pleasant orange-coloured sherbet, slightly laxative. The dried slices give a reddish solution, acid and astringent in its action (or by some authors considered stimulant to the mucous membrane, but not astringent), and not possessed of the characteristic fragrance of the ripe fruit. The dried slices are prepared from the unripe fruit before the pulp has either become flesh-coloured or acquired its characteristic odour. Dr. Moodeen Sheriff (in the official correspondence quoted) says it is “a tonic, stomachic febrifuge, nauseant, and a remedy in dysentery, scurvy, and apthe. It is not astringent, and therefore not useful in all forms of dysentery and diarrhoea. Acute dysentery is the disease which is most benefited by it, particularly in its first stage. It seems to exercise a greater influence in altering the nature of the motions than in diminishing their frequency. Its usefulness is greatly enhanced by the combination of opium. (Pulv. lpecac. Co.)” (Compare with medical opinions.)

Chemical Composition.

According to Dr. Macnamara and Mr. Pollock, bêl contains tannic acid, a concrete volatile oil, a bitter principle, and a balsamic principle resembling Balsam of Peru. Speaking of this analysis, Professor Flückiger and D. Hanbury, in their Pharmacographia, say they are unable to confirm the conclusions arrived at; “Nor can we explain by any chemical examination upon what constituent the alleged medicinal efficacy of bael depends.” With reference to the unripe dried fruit these learned authors say: “The pulp, moistened with cold water, yields a red liquid
Marmelos.

MEDICINE.

containing chiefly mucilage and (probably) pectin, which separates a liquid is concentrated by evaporation. The mucilage may be produced by neutral acetate of lead or by alcohol, but is not coloured by it. It may be separated by a filter into a portion truly soluble (as proved by addition of alcohol or acetate of lead), and another, comprehending the larger bulk, which is only swollen like tragacanth, but is far more viscous and completely transparent.

"Neither a per- nor a proto-salt of iron shows the infusion of any appreciable quantity of tannin, nor is the drug in any sense of astringent properties." (Pharmacographia, Ed. 1879, 131.)

§ "A section of both the ripe and unripe fruit, when moistened with a solution of ferric chloride, gives a most marked tannic acid reaction and shows the strongest in those portions of the pulp nearest to the rind. F. Gluck Hanbury's statement (quoted above) that the drug does not contain a considerable amount of tannin, and is therefore not possessed of astringent properties, requires to be modified. The clear mucilage which some parts of the seeds has an acid reaction, and is readily soluble in water. If no reaction with either ferrous or ferric salts, and does not possess astringent properties. It contains lime." (Surgeon Warden, Chemistry, Calcutta.)

Offical Preparations.

(1) Extract of Bél.—Made from the fresh unripe fruit. Dose a drachm to one drachm twice or thrice daily.

(2) Liquid extract of Bél.—Prepared from the dried slices of unripe fruit. This possesses in a much less degree the properties of the other. Dose one to two fluid drachms.

Made official in Pharmacopoeia of India in 1868.

(3) Dr. Mooden Sheriff says that a powder of the dried pulp is a convenient form of administration; it keeps well in tight bottles as a tonic 12 to 15 grains; as a febrifuge and remedy for scurvy, 10 to 20 grains; and as a nauseant and remedy in diarrhoea 20 grains to 2 drachms.

Opinions regarding the Unripe Fruit.

§ "The pulp of the unripe fruit is soaked in gingelly oil for a while, this oil smeared over the body before bathing, to remove the burning sensation in the soles of the feet so common among sailors. (Surgeon-Major John Lancaster, M.B., Chittore.) "I have found this fruit very useful in cattarrh and diarrhoea; very little use in acute dysentery. I consider the taste unpleasant. (Surgeon-Major H. J. Haalitt, Ootacamund, Nilgiri Hills.)

"The unripe fruit, in the form of decoction, is very effective in chronic diarrhoea, such as occur in jails, where there is also a scurvy element present. Its efficiency is increased by the addition of opium. I have not found it produce hemorrhoids in any of my patients although the drug has been continued for a long time." (Surgeon Brown, M.D., Hoshangabad, Central Provinces.)

"Pulp of green fruit, softened by roasting and sweetened with candy, is useful in chronic diarrhoea and dysentery. The 'sharh' fruit is a pleasant, cooling drink, but heavy of digestion, often acidity and heartburn." (Assistent Surgeon Shih Chunder Bhun Chanda, Central Provinces.)

"Very useful in chronic dysentery. In the acute form it is not owing to the rapidity with which inflammatory action proceeds an ulceration supervenes." (Surgeon-Major C. R. G. Parker, Pondicherry, Madras.) "Most useful in diarrhoea due to general relaxed state.
regarding the Baccl Fruit.

AEGLE
Marmelos.

(more particularly in summer.)” (Surgeon H. D. Masani, Karachi, Bombay.) “Astringent in chronic dysentery and diarrhea, the unripe fruit made into decoction. The ripe fruit is eaten with sugar.” (Surgeon-Major A. F. Dobson, M.B., Bangalore.) “It is also pickled, and in this state is of great benefit in chronic dysentery.” (Surgeon-Major A. S. G. Jayakar, Muscat, Arabia.) “I always use this in chronic diarrhea, especially after an attack of dysentery.” (Surgeon-Major H. D. Cook, Calicut, Malabar.) “If used for any length of time, bél is apt to produce hemorrhoids, but this is avoided by using a little sugar along with the bél.” (Surgeon G. A. Emerson, Calcutta.)

The powder is more useful in acute diseases, and the syrup in chronic affections. In acute dysentery, the powder should be administered in much larger doses than in any other disease. Its first good effect is the rapid disappearance of blood and increase of the feculent matter in the motions. It seems to have, in fact, more power to alter the nature of the motions than to reduce their number. For the latter purpose, i.e., to check the frequency of the motions, it requires to be combined with some preparation of opium. The powder of bael fruit is also useful in relieving the febrile symptoms in all forms of idiopathic fevers, including hectic and typhoid. The abnormal temperature, in febrile conditions, is reduced under its use, in a very remarkable manner. Doses of the powder, as a remedy in dysentery, from 20 grains to 1 drachm, 4, 5, or 6 times in the 24 hours; and for all other purposes, from 10 to 20 grains. Of the syrup, from 2 to 4, or 6 fluid drachms 3 or 4 times in the 24 hours.” (Hony. Surgeon Moodeen Sheriff, Madras.)

“Used as an astringent in diarrhea and dysentery. The following powder is found very efficacious in chronic diarrhea and dysentery:—

Bél pulp. | Almond.
Bruised mango seeds. | Sugar.”
Catechu. | (Faswant Rai, Mooltan.)
Bruised seeds of Plantago Isphagula.

“The ripe fruit, when fresh, is mucilaginous, astringent, and slightly acid; I have found it useful in diarrhea. The powder or decoction of the dry fruit may be used in the place of fresh fruit.” (Assistant Surgeon Bhagwan Das, Rawal Pindi.)

“The half-ripe fruit, freshly gathered, is very useful in cases of obstructive diarrhea and dysentery, especially if scurvy be present. Made into a powder with arrowroot it is very useful in the bowel complaints of children.” (Brigade Surgeon J. H. Thornton, B.A., M.B., Monghyr.) “A liquid extract is the best way of administering this drug; it is somewhat overrated. It is useful in dysentery with scorbatic taint.” (Surgeon G. Cumberland Ross, Delhi.)

“I think the ripe pulp is of very little value as an astringent. The unripe fruit is decidedly astringent.” (Deputy Surgeon-General G. Bidie, C.I.E., Madras.)

“1. I have used unripe bél fruit in two ways: (a) entire bél fruit, partially burnt, about half or one third of each fruit to a man once a day. The burning softens the pulp and makes it more digestible; (b) unripe bél cut into slices and sun-dried before eating with a little sugar. In both ways it has been found to be a mild astringent, stomachic, and nutritive, most useful in chronic dysentery and diarrhea; slowly but steadily reducing the number of motions and the quantity of mucus. The ripe fruit made into a sherbet is a mild laxative and cooling drink; a little dahi or tamarind and sugar is added to give a subacid taste and to increase the cooling laxative property.” (Surgeon D. Basu, Faridpur.)

“Both the ripe and unripe fruits are useful in dysentery, especially after

A. 545
AEGLE Marmelos.  

**The Bael Fruit.**

MEDICINE. The acute symptoms have been checked by ipecacuanha." (Surgeon Shahabad.)

"I have used a strong decoction of the dried and sliced fruit in dysentery and diarrhoea, also the sherbet and pulp of the ripe fruit in the different forms of bel powder and preserve." (Surgeon Purneath.) "The unripe fruit is roasted in the fire, and the juice is strained and used in chronic dysentery and diarrhoea." (Surgeon Bensley, Rajasthan.) "Its astringent property is due to the presence of tanins." (Surgeon C. M. Russell, Sarun.) "Used in chronic gonorrhoea; the pulp of a fresh fruit is mixed with milk and administered as powder. Supposed to act as a diuretic and astringent on membranes of the generative organs." (Surgeon-Major J. Patrick, M.D., Coimbatore.) "The unripe fruit is half roasted in the sun before the whole fruit, with the rind and all, is beaten into a pulp with a sufficient quantity of water, strained, and taken in large doses, with a little palm sugar-candy in cases of chronic dysentery." (Surgeon-Major D. R. Thompson, M.D., C.I.E., Madras.) "The unripe fruit, powdered and given in doses of gr. 3, to 4 Co. gr. i with sugar gr. ii in each powder, to a small child infected with chronic diarrhoea, was most useful. Extract has been prepared the same by powdering, mixing with water, and evaporating to strength." (Surgeon G. F. Poynder, Roorkee.) "The unripe fruit is used as a pickle. It is also made into chutney and commonly used for cases of dysentery." (Surgeon-Major Ahmedabad.)

**Regarding the Ripe Fruit and Sherbet.**—"The use of ripe fruit in a form of sherbet, is very valuable in seasons of prevalence of bowel trouble and cholera. The strained pulp of the half-roasted unripe fruit is more efficacious than the extracts sold by English druggists in diarrhoea and dysentery." (Surgeon R. L. Dutt, M.D., Pulna.) "Sherbet made of the ripe fruit is most useful in chronic dysentery and diarrhoea," (C. H. Joubert, Dorgiling). "The ripe fruit is an excellent laxative. The sherbet made thick enough to be eaten with a spoon, and not, as many make it, so thin that it can be drunk. The quantity required to produce a laxative effect is a small tumblerful; a mixture of half milk and half fruit is an agreeable drink." (Surgeon Edw. Borill, Champaran.) "A very pleasant and extremely useful fruit. Thick sherbet made of the ripe fruit is the best and surest laxative I know; the quantity necessary to produce this effect being an ordinary tumblerful. Very useful in dyspepsia and habitual constipation." (Surgeon G. Price, C. India.) "The pulp of the fresh fruit in the form of a thick sherbet is recommended in scurvy, acting at the same time as a purgative." (G. W. Subacut and chronic dysentery often invaluable, taken in the form of sherbet." (Surgeon J. Maitland, M.B., Madras.) "Prescribed in diarrhoea and dysentery. I have used the sherbet very successfully as an injection in cases of gonorrhoea, when the ripe fruit is eaten with sugar by natives suffering from dysentery or other complaints." (Surgeon W. Barren, Bhuji, Cutch, Bombay.)

**Regarding the Leaves.**—"Leaves are very efficacious when put into a pulp without any admixture of water and applied cold in cases of fever, and to ulcers." (Assistant Surgeon A. M. Mukerji, Noakhally.) "The fresh juice of the leaves acts as a mouth wash in cases of fever and catarh, and has probably the effect of these conditions." (Doyal Chunder Shome, Lecturer, Camphor School, Staluk.) "The decoction of the leaves is used as a febrifuge."
Products of India.

Food, Timber, Domestic and Sacred Uses.

**ÆGLE Marmelos.**

**FOOD.**

The fruit when ripe is sweetish, wholesome, nutritious, and very palatable, and much esteemed and eaten by all classes. The ripe fruit, diluted with water, forms, with the addition of a small quantity of tamarind and sugar, a delicious and cooling drink.

**TIMBER.**

Structure of the Wood.—Yellowish white, hard, with a strong aromatic scent when fresh cut; no heart wood, not durable, readily eaten by insects. Weight 40 to 50 lbs. (Brandis) Wallich gives 49; Mr. Gamble's specimens averaged 57 lbs.

Used in construction for the pestles of oil and sugar mills, navies and other parts of carts, and for agricultural implements. The wood is also valued for making charcoal, but is not often used. (Stewart, Ph. Pl.) The wood is used in the Panch Maháls for oil-mills.

**DOMESTIC USES.**

Domestic and Sacred Uses.—"The fruit is nutritious, warm, cathartic; in taste delicious, in fragrance exquisite; its aperient and detersive quality and its efficiency in removing habitual costiveness have been proved by constant experience. The mucus of the seed is for some purposes a very good cement. The fruit is called Shripôla, because it sprang, say the Indian poets, from the milk of Shri, the goddess of abundance, who bestowed it on mankind at the request of Tówarra, whence he alone wears a chaplet of Bîlva flowers; to him only the Hindús offer them; and when they see any of them fallen on the ground, they take them up with reverence and carry them to his temple." (Reed, in As. Res., Vol. 2, 340; also quoted in his Flora of India.)

"This is one of the most sacred of Indian trees, cultivated near temples and dedicated to Śiva, whose worship cannot be completed without its leaves. It is incumbent upon all Hindús to cultivate and cherish this tree, and it is sacrilege to cut it down." (U. C. Dutt, Civil Medical Officer, Srímpore.)

Birdwood, in his Industrial Arts of India, says it is sacred to the Trinòri, being a representative of Śiva. It is also sacred to the Parvati, and is the Vîlûva-rupra, one of the Patricias, or nine forms of Kálî. It is one of the trees the planting of which by the waysides gives long life. "Leaves used in enchantments." (Irvine.)

A. 548
ÆRUA lanata.

Snuff-boxes, 549
Medicine dishes, 550
Orchids, 551

Amarantaceous Herbs.

“In Peshâwar, large numbers of snuff-boxes for Afghans are
from the shell of the fruit, which is prettily carved over, and fitted
small bone plug for the opening in the end, which serves as entrant
exit for the snuff.” (Stewart, P. Pl.)

The young dry shell is also largely used for medicine dishes
bottles.


Ærides, a large genus of tropical orchids, of which Æ. odoratum
most common, and at the same time most handsome species, growing
and perfuming the orchid house. The leaves in this genus are disj
channelled, and unequally truncate, but sometimes round. The luts
are large and frequently scented. Æ. toninale, a native of Sylh
Mânipur, has flat green rootlets, closely embracing the twigs upon
it grows, somewhat like a tape-worm, hence the specific name. Æ
and Æ. odontochilum are also met with in Assam and Sylhet, w
Western India occupies the spotted species, Æ. maculosum. Not
known to be of economic value, although all are much prized as cul
plants.


A small genus of shrubs or herbs (placed in the Natural Order Amaran
TACEAE), comprising in all some 10 species; they are inhabitants of tropical A
and Africa.

Erect or scendent, closely covered with a short white tomentum. Leaf
alternate, opposite or almost whorled, linear oblong or ovate, entire
Flowers small or minute, arranged on terminal or axillary simple or panic
spikes, white or rusty; hermaphrodite, polygamous or dioecious, with a
large and two small bracts, concave and persistent. Perianth of 5 (rarely 4)
short leaves, oblong-lanceolate, acute or acuminate and very hairy. Stam
5 (rarely 4); filaments often unequal, subulate, united at the base into a sh
cup. Ovary sub-globose; style short; stigma 2 or capitate. Ovary o
coiled with a single ovule suspended from a long funiculus. Seed invol
ovoid or reniform, compressed; testa thin, coriaceous; arillus wanting;
albumen farinaceous; radicle superior.

Ærura javanica, Ruiz.; Gen. Pl., III., 34; Wight, Ic., t. 876.

Syn.—Achyranthes incana, Roxb., Fl. Ind., Ed. C.B.C., 225; C
LANATA, Linn.; Achyranthes Javanica, Wight & Arn., t. 876.

Vern.—Probably same as Æ. LANATA.

References.—Veitch’s Hort. Cultiv., 317; Dyal. and Gibbs, Bomb. F
DC. Prod. XIII., Part 2, 209.

Habitat.—Common throughout the Peninsula, and in flower all the
Botanic Diagnosis.—A small or ascending herbaceous plant, t
bose hoary. Leaves ovate-lanceolate, obtuse, shortly mucronate.
solitary, sessile, ascending. Calyx a little longer than the ac
one-nerved bracts.

Æ. lanata, Just.; Gen. Pl., III., 34; (Wight, Ic., t. 723?)


Vern.—Chaya, Beng.; Bâli, Raj.; Bâli, Jârv; Sind; Bâli-hallam (as wild in bazar), Pâk.; Kud-kâjir, khâli, Duk.; Jâli.
TRANS-INDUS; Kapur-madhura, Mâ.; Sirrok-pâlay-sayy, Tâm.;
condâ, Tél.; Astmabâyda, Sâns.

References.—DC. Prod., XIII., Part 2, 203; Dymock, Mat. Med., W
50; Murray’s Fl. and Drugs, Sind, 101.

Habitat.—Small, herbaceous weeds, common everywhere in the
ascending to 3,000 feet in altitude; from the Indus eastward to B
and Burma, and southward to the Madras Presidency.

Botanic Diagnosis.—A small, herbaceous plant, ash-coloured,
The Sola Plant.

AESCHYNOHEME aspera.

Little tomentose. Leaves ovate, obtuse, shortly mucronate, pubescent on both sides. Spikes solitary or in twos or threes, sessile, horizontal. Calyx twice as long as the bracts.

Properties and Uses—

Medicine.—The flowering tops are officinal, and the roots are used in the treatment of headache, and by the natives of the Malabar coast are regarded as demulcent. The flowers are sweetly scented. (Graham, Murray, &c.)

§ "I am not aware of its being used medicinally in South India." (Deputy Surgeon-General C. Bidie, O.I.E., Madras.)

In Sind, Stewart says the woolly spikes are used for stuffing pillows; rats are fond of the seed. The stems are often covered with woody galls.


Syn.—Achyranthes scandens, Roxb.; Fl. Ind. Ed. C.B.C., 217; Gamble’s Trees and Shrubs, Darj., 63.

Vern.—Nuriya, Beng.

Habitat.—A large climber, covering the tallest tree with its masses of handsome flowers and soft whitish leaves; common in the lower hills, ascending to 6,000 feet; Monghyr, the Terai, Kumaon, &c.

Botanic Diagnosis.—Stem sub-fruiticose, climbing. Leaves elliptic-oblong, acuminate at both ends, mucronulate, pubescent, green.


A genus of herbs or shrubs (belonging to the Natural Order Leguminosae), comprising some 30 species, distributed throughout the tropics. Leaves odd pinnate with numerous sensitive leaflets. Flowers in sparse racemes. Calyx deeply two-lipped, the lips toothed. Corolla early caducous; standard orbicular; keel not beaked. Stamens in two equal bundles. Ovary stalked, linear, many-ovuled; style filiform, incurved; stigma terminal. Pod with a stalk longer than the calyx, composed of 4–8 joints, each one-seeded.

The name “Æschynomene” is derived from airwvoua, to be ashamed. It was given to a sensitive plant (? a Mimosa) mentioned by Pliny, probably in allusion to its closing so readily on being touched.

The genus to which the name is now applied belongs to the Sub-Order Papilionaceae, not to the Mimoseae. There are two Indian species.

Æschynomene aspera, Linn.; Fl. Br. Ind., II., 152; Wight, l.c., 1, 299.

Syn.—Hedysarum lagenarium, Roxb., Fl. Ind., Ed. C.B.C.

Vern.—Sora or shola, phulshola, Beng.; Kuhli, Ass.; Bhend, Mar.; Atmone, teke, Tam.; Niyilâa, bend, Tel.; Panaban, paubhun, Burm.

Habitat.—A small, sub-floating bush, frequenting marshes and growing mostly during the season of inundation in Bengal, Assam, Sylhet, Burma, and South India.

Botanic Diagnosis.—Stems robust, swollen (often 2 inches in diameter), full of white light pith, with a central channel and a thin yellow-grey bark, not more than ¼ inch in thickness), simple, rarely if ever branched. Erect. Peduncles, calyx, and large corolla hispid.

Properties and Uses—

Fibre.—In Burma a fibre is obtained from the thin bark.

Domestic Uses.—The so-called pith or sola, however, is the most valuable product of the plant; it is largely used by fishermen for floats; it is cleverly cut up into paper-like sheets and made into temporary decorations for idols during certain festivities. Europeans use it for making hats.

FIBRE.

501

DOMESTIC USES.

502

Plants.

557

558

559

560
ÆSCULUS indica. The Indian Horse-chestnut.

\begin{tabular}{|l|}
\hline
\textbf{Hats.} 563 \\
\textbf{Toys.} 564 \\
\hline
\end{tabular}

(sola topiś) which, while being perfect protectors from the sun, are extremely light. The pith models of bullock-carts and other articles of Indian interest, made chiefly at Tanjore in Madras, are both curious and artistic. Sola is also made into a multitude of highly-coloured toys.

§ 2. A common weed in tanks. The soft and spongy pith is used as a substitute for sponge for the preparation of surgical lint which is used for widening the narrow openings of sinuses and abscesses, and as a diluting the rigid os uteri. If a piece of the pith, about an inch long and shaped like a cone with a sharp knife, be pressed between the fingers, it becomes very thin, and if inserted into the narrow opening of an abscess or sinus, it absorbs the moisture and swells up to its original size, and thus enlarges the opening without cutting.

\textbf{(Hony. Surgeon Mooden Sher Khan Bahadur, Madras.)} “The pith of the stem can be used as a substitute for cords in medicine bottles.” (Brigade Surgeon G. A. Watson, Allahabad.)

Æschynomene cannabinà, \textit{Retz.}

Syn. for \textit{Sesbania aculeata}, \textit{Pers.}, \textit{var. cannabinà}, which see.

\textbf{Æ. grandiflora, \textit{Linn.}}

Syn. for \textit{Sesbania grandiflora}, \textit{Pers.}, which see.

\textbf{Æ. indica, \textit{Linn.}; Fl. Br. Ind., I., 151; Wight, t., 1. 405.}


\textbf{Vern. — Tiga jilaga, Tel.}

Habitat. — From the plains of Bengal to the lower hills; ascending Kashmir to 5,000 feet and to 4,000 in Kumaon. Distributed to Ceylon, Siam, Japan.

Botanic Diagnosis. — Stems slender, much branched. \textit{Petunias viscidus} small; \textit{corolla} glabrous.

Apparently not put to any economic purpose.

\textbf{Æ. Sesban, \textit{Linn.}}

Syn. for \textit{Sesbania aegyptiaca}, \textit{Pers.}, which see.

\textbf{ÆSCULUS, \textit{Linn.}; Gen. Pl., I., 398.}

A genus of trees (belonging to the Natural Order \textit{Sapindaceae}), comprising in all only 14 species, natives of the temperate parts of Asia and America.

\textit{Leaves} exstipulate, opposite, digitate, deciduous. \textit{Panicles} terminal, thyrsoid. \textit{Flowers} large, polygamous, irregular. \textit{Sepals} and \textit{petals} 4-5, unequal. Disk annular or unilateral, lobed or entire. \textit{Ovary} sessile, \textit{2-celled}. \textit{Style} elongated; \textit{stigma} simple; \textit{ovules} 2 in each cell, superposed. \textit{Fruit} capsular, \textit{1-3-celled}. \textit{Valves} loculicidal, coriaceous; \textit{seeds} \textit{1-seeded}. \textit{Seeds} exalbuminous, with a broad \textit{hilum}; \textit{testa} coriaceous; \textit{cotyledons} thick, corrugated, confluent.

The generic name is derived from the Latin word \textit{Æsculus}, given by Virgil and Horace to a tree believed to have been a species of Oak.

\textbf{Æsculus indica, \textit{Calebr.}; Fl. Br. Ind., I., 675; Bot. Mag., t. 5117.}

\textbf{The Indian Horse-chestnut.}

\textbf{Vern. — Torjiga, Trans-Indus; Hóne, kanddón, Kashmir; Gón, kanor, \textit{Ps.}; Kíshing, N.-E. Kumaun; Banbhó, gugu, kanor, pánkar, \textit{Hind.}}

Habitat. — A large tree, 60 to 70 feet in height, deciduous, found most abundantly in the North-West Himalaya, extending from the Indus to

A. 567
Horse-chestnut.

ÆSCULUS

Hippocastanum.

Nepal, between 4,000 and 10,000 feet in altitude. It grows on any soil, and produces annually an abundant crop of nuts and elegant foliage.

Botanic Diagnosis.—Leaves 7, acuminate and minutely serrate, distinctly petiolate. Petioles oblong, nearly equalling or exceeding the leaves. Flowers secund. Petals 4, red and yellow, the place of the fifth vacant. Capsule ovoid, reddish brown, without spines, rough. Seeds dark. The bark peels off in long vertical strips, giving old trees a scaly appearance.

Properties and Uses—

Fodder.—The fruits are in the Himalaya eaten greedily by cattle, and in times of scarcity by men after being steeped in water, and sometimes mixed with flour. The leaves are lopped for cattle fodder.

Medicine.—The fruit is given to horses during colic. It is also applied externally in rheumatism, but for this purpose the oil is generally extracted from the seed.

Structure of the Wood.—White, with a pinkish tinge, soft, close-grained. Weight 44 lbs. per cubic foot.

It is used for building, water-troughs, platters, packing-cases, and tea-boxes; it is easily worked.

Domestic Uses.—Thibetan drinking-cups are sometimes made of it.

Cultivation.—The Indian Forester, February 1884, page 57, gives a useful and practical note regarding the rearing of this tree. It recommends that the seed should be collected in November or December, and sown in good rich soil in drills. In the following cold weather, when the young trees shed their leaves, they should be transplanted into lines, each seeding 18 inches apart. If kept free from weeds, by the following cold season they will be ready for re-transplantation into the forest.


THE HORSE-CHESTNUT.

Vern.—Pé, Pr. Him. Name (Brandis).

Habitat.—A well-known tree in Great Britain and in Europe generally. It is supposed to have been introduced most probably from Asia. It is found in Persia and the Caucasian region, in India only in a state of cultivation. The home of the common horse-chestnut is at present unknown.

Botanic Diagnosis.—Leaves 7, digitate, the larger ones woolly when young, bi-serrate and with prominent lateral nerves. Capsule echinate.

As an ornamental tree for parks, pleasure-gardens, road-sides, and avenues in temperate countries, this is justly a great favourite. The avenue in Bushy Park, London, planted by William III., affords a fine example of the adaptability of the horse-chestnut for ornamental purposes. (Sowerby's Dictionary.) It is not particular as to soil.

Dye.—An extract from the wood is said to be used in imparting to silk a black dye.

Food.—The nuts are variously utilised; in Turkey they are ground with other food and given to horses, hence the name; in France they are employed in the manufacture of starch; in Ireland they are macerated in water, and being saponaceous are used to whiten linen.

Chemical Composition.—The bitter principle of the fruit has been termed esculin and may be obtained by precipitation with acetate of lead. It forms shining, white, prismatic crystals, inodorous, bitter, slightly soluble in cold water. Its formula according to Schiff is C_{16}H_{22}O_{16}. When treated with dilute sulphuric acid it is converted into grape-sugar. Tannin is also found in all parts, the leaves and bark more especially.

A. 576
AGANOSMA
calyicina.

Eagle-wood.

577 Aesculus punduana, Wall. ; Fl. Br. Ind., I., 675.

Syn.—A. assamica, Griff. (Kurz, 260).

Vern.—Cheeranngiri, NEPAL; Kunkirkola, ekukheh, Ass.; Dingri, DUARS; Bidnamah, GABO.

Habitat.—A moderate-sized, deciduous tree, found in Northern Bengal, in the Khásia Hills, Assam, and Burma, ascending to 4,000 feet.

Botanic Diagnosis.—Leaflets 5-7, shortly petioled. Panicles narrowly lanceolate, nearly equalling the leaves, lower pedicels longer. Petals white and yellow.

Structure of the Wood.—White, soft, close-grained. Weight 36 lbs. per cubic foot. Rarely used.

AZFELIA, Sm. ; Gen. Pl., II., 580.

579 A small genus of erect unarmed trees (belonging to the Leguminosae) comprising only 10 species; distributed throughout the tropics of the Old World. Leaves abruptly pinnate, with few pairs of opposite leaflets. Disk at the top of a long calyx-tube. Sepals 4, unequal; only one petal developed, the others absent or rudimentary. Stamens 3-8, free; filaments long, pilose. Pod large, oblong, flat.

There are four Indian species—all, however, confined to the Straits and the Andaman Islands.

Afzelia bijuga, A. Gray. ; Fl. Br. Ind., II., 274.

Vern.—Shoodul, kunga, BENG.; Pynkado, BURM., IN THE ANDAMANS; Pirijda, dawunnd, AND.

Habitat.—A moderate-sized, evergreen tree, found in the Sunderbans, Bengal, Andaman Islands, and the Malay Archipelago.

Structure of the Wood.—Sapwood white, moderately hard, relatively large in young trees. Heartwood reddish brown, hard, close-grained.

Weight: young wood, 36 to 42 lbs.; old wood, 45 to 49 lbs. (Browne, Memorandum on Andaman Woods, 1874, Nos. 12 and 13, gives 50 lbs.) A valuable wood, used in the Andamans for bridges and house-building. It is, however, very little known in India.

Agallocha, see Aquilaria Agallocha, Roxb.; THYMELEACE.

The Eagle-wood; Aloeis-wood; CALAMBC-WOOD; AGILA; AKAYA.

Agallocha, see also Exocaria Agallocha, Wild.

AGANOSMA, G. Don ; Fl. Br. Ind., III., 663 ; Gen. Pl., II. 717

reduces this genus to Ichnocarpus.

A genus of Apocynaceae, belonging to the sub-tribe Burchitideae, comprising some 5 species; confined to India and the Malaya. Nearly allied to Ichnocarpus, the seed of the corolla separating them.

Flowers in terminal tomentose cymes, large or middle-sized. Sepals 4, lanceolate-acuminate, with subulate glands at the base. Corolla salver-shape, tube short, throat naked, except with longitudinal bands behind the anthers; lobes lanceolate to linear-oblong or broad and rounded, in bud overlapping to the right and then straight. Stamens included; anthers sagitate, connivent; stigma adnate to the stigma and adnate to the styles spurred at the base. Disk 5-clefted. Carpel 1, distinct, hisrate, many-ovuled. Follicles short or long, terete, straight or curved, linear. Seeds ovate linear-oblong, flattened, glabrous, not beaked.

Aganosma calyicina, A. DC. ; Fl. Br. Ind., III., 664.

Syn.—Echites carophyllata, Roxb. ; E. calyicina, Wall. ; A. ROXBURGH, G. Don, ex Wight, K., t. 440.

Habitat.—An evergreen, scandent shrub, met with in the forests of Tenasserim, flowering in September.

A. 583
Mālatī Medicine.

Botanic Diagnosis.—Leaves elliptic-oblong, acuminate, glabrous, 7-10 pairs of arching, slender, impressed nerves. Clymes terminal, lax-flowered, densely rusty-tomentose. Sepals 4-1 inch long, eglandular. Petals ovate-acute. Ovary quite glabrous.

Aganosma caryophyllata, G. Don; Fl. Br. Ind., III, 664.

Syn.—Echites caryophyllata, Wall.; nov. Rott.
Vern.—Mālatī, Hind., Beng., and Sans. Voigt gives Gandhamulati as the Bengali name.

Habitat.—Lower Bengal (Monghyr, Hamilton); common on rocks at Riskiund (Wall)hich, Deccan Peninsula (Heyne), &c.

Botanic Diagnosis.—Leaves ovate-acute, obtuse or acuminate, glabrous or tomentose, nerves red-coloured, 3 pairs, very oblique. Clymes lax-flowered, pubescent; pedicels shorter than the sepals; sepals glandular within. Corolla-lobes obliquely orbicular. Ovary hairy at the tip.

Properties and Uses—

Medicine.—The only mention I find of Aganosma being medicinal is in U. C. Dutt’s Materia Medica, where it occurs in his Glossary of Indian medicinal plants mentioned by Sanskrit writers. He does not give its supposed properties, but states that the vernacular name for A. caryophyllata, G. Don, is Mālatī, whereas all other writers give that as the vernacular name of A. calycina, DC. It seems, therefore, that the plant has not been carefully identified by the author of the Hindī Materia Medica.

§ “According to Sanskrit authors this plant is heating and tonic; useful in diseases caused by disordered bile and blood.” (U. C. Dutt, Civil Medical Officer, Serampore.)

A. cymosa, G. Don; Fl. Br. Ind., III, 665.

Habitat.—A stout, rambling climber, met with in Sylhet, and also in the Western Peninsula from Bombay to Travancore.

Botanic Diagnosis.—Leaves acute or finely acuminate. Clymes dense-flowered, rounded, densely tomentose. Sepals ½-1 inch long. Corolla-tube ½ inch; petals ovate-acuminate.

A. marginata, G. Don; Fl. Br. Ind., III, 663.

Habitat.—A large, evergreen, scented bush, met with in Sylhet, hittagong, Tenasserim, Malacca, and distributed to Java, Sumatra, and the Philippine Islands.

Botanic Diagnosis.—Leaves oblong-acute, acuminate or caudate, nerves very strong beneath, accurately uniting towards the margin. Clymes lax Corolla glabrous, tube rather longer than the acute calyx-segments; lobes linear-obtuse.

Structure of the Wood.—Light, coarsely fibrous, close-grained, soft, and pale coloured (Kata).

Timber. 588

Gar-agar or Ceylon Moss, see Gracilaria lichenoides, Greville, Lichenea.


A large and important genus of Fungi, referred to five series, each containing a number of subgenera. Spores of various colours. Gillı membrandaceous, persistent, with an acute edge. Trama (the layer of tissue which separates the gills at their union to the pileus) floccose, confluent with the inferior hymenium. Fleshly fungi, which, on being dried, putrify and cannot again be revived.

Series I.—Lecanorin—Spores white.
Series II.—Hyponotide—Spores pink.

A. 589
**AGARICUS campestris.**

The Mushroom.

Series III.—Dermin.—Spores brown.
Series IV.—Pratellæ.—Spores purple.
Series V.—Coprinari.—Spores black.
Each of these is again subdivided into—

**Hymenophore, distinct from the fleshy stem.**

**Hymenophore, confluent and homogenous with the fleshy stem.**

**Hymenophore, confluent with but heterogenous from the cutinose part.**

More than 1,000 species are known and referred to AGARICUS, the typical genus of the Order. (Cookie, Hand-Book Br. Fungi.)

**Agaricus campestris, Linn.**

**The Mushroom.**

_Vern._—Kot phula, Ass.; Alonme, kalâmbe, Bomb.; Mânakhal Kashi, Mokha, Chamba; Kuti leshá, dhunna Sind.; Kudana ché, Guj.; Chattrail, Sans.; Khambh, khambah, chattri, Arr. Eng. Names: Ot, Sant; Kumbh samarch (Stewart), Herar, Poi formus. Kulallale-dho (Faires' cap), also chatrai-mor (Snake's unit and samarch, Pers.

_Habitat._—There are in India several species of fungi eaten indiscriminately, but as these have not as yet been botanically determined, preferable to refer to all under the common name which in English would doubtless receive, viz., The Mushroom.

_Botanic Diagnosis._—"Pileus fleshy, convexoplane, dry silky floor or squamose, stem stuffed, even, white; ring medial, somewhat to gills free, approximate, ventricose, sub-delicquesc, flesh-coloured, brown." (Cookie.) This species belongs to the series Pratellæ and sub-genus Psalliota.

_Chemical Composition._—Interesting information regarding the mystery of certain species of Agaricus will be found in the Year Book of Pharmacy, 1877, p. 142; 1881, p. 147.

§ "Dr. N. Öhever, in his work on Indian Medical Jurisprudence, refers to a case in which symptoms closely resembling those of intoxication rapidly ensued after eating mushrooms, and the author, therefore considers it probable that there exists in Bengal a fungus which closely resembles an edible variety in form and colour, but which contains amanita or muscarine, the poisonous principle of the Amanita Muscaria. Amanitine is stated also to exist in A. bulbosus and A. volvacea. This principle sometimes acts as an irritant, at other times as a narcotic narcotizing acid, and the symptoms may be developed within a minute or not for several hours. Muscarine is described as being soluble in water, and appears to be a somewhat stable compound. Its action upon the system is opposite to that of atropine. (Journ. Ph. Soc.)

_A. Muscaria_ or fly mushroom is in England most frequently found in woods or beech woods. It has a rich vermillion pileus studded with white slightly yellowish warts, white gills, and tall, white stem, swollen at base into a bulb, and furnished with a ring a short distance below the pileus. This fungus is used in Siberia as an intractable suppository and one or two suffice to produce pleasant intoxication for a whole day. (Spours' Encycl.) Some persons through idiosyncrasy are injudiciously affected by ordinary edible varieties, the effects being usually colic, purging, and vomiting. (Parry.) Edible mushrooms contain non-saponifiable, buttery, fat Agaricin. (Lefort.) The recent research of Dupérit indicate that all edible mushrooms contain a poisonous principle which resembles the soluble ferments and not the known alkaloids. This poisonous principle is destroyed at a temperature of 100° C. and the mushrooms rendered innocuous. This author has also obtained an alkaloid from edible mushrooms." (Surgeon C. J. H. Warden, Professor Chemistry, Medical College, Calcutta.)

**A. 590**
Fungi.

Properties and Uses—

Food.—In many parts of India, especially in the Panjáb, the true Mushroom is abundant in fields. It is universally eaten by the natives, fresh or dried in the sun. It is apparently a very common plant in Afghanistan, Atchison mentions A. Mitto, Pers., as met with in Kúrum district; he also mentions Morchella esculenta, Helvella crispa, and Hydnum coralloides as eaten by the Afghans, the last-mentioned being collected in August, and sun-dried.

The common mushroom, says Dr. Stewart, is abundant in cattle-fields in many parts of the central Panjáb after the rains, and is also frequent in the desert tracts of central and southern Panjáb. It is largely eaten by the natives and is described as excellent and equal to the English mushroom by those Europeans who have eaten it. It is also extensively dried for future consumption, and is said to preserve its flavour tolerably well. Mushrooms are largely used in Europe in the manufacture of ketchup. A trade in Panjáb mushrooms might easily be established were they to be improved in quality by cultivation. It may not be out of place to mention here a few of the characters by which a wholesome fungus may be recognised:—

1st.—Wholesome fungi are found growing in fields or in open grassy places in forests.

2nd.—They are scattered, each rising direct from the ground; never collected into clumps nor found growing upon trees.

3rd.—The stem should break easily when touched; it should spring from the centre of the pileus. The cap should be thick relatively to the gills.

4th.—They should not be acid in flavour nor smell. No fungus is so poisonous but that this test may be put into force; but it does not follow an acid fungus will be poisonous; indeed, Hydnum repandum and Cantharellus cibarius are both acid, yet are excellent articles of food. A hot burning taste or acid flavour should, however, as a rule, be avoided.

5th.—The bright rosy or pink gills and the absence of any yellow stain when bruised are two good tests.

The natives of India seem to eat any fungus, and, indeed, if properly cooked, few are dangerously poisonous. If macerated in vinegar before being cooked, and if eaten with plenty of bread, there is almost no danger. It is a good practice with any acid or doubtful mushroom to slice it into hot water, and then to press the slices in a cloth before stewing. The Russians preserve mushrooms in salt, but this is far from destroying their poisonous property; witness the death of the wife of the Czar Alexis I. from eating mushrooms in Lent. The narcotic poison in certain fungi resembles, in its action, Indian Hemp. No antidote has as yet been discovered for this poison.

Medicine.—The small dried mushrooms are official in the Panjáb, and are sold as “Mokshai,” being regarded as alternative.

§ 6. The cultivation of several indigenous varieties of mushroom is of importance for supplying an excellent nutritious food for European convalescents. There are many valuable varieties procurable in the plains of India. Even Truffles—white and black—I have seen in abundance at Banura. In taste and flavour they are not inferior to the French plant. They grow under the soil below “Sal” trees, and are dug out by the Santals.” (Surgeon-Major R. L. Dutt, M.D., Purna.)

“Common in South India, and used by the natives.” (Deputy Surgeon-General G. Bidie, Madras.)

The following species are also mentioned by Indian writers on Economic
The Garikin.

plants; but the subject is at present too imperfectly known to allow more than the enumeration of the names used by authors. It is
probable that this confusion of want of definite information, regarding the
official Asiatíc fungii, may bring about an investigation of them.
and scientifically, cannot fail to prove valuable instructive.

Agaricus ignarius and A. albus are referred to by Dr. Virgo
in his "Punjab Plants"; Polyponsa ignarius by Dr. Irwin
officially as Dr. Dymock.

Vern. - Bulgar jangli, Kashmir; Bati-ka-mochha, Chena
Garikin, a Bazar name.

Medicine. - Stewart remarks: "This appears to come in about 15 seers being annually imported from Peshawar," being given for internal disorders. The tinder or ashes
by Honigberger to be used to stop hemorrhages. Dr. Irvin
Account of the Native Materia Indica of Patna describes
ignarius. He gives it the Hlho name garigong, and the
name, and describes the drug as "used as a styptic externally, and as a bitter tonic and laxative." He gives the doa
of grains, and says that it fetches the extraordinary price of
is most probably the same plant as Dr. Dymock
name of Polyponsa officinalis, the Garikin of Bombay
largely imported from the Red Sea and the Persian G.
bay, and is much used by hakims.

"This is the Agaricus of Dioscorides and the white
medicine." It is commonly kept by native druggists
ported article in the Materia Medica of the Moham,
it in a great number of disorders, but generally in c
According to their hakims, it acts principally on the
bulbous humors." (Surgeon-Major Dymock, Maj. H.

Hanbury, in his "Science Papers," p. 184, speaking
the same as the above fungus, says: "During
exported from Asia Minor, and in the Paris B
this region—that is to say, from the Gulf of

What is the tree from which this Asiatíc Agaric
upon the larch in Northern Russia,'" and us
"Garikin acts as a purgative, and is used
and emmenagogue, and is used
has been employed with
assigned to it. It has been used in affl
bladder. It is used as a gargle in affl
and teeth. In combination with liquorice
bronchitis and asthma, and with syrup of
enlargement of the spleen. It is said to be of
guard against scorpion-bites. In large dos
bedastur is said to be its antidote." (Assist

A. albus furnishes a principle agaricine
as a specific for lessening the night s
coming largely into use." (Surgeon-Maj.
"It is diuretic, laxative, and expectorant.
(nerve tonic). (Assistant Surgeon-Maj.
fungus is imported as a medicine from
and is called Garikin." (Surgeon-Maj.

From the conflicting opinions which seem to
numbers of widely different.
American Aloe Fibre.

Agaricus ostreatus, Jacq.

Vern.—Phanas-alambe, or vulgarly phanasimba, Cutch, Bom.

“This is a dark, snuff-coloured fungus, which grows upon the stumps of old jack-trees (Phanae). It consists of a short, thick stalk, which supports a flat woody pileus, having a considerable resemblance to an oyster-shell, and consisting of a number of laminae, upon the under-surface of which is situated the hymenium.”

Medicine.—“Phanas-alambe is ground to a paste with water and applied to the gums in cases of excessive salivation. It appears to have much the same properties as Amadou, and to be a useful styptic.” (Surgeon-Major Dymock, Mat. Med., W. Ind., 704.)

§“Useful in stomatitis.” (Surgeon W. Barren, Bhuj, Cutch, Bombay.)

Food.—The species is edible.

Agathotes Chirata, D. Don, see Swertia Chirata, Ham.; Gentianaceæ.

The Chireta.


A generic name, formerly applied to one or two species of plants, now reduced to the section Agati under the genus Sesbania (Natural Order Leguminosæ). They differ from the type of the other Sesbanie chiefly in having larger flowers with the flower-bud falcately recurved.

Agati grandiflora, Dev.; or Aeschynomene grandiflora, Linn.; Roxb.; Coronilla grandiflora, Willd.; see Sesbania grandiflora, Pers., Leguminosæ.


The name of a large and important genus belonging to the Natural Order Amaryllidæ. There are several species, all originally natives of Central America, and chiefly of Mexico. They are now, however, widely acclimatised in most warm, temperate, or sub-tropical and tropical countries—in Spain, Italy, Africa, Western Asia, and India. They are first mentioned in Europe in 1561, and are supposed to have been introduced into India by the Portuguese. They are commonly, but erroneously, called American Aloeas. From the Aloë proper they are botanically separated by the position of the ovary, which is inferior in the Agave but superior in the Aloë. Like the Aloë, however, they consist of a crowded whorl of thick, fleshy leaves, more or less spirally arranged on the top of a short stem, which, in the majority of species, rarely rises much above the level of the ground. Along the margins are arranged sharp prickles, and each leaf ends in a formidable apex, long, sharp, and spear-like. In most species so closely do the leaves in the bud embrace each other, that each impresses its outline upon the fleshy substance of the other, forming a graceful variation on the otherwise smooth, glaucous surface. In cultivation several species become variegated in colour, the most striking being one with golden bands along the leaves. They take several years to reach the flowering stage, and from the fact that in adverse circumstances their development may be retarded from 10 to 50 or even 100 years, they are popularly called the Century Plants. When about to
AGAVE americana.

The Century Plant or American Aloe.

Flower, an axis is developed from the centre of the rosette of rising at the rate of from 5 to 10 inches a day, it often attains of 20, 30, or even 40 feet. Thereafter it produces its flower divisions, and continues to do so for over a month. After seeding the plant dies, but from the ground daughter off-shoots, and thus a hedgerow of Agave continues to flower year after year.

Generic Diagnosis.—Leaves thick, fleshy toothed and spiny the apex of a short, erect, succulent stem. Scapes rising from the leaves, erect often becoming very high and rapidly developing towards the upper third into an immense thyrsiform paniculae on the branches of the panicle, greenish white, erect tube often very short, split into 6 sub-equal lobes. Stamina: the perianth upon which they are inserted; filaments tap flattened below. Ovary inferior, globose-ovoid, often reflexed ovules numerous on the central angle on each cell and 2-5 filiform at the base, 3-celled like the ovary.

The genus Fourcroya is so nearly allied to that of Agave various species are popularly viewed as mere varieties of A. an that can be said regarding the fibre of the species of Agave applicable to the fibres from the species of Fourcroya. Indeed of Aloe fibre cultivation are uniformly written in what was it is described as commercial language, and it is quite impossible whether the good or bad varieties mentioned by writers on the different species of Agave, or even of Fourcroya, or merely accidental varieties of A. americana. It has been repeated that Aloe fibre plants change their character when taken from to another, and at the present moment it is next to impossible at any definite knowledge regarding the species and varieties for their fibre. The foregoing diagnostic characters of Aloe Parrowe with Fourcroya, should help, however, to remove ambiguity in the forms of the so-called American Aloe fibre. As in usual it would be taken were the fibre-yielding plants to be carefully their respective genera. The account of A. americana in those pages should be viewed more as Aloe fibre plant, since it seems that the name A. americana is popularly given to a series of varieties yielding allied fibres.

The generic name is derived from the Gr. ἁγάνεις, admirable, in allusion to the stately form of the flowering stem.

Agave americana, Linn.; Amaryllideae.


Vern.—Rakas-pattha, banakeora, baram kanwar, kantala, rad kantho, HIND.; Jangli or bilati-janambish, vulgarly in kora, bilatipata, bowan, incorrectly called murga murti, T. kaitalu, Pn.; Kantala, Sans.; Subahro, Arab.; Pā Rakas-pattha, DUK.; Jangli-kunvar, GUJ.; Anvik-kat, kakabuntha, TAM.; Rakashimatalu, Tel.; Panam-kat Khattele, budakattalkemara, KAN.; Ktēg, Hyderābād (in other parts of India to Pandanus).

References.—Roth., Fl. Ind., Ed. C.B.C., 256; Roe, P. Christy, New Com. Pl., 45; 47; Desvry, Us. Pl., 31; Lindley, Treas. of Botany; Smith's Dict., Econ. Pl.; Spens. En Correspondence.

Habitat.—Originally a native of America; naturalised in India. While plentiful throughout the country, the Agave no gregariously. In the Madras Presidency several varieties an
used for hedges to protect the railways, and in many of the hotter portions of Central India they grow where scarcely anything else grows, and, as hedges, serve the valuable purpose of checking the translation of sand and surface soil by the hot winds, which for some months sweep across the dry arid tracts. As has been remarked, they "stand isolated in the midst of dreary solitude, and impart to the tropical landscape a peculiarly melancholy character." It is one of the most remarkable features of the Agave that, while thus luxuriating under warm, tropical influences, it is equally at home on the hills under widely different climatic conditions. This strikes the traveller forcibly when, after hurrying across the tropical plains of Madras, with their interminable hedges of Agave and Cactus, he finds, on the hills amid a temperate vegetation, equally luxuriant hedgerows of Agave.

If planted at regular distances, with a ditch on one side so as to carry off the excess of moisture, the plant will thrive under the greatest variations of temperature, ascending in India to the altitude of the tea plantation, where it is largely employed as a hedge.

Synopsis of the Properties and Uses of Agave.

The leaves and the roots yield an excellent fibre, generally known as Pita, American Aloë Fibre, or Vegetable Silk. The word Pita is, by some authors, restricted to a form which appears to be a variety of this species. The large, moist, fleshy leaves are sometimes used as a poultice. They are occasionally used as fodder.

The roots are diuretic and antisyphilitic, and are said to find their way to Europe mixed with Sarsaparilla. Prescott, in his History of Mexico, says that when properly cooked the root affords a "palatable and nutritious food."

The sap.—If the central bud be lopped off at the flowering season, the cut stem discharges freely a sour liquid, which ferments rapidly and forms the Pulque Beer of the Spaniards, or, by distillation, a kind of brandy known as Mexican. The expressed juice of the leaves is administered by American doctors as a resolvent and alterative, especially in syphilis. It may also be used as a substitute for soap.

The flowering stem, dried and cut into slices, may be used as natural razor-strops, or as a substitute for cork. Wall plaster, impregnated with the expressed juice, is said to be proof against the ravages of white-ants.

THE GUM.

It is stated that in America a gum exudes from the leaves, which in some respects resembles gum arabic. It contains a much larger proportion of lime and is only partially soluble in water. The soluble portion resembles gum arabic, and the insoluble, gum bassora (U. S. Dispens., 14th Ed.). The exudation of gum has apparently not been observed in India.

THE SAP AND JUICE.

The Sap and the Spirit.—In their Treasury of Botany, Lindley and Moore state that "the most important product of the Agave, and especially of A. americana, is the sap," and that many varieties of this species are "common everywhere in equinoctial America, from the plains even up to elevations of 9,000 or 10,000 feet." The sap is further stated to have given a net revenue of £166,497 from three cities.

In the Pharm. Journal, 3rd series, V., 461, occurs an interesting article upon Agave by Mr. J. R. Jackson, an abstract of which will be found in the Year-Book of Pharmacy for 1873, from which the following passages have been extracted: "The juice forms a large article of internal
AGAVE americana.  

The American Aloe Fibre.

Trade in Mexico. The plant is known as the Maguey, or 'tree of life,' and even at the present time, in some parts of Mexico, it is considered one of the most important productions of the soil. The use of the juice of the plant as an intoxicating beverage, is said by some to date back for many days of the early inhabitants of the Mexican Continent.

Several varieties of the plant are cultivated in Mexico, being known for the greater or lesser quantity of the juice it produces, colour, whether yellow or greenish, its thickness or sweetness of taste. These variations as to the properties or consistency of its juice will depend on the nature of the soil and of the temperature; thus it is the least mucilaginous in a somewhat clayey soil, being cultivated with the greatest success at an elevation of about 6000 ft. The juice of a healthy plant is thick, sweet, and of a yellowish-white colour, and has the consistency of honey.

The mode of propagation is by removing the young suckers from the old ones, and after spreading them on the ground two or three months to partially dry them, so that they may instead of starting into growth; they are planted in rows, and sown between them, which is considered rather to assist their growth. In a good soil, the Agave plant requires a period of from ten to twelve months before attaining maturity. The plant upon attaining its full development, which is easily discernible by its height and the prodigious extent of its leaves, brings forth a tall stem crowned with yellow flowers, and certain amount of pruning becomes necessary, so as to form a reservoir in the centre, and what is technically termed a cara around it, so as to cause the juice to flow towards the same spot and facilitate the extraction of it by removing some of the interior leaves and thorns.

"To collect the juice or pulque, as it is called, as soon as it begins to turn yellow, a small concave aperture is scooped in the centre of the plant, and an elongated tube-like gourd, the air in which is exhausted, is thrust into the aperture; each labourer carries with him a bag to which he is strapped to his back, an impervious sheepskin bag, into which the tube is emptied as soon as it is filled. The juice is emptied into the bag and allowed to stand for about 36 hours, when fermentation ensues and its yellow transparent colour changes into a milky white.

Trade in Pulque.—"Not less than 20,000 mules and donkeys, with the beverage enter the city of Mexico every month by the gate to the Maguey district. To the quantity paying duty must also be added that which is smuggled in, and including this it is calculated that about 50,000,000 bottles are now annually introduced into the city of Mexico.

Mezcal or Mexican Spirit.—"Besides this pulque, which, as seen, is the chief product of the Agave in Mexico, a strong spirit is made from the sap, known as mezcal, also a kind of brandy of 80 degrees of strength, a sweet, thick substance resembling honey, a concentrate used in medicine, brown sugar, loaf-sugar, sugar-candy, and very excellent quality, so that the Agave, the value of which to us for its fibre, is, in fact, one of the most important economic plants of Mexico." (Year-Book of Pharm., 1875, 232; also 1883, 221.)

The American Aloe Fibre.

The immense and growing demand for new and cheap textile fabrics recently caused the fibre greatly to surpass the sap in importation, the latter may be said to be unknown to the natives of India, much to be regretted that the same might almost be said of the American species. Although various species of Agave are now widely cultivated, if not so much as in India.

A. 610
Flourishing under the most diverse circumstances, the Agave is in
India eminently suited for providing a supply of fibre, if not for trade
and exportation, at least for domestic purposes. Every encouragement
should therefore be given to develop an interest in this most useful plant. In
America rapid progress is being made in this direction, and it is evident
that, with the American inexhaustible supply, and with improved machin-
ery, the Pita fibre must, sooner or later, affect certain branches of the
jute and other textile industries. For cordage it is now held in high esteem,
and the manufacturers assert that the fibre imported into England from
America improves every year. It is composed of large filaments, white,
brilliant, and readily separated by friction without danger to the fibre. It
takes colour freely and easily. It is light, contracts under water rapidly,
and becomes fixed, while it bears changes of humidity even more severe
than can be resisted by the best hemp. In London the aloe fibre gene-
rationally fetches from £35 to £40 a ton.

In Mauritius, Agave fibre has attracted considerable attention within
the past few years, the sterilization of the soil, through constant cultivat-
ion of sugarcane, having forced upon the planter the necessity of
adopting some new and less exhaustive crop. There are already some
six companies in existence, with a capital of £150,000, working the fibre,
which they appear to extract chiefly from *Fourcroya gigantea* ("The
green aloe"), the fibre of which they export to Europe under the name of
"Mauritius Hemp."

**Cultivation.**

The Agave is planted about 5 feet apart, and the furrows 5 feet
distant from each other, so that an acre would contain from 1,600 to
2,000 plants. When about 7 to 8 years old the cutting may commence,
but by planting with off-shoots this need be only some 3 or 4 years
after the opening up of the plantation. They will continue to yield for
four or five years. The Superintendent of the Hazaribagh Jail, Dr. R.
Gob, furnished the following report detailing the process adopted by
him in the cultivation of the fibre, which is here published in the hope that
it may prove useful to interested persons:

"*Growth from seed.*—It may be grown from seed collected from the tall
candelabra-like stems thrown up by the plant after it has reached the age
of from five to seven years. The seed should be planted in a nursery in
rows, 18 inches apart, and the seeds 12 inches from each other. The best
time to plant them (in Hazaribagh) is during the rains; they will then
rarely fail to germinate, and throw out leaves three or four inches long by
the end of the year. If, however, they are put down in the dry season,
they require watering at least twice a week. The young plants should be
allowed to remain in the nursery till the following rains, when they may be
transplanted to the hedge or plantation where they are intended to grow.

"*Growth from shoots.*—This is the best method, because there is no
chance of failure of germination, the labour of sowing is saved and much
time is gained. Young plants from one to two years old should be pro-
cured at the commencement of the rainy season, and put down where they
are intended to grow permanently. If for hedgerows, a ditch should be
dug, and the young plants put on the top of the earth thrown up. They
should not be closer than two feet from each other. The holes in which
they are placed should be eight inches in depth, and the earth should be
well pressed round them. No further care is then required, and in about
three or four years the plants will grow quite close together and make an
excellent fence. If it is intended to make an aloe plantation, the young
shoots should be planted in rows, ten feet apart, and five or six feet should
be allowed between each plant in the rows."
AGAVE Americana.

The American Aloe Fibre.

"Soil.—A gravelly or laterite soil appears to be best suited to the growth of the aloe plant. If he plantation is made on high ground, it is not necessary to make ridges to plant on, and the plant is quite at ease with young shoots, for experience has shown that they do equally well on flat ground, but in low situations and hollows it is necessary to make ridges 18 inches high, the plant being very partial to a light dry soil. If the soil is damp and water-logged soil is death to it. No manure is required except for the growth on the most stony ground, where apparently there is not enough soil to support life in the plant. In some places it may be seen in the crevices of the rocks. We have not found it necessary to hoe up the land near the plants, and weeds, grass, &c., do not appear to interfere with its growth. From experiments which have been made by the use of the expressed juice of the leaves, as manure, has been found to accelerate the growth of the plants.

"Cutting the leaves.—The leaves should not be cut until they are seven years old, after it has thrown up its tall candelabra-like flowers. Some of these grow to the height of 18 or 20 feet; they flower, and the seeds are produced before these are thrown up, the fibres are weak and will not manufacture."

"Protection of plantation.—It is commonly supposed that the aloe plant is not eaten by herbivores because of its sharp pointed leaf and the juice which flows from these. We have found this to be an error. Several large animals have been found to eat the leaves, and very young plants have been cropped close to the ground. It is advisable, therefore, to keep the area by means of a ditch (outside) and a close hedge round the plantation.

"Value of crop per acre.—After the plants are seven or eight years old, one acre of land may be expected to yield seven maunds of annum (it requires as much as forty maunds of leaves to make one maund of fibre). There is no doubt about this, as repeated experience has been made in this jail. After the ground has been planted, no further treatment is required, and the cost of planting depends greatly on the condition of the land from which the plants have to be brought.

"Preparation of fibre.—After the leaves are cut, they are put in a crushing machine, invented by my jailor, Mr. Pimm, which hard back of the leaf and crushes out the juice. It has been found that a great deal of manual labour is saved by this process. The machine is not unlike a sugar-crushing machine. This process should be carried out as near water as possible. The crushed leaves are pounded with a smooth stone by a wooden mallet until all the bark and woody matter is removed. The fibre is then washed until the whole of the sap and material is cleared out of it. It is dried in the sun and is then ready for use.

Manufacture and Trade.

M. Evenorde Chazal has recently published a most interesting article on the cultivation of the plant, and separation of the fibre, as practiced in Mauritius, from which it would appear that the machinery used originally from £1,000 to £1,200, apart from the necessary building and purchase of land. From the output per acre, generally plantations at from 40 to 70 tons of green leaf, yielding about 1½ tons of fibre valued at £40 per ton, it would take some four or five years before Agave (or aloe) fibre-extracting factory could give any return. It must not be overlooked, however, that a large part of the above expenditure is for motive power, and that if the industry were combined with that of the tea and coffee plantation or the indigo waste lands in the vicinity would become productive, and possess
the factory is now silent would be fully and profitably occupied. A correspondent from Colombo in the *Tropical Agriculturist* for 1882-83, p. 429, strongly urges this view, and he calculates that a "gratteuse" or fibre-extracting machine could easily be constructed for Rs. 100 and worked by any available motive power. The subject seems well worthy of the attention of our planters.

In the spring of 1882, what appears an excellent machine for the separation of this fibre was patented in the United States and favourably noticed and illustrated in the *Scientific American*. It is exceedingly probable, however, that the Ekman or some other chemical process of extraction of the fibre will supersede completely the mechanical. The *Planters' Gazette* very justly remarks that a fibre would then be obtained fine enough for spinning and weaving purposes, the market value of which would be three or four times as much as that obtained for the coarse fibre extracted by mechanical contrivances. In India there should be no difficulty in introducing the Ekman process, since bi-sulphate of magnesia is easily and cheaply procurable. The Aloe fibre succeeds best where few, if any, trees will grow; the chemical process removes the difficulty regarding the fuel supply.

Two samples of Agave fibre from Mauritius were exhibited at the late Calcutta International Exhibition,—the one in the Mauritius Court, prepared by the usual process practised in that island; the other in the New South Wales Court, prepared by a patent process invented by M. G. A. Lusignan of Sydney.

**Rope.**

In India, the Agave, as a fibre-producer, has attracted attention from time to time since 1798. In that year a Mr. W. Webb, who had a plantation of it near Madras, made ropes from it. He submitted a coil of this rope to the Military Board of Fort St. George, with a suggestion that he should be allowed to supply it in lieu of rope made in Europe. Captain P. Malcolm, of His Majesty's ship *Suffolk*, after trying it, reported it to be as strong as, if not stronger than, coir, and as having the advantage of pliability. A committee of the Military Board, after a trial with it, were of opinion that it was at least equal in point of strength to the best European rope of the same size. "As regards durability, it was mentioned that part of a coil which had been fixed to the anchor of a boat and kept constantly under water for six months, appeared to have undergone no other alteration than European rope would have done in the same situation."

At the beginning of the present century Dr. Buchanan found the villagers in Mysore employing the Agave for making strong hedges, and separating the fibre for cordage.

In 1841, rope was made at the Alipore Jail (Calcutta) from Agave plants grown there by the convalescent insane. The rope was tested and gave the following results, as compared with other ropes:

- Agave rope broke with 2,510½
- Coir rope (same dimensions) 2,172
- Jute " " " 2,450½
- Country hemp (turn) 2,269½

In 1851, a varied assortment of string, cord, rope, and fibre, undyed and dyed,—orange, red, maroon, and green, as also paper made from the fibre,—was prepared at the suggestion of Dr. Hunter of Madras in his School of Arts, and by the prisonners in the jail at Madras. The assortment was shown and admired at the London International Exhibition of that year. There existed at the time a small export trade in Agave fibre from the Madras Presidency to the United Kingdom, Bombay, Cutch, Gujarát, A. 611.
AGAVE americana.  

Agave Fabrics.

Sind, and Bengal. The value of this trade was in the official year 1852 put down as Rs7,095 and in 1853-54 Rs1,506. The quantity exported continued to decline, until the trade practically died out. It may be mentioned, however, that this was in all probability mainly due to the growth of the jute trade, which, at this period, began to develop a large and important industry.

In 1852, Dr. G. Tranter, Surgeon in charge of the United M. Contingent (Central India), forwarded to the Agri-Horticultural Society of India some specimens of the fibre which he had extracted from Agave grown in Malwa, where it is plentiful; the specimens were reported quite equal in strength to the best Russian hemp.

Dr. Wight gives the following as the results of his experiments with the chief fibres in the Madras Presidency:

<table>
<thead>
<tr>
<th>Fiber</th>
<th>Strength (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colr</td>
<td>160</td>
</tr>
<tr>
<td>Hibiscus Cannabis</td>
<td>224</td>
</tr>
<tr>
<td>Sanseveria zeylanica</td>
<td>390</td>
</tr>
<tr>
<td>Gossypium herbaceum</td>
<td>346</td>
</tr>
<tr>
<td>Agave americana</td>
<td>362</td>
</tr>
<tr>
<td>Crotalaria juncea</td>
<td>407</td>
</tr>
<tr>
<td>Calotropis gigantea</td>
<td>552</td>
</tr>
</tbody>
</table>

The breaking strain of a rope is said to be 270 to 360 pounds as against Russian hemp at 160 pounds.

All this was shown and urged by Dr. Royle nearly 30 years ago; as far as India is concerned, no progress has been made, except that plant has spread and taken a firm hold of immense scattered tracts. In concluding his notice of this fibre, Dr. Royle urges, what we cannot do better than repeat, that it is very desirable that experiments should be made with the view of discovering the climate best suited for the production of the strongest fibre, the age at which the leaves should be cut, how long they should be macerated, if at all, and the commercial value of the fibres yielded by the various species of Agave and Fourcroya. Spons' Encyclopaedia contains an interesting account of the preparation of this fibre by mechanical means. The writer urges that where cheap labour can be had, the hand-prepared fibres are preferable— an important consideration for India. He further states that the leaves should be cut before the flower appears, and that in fact they cannot be too young, as the older the leaf, the coarser the fibre. (Compare with Cobb's opinion based on his Hazaribagh experiments.)

FABRICS.

At the Calcutta International Exhibition, 1882-84, some excellent samples of Agave fibre were exhibited from Mysore in Madras and from Hazaribagh in Bengal. In the latter case large bundles of both dyed and undyed fibre were exhibited in the Economic Court, as also samples of small carpets woven from the fibre. So early as 1839, however, carpets are reported to have been experimentally made in Balasore (Bengal). Mention is also made of sataranjis (carpets) being made in the Balandesh district, North-West Provinces, and in 1892 the Revenue and Agriculture Department received a sample of matting made of this fibre at Hoshiarpur in the Panjáb; but the preparation of Aloe fibre must be regarded as in an experimental condition only, as far as India is concerned. The chief difficulties are the want of a collective supply (the plant being scattered along road sides and not cultivated as a crop) and a cheap and convenient appliance for the extraction of the fibre.

§ "The plant requires three years to come to perfection. In Mexico,
5,000 to 6,000 plants go to an acre, the average number of leaves being 40, and yielding 6 to 10 per cent. of fibre. The leaves should be cut before they are over-ripe. It is better to cut them too soon than too late, as over-ripe leaves yield a coarse fibre of inferior colour. In Mexico the natives prepare the fibre in the following manner. The cut leaves are steeped in water, then beaten and scraped to remove non-fibrous portions, washed and bleached in the sun. Another plan is to deprive the leaves of about 6 inches of the pointed end, and after having been well beaten, they are tied in bundles, laid in heaps, and allowed to ferment. After the beating the bundles are macerated in water for 14 days, and then finally washed and dried. The process of retting having proved injurious to the fibres of all endogens, mechanical contrivances are now used for separating fibres from the leaves of the Agave, &c. The length of the fibre varies from 3 to 7 feet, and the commercial article is white to straw-white. The breaking strain of a rope has been stated at 270 lb. to 362 lb. as against Russian hemp at 160 lb. In its native countries the fibre is used in the manufacture of ropes, hammocks, twine, &c. The short fibres have been carded and spun, while the waste is an excellent material for the manufacture of coarse paper. Slips of paper weighing 39 grains bore an average weight of 80 lb. as against Bank of England pulp 47 lb. (Spots' Encycl.). As the plant is exceedingly hardy, very prolific, and will grow in arid wastes, where scarcely any other plant can live, it might perhaps be advantageous to plant with Agave those districts in India in which the soil proves unfertile from the presence of alkaline salts, &c. The experiment would not be costly, and might give good results. Bousinault found the juice to contain over 6 per cent. of cane-sugar. The fermented juice, pulque, contained 35.4 grains of alcohol per litre.” (Surgeon C. F. H. Warden, Professor of Chemistry, Medical College, Calcutta.)

AS A PAPER MATERIAL.

In India scarcely any Agave fibre is used in the manufacture of paper. In October 1877 the Revenue and Agriculture Department of the Government of India issued a Resolution, requesting Provincial Governments to consider the utilization of the Agave fibre, and especially directed the attention of the Government of Bombay to the advisability of making an experiment with it, adding that there was a prospect of utilising large quantities of a material now almost altogether wasted. An experiment was accordingly made at the Girgaum Paper Mill, and, under the instructions of the Bombay Government, 300 mounds of leaves were, on 30th July, furnished by the Collector of Thana. The manager of the mill could not, however, conveniently use them, and they lay in a heap until the middle of August, when, without having been previously prepared, they were put into the steam-machine to be worked up direct into paper. The result was of course a failure.

In Bengal, at the Central Jail, Hazaribagh, an experiment was also undertaken. An area of 300 acres of waste land was put under Agave in 1878-79 to furnish stock to be experimented with at the jail paper-mill. Samples of this fibre were also supplied to the Bally Paper-Mills (Calcutta), where it was discovered that one of the greatest difficulties in the way of Agave fibre for paper manufacture was the fact that the young leaves yielded too fine a pulp. The best leaves were those three years old. A mixture was proved to be injurious, and therefore a difficulty exists in the necessity of getting leaves uniformly of the same age, and if possible leaves three years old.

For paper manufacture this fibre seems likely, however, to command a good market. “It is the most highly approved of all the paper fibres, A. 613
AGAVE americana.

Medicinal Properties of Agave.

Making a strong, tough, smooth paper which feels like oiled paper even while unsized, may be written upon, without the ink running; price is governed by that of Manilla hemp, being generally $1 a ton less than the latter." "The fibre prepared in India is hard, brittle, though of good colour; it is not met with in commerce." (Encyclop.) The character of the Indian-prepared fibre is chiefly the mode of its extraction.

SOAP SUBSTITUTE.

The juice is made into soap. For this purpose it is expressed the watery part evaporated either by artificial heat or by simple exposure to the sun. On its reaching a thick consistence it is made up into bars along with lye-ash. This soap lathers with salt as well as with water. A gallon of the sap yields about a pound of the soft soap. (Treasury of Botany; U. S. Dispens., Ed. 15th; &c., &c.)

MEDICINAL PROPERTIES OF AGAVE.

Medicine.—The leaves, as also the root when cut, yield a sap which by evaporation may be converted into a syrup having a nauseous odour and acid taste; it reddens litmus paper. This is attested by American doctors, having attributed to it resolvent and antispasmodic properties; it is regarded as specially useful in syphilis. Dr. Ross (Ind., 225) is said to have employed the roots in secondary syphilis with great apparent benefit, in the form of a decoction, in the proportion of two ounces to one pint of water. The sap is stated to be laxative, diuretic, emmenagogue, and in doses of two fluid ounces, three times a day, has been found very useful in scurvy. (U. S. Dispens.) General Sheridan is said to have used the juice with great success amongst his men while suffering from scurvy, in a small isolated post on the Texas border, the disagreeable smell of the juice, which has been compared to putrid meat, causes a person at first to turn from it in disgust, but a while the odour is overcome, and a liking for it takes the place of its previous dislike (Year-Book, Pharm., 1875, 232). The large, moist leaves are stated to have been used with much advantage as a poultice, the fresh juice is applied to bruises and contusions. The outer exuding from the leaves and lower part of the stem is used in Medicine as a cure for toothache.

§ "The pulp of the leaves placed between folds of muslin is applied to the eye in conjunctivitis; it is also used, mixed with sugar, in gonorrhea, twice a day, the dose being 3 c.c. (by weight). (Hony, Surgeon-P. S. Chitsecole, Ganjam District, Madras.) "Not used medicinally, I think, in South India; it is cultivated as a hedge, and for making fibre." (Surgeon-General G. Bidie, C.I.E., Madras.)

"The roots are diuretic. (Lindley.)" (Dr. H. W. Hill, M.D., Madras.) "Used by the natives in chronic gonorrhoea." (Surgeon-Major Zorab, Balasore.)

DOMESTIC USES.

The dry flowering stem is cut up into useful razor-strops and used as a substitute for cork. "The leaves and stems are employed for roofing; the decayed leaves are also used as fuel when fired, the terminal spines serve as pins and nails." (Clegern, plaster, impregnated with the expressed juice, is said to be proof against the ravages of white-ants. Sugar, vinegar, and a kind of beer are made from the sap.

Spines. 627    Wall plaster. 628

A. 628
The Bastard Aloe.

Agave angustifolia is cultivated as a source of fibre, but is not distinguished by the planter from A. americana.

A. saponaria is a powerful detergent; its roots are used as a substitute for soap. (Lindley’s Vegetable Kingdom, 1847, pp. 175, 188.) Compare with remarks given under A. americana as to the detergent properties of the sap of that species.

A. sisalana.

The Henequen Fibre or Sisal Hemp of America.

This fibre is rapidly gaining favour. It is said to be prepared without maceration. The leaf is laid upon a board and scraped with a wooden chopper till all the pulp has been removed. The fibre is then bleached and dried in the sun. It is more easily dyed than any other fibre of this class, and is thus very useful for making fancy articles of different kinds. At the same time Henequen is now made into sacks and used in the grain trade. The following extract from Christy’s New Commercial Plants will be found interesting as showing the progress made in the Sisal Hemp industry:

“In Yucatan the two varieties of the fibre are distinguished as the Yashqui henequen, which produces the best quality, and the Saququi henequen, which gives the greatest quantity. It is worked by machinery, and from July 1875 to June 1876, Yucatan produced 22,999,910 lbs. of Henequen fibre, 15,000,000 lbs. of which were sent to British ports. The remainder was sent to Cuba and Mexico. I am unable to give the figures as to the American importation in late years, but the amount must be considerable, as the fibre is now in high favour as a cordage material, manufacturers declaring that it has been growing better and better each year in quality. A few figures are given in the latter part of the flax and hemp report under the heading ‘Other Fibres,’ which will give some idea of the amount consumed at present in this country. A recent report, published in Yucatan, gives the following figures: Taking 11 lbs. of fibre for the yearly production of each Henequen plant, we come to the conclusion that at present there are more than 15,000,000 plants under cultivation. For this number of plants over 420 scraping-wheels are in operation, moved by 222 steam-engines, with a force of 1,732 horse-power, and 30 wheels moved by animal power. Each scraping-wheel cleans daily, on an average, 300 lbs. of fibre; so the 450 wheels in existence do not work at present 163 days in the year.

“It is estimated that in Yucatan alone a capital of over $5,000,000 is vested in this industry.

“A peculiarity of this fibre is that it resists the action of dampness for a greater length of time than hemp or similar fibres, which makes it very desirable in the manufacture of cable-ropes, &c., used in the rigging of ships.”

Cultivation and Yield of Fibre.—As cultivated in Mexico, an acre generally contains 5,000 to 6,000 plants. A dry, stony soil is selected for its cultivation. Young plants, 2 to 3 feet high, are planted out 12 feet apart, and weeded twice a year. The yield commences by the lower leaves being cut off about the fifth year, and this is continued annually for ten years or more. Of the shoots that spring up at the 8th, 10th, or 12th year, one is left to replace the parent plant, which is then destroyed, and the other daughter off-shoots are transplanted. The annual yield of fibre is about a ton an acre.

A. vivipara, L.

The Bastard Aloe.

Syn.—Agave Cantala, Roxb. This may prove but a variety of A. americana.

Vern.—Khetki, khäthi chingdr, Ourd; Kathalai, Tam.; Petha-kalabantha erikotali (Bellary), Tel.; Kantala, Sans.

Habitat.—Commoner in upper than in lower India, specially in the North-West Provinces; almost unknown in Bengal.

A. vivipara.
Agave Soap.

A genus of trees or shrubs, glabrous, lepidote or stellately pubescent (belonging to the Natural Order MELIACEAE and the Tribe TRICHILOIDE), comprising some 50 species; inhabitants of China, India, the Malay Peninsula, and the Islands of the Pacific.

Leaves pinnate or trifoliate, leaflets quite entire. Flowers polygamo-dioecious, small, globose or turbinate (not oblong-linear), numerous, paniculate. Calyx and corolla each 5-lobed. Stamens united into an urn-shaped tube; anthers 5, included or sub-exserted, erect. Disk small. Ovary 1-2-celled, with 2-4 ovules in each cell; style very short. Berry dry, 1-2-celled and seeded.

This genus is now made to include Nemedra, Fuss., and Milnea, Roxb., the former used to be referred to Amoora, and the latter retained as a distinct genus. (See Appendix to Gen. Pl., I.) Aglaia, a Gr. proper noun. Aγλαία, derived from ἀγλαία, beauty, splendour—the youngest of the Three Graces.

A species collected by Kurz in the Andaman Islands, A. manica, Hiern, is called in Burmese Tan-dhiyuen.

Aglaia edulis, A. Gray; Fl. Br. Ind., I, 556.

Vern. — Late mahoa, NEPAL; Sinbadang, LEPECHA; Gumi, GADO HILLS and SYLHET.

Habitat.—A middling-sized tree of Eastern Bengal, as also the Gado Hills and Sylhet, flowering in June-July; fruit ripening two or three months later.

Botanic Diagnosis.—Shoots, leaves, and inflorescence with ferrugineous scales, mixed with stellate hairs, leaflets 9-13, opposite or sub-opposite. Flowers shortly pedicelled, arranged in pyramidal panicles shorter than the leaves.
Properties and Uses—

Food.—Fruit eaten by the natives. Roxburgh says the natives of the Gáro Hills and Sylhet “eat the large succulent aril which surrounds the seed under the cortex of the berry.”

Aglaia minutiflora, Bedd.; Fl. Br. Ind., I., 557.

Habitat.—A handsome tree, 25 to 40 feet in height, with exceedingly hard wood, was collected in Courtauldn, Voigl, and Beddome at Travancore, altitude 2,500 feet. Griffith and Maingay found it in Tenasserim and Malacca.

Botanic Diagnosis.—Leaflets 7-15, pubescence ferruginous or rufous sterile, narrowly elliptic, acuminate. Panicles divergently branched, many-flowered, half to as long as the leaves. Fruit sub-globose 1-2 seeded, ⅓ to 1 by ⅓ inch.

A. odorata, Lour.; Fl. Br. Ind., I., 554; Wight, Ic., t. 511.

Habitat.—An elegant shrub or small tree, met with in the Eastern Peninsula, often cultivated in gardens on account of its sweetly-scented flowers.

Botanic Diagnosis.—Extremities of the young shoots covered with stellate hairs, rapidly becoming glabrous. Leaflets 3-5, rarely 7, obtuse. Panicles lax-flowered; ovary hairy.

A. Roxburghiana, Miq.; Fl. Br. Ind., I., 555; Wight, Ic., t. 166.

Vern. — Priyangu, Beng., Hind., and Sans.

Habitat.—A large tree of the Western Peninsula; from the Konkan and Midnapore southwards; Ceylon, ascending to 6,000 feet; Singapore, Sumatra, and other Malay Islands.

Botanic Diagnosis.—Leaflets 5, rarely 7 or 3, elliptic-obtuse, glabrescent. Panicles dense-flowered, somewhat supra-axillary, pyramidal elongate; flowers on very short pedicels, ½ in. diameter. Calyx yellow, often covered with stellate hairs. Fruit ¼ in. diameter, buff coloured, minutely pilose.

Properties and Uses—

Food.—Fruit said to be edible.

Medicine.—§ is regarded by Sanskrit writers to be cooling and useful burning of the body and painful micturition. The fruits are described sweet, astrigent, and tonic.” (U. C. Dutt, Civil Medical Officer, Seringapatam.)

Agricultural Implements and Machinery, Timbers used for.

Acaasia arabica.
A. Catechu.
A. ferruginea.
A. melanoxylon.
A. modesta.
A. planifrons.
Acacia elongum.
A. pictum (ploughs).
Adina cordifolia.
Ægle Marmelos.
Abizia amara (ploughs).
A. procera.

Anogeissus pendula.
Bauhinia purpurea.
B. variegata.
Berrya Ammonioides.
Bredelia retusa (agricultural implements and cattle-yokes).
Buchanania latifolia (cattle-yokes).
Calophyllum inophyllum (machinery)
Capparis aphylla.
Caryota urens.
Cassia Fistula.
C. siamea (mallets).
A small genus of herbs (belonging to the Natural Order Rosaceae), containing in all some 8 species, 5 of which are met with in India. Leaves interruptedly pinnate; stipules slightly adnate. Flowers small, yellow, in terminal spike-like racemes, 2 bracteolate; petals 5; calyx tubular, with spinous spines; 5 triangular imbricate. Petals 5. Stamens 5-10 or more, inserted at the mouth of the calyx. Disk lining the calyx-tube, its margin thickened. Carpels 2, included in the calyx-tube; styles exserted; stigmas 2-lobed; ovules 1, pendulous. Fruit enclosed within the hardened spiny calyx.

Habitat.—An herb of the temperate regions, freely growing in hedgerows and thickets. It is common in England, America, and India; in the latter all along the Himalayas from Kashmir to Sikkim, altitude 5000 to 10,000 feet, and to the Khāsia, Naga, and Mishmi hills.

Medicine.—From the remotest times Agrimony has enjoyed a high reputation amongst the herbalists of Europe; it is strange that it should have been so long neglected in India.
Fodder Grasses.

**AGROSTIS tenacissima.**

Root. 650 DYE. 651

Fodder Grasses, apparently quite unknown to the native doctors of India. The a powerful astringent, a useful tonic, and a mild febrifuge. The plant also yields a dye, which seems to be unknown to the hill- 

**Hemp,** see Eupatorium cannabinum, Linn.; **COMPOSITAE.**

**AGROSTIS, Linn. ; Gen. Pl., III., 1149.**

genus of grasses, the type of the Tribe AGROSTIDÆ (Natural Order INER.-based, comprising about 100 species, distributed through the colder rate regions, creeping annual or perennial grasses. Paniacle loose, spikelets laterally com- 
d, 1-flowered. Glumes membranous-acute, unarmed, the upper being re than the lower. Flower with hairs at its base and no rudiment. Palea 
al, scarios; dorsal awn falling short of the glumes, or wanting. Stamina 
ally 3. Style short, distinct; stigma feathered. A. canina, Linn., does 
sees the inner pale.

Duthie enumerates, amongst others, the following species: as 
th in the N.-W. Provinces. Very little is known regarding the 
ic uses of the Indian members of this genus.

**is alba, Linn.; Duthie's Grasses, 29.**

**Fiorin or White Bent Grass,**

Syn.—A. stolonifera, Sav. ; A. sylvatica, Host.

biat.—Grows in all kinds of soils; delights in one that is rich and moist. 

tic Diagnosis.—Stem procumbent, creeping, often with long 
sheth rough; ligula long, acute. Panicle-spreading in flower, 
ads becoming close. Pedicels very much toothed. Florets rarely 
glumes nearly equal, lower toothed through its keel. 
nder.—A most valuable fodder grass.

**na, Linn. ; Duthie's Grasses, 29.**

Syn.—A. rubra, Linn. ; Agranulus caninus, Beauv. ; Trichodium cani 
num, Schrad.

biat.—Western Thibet, altitude 12,000 feet; in Europe common 
ics. 

tic Diagnosis.—Branches and pedicels rough; sheath smooth; 
olong acute. Glumes unequal, acute, lower pale, jagged, at the 
rubbed, knee and twisted, awn from below the middle of and 
ng the pale, lower setaceous and tufted.

**ata, Trin.; Duthie's Grasses, 29.**

Syn.—Lachnostegia ciliata, Nees.

biat.—North-West Himálaya from 8,000 to 15,000 feet.

**ndra, Linn. ; Roxb., Fl. Ind., Ed. C.B.C., 106. 
bena jonj, Beng. Syn. for Sporobolus diander, Beauv., which see. 
**xina, Roxb. ; Fl. Ind., Ed. C.B.C., 107. Syn. for Thysanotena 
us, Nees, which see.

**iacissima, Linn. ; Roxb., Fl. Ind., Ed. C.B.C., 106. Syn. for 
porobolus tenacissimus, Beauv., which see. 

A. 656
AILANTHUS, Ailanthus, Def.; Gen. Pl., I., 30

A small genus of lofty trees (belonging to the Natural Order St. comprising 3-4 species, of which two are met with in India.

Leaves very large, unequally pinnate. Flowers small, polygamous or axillary panicles. Calyx 5-fid; lobes equal, imbricate, valvate. Disk 10-lobed. Stamens 10 (in the hermaphrodite flowers 2-5-petalled; anthers one in each cell; fruit a one-seeded samara.

The generic name is said to be derived from "Ailiate", name for a species met with in the Moluccas.

**Ailanthus excelsa**, Roxb.; Fl. Br. Ind., I., 518; Wight

Vern.—Maha rubha, maharubha, limbada, HIND.; ma

Mahasina, maha, gormi-korab, URNA; Ghorabam, P,

padua, GOJ.; Varna, mahorab, DUK.; Arua, N.-W.P.

Pera, pea, perumalurut, TAM.; Pedu, pea, pinda, pea

TEL.; Perumaram, MAL.; Madada, ara, SANS.

**Habitat.**—A tree about 60 to 80 feet in height, somewhat

ash; probably introduced into India; common in the Provinces, Behar, the Western Peninsula, and the Cari Bombay Presidency widely distributed over the Kaira, P

and Gujard District; occasionally met with in Räjputan 27. Common on the Coromandel Coast and in Ceylon.

**Botanic Diagnosis.**—Leaves 1-2 feet long, gradually

very coarsely toothed. Stamen with the filaments about half

the anther. Simara 2 inches by ½ inch, red, twisted.

**Gum.**—A red gum, sent from Madras to the Panjab said to have been prepared from this plant at Chingleput. Moringa gum, and consists of large rounded tears of a deep

**Medicine.**—The bark is aromatic and used for dyspeptic

is also regarded as a tonic for febrifuge in cases of debility, and antispasmodic, given in chronic bronchitis and asthma

VI., p. 15). The leaves and the bark are used as a medicine

VII., 42). "This bark has a pleasant and somewhat aromatic

prescribed by the native practitioners in infusion; in doses, to the extent of three ounces twice daily." (Ain.

mock says this description is scarcely correct; the bark is in

like quassia. "In Bombay the bark and the leaves are in

as a tonic, especially in debility after childbirth. The name

also applied to a species of cinnamon by the Konkanist

Bombay." (Dr. Dymock, Mat. Med., W. Ind., 116.) The

eral, Madras, in forwarding, through the local Government to

Government, certain proposals regarding a future edition of copaia of India suggested "that the bitter principle of this plant should be made officinal. A powder made from

mixed with milk is given in small doses in dysentery and

§ "Used also as an astringent in diarrhoea and dysentery mix it with curds." (Surgeon-Major W. D. Stewart, C.G.

**Chemical Composition.**—This substance has not been ca

ined, but Dr. Dymock informs me that "Mr. N. Daji says the principle which he named "Ailantic acid. It is reddish brown

very easily soluble in water, less in alcohol and ether, and

cholesterol and benzol." Mr. N. Daji also found a bitter

lizable principle, but he attributes the medicinal virtue to

"Ailantic acid may be given in doses of 1 to 3 grains to

be tonic and alterative. In large doses it causes nau
ing, and is purgative. He recommends its use in dyspepsia with constipation. Mr. Narayan Daji's paper is of a high class. (Deputy Surgeon-General G. Bitie, Madras.)

**Structure of the Wood.**—Soft, white; similar to that of A. malabarica. Weight 28 lbs. per cubic foot. Dr. Dymock says that the microscopic structure “of the bark shows large stony cells collected together in groups. There are also many conglomerate raphides.” Used to make floats for fishing nets and lines, sword-handles, spear-sheaths, and catamarans. (Ainslie; Roxburgh.) The wood is used in making drums and sword-sheaths. (Bomb. Gaz., VII, p. 42.)

Ailanthus glandulosa, Desf.; Fl. Br. Ind., I., 518; Brundis. For. Fl., 58.

Incorrectly called the Japan Varnish Tree, Eng.; Göt-terbaum (Tree of the Gods), Ger.; Vernis du Japan, Fr.

Habitat.—A lofty tree, met with in North India, most probably introduced from Japan. Extensively cultivated on the Continent as an avenue tree along with the tulip-tree, the horse-chestnut, the plane, &c. The leaves are not liable to be attacked by insects, and therefore, until the first frosts of November, the tree remains covered with its large leaves, affording a grateful shade. “It grows rapidly, throwing up abundant root-suckers, and has for that reason been employed in plantations made to clothe the barren stony hills in the south of France.” (Gamble.)

Botanic Diagnosis.—Leaves often exceeding 1 foot, pubescent or sub-glabrous; leaflets very numerous, coarsely toothed at the base. Stamens exserted; filaments several times the length of the anthers. Samara 1 inch by ¼ inch, membranous, linear-oblong.

**Sericulture.**—Upon the leaves of this tree the wild silk-worm Attacus Cynthia, Denys, is reared in Europe, and it is perhaps the most successful tree for the experimental rearing of different species of silk-worms. It grows freely even in England, and the insects thrive upon it. It is anticipated that the rearing of Attacus Cynthia upon this tree may become an established industry in Europe.

In connection with the subject of the value of Ailanthus as a food for silk-worms, it seems highly desirable that experiments be performed in India, with the object of producing a realete hybrid-eri cocoon, which would still preserve the valuable property of feeding upon an annual plant such as the castor-oil. The Ailanthus glandulosa has proved a most convenient plant for experimenting with Indian wild insects in Europe, but, both for experiments in India and in Europe (as far as the respective climates will permit), the following plants are those which would most probably afford the means of prosecuting the investigations necessary for the production of hybrids of Indian indigenous silk-worms. The plants have been grouped in a way which brings out the overlappings in habit, as also some of the structural affinities of the more important species of silk-worm.

**Temperate Plants.**

* Actias and Caligula Series.

**Timber.** A. 665

- Rosaceous plants such as Prunus Cerasus (the wild cherry), Pyrus communis (the wild pear), and Cydonia vulgaris (the wild quince); small trees met with in India on the Himalaya and the hills of the Eastern Peninsula, at altitudes of from 5,000 to 10,000 feet.

The following species of silk-worms feed upon these plants in their wild state: Actias selene, Caligula simla, C. thibeta.
AILANTHUS glandulosa.

A Classified List of the Plants

2nd.— *Pieris ovalifolia*, an exceedingly plentiful, Ericaceous, so coming into fresh green foliage just before, and flowering during rains, on the Himalaya and mountains of the Eastern Peninsula, altitudes of from 4,000 to 8,000 feet.

The following insects feed upon it : *Actias selene*, Caligula.

** Actias and Attacus Series.

3rd.— *Ailanthus excelsa* and *A. glandulosa* (the former would probably not succeed in England).

The following are the insects regularly found feeding on trees in India: *Attacus ricini* (the *eri silk-worm*) and *A. cyperi*.

4th.— *Coriaria nepalensis*, a small leafy bush, belonging to the Order Coriariæ (allied to Morinæ, and Leguminosæ) on the Himalaya and mountains of the Eastern Peninsula and the Straits; altitude from 5,000 to 10,000 feet. Should grow well in England. This is one of the most curious plants enumerated in this list, and for the purpose of rearing hybrids seems the most promising.

The following insects feed upon it in their wild state: *Actias* cinnamomeus, *A. ricini*.

** Warm Temperate Plants.**

*** Attacus, Antheraea, and Cricula, or the *Eri, Munga* and Tusser Series.

5th.— *Symlocos crassiglades*, *S. grandiflora*, and *S. ramosa*. Small trees or shrubs on the Himalaya and lower hills, ascending to 7,000 feet in altitude.

The following insects are known to feed upon these plants, and actually fed upon them, in their semi-domesticated condition: *Attacus atlas*, *A. ricini* (small red form of *Eri*), and *A. assama* (the *Munga silk-worm*).

6th.— *Ricinus communis* (the common castor-oil plant), cultivated on the plains of India and on the hills up to an altitude of 8,000 feet. Grown as an annual in England, ornamentally, and often having been produced by the gardeners.

The following are the insects which feed upon this plant: *ricini* (the *Eri silk-worm*). This is its principal food in India, and also in its wild state. *A. cythia* and *A. myletta* (the *Tusser silk-worm*).

7th.— Species of Laurels, in India chiefly *Machilus odoratus* to altitude 8,000 feet, the principal food of the *Munga* and *thera polyantha*.

The following are the insects which feed on these plants, *A. assama*, one or two allied species of laurels: *Antheraea assama* (the *silk*) and *Cricula triniestra* (the common wild, yellow, red cocoon of Burma and of the South and West of India). Former tree these insects chiefly feed, both in their wild and domesticated conditions.

** Tropical Plants.**

It is necessary to add to the experimental plantation one or two trees with the view of admitting of a more thorough investigation of the forms and possible hybridisation of the *Tusser silk-worm.***

**** The Tusser Series.

8th.— *Zizyphus Jujuba*.

9th.— *Lagerstroemia indica.*

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Two small trees or bushes which experience has shown to be perhaps upon the whole the best plants for the cultivation of the tusser worm.

10th.—Terminalia tomentosa and one or two allied species (the myrobalan or wild almond family). These are the trees which the tusser worm seems to prefer most in its wild condition.

In the above brief indication of the food materials of certain silk-worms, only the more important species or the genera most likely to afford useful hybrids have been mentioned.

It is interesting to observe that this climato-botanical classification brings the indigenous silk-worms of India into groups closely corresponding to those formed upon a more scientific principle. It would almost seem that hybridisation to be successful must pass through these natural affinities. It is remarkable that none of the Indian Saturniids (the family to which the foregoing silk-worms belong) show the slightest tendency to feed on the plants upon which the mulberry silk-worms (the Bombycidae) are reared—a fact which gives some weight to the idea that the latter are not truly indigenous to India. (For further information consult the account given under "Silk").

**MEDICINAL PROPERTIES AND USES.**

According to Prof. Hetet the bark of *Ailanthus glandulosa* is an active vermifuge; in powder it has a strong, narcotic, nauseating odour. It exercises a powerful depressing influence on the nervous system similar to that of tobacco. Various preparations of the bark administered by Prof. Hetet to dogs had a purgative effect with the discharge of worms. The powdered bark has been given in one or two cases of tape-worm in the human subject and proved remarkably successful in expelling the worm and at the same time operating on the bowels.

It was found that the depressing effects on the nervous system were due to the presence of the volatile oil, the resin having no such influence. The oleo-resin produces the same effects as the powdered bark and has the advantage that it keeps better. The dose of the powdered bark, sufficient for the expulsion of tape-worm, was found to be from 8 to 30 grains, the oleo-resin somewhat smaller. (U. S. Dispens., 15th Ed., 1865.)

**Structure of the Wood.**—"Extremely durable, pale yellow, of silvery lustre when planed, and therefore valued for joiners' work; it is tougher than oak or elm, easily worked, and not liable to split or warp." (Baron F. Von Mueller.)

It grows exceedingly rapidly, sending out numerous suckers from the roots, and as it is not particular about soil, it is admirably suited for the reclamation of waste lands. Professor Meehan states that it interposes the spread of the rose-bug, to which the tree is destructive. (Extra-Trop. Plants, Baron F. Von Mueller.)


**Vern.**—Peru, peru-maratttu-pattai, maddi-poli, Tam.; Perumorun, pedam-pana-pata, maddi-mali, Tel.; Peru-marat-toli, mattip-poli, Mal.; Gugulu-dhip, ud, Mar.; Dhup, bagu-dhip, gugulu-dhip, Kac.; Manda-dhip, Hassan; Mittipal, Anamalais; No Burmese name; Kambali, waliling, koombaloo-gass, wal-biling-gass, Cingh.

**Habitat.**—A large, deciduous tree, of the evergreen tropical forests abundant in the Western Ghâts; rare in Pegu, but met with on the
AJUGA.

Mutti-pál Resin.

eastern slopes, and in the valley of the Tsit-toung. Often
South India for ornamental purposes.

Botanic Diagnosis.—Leaves very large; leaflets distant,
nearly glabrous. Stamens exserted, upon filaments many
than the anthers. Samara large, rounded at both ends, not
Resin.—On incision the bark yields a dark-coloured soff
as Mutti-pál, which, in time, hardens into a brittle resin with
sambi odour.

§ “Exudes a reddish gum.” (J. E. Harding, Rangoon)
Mr. Broughton, Quinologist to Government of Madras, r
the resin as follows: “This resin, as commonly met with, is a
grey in colour, is plastic, opaque, and has an agreeable smell
much impurity. The pure resin is very soft, having the char
thick treacle; and this is doubtless the reason why it is always
fragments of wood and earth, which make it more easy to
sample which I examined contained but 77 per cent. of resin
oder being adulterations. Alcohol readily dissolves the resin
poration leaves it as a very viscous, transparent, light-brown
which does not solidify by many days’ exposure to a steam
burned it gives out a fragrance, and hence it is sometimes
incense. Its perfume is, however, inferior to that produced by
resins employed in the concoction of the incense employed
and heathen worship. The peculiar consistency of the resin
it to substitute Venice turpentine for many purposes, that
(R6 for 25 lbs. in the crude state) forbids an extensive e
“Resin burnt as an incense in Hindú temples.” (Bomb. G
1, 61.)

Medicine.—The resin called muti-pál was first discove
Buchanan. It is used medicinally, especially in dysentery.
regards it as a good stimulant in bronchitic affections.” (Pha
The fruit is considered useful in cases of ophthalmia.
Rham Valley Plants, in Jour. Linn. Soc.) “The fruit, th
mango and mixed with rice, is reckoned useful in cases of
(Surgeon-Major Dymock, Bombay.)

The bark is bitter and given in the treatment of dyspepsia.
describes this bark as rough and very thick, studded with b
looking grains, apparently of a resinous nature, which do
either in spirit or water. “A further knowledge of this bark
itation is desirable.” (Pharm. Ind.)

§ “A valuable substitute for Ipecacuanha in the treatm
Fresh juice of bark (1 oz.), with equal quantity of c
and evening, proves highly useful. Commonly used by t
classes.” (Surgeon E. W. Savage, Rajamundry, Godav
“ This tree is very common in the Vizagapatam District. I ha
used a decoction of the bark in chronic dysentery with th
effect.” (Hony. Surgeon Easton Alfred Morris, Nigapatam.)
bark, coarsely bruised and kept soaking in gingelly oil,
internally, is said to be an antitoxin for cobra-poisoning.
Major B. R. Thompson, Madras.)

Structure of the Wood.—White, very soft and spong
23 lbs. per cubic foot. Useless.

Ajowan, see Carum copticum, Benth.; Umbelliferae.


A small genus of herbaceous plants (belonging to the Nata
Labiatae), containing some 30 species. Corolla with upper lip w
Medicine, Timber.

Alangium Lamarckii.

2-lipped, lower 3-lipped and much longer than the upper. Calyx ovate, bell-shaped, nearly equally 5-toothed. Stamens parallel, protruding beyond the upper lip of the corolla; the lower pair the longest. One of the most marked features of the genus is the prevalence of leaves or bracts in the spike-like inflorescence, causing them to appear more like an Acanthaceae than Labiatæ.


**Vern.**—Raipatha, Kumaon; Kauri bōri, Jhelum; Karka, nilkantthi, Sutlej; Kharbani, Trans-Indus Panjābi name.—The bazaar names are Jān-ī-adam, mukund babri, nilkantthi. Mr. Baden Powell gives jān-i-adam as the vernacular of Ajuga reptans, a European species, and Stewart further gives that name to *Salvia lanata*.

**Habitat.**—A small, herbaceous plant, met with on the Himālaya, altitude 2,000 to 3,000 feet, extending from Afghānāstān to Nepal.

**Medicine.**—“Jān-ī-adam is described as a bitter astringent, nearly inodorous; sometime... substituted for cinchona in the treatment of fevers” (Baden Powell). “Mukund babri.—On the Salt Range it is used to kill lice, and is regarded as depurative.” (Stewart.) “An aromatic tonic, specially useful in age.” (Baden Powell.)

There appears to be some confusion as to the identification of the medicinal products sold in the bazars of the Panjab and North-West Provinces under the names of Jān-ī-adam and Mukund babri. The leaves of the species of *Ajuga* have a peculiar resinous, not disagreeable odour, and a bitter, balsamic taste. They are said to be stimulant, diuretic, and aperient. They have been given in rheumatism, gout, palsy, and amenorrhœa in doses of from 1 to 2 drachms. (U. S. Dispens.)


Akakia.—This is an extract prepared from the species of Acacia,—see *A. arabica*.

Akakia, a redstone said to be used medicinally. Dr. Irvine, in his *Musical Topography of Ajmere*, mentions this drug, and says it contains iron. It is used as a tonic.


A genus of shrubs or small trees containing only 2 species (belonging to the Natural Order Cornaceae). Leaves alternate, petioled, entire, serrated at the base, persistent. Flowers hermaphrodite, fascicled upon the naked twigs, silky white, jointed on the pedicel; bracts absent. Pedals narrow, much elongated. Stamens twice or thrice the petals. Ovary inferior, 1-celled, surmounted by a disk; style long; stigma capitate; ovules pendulous. Fruit a berry crowned by the disk and the enlarged calyx. Seed with crumpled envelops and ruminated albumen.

The generic name appears to be the Tamil name Alangi Latinised.

Alangium Lamarckii, Thwaites; Fl. Br. Ind., II., 741; Wight, Ic., I., 194.

**Syn.**—A. Hexapetalum, Roxb.; Fl. Ind., Ed. C. B. C., 404; A. Decapetalum, Lam. (Kera, I., 543).

**Vern.**—Akola, thaiya-anakul, äkera, Hind.; Kali-akol, anakul, Bomb.; Onkla, Guj.; Ankol, Mar.; Akhar-kanta, bāka-anakul, dhalakura (U. C. Dutt), Beng.; Dola, Santal.; Kimri, Mal. (S.P.); Ankol, Kol.; Anakul, dola, anika, Utya; Asinghī-maram, ašīnī, alangi, Tam.; Urgu, udugachettu, woodiya-chettu (in Godavari Dīst.), A. 681
**ALANGIUM Lamarckii.**

<table>
<thead>
<tr>
<th>MEDICINE.</th>
<th>Root-bark.</th>
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**Habitat.**—A deciduous shrub or small tree met with throughout and Burma in tropical forests.

**Medicine.**—The **root-bark** is used in native medicine, both as anthelmintic and purgative. It is mentioned by Sanskrit writers as **ankolam-chettu**, Tel.; **Ankola,** anisarulli, anasrali, anasrali, Kh.; **Uru,** ankola, Goon; **Ankola,** Sans.; **Baku.**

**Sheriff,** in his valuable *Supplement to the Pharmacopoeia of India*, Dr. **Moodeen Sheriff** says further, "It possesses the emetic and nauseant properties of ippecacuanha, used by natives in cases of leprosy and syphilis, and other skin diseases. It appears to be useful in this respect." **Drury** says: "it is also employed in doses of from 1 to 2 grains, and pulverised, is a reputed antidote in snake-bites." Believe the fruit to be a hydragogue purgative.

Assistant Surgeon S. Arjun (Bombay Drugs, p. 70) states: "The leaves are used as a poultice to relieve rheumatic pains."

Mat. Med., W. Ind., 332.)

“My experience of the root-bark of the white-flower *Alangium Lamarckii* (A. decapetalum) is much greater than am now able not only to confirm my former opinion as to it as an emetic in 45 or 50 grain doses, but also to speak of some medicinal properties in more favourable terms. In the case of leprosy, psoriasis, secondary syphilis, and some other skin diseases, the benefit is satisfactory if it is used sufficiently long according to each disease and individual case. It is a good substitute for and proves useful in all the diseases in which the latter is except dysentery. As a diaphoretic and antipyretic it has been useful in relieving pyrexia in many cases of simple, slight, or idiosyncratic fevers. It is very frequently resorted to as an antiepileptic, especially in cases of bites from poisonous snakes. Powder is the most convenient form of using the root-bark as an emetic, from 45 to 50 grain doses; as a nauseant, diaphoretic, from 6 to 10 grains; and as an antiepileptic, from 2 to 1 grain. (Hony. Surgeon Moodeen Sheriff, Madras.)

"The root is described by Sanskrit writers as having a heating, acrid, and it is laxative and useful in worms, colic, inflammatory conditions. The fruit is said to be cooling, tonic, not in burning of the body, consumption, and in hemorrhage. Dutt, Civil Medical Officer, Serampore.)

“There are two or three sorts, with flowers dark, white, and of the latter is used as an antidote in snake-poisoning." (J. F. L. Ratton, Salem.) The root-bark, pulverised and nutmeg, mace, and cloves, of each grs. 10, is given to check the symptoms of leprosy; 40 grains of the powder of this bark made into a paste, is given in cases of cobra-poisoning. It is well worth trying in acute rheumatism. No personal experience is reported. (Surgeon Joseph Parker, M.D., Poona.)

Food.—The fruit, a fleshy one-seeded drupe, is eaten, the gen and acid. (Bom. Gaz., XV.)

**A. 683**
The Albizzia.

Structure of the Wood.—Sapwood light yellow; heartwood brown, hard, close and even-grained, tough and strong, easily worked, with a beautiful glossy surface. “The wood is beautiful.” (Rosk.) Wight found it to sustain a weight of 210 lbs. Weight 49 to 55 lbs. According to the Mysore Gazetteer the wood is strong and beautiful. It is used as pestles for oil-mills, wooden bells for cattle and other purposes, and is valuable as fuel.

**ALBIZZIA, Duraz.; Gen. Pl., 1, 396.**

A genus of unarmed trees (belonging to the Natural Order Leguminosae and the Sub-Order Mimosae), comprising some 30 species, distributed through the tropics of the Old World. Leaves bipinnate, often glandular at the base of the petiole, or between certain pinnae. Flowers in globose heads, sessile or pedicellate, usually pentamerous and all hermaphrodite. Calyx campanulate or funnel-shaped, distinctly toothed. Corolla funnel-shaped; petals firmly united below the middle. Stamens indefinite, monadelphous at the base (tree in Acacia); filaments several times the length of the corolla; anthers minute, not gland-crested. Ovary sessile or only shortly stalked; stigma minute. Pod large, thin, flat, strap-shaped, straight, sutures not thickened.

The Flora of British India refers the Indian species to two sections:

* Leaflets oblong, at least 1-1/2 inch broad.
  

** Leaflets narrow, dimidiate-lanceolate, with the midrib close to the upper edge.

A. Julibrissin, A. stipulata, A. myriophylla, and A. amara.

**Albizzia amara, Boivin.; Fl. Br. Ind., II., 301.**

Syn.—A. AMARA and A. Wyattii, Grab. (Beddome, t. 61, acvii.); Mimoso amara and M. pulchella, Ranb., Fl. Ind., Ed. C.B.C., 418.

Vern.—Lalai or tali, Mar.; Mota sarsiya, Guj.; Tharingii, wansja, suranya, shekram, Tam.; Nallarenga, shekrami, sikkai, narlingi, Tel.; Wasei, Madura (Madras); Bil-kambi, Kan.; Kadigge, Coorg; Ooslav, Mal.; Krishna srih, Sars.

Habitat.—A moderate-sized, deciduous tree, met with in South India and the Deccan, also Ceylon and distributed to Abyssinia and Kordofan.

Botanic Diagnosis.—Pinnae 8-20 and 1-3 inch long; rachis densely pubescent; leaflets 30-60, 1-1/2 inch long, sessile, caducous, finely pubescent; stipules minute, caducous. Heads of flowers crowded in the axils of much-reduced leaves. Pods distinctly stalked, 6-9 inches by 3-1 inch and 6-10-seeded.

Properties and Uses—

Gum.—It yields a good gum, not very much known.

Medicine.—§ “Described by Sanskrit writers as cooling and useful in erysipelas, eye disease, inflammation, and ulcers.” (U. C. Dutt, Civil Medical Officer, Serampore.)

Structure of the Wood.—Sapwood large; heartwood purplish brown, beautifully mottled, extremely hard, with alternate, concentric, light and dark bands.

Skinner gives the weight at 70 lbs.; Gamble’s specimens weighed 61 to 62 lbs. Skinner also says: “The wood is strong, fibrous, and stiff, close-grained, hard, and durable, superior to sill and teak in transverse strength and direct cohesive power; also that it is used for the beams of native houses and carts; the wood of the crooked branches for ploughs.”

Beddome states that it is a good fuel, and is extensively used for the locomotives at Salem and Bangalore. (Gamble.)

A. 689
<table>
<thead>
<tr>
<th>ALBIZZIA Lebbek.</th>
<th>The Pink Siris Tree.</th>
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<td><em>Dictionary of the Economic Uses.</em></td>
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**Domestic Uses.** — The natives use the leaves as a detergent for the hair.

**Albizzia anthelmintica.**

A native of Abyssinia, has recently attracted considerable attention as an anthelmintic. It is known as *Muxena or bisenna.* The natives employ the powdered bark to expel the tapeworm, to whi...t subject owing to the habit of eating raw flesh. About two days after taking the powdered bark, the worm is expelled from the body, sometimes or made into a confection with honey. It produces no pain in the body. The same day portions of the worm are expelled, and the next morning.

This tree might with advantage be introduced into India.

**A. Julibrissin,** *Durazz. ; Fl. Br. Ind., II., 300.*

**The Pink Siris.**

**Syn.** — *Mimosa Kalkora,* Roxb.; *Fl. India., Ed. C.B.C., Julibrissin,* Wild.

**Vern.** — *Siris, kumaru, suranguru, shersh, shesh, base, Taud, Brind,* Pung.; *Lal siris, haraulia, varun, bhokra,* Hind.; *Beng.*

**Habitat.** — A moderate-sized, deciduous, ornamental tree, with blossoms, met with in the Himalaya, from the Indus to Sikkim, to 7,000 feet.

**Botanic Diagnosis.** — *Pinnas 8-24, Rachis downy with a gla...leaves 20-50, sessile, sensitive, ½ inch long, with the mid-rib close to the straight upper edge; stipules caducous. Heads of flowers not panicked but crowded in upper nodes. Corolla 3 times as long as the calyx; pods g...inches long by ½ to 1 inch, 8-12 seeded, narrow to the back, short stalk.*

**Medicine.** — Used like *A. Lebbek.* Stewart says the word is derived from *Gul abresham,* in Egypt "1" being pronounced.

**Structure of the Wood.** — Sapwood large; heartwood dark brown, almost black in old trees; beautifully mottled, shining. Axially distinctly marked by a sharp line. Weight 43 to 52 lbs. per cubic foot. Used to make furniture.

**A. Lebbek,** *Benth. ; Fl. Br. Ind., II., 298.*

**The Siris Tree.**

**Syn.** — *Acacia Sirissa,* Ham. ; *A. Lebbek,* Wild. *(DC, Preciosa,* Wild.; *Mimosa speciosa,* Jacq.; *M. Sirissa,* Rox. Latipollae,* Bovin.*

**Vern.** — *Siris, sirin, sword, sirun, sirin, mathiromi, lasrin, kalsis,* Hind.; *Siriska, siris,* Beng.; *Pit shirish,* Sans.; *Chapata-Tinna,* Urdu; *Vagche, kot vagche,* Tami.; *Dirasam, darsham pedda dachriram,* Tel.; *Kal baghi, bengha, airasana,* K.; *Kan,* Kan.; *Chikela, mathi siras,* Mar.; *Doli, sasra, Panch sarwhio,* Guj.; *Strasa, shirrus, surin,* Sind.; *Kokko or koko Beymada, gachola,* And.

**Habitat.** — A large, deciduous, spreading tree, found wild in most parts of India; grows in the evergreen mixed forests.
The Sisra Tree.

Himalayan tract from the Indus eastward, in Bengal, Burma, Central and South India, ascending to 5,000 feet in altitude.

"A handsome and common tree in the town of Madras, grows best when self-sown; yields a gum." (Deputy Surgeon-General G. Bidie, C.I.E., Madras.)

Botanic Diagnosis.—Pinnate 4-8; leaves 8-18, short-stalked, obtuse, oblique, 1-1½ inch long and ¥ 4 broad. Heads of flowers not panicked, 3-4 together. Corolla greenish yellow, twice the length of the calyx. Pod strap-shaped, yellow-brown, ½-1 foot long by 2-2½ inch broad, 6-10-seeded.

An ornamental tree with light-coloured bark, exceedingly good for avenues. Its roots do not penetrate very deep; it may be propagated readily by cuttings.

Properties and Uses—

Gum.—It yields a gum, which is said not to be soluble in water, but merely to form a jelly. It resembles gum arabic. Roxburgh states that he has often seen large masses of pure gum upon this plant, while other authors give conflicting opinions regarding its properties. Mr. Baden Powell says that, under the name of lera, it is used as an adulterant for pure gum arabic in calico-printing and in the preparation of gold and silver leaf cloths. The Mysore Gazetteer remarks that the tree yields a good gum. (Vol. I., p. 47.) "A dark gum oozes from wounds in the bark." (Bombay Gazetteer, XV., Pt. 1., 61.)

Tar.—The bark is said to be used in tanning leather.

Oil.—An oil extracted from the seeds is considered useful in leprosy.

Medicine.—The seeds are official, forming part of an ajana used for ophthalmic diseases (Stewart). They are astringent, and are given in piles, diarrhoea, gonorrhoea, &c. The oil extracted from them is considered useful in leprosy. The bark is applied to injuries to the eye (Madden).

The flowers are considered by the natives a cooling medicine, and are externally applied to boils, eruptions, and swellings; they are regarded as an antidote to poisons. The leaves are regarded as useful in ophthalmia. (Baden Powell's Panjab Prod., s. v. Acacia speciosa, p. 545.) "Powdered seeds in doses of 6 mashes—one have been successfully administered in cases of scrofulous enlargement of the glands. A paste of pounded seeds and water is useful as a local application at the same time." (Asst. Surgeon Ghulam Nabi, Peshawar.) "This is sometimes used in ophthalmia, but my experience of it is too limited to enable me to give any opinion." (Surgeon-Major C. J. McKenna.) "The powder of the root-bark is used to strengthen the gums when they are spongy and ulcerated." (Native Surgeon Ruthnam Moodliar, Chingleput, Madras.)

Fodder.—The leaves are used for camel fodder. It is often cultivated as a fodder plant in Mysore. The tree grows rapidly and flourishes on almost any soil, especially on canal embankments and roadsides, affording both fodder and fuel where these are otherwise scarce. Deserves to be cultivated to a much greater extent than at present.

Structure of the Wood.—Sapwood large, white; heartwood dark brown, hard, shining, mottled, with deeper coloured longitudinal streaks. The annual rings in trees grown in the Panjab are marked by a distinct line. Weight 40 to 60 lbs., per cubic foot. It seasons, works, and polishes well, and is fairly durable. The value of the tree may be inferred from the fact that the Burmese Government fixed a higher tax upon the felling of khk-kho than for teak or any other tree. (Burmese Gazetteer, 1., 128.)

It is used for picture-frames, sugar-cane-crushers, oil-mills, furniture,
well-curbs, canoes (Burma), and wheel-work; in South India for boats. In the Andamans, where trees of large size are procurable, it is utilised for building, but more usually for house-posts. Used for furniture and picture-frames in Mysore. In the Deccan the wood is regarded as of excellent quality. In Northern India it is considered unlucky to employ the timber in house-building. (Drury; Roxb., &c.) It is a common practice to pollard the tree, the cuttings being used as firewood.


**Habitat.**—An Australian small tree or bush, now largely grown in India; naturalised on the Nilgiri Hills.

**Botanic Diagnosis.**—Closely resembles *A. amara*, only that the flowers are in spikes. One of the most rapidly growing trees for copses, affording temporary shade in exposed localities.

**Tan. Bark.**

**Pods.**

**Structure of the Wood.**—Heartwood hard, brown, with dark streaks and alternating dark and light-coloured concentric bands. Average weight 50 lbs. per cubic foot.

**Timber.**

It is hard and good, and used for pots in Assam.


**Vern.**—Sil korai, Beng.; Sil-korai, Ass.; Tapri-korai, Nepal; Ngera-lepe; Messigob, Ass.; Gunhi, Magh.; Thanthali, Burm.

**Habitat.**—A large, deciduous tree, met with in Eastern Bengal, Assam and Burma.

**Botanic Diagnosis.**—Pinnate unijugate; leaflets 2 to 4, rarely 6, oblong acute, 2 to 4 inches long, glabrous, bright green. Panicles of heads bellate or corymbose.

**Structure of the Wood.**—Heartwood hard, brown, with dark streaks and alternating dark and light-coloured concentric bands. Average weight 50 lbs. per cubic foot.

**Timber.**

It is hard and good, and used for pots in Assam.


**Vern.**—Sirta, sira, khandir, beris, bais, bason, bina, Hind.; Sang in Sontal; Laurin, karbrum, polach, Pu.; Chickua, chichola, yerjokul; Gond.; Chickora, Kukru; Jati-korai, siris, Ass.; Sisso, Garo; Khar Cachar; Tedong, Lepe; Kalthurangi, kar eagha, karva, biwara, solomanim, sel vanjai, karwaga, Tam.; Shinuduga, shin tela, yerruchinta, karu wage, Tel.; Pulibaghi, billawar, bivar; Kan.; Siris, chichua, chichola, siras, shiras, Konkan, Bom.; Del; Mar.; Kali-saras or karreri, Panch Mahals; Hil. mara, Cinch.; Thiemagi, Burm.

**Habitat.**—A large, deciduous tree, met with in the Sub-Himalayan tract from the Indus eastward, ascending to 3,000 feet in altitude; in Bengal, Assam, Burma, and Central and South India.

**Botanic Diagnosis.**—Pinnate 6-8, with a gland between the 1-2 pairs; leaflets 10-30, sessile, obtuse, very oblique, glaucescent beneath, strongly veined, with the mid-rib parallel to and at a little distance from the upper edge, ½ inch by 3½ inch. Heads of flowers copiously paniced, each flowered, apricot-scented, pale-greenish white.
The Rain Tree.

### Properties and Uses

**Gum.**—It yields a dark-brown gum in rounded tears, tasteless but soluble in water.

**Dye.**—§ "The bark is boiled by the Gārō people, together with the leaves of the dhādi, Sarcoclinea pulcherrima, and the yarn for their cloth, to give the latter a brownish colour." (Mr. G. Mann, Conservator of Forests, Assam.)

**Medicine.**—The bark, applied externally, is considered efficacious in leprosy and in invertebrate ulcers.

§ "The leaves boiled in gāhi are used by the Santals as a remedy for coughs." (Rev. A. Campbell, Pachumbā)

**Fodder.**—The leaves and twigs are used for fodder, and in the Konkan they are regarded as of excellent quality. (Bomb. Gaz.)

**Structure of the Wood.**—Sapwood large, white; heartwood dark brown, with darker streaks; very hard. Dark, narrow, concentric bands (annual rings?), alternating with bands of lighter colour. "Grain ornamental, but rather open." (Cleghorn.) It seasons, works, and polishes well, and is fairly durable. Weight 42 to 60 lbs. per cubic foot.

It is used for wheels, oil-mills, and furniture. The timber is excellent for all purposes requiring strength and durability. One of the most valuable of jungle timbers found around the villages of the Indian peasant. It is the principal wood used for cart-wheels in Gujarāt.

### Albizzia procera, Benth.; Fl. Br. Ind., II., 299.

**Syn.**—Mimosa Elata, Roeb.; Fl. Ind.; Ed. C.B.C., 418.

**Vern.**—Safed siris, guhar, kara, karo, karanji, gujar, gujar, baro, karol, gervis, HIND.; Koroi or kor, BENG.; Kili or kalī, Gārō; Pandurai, KOL.; Gurus, Kharkar; Lāhiri, MACH.; Sīlo sīris, NEPAL; Takmar, Lepcha; Passergi, GONG.; Sarphari, tinia, TINIA; Karali, kīnai tīhari, BOMR.; Kiini, Behl; Kanal, DUK.; Kinai, MAR.; Kinnai (Thana), KONKAN; Kondal vāgha, TAM.; Pedda pattaru, telia agar, telia chindag, TEL.; Chikul, KAN.; Choi, MACH.; Sest or sit, BURM.; Bārdā, AND.

**Habitat.**—A large, deciduous, fast-growing tree, found in the Sub-Himalayan tract from the Jumna eastward; in Bengal and Behar, in the Sarpura Range, in the Central Provinces, in Gujarāt, and South India and Burma.

### Properties and Uses

**Gum.**—This tree yields large quantities of gum.

**Tan.**—The bark is sometimes used as a tan.

**Structure of the Wood.**—Sapwood large, yellowish white, not durable; heartwood hard, brown, shining, with alternate belts of darker and lighter colour. The wood is straight and even-grained, seasons well, and the heartwood is durable. Weight 26 to 60 lbs. per cubic foot. Yields excellent timber and is in great request. (Bomb. Gaz., XV, p. 61.)

It is used for sugarcane-crushers, rice-pounders, wheels, agricultural implements, bridges, and house-posts. It is used by tea-planters for stakes for laying out tea-gardens, as it is found to split well, and occasionally it is also used for tea-boxes; it is found to be very good for charcoal.


**The Rain Tree or Guango.**

**Habitat.**—A native of Mexico, Brazil, and Peru; it is experimentally cultivated in most warm-temperate countries, and would succeed well in many parts of India, especially in the vicinity of the sea or salt-lakes. Is one of the best trees for roadsides.

### A. 720
ALBUMEN.  

Gum used for Sizing Daphne Paper.

TIMBER.  721  

"The wood is hard and ornamental, but the principal utility lies in its pulpy pods, which are produced in great abundance, and are sometimes eaten by man and the beasts of the field, as a relish." (Mueller, Extra-Tropical Plants.)

ALBizzia stipulata, Bovin; Fl. Br. Ind., II., 300.

Syn.—Mimora stipulacea, Roxb.; Fl. Ind., Ed. C.B.C., 418.

Vern.—Siran, bagunja, patta, samusundra, HIND.; Chakn BENG.; Oli, el, sirin, gharsha, hajir, PAK.; Chakn, kera se Bumshri, MEGH.; Kala sirin, NEPAL; Singriang, LEPCHA; AS.; Selcho, GARG; Kat turaniu, TAM.; Konda chiraq, TEL.; Udala, BOMB.; MAR.; Phakri (THANA), KONKAN; Dhacch Mahals; Kat baghki, kat baghki, bagra, KAN.; Kaha Pokoh, bhau-mai-aa, MAGE.; Cubal-murd-gast, bumbai, BURM.

Habitat.—A large, deciduous, fast-growing tree, met with in the Himalayan tract from the Indus eastward, ascending to 4,000 Oudh, Bengal, Burma, and South India.

Botanic Diagnosis.—Pinus 12-40, with many glands on the leaflets 40-80, 1/4 inch or less in breadth, sessile, finely downy, cordate-aculeate, persistent. Flowers panicle-shaped, racemes densely pubescent. Pod 5-6 inches by 1 inch, pale brown, indehiscent, sub-sessile, 8-10-seeded.

This tree is attracting considerable attention in Assam. It is found that tea flourishes better under it than when exposed to the sun. The most favourable explanation of this fact is that the leaves moisture ; the roots, which do not penetrate deep, tend to open up the soil and to form a closer and during early morning.

Properties and Uses—

Gum.—It yields a gum, which exudes copiously from the stem, and is used by the Nepalese for sizing their "Daphne" paper.

Fodder.—The branches are lopped off for cattle fodder. (Gambal)

Structure of the Wood.— Sapwood large, white, heartwood generally not durable, soft, shining. Weight 25 to 45 lbs. per cwt.

It is also used as fuel.

It is said by Beddome, probably quoting Skinner, to be suitable for building and for naves of wheels. Kurz says it is good for cabinet furniture, and similar purposes. Brandis' Burma List, 1862, No. 25, it is prized for cart-wheels and for wooden bells. In Bengal it is tried for tea-boxes, for which purpose it will probably suit better for charcoal. Said to be much used in South Kanara.

ALBUMEN.

A term which, in chemistry, means a compound containing in addition to the carbon, hydrogen, and oxygen of the starch readily known by its coagulating with heat. The white of an egg is a good example of this compound in animal matter, but it is also present in vegetable substances, and especially so in the sap of peas.

In botanical science, however, the term "Albumen" has a wider meaning. It is a layer of albuminous matter (albumen, fibrine, and casein, together with starches), surrounding the embryo within the seed-coats. In the pea the albuminous matter within the embryo itself, filling its seed-leaves (the halves of which and such a seed is therefore called "albuminous") in botanical terminology.

A. 727
Vinous Fermentation.

the castor-oil seed, on the other hand, the albuminous matter forms a distinct and complete layer around the embryo (or infant plant), and such is therefore regarded as an albuminous seed. An exalbuminous seed does not imply the absence of albuminous matter (chemically), but the absence of a peculiar layer of such matter around the infant plant and within the seed-coats.

**Medicine.**—Albumen is described in the *Indian Pharmacopoeia* as emollient, demulcent, and nutritive. It acts as an antidote to the soluble salts of copper and zinc, and corrosive sublimate or creosote.

**Chemical Note.**—§ "Albuminoid or proteid is a generic term given to the chief mass of nitrogenous material of plants and animals. All proteids contain nitrogen, carbon, hydrogen, oxygen, (sulphur and phosphorus). The white of egg is an example of an animal proteid, while in vegetable juices which are coagulated by heat, a substance exists which is either identical with or closely resembles egg albumen. Proteids have been divided into classes by *Hopper-Seyler*, and comprise egg-albumen, serum-albumen, myosin, globulin, fibrinogen, vitellari-filum. Besides these there are devoir albumens, obtained by the reaction of reagents on an albumen. Thus an albuminoid, which has been digested or dissolved by the gastric juice, is called a peptic:" (*Watts*). "A peptic differs in a most marked manner from the proteid from which it has been obtained. It is very soluble in water, and is not precipitated by heat. It is also soluble in dilute alcohol. It is uncrystallizable and devoid of odour and almost tasteless." (*Surgeon Warden, Prof. of Chemistry, Medical College, Calcutta.*)

§ "Eggs are very useful in cases of anemia resulting from loss of blood or chronic discharges. They also act as an aphrodisiac. In combination with *kandur* it is employed in chronic bronchitis, and with *butan* in asthma. A mixture composed of eggs, *kohroba* and *takhatir* is said to act as a powerful astringent, and is used in hemorrhage and chronic diarrhoea. Yolk of egg is often applied locally to the part bitten by a snake.

"A liniment composed of eggs, *rogungul*, and *babuna*, is said to be a very useful local application in ophthalmia and orchitis. An ointment made with *mum rogin* has been employed with benefit in cases of severe neuralgia and other painful affections. Volks of egg, mixed with *tira bermani*, and spread over a piece of paper and applied while warm over the loin, is said to remove the pain. Eggs are also used as a local application in cases of burns and scalds. Eggs burnt to ashes and mixed with honey are said to be very efficacious in removing the opacity of the cornea." (*Adjutant Surgeon Gholam Nabi, Feshawar.*)

**ALCOHOL.**

Alcohol.

The product of vinous fermentation. Through the agency of the fungus—Yeast—sweet liquids have their chemical constituents rearranged. They are said to be fermented, and the spirit or pure alcohol formed may be separated from admixture by distillation.

**Chemical Note.**—§ "Chemically, alcohol means a neutral compound of oxygen, carbon, and hydrogen, from which an ether can be obtained. Usually, however, the term is restricted to ethyl alcohol—spirits of wine. Alcohol is a product of the fermentation of saccharine matter by the action of a fungus, the *Saccharomyces cerevisiae*, a constituent of yeast. In commerce three varieties of alcohol of different strengths are recognised—Absolute Alcohol, Rectified Spirits, and Proof Spirits. Absolute Alcohol is alcohol which has been deprived of water; Rectified Spirit is Absolute Alcohol mixed with 16 per cent. of water by weight; and Proof Spirit,
Aleurites cordata.

Absolute Alcohol with 50−76 per cent. of water. The strength of an alcoholic liquid may be expressed in terms of one of the varieties of alcohol. For excise purposes, "Proof," "and "over Proof" are terms which are constantly employed. The strength of spirit was ascertained by pouring some of it over and igniting the spirit. If the powder inflamed, the spirit was "under Proof." The Proof spirit has been defined by Act of Parliament, and is already stated. If the spirit be stronger than Proof spirit, it is so many degrees over per cent. of proof, or O. P., and much per cent. under Proof, U. P. A liquor described as degrees U. P. means that 100 parts of the spirit contain 80 spirit and 20 parts of water, while a liquor 20 O. P. means parts of the spirit were diluted with water till the mixture parts, the product would be Proof spirit. For purposes of &c., Rectified spirit is issued duty-free, after admixture of commercial wood, naphtha. This addition rectifies the spirit and makes it fit for potable purposes, and the spirit so treated is known as Spirit of Wine. In India, for certain trade purposes, the Excise permit the addition of caoutchouc in lieu of wood spirit.

Medicine.—It is chiefly used for chemical purposes as a paration of tinctures. Rectified spirit is a powerful diffusant, and useful as an evaporating lotion, but not administered internally.

Alder, see Alnus glutinosa and A. nepalensis.

Aleurites, Port.; Gen. Pl., III., 292

A small genus of Euphorbiaceae, containing trees with simple or lobed leaves with 2 glands at the base. Calyx 2−3-parted. petals 5, twisted, longer than the sepals. Disk present in the bud. Stems indeterminate, erect in bud; anthers 2, parallel, dehisced longitudinally, with a solitary ovule in each cell; styles as many as the petals. Fruit drupaceous, of 2−5 cocci; endocarp crustaceous; succulent. Seeds compressed-globular, with a spurious white aril; cotyledons large, the radicle minute.

The generic name is derived from aleuritis, made of aleurin, because of the mealiness of the plant.

Aleurites cordata, Müll.


Habitat.—This exceedingly interesting tree is said to have been introduced into India by Wallich in Nepal (Wall., Cat., N., 1798), but apparently rare, or its valuable properties are quite unknown to the native.

Varnish.—In the Kew Recall for 1880, p. 11, this is said to be a wood which yields the Chinese varnish (formerly supposed to be the Japanese varnish, Rhizus vernicifera). Samples of various varnishes were exhibited at the Calcutta International Exhibition, and were most probably obtained from this plant, which yields the Chinese varnish (formerly supposed to be the Japanese varnish, Rhizus vernicifera). Samples of various varnishes were exhibited at the Calcutta International Exhibition, and were most probably obtained from this plant. (Extra-Tropical Plants) says: "This tree, for its beauty and wood, deserves cultivation in our plantations in humid districts, as it is an article of enormous consumption amongst the Chinese, and is used in the caulking and painting of junks and boats, wood-work, varnishing furniture, and also in medicine."

The Belgaum of Indian Walnut; the Candle-nut.

Syn.—A. triloba, Forst.

Vern.—Akbrot, akola, jangli-akrot, Hind., Beng.; Akhota, Sans. (Sabkhoram Arijum, Bombay); Khatte-hindi, jowasbarri, Akar.; Girdagandhi, chahtar-mughar-hindi, Pers.; jangli eranda, jolopa, jangli akbrot or akrot, jhukal, Bomb.; Akhoda, Guj.; Jophala, abhog, Mar.; Akhota, Cutch; Niltu-abrolu-khati, Tam.; Nilu-abrolu-vutta, Tel.; Nilte, and atkut, Kakkanur, Sankh.; Tzolphi-ei, Pt. S. India, China.

The names given, in most parts of India, to this plant are those which more properly belong to the Walnut, the akrot. It is therefore advisable to add the word "wild"—jangli-akrot.

Habitat.—A handsome tree, introduced from the Malay Archipelago, and now found in cultivation or wild in many parts of South India.

Roxburgh says of it: "A large tree, now pretty common in gardens about Calcutta." "Flowering time the hot season; seeds ripen in August." Cleghorn remarks that it thrives well in Madras.

Botanic Diagnosis.—Leaves and twigs covered with a brownish, stellate, scaly, minuteomentum. Leaves ovate, base truncate-obtuse, having two glands, acute or acuminate, often 3 lobed. Pusicles on the extremities of the branches, covered with scalyomentum and crowded with white flowers.

Properties and Uses.

Gum.—Bark smooth, olive-green, a gum often naturally exuding from the stem and found also upon the fruit. This gummy substance is said to be chewed by the Tahitians, especially that from the fruit.

Dye.—The Treasury of Botany says the root of the tree affords a brown dye, which is used by the Sandwich Islanders for dyeing their native cloths. This may be the brown dye of Tonkin, of which samples were exhibited at the Calcutta International Exhibition of 1873-84.

Oil.—Nut Oil or Artist’s Oil.—The nuts of this plant contain 50 per cent. of oil, which is extracted and used as food and for burning. It is known as Kekuna in South India and Ceylon. The nuts when strung upon a thin strip of bamboo and lighted are said to burn like a candle. Strung upon strips of the wood from the palm leaf they are regularly used by the inhabitants of the Sandwich Islands, where the plant is called Kukui, and the torches are reported to burn for hours, giving a clear and steady light. The yearly production of the kukui oil in the Sandwich Islands is said to be 10,000 gallons. It is now exported to Europe for candle-making, and is reported to be equal to gingelly (Sesame) or rape oil. Simmonds reports that 3½ gallons of the nut yield 10 gallons of oil, which bears a good price in the home market. It may be obtained either by boiling the bruised seeds or by expression.

"The oil is very fluid, of an amber colour, without smell, concealing at 3° Fin. insoluble in alcohol, readily saponifiable, and very strongly drying. ([U.S. Dispens., 15th Ed.)] "The cake, after expression of the oil, is a good food for cattle, and useful as manure." (Drury’s Us. Pls.) "The cake, left after the expression of the oil, given to a dog in the dose of about half an ounce, produced no vomiting, but acted strongly as a purgative." ([U.S. Dispens.) These opinions would seem to be rather conflicting.

"The oil makes a capital dressing for ulcers." (Surgeon W. Barron, Blug, Cutch, Bombay.)

Medicine.—The kernels "yield on expression a large proportion of a fixed oil, which has been pronounced by the Madras Drug Committee A. 741
The Camel Thorn.

(1855, p. 428) to be superior to linseed oil for purposes connected with arts. Medicinally, a dose of about two ounces has been found to act from three to six hours as a mild purgative, its action being unattended with either nausea, colic, or other ill effects. It approaches castor oil, has been found quite as certain in its action, with the advantage of possessing a nutty flavour; dose ¹⁄₂ to 1 oz. (Pharmacopoeia of India.)

Dr. Irvine says the nut is a stimulant and sudorific; dose ½ to 1½.

Dr. Calixto Oxamendi (Anales de Medicina de la Habana) performed a series of experiments by which he arrived at the conclusion that the oil must be administered in much smaller doses than is commonly stated. He found that half an ounce was quite sufficient to move the bowels of an adult. He recommends that it be used as a substitute for other aperients on account of its having a pleasant, nut-like taste and acting freely in three hours without giving pain or griping. Dr. Oxamendi attributes this property not only to the oil itself but to a peculiar resin which irritates the intestinal mucous membrane. He recommends gumb arabic to be combined with it, and for external application in obstruent constipation, he suggests that it should be combined with Tinct. of Cantharids and Ammonium Carbonate: B. Ol. Nucis Alercites Triloba, ½ oz., Tinct. Cantharid and Ammon. Carb. a. a. ½ li. (M. Linam.)

Food.—It is cultivated for the sake of its fruit, which is generally 2 inches in diameter. Roxburgh says: "The kernels taste very much like fresh walnuts, and are reckoned wholesome."

Algarobilla and Algaroba.

A tan obtained, chiefly in America, from certain members of the genus Prosopis, of which P. pallida, Kuxth, P. glandulosa, P. dulcis, and H. spicigera, are the most important species. See Prosopis.

By some authors Algaroba is restricted to the Carob tree, Ceratonia Siliqua, which see. The U. S. Dispensatory, 15th Ed., says that Algarobilla is the pod of Balsamocarpus brevifolium, a drug containing 60 to 68 cent. of tannin and a large quantity of ellagic acid, but none in the seeds. It is obtained from Chili. Dr. R. Godeffroy (in Archiv. der Pharm., XI 1849) regards this as a good source from which to prepare Tan (Year-Book, Pharm., 1879, 215; and 1883, 208).

The word Algaroba is said to be derived either from Algarobos, town in Andalusia, or from the Arabic Al-the, and Kharrub, the Carob tree. It seems probable that the name is applied to a number of plants the pods of which contain a sweet mucilage—the pods which are alluded to in the Scriptures as the husks or beans.

ALHAGI, Deny. ; Gen. Pl., I., 512.

A low shrub, armed with hard spines ½–1 inch long, belonging to the Natural Order Leguminosae. Leaves simple, drooping from the base of the spines or branches, oblong-obtuse, conicaceous, glabrous. Flowers ½–1, axillary to a spine, on short pedicels. Calyx campanulate-glabrous, ½ to 1 inch; teeth 5, minute. Corolla reddish, 3 times the size of the calyx; standard broad; style obtuse. Stamens 10, diadelphous; anthers uniform. Ovary linear, sub-continuous; joints small, fagad, smooth.

The generic name is the Arabic for the plant Al-hagu, pronounced by the Egyptian Arabs el-hagu.

Alhagi mauroorum, Deny. ; Fl. Br. Ind., II., 145.

The Camel Thorn; The Persian Manna Plant.

Syn.—Hedysarum Alhagi, Wild.; as in Roxb., Fl. Ind., Ed. C.B.C., p. 574.

A. 745
The Persian Manna Plant.

**Vern.**—Jowda, jamvasa, or jumvasa, or jowdsha, or jowdsh, Hind., Bomb.; Zunaskha, Cutch; Dalat-libhda, jowdsh, Beng.; Daralba, girikarnika-javasa, Sans.; Shhtar-khar, or ughtar-khar, kh bursting, Pers.; Alhahi, haj, adgil, shokul-jamil, Ahar; Girikarnika, telia, giniya-chetta, Tel.

The names Unt-kadra and ünt-katyah, Mooden Sheriff says, are sometimes, but incorrectly, applied to this plant. The Manna is known as **Taranjabin**.

**Habitat.**—A widely-spread shrub of the Ganges valley and of the arid and northern zones. A native of the deserts of South Africa, Egypt, Arabia, Asia Minor, Greece, to Beluchistan and Central India, the Konkan, and the plains of the Upper Ganges and North-West Provinces. Very common near Delhi.

**Properties and Uses.**

**Medicine.**—The herb is cooling and bitter and has antibilious properties. The twigs are often resorted to as a poultice or fumigation for piles; the flowers are also sometimes used for this purpose. The thorny twigs are sold as the medicinal product; and the preparation generally used is the extract by evaporation of a decoction of these. This is called Pansvar-kard. It is sweetish-bitter, and is a favourite remedy for the coughs of children. By the Hindus the fresh juice is used as a diuretic in combination with laxatives and aromatics. The "expressed juice is applied to opacities of the cornea, and is directed to be sniffed up the nose as a remedy for megrim." (Dynam. Med. Med. W. Ind., 179.)

‡ "The infusion has a diaphoretic action." (Surgeon W. Barren, Bhuj, Cutch, Bombay.)

Oil.—The oil, prepared with the leaves, is used as an external application in rheumatism.

**Manna.**—The Sanskrit writers do not appear to refer to the Manna or sweet sugary excretion obtained naturally from the plant by shaking its twigs over a cloth. This is chiefly collected in Khorasan, Kurdistan, and Hamadan, and imported into Bombay from November to January. It is called Taranjabin. It occurs in small, round, unequal grains, of the size of coriander seeds, caking together and forming an opaque mass. Royle states that the Indian plant does not yield the manna, and that the Taranjabin of the bazaars is imported into India from Persia and Bokhara. (O'Shaughnessy.)

§ "I have never observed any manna or sweet sugary excretion on this plant, although I have seen it in every stage of its growth in large quantities in all parts of the Panjab and North-West Provinces." (Brigade Surgeon G. A. Watson, Allahabad.) The Jowda trees in the districts of Muranagar, Meerut, &c., on the banks of the Jumna yield Taranjabin, but only in small quantities. My assistant has seen it growing and has collected the manna in these districts." (Surgeon-Major C. W. Calthrop, M.D., Morar.)

The editors of the Pharmacographia state that Alhagi Manna is collected near Kandahar and Herat, where it is found on the plant at the time of flowering. Specimens sent them by Dr. E. Benton-Brown and Mr. T. W. H. Talbot had the form of roundish, hard, dry tears, varying in size from a mustard seed to that of a hemp seed, of a light brown colour, and agreeable, saccharine, senna-like smell. The leaflets, spines, and pods, mixed with the grains of manna, are characteristic. It is imported into India from Kabul and Kandahar to the extent of 2,000 lbs. annually, and is valued at 30 shillings per lb. According to Ludwig, it contains cane-sugar, dextrine, a sweetish mucilaginous substance, and a little starch." (Surgeon Warden, Prof. of Chemistry, Calcutta.)

A. 752
ALISMACEÆ.

The Alisma and Sagittaria.

Chemical Composition.—"According to Villiers, Alhagi M being boiled with animal charcoal and evaporated to a syl
tallized after some months in small brilliant crystals, which p
- lization from alcohol, formed large white crystals of the form
\( O_4 + H_2O \). It is dextrorotatory, its power being + 94° 48',
sodium flame, + 88° 51'. On boiling with an acid, it is con
-glucose, and its rotatory power is reduced to that of glucose,
- It then reduces Fehlig's solution; nitric acid oxidizes it to oxalic acids, its melting point is 140°. It is thus seen to be
with Bérbelot's melezitose. It crystallizes in monoclinic clini
-prisms. The mannite of Alhagi also contains cane-sugar, be
-isolated by treating the mother liquor of the melezitose with
and adding ether till a slight precipitate is formed. Crystals
sugar are then deposited. The mother liquor acts like a soli
t-sugar containing dextrorotatory foreign substances which are r
able with beer-yeast. (Vide Jeff. Chem. Soc., April, 1877)."

Fodder.—In the hot season, when almost all the smaller
this puts forth its leaves and flowers, which are used as a car
just about this time the leaves and branches exude a gum
liquid which soon thickens into solid grains; these are gr
shaking the branches, and constitute the edible substance
manna. This secretion, however, is apparently not found on
plant, but is collected at Kandahar and Herat, whence small
of the manna are imported into Pesháwar.

Domestic Uses.—The twigs are much used for making
(cooling mats) used in Upper India in the hot season.

ALISMACEÆ.

Alismaceæ; Gen. Pl., III., 1003; Mono. Phanér., DC.
A Natural Order of aquatic monocotyledons, with radicle sheathing
-marked leaves. Flowers hermaphrodite or monocious. Perianth
ous, 2-seriate—a distinct calyx and corolla. Stamens hypogynous or
-ous, equal to or double the number of the perianth leaflets. Ovaries
-less numerous, whorled or capitate, distinct, 1-celled and 1-to.
Ovules campylotropous. Fruit a follicle. Seeds recurved exalbum
embryo hooked.

This Natural Order has its chief affinity to Juncaginæ (the Naïa
which only differ in their extrorse anthers, anatropous ovules, and
embryo. The Butomææ are so closely related that they have been re
a tribe of the Alismaceæ, being only separated by their placenta
number of the ovules.

Economic Properties.—There are 12 genera in this Order, A
Sagittaria being the largest and most abundant, both of
representatives in India, found in tanks and marshes. Their co
are apparently unknown to the natives of India. For some time the
in Europe the reputation of being useful in the treatment of hy
having been pitched upon by empirics. The rhizomes are, howe
eaten in many parts of the world. In China Sagittaria chine
vated as an article of food, and so also, in North America, is S.
In India S. sagittata folia is found in every tank throughout the
by desiccation the rhizomes of this species lose their acridity;
dition they are eaten by the Tartar Kalmucks. Apparently
of India are ignorant of this property, and it would appear
advantage might be taken of the edible rhizomes of Sagittaria
famine. (See Sagittaria.)

A. 756
Products of India.

Alkanet.

**Alismata Plantago, Linn.**

Common in tanks in Bengal; also in marshes and lakes; it extends throughout the Himalaya to Kashmir.

**ALKALINE ASHES.**

**Alkalis, or Alkaline Ashes, or Pearl-Ash.**

The ash produced by the incineration of plants may be referred to many classes, each characterised by the prevailing constituent present. Amongst these may be mentioned pearl-ash or alkaline earths; these contain potash. Barilla is a vegetable ash containing soda salts; Kelp, bromine, and iodine ash. Silicon is also frequently present, especially in the ash of graminaceous plants, and so also is lime in others. The first three are those of commercial importance. The following are the chief plants which yield pearl-ash in India:

- Abrus precatorius.
- Achyranthes aspera.
- Adhatoda Vasica.
- Alstonia scholaris.
- Amaranthus spinosus.
- Anthonomenum indicum.
- Bamboo ash.
- Borassus flabelliformis.
- Butea frondosa.
- Cassalpinia Bondacella.
- Caroxylon foetidum.
- C. Griffiiiiii.
- Clatropia gigantea.
- Cassia Fistula.
- Cedrus Deodara.
- Euphorbia nerifolia.
- E. Tirucalli.

- Erythrina indica.
- Gmelina arborea.
- Holarrhena antidysenterica.
- Indigofera tinctoria.
- Luffa agyiatica.
- Musa sapientum.
- Nerium odorum.
- Penicillaria spicata.
- Plumbago zeylanica.
- Pongamia glabra.
- Shorea robusta.
- Stereospermum suaveolens.
- Suda indica.
- S. nudiflora.
- Symplocos racemosa.
- Vallaris dichotoma.
- Vitex Negundo.

These salts are largely used in India as mordants, but rarely in a pure form.

Of minerals alum and saffit-mal (an impure carbonate of soda, found as a natural earth) are those most used. (See Auxiliaries, Dye.)

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**ALKANET.**

Alkanet, said to be derived from al-kanna, a dye supposed originally to mean the *henna* dye or *Lawsonia alba*. It is now restricted to the root of *Anchusa tinctoria* of China, a red dye, much used in colouring liquids. The Alkanet of Sikkim is obtained from *Oxalis Hookeri, Clarke* (which see). Dr. Dymock informs me that a root is imported from Afghanistan as an alkanet which he thinks may prove a species of *Annea. Albana tinctoria, Tausch*, grows on sandy places on the Mediterranean coast.

**ALLAMANDA, Linn.; Gen. Pl., II., 690.**

A handsome genus of climbing Apocynaceae; there are 13 species, chiefly inhabitants of Brazil and other parts of South America. They have been introduced and form much-prized additions to the flower-gardens of India.
ALLIUM
ascalonicum.

The Shallot.

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Allamanda cathartica, Linn.

Syns. & References.—A. Aurelii, Rohl.; DC. Prod., VIII., 30; Mat. Med., W. India, p. 421.

Vern.—Jahari sotakki, pieli kanher, pilli-baner, BOM.

Habitat.—A large yellow-flowered shrub from America, much in India and run wild in the tidal back-waters of the west (Beddome.)

Botanic Diagnosis.—This is the species most frequently seen in gardens. The leaves are in fours, oblong-lanceolate; the flowers extremities of long trailing branches, tube 1 inch long, and the bracts portion 2 inches long. This is a native of Guiana; it flowers freely cutta gardens during the hot and rainy seasons.

Medicine.—Dr. Dymock remarks: "Though not used in India for a medicinal reputation, the leaves being considered a valuable ca
moderate doses." Ainslie (Mat. Ind., II., 9) says that the Dutch
an infusing the leaves as a valuable cathartic.

A. Schottii, a native of Brazil, is even a still more showy
having much larger flowers, with an extra tooth between the per
nerifolia, another Brazilian species, is much more compact and
with broader leaves. The flowers are deep yellow streaked with
occurring in dense panicles. A. violacea has reddish-purple
(Treasury of Botany.) Firminger says that he has never seen
mands produce seed in India, but that they are all easily prop

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Leaves.

ALLÆANTHUS, Thwaites; Gen. Pl., III., 361.

Allæanthus Zeylanicus, Thu. ; URTICACEÆ.

Vern.—Allandoo-gass, CINGH.

Habitat.—A tree met with in the central province of Ceylon
1,000 to 2,000 feet.

Fibre. 765

A very tough fibre is obtained from the inner bark of
which is used by the Cingalese for a variety of purposes. (Enum
Enumeratio Plantarum Zeylanica, p. 263.)

Allmania, see Amaranthaceæ.

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A genus of bulbous, herbaceous plants, belonging to the Natural
LILACÆ, containing some 250 species, confined to Europe, and the tem
extra-tropical regions of Africa, Asia, and America.

Bulb unincised. Spathe many-flowered. Umbels crowded. Flowers
lar, 6-merous; segments distinct or only slightly united below. Stam
thers oblong, attached by the middle and on the back. Ovary sup
sessile, 3-celled; stigma 3-fid; ovules mostly 2 in each cell.

Allium is the classical name for the garlic, leek, &c.

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Allium ascalonicum, Linn.; Roxb. Fl. Ind., C.B.C. Ed., 2

The Shallot.

Vern.—Gandhan, Gandana, Pa.; Gandana, Saharanpur, N.
Gandana, Aig.; Gundhan, BENG.

Roxburgh gives this species the vernacular name of peesaj, but this
seem to be a mistake. The specific name is in honour of the ancient city of As
where Richard the First, King of England, defeated Saladin's army in 1187.

Habitat.—A hardy, bulbous perennial, native of Ascalon tine. Has been cultivated from the remotest times by all the

A. 767.
The Onion.


**Oignon**, Fr.; *Zwiebel*, Ger.


References.—Bentley and Trimen, Med. Pl., p. 280; Mooden Sheriff's Supp. to Pharm. of India, p. 37; Baden Powell, Pandj Products, I., p. 38.

Dr. Mooden Sheriff says that in some Indian languages the same names are applied to the onion as to the garlic, the latter being called the white onion—a name very easily confused with the names applied to the white forms of the true onion. *Kondā* is the Hind. for squill; it very much resembles the Mar. *kondā* for this plant.

**Habitat.**—Cultivated all over India. There are, in Bengal, two forms, known as the Patna and the Bombay; the onions of Janjira, Bombay, are much prized, being small and white. (Bomf. Gaz., *XII.*, 415.)

English seed does not as a rule succeed so well as country, because, before it can come to India in time for the Indian season, it is two years old.

**Onion** seed will not keep for certain more than one year. Firminger recommends that selected bulbs be planted, and seed obtained from these.

If planted in the cold season, they will seed about the beginning of the hot season; and if carefully preserved, after being well ripened and dry, the seed obtained in this way will be found to yield a good crop in the following cold season, from October to February.

**Chemical Composition.**—Fourcrroy and Vauquelin obtained from the onion a volatile oil containing sulphur, albumen, much uncrystallizable sugar and mucilage, phosphoric acid, both free and combined with lime, citrate of lime, and lignin. The expressed juice is susceptible of various fermentation. The oil is essentially the same as that from *A. sativum*, consisting chiefly of allyl-sulphide, G,[H₂]S. (U. S. Dispens., 15th Ed.)

**Medicine.**—The bulbs contain an acrid volatile oil, which acts as a stimulant, diuretic, and expectorant. Onions are occasionally used in fever, dropsy, catarrh, and chronic bronchitis; in colic and scurvy; externally as rubefacients, and when roasted, as a poultice. Considered by the natives hot and pungent, useful in flatulency. Said to prevent the approach of snakes and venomous reptiles. (Baden Powell.)

They are also described as aphrodisiac and carminative. Eaten raw they are emmenagogue. The juice rubbed on insect-bites is said to allay A. 770.
irritation; the centre portion of a bulb, heated and put into the earring, is a remedy for earache. The warm juice of the fresh bulb is also used for this purpose. In addition to the oil obtained from the bulbs, there is a colourless clear oil used in medicines.

Opinions of Medical Officers.—§ “The bulb is crushed and the juice used as a purgative,” (Surgeon-Major Robb, Ahmedabad.) “Said to increase the appetite and to alleviate the symptoms of jaundice,” (Surgeon-Captain, Jahanpore.) “Used as a decoction in cough,” (Surgeon G. C. C.) “Onion juice, mixed with mustard oil in equal proportions, is a remedy for rheumatic pains. The bulbs, made into a poultice and applied to the affected part, are a remedy for scurvy.” (Asst. Surg. Chander Mukerji, Noakhali.) “The onion promotes appetite and digestion; it acts also as a deodoriser, and is employed to counteract the effects of the atmosphere, when cholera or any other epidemic disease is prevailing. Eaten raw, it acts as a diuretic and emetic. Cooked with vinegar, it has been employed with benefit in the treatment of jaundice, enlargement of the spleen, and dyspepsia. The bulb is also used as a local application in the treatment of boils.” (Gholam Nabi, Peshawar.)

“I have found the onion very useful in preserving meat from putrefaction.” (Surgeon L. Cameron, Nuddea.) “The juice of 1 or 2 bunches of onions, mixed with about 1 pint of sugar, is a capital remedy for bleeding piles; one dose a day.” (Asst. Surgeon Nundo Banipur.) “A medium-sized onion is eaten twice a day, and three black peppercorns as a favourite remedy in malaria, and in cases of dysentery. The decoction of onion is used in cases of stranguary.” (Surgeon J. M. North, Bangalore.) “Upon the cut surface of a large onion, a piece of raw sugar is placed; this rubbed over the part stung by a scorpion, it produces immediate relief.” (Surgeon-Major D. R. Thompson, M. B., Calcutta.)

“Soporific when eaten raw. The juice is a valuable remedy in cases of faintness; it should be applied freely to the nostrils, locally for the cure of scorpion-bites. It is said that the properties of onions are enhanced by preserving them in a well-garnished pot and then permitting the latter to remain in “a cow dung heap” for a period of four months. One onion treated after this method produces a strong aphrodisiac effect.” (Surgeon W. Barron, B. C. M., Bombay.)

“The natives use this largely in cases of dysentery. It is thus: a grain of opium is buried in a bulb, and this is roasted in ashes, and is then administered to a patient suffering from acute dysentery. Good success follows this mode of treatment. Three ordinary-sized bulbs, with a handful of the leaves of the Tamarindus indicus, is then made into a paste and applied as a purgative.” (Surgeon Lee, Mangalore.)

“Fresh juice of the bulbs rubbed on the body in case of sunstroke is said to be a safeguard against hot winds.
The Leek.

they are commonly given to children as a stomachic." (Ass't Surgeon Sib Chunder Bhattacharyji, Chanda, Central Provinces.)

Food.—The onion is cultivated very extensively all over India, especially in the neighbourhood of large towns, and is consumed both by Europeans and natives. The Mussalmans of India never cook curry without onions; but the strict Hindus of Bengal regard them as objectionable, and rarely if ever eat them. The Patna onion is of a superior kind, and is much sold in the Calcutta markets. The onions of the northern provinces are larger and more succulent than those of Bengal and the southern provinces. Deprived of its essential oil by boiling, the onion becomes a mild esculent.

Onions, leeks, and garlic were cultivated in Egypt in the time of Moses, and Herodotus (B.C. 413) mentions an inscription stating that 1,600 talents, equal to £428,800, were paid for the onions and garlic eaten by the workmen engaged upon the erection of the great pyramid.

§ "When pressure of work or any other cause prevents the cooking of curry, the natives frequently eat onions with their daily meal, which, in the case of the poorer Bengalis, is stale rice and water with salt, and with the natives of Upper India coarse bread. The onion in these cases is eaten raw, for the purpose, apparently, of flavouring the meal." (Mr. L. Liotard.)

Allium fistulosum, Linn.

The Welsh Onion; Rock Onion; Stone Leek.

A native of Siberia, said to have been introduced into Europe in 1629. Cultivated in gardens, but not admired as a culinary vegetable. It is a strong-rooted perennial plant, with sharp-pointed leaves, more or less in length. It never forms a bulb like the true onion, but has long tapering roots. From being very hardy it is generally sown to supply early onions for salad. (Smith's Dictionary.)

A. leptophyllum, Wall.

The Himalayan Onion.

The bulbs are regarded as sudorific: they are said to have a stronger pungency than ordinary onions. The leaves form a good condiment. Is this the species said to be exported from Lahoul?


The Leek.

Vern.—Kirith or Kirás, Ar. (Ak.; Pák, Beng.; Tan kyey thoon, Burm. (Bafour.).

This esculent plant has been known from time immemorial. According to some authors it was originally a native of Switzerland, but more probably, like the onion, it came from the East. It is mentioned in the sacred writings, and was cultivated by the Egyptians in the time of Pharaoh. Pliny says leeks were brought into notice by the Emperor Nero. The leek has been the badge of Welshmen ever since the sixth century, and is worn on St. David’s day in commemoration of a victory they had over the Saxons, when they were instructed to wear the leek as a distinguishing badge during the battle. (Treasury of Botany.)

Firminger says leeks are best propagated in India by sowing the seed broadcast on a small bed immediately the rains stop. When the seedlings are about six inches high they should be carefully transplanted, taking care not to injure the roots. They should then be planted in rows

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six inches apart. They require plenty of water and should be eaten once or twice.

Allium Rubellum, Bieb.

Vern._jangli pias, barani pias, chiri piasi, Hind.

Habitat.—Slender-leaved species, common in North-West India extending into Lahoul.

Food.—The root is eaten raw or cooked.


THE GARLIC.

Vern.—Lasun, or lahsan, Hind.; Rasún, or lasún, or lasha, Nagarn, Ass.; Rasun, Sant.; Maha-ushadha, lasuna, Samb; Sir, Pers.; Lasunna, Mar.; Lasun, Guj.; Shunn, Vallip-phudu, Tam.; Vellulil tella-gaado, Tel.; Belluli, Kanh.; Boho; Samsak, Turki; Kyat-thou-bro, kesum-phius, kyi-tel; Bum; Sudu-lané, Cingh.


Habitat.—Cultivated all over India; Firminger says it is very much cultivated by the natives in most parts of India, and can be had at any bazaar. It is propagated by planting out the cloves singly, in October, about 7 inches apart and 2 or 3 inches deep. The crop is taken in the hot weather, and after being dried in the sun the bulbs are stored for future use.

Botanic Diagnosis.—Bulbs numerous; enclosed in a common branous covering. Stem simple, about 2 feet in height. Leaves lanceolate, sheathing the lower half of the stem. Scapes smooth and solid, terminated by a membranous pointed spade enclosing a cluster of flowers and solid bulbs and prolonged into leafy points. Flowers white.

Chemical Composition.—“Allyl sulphide is the chief component of the oil obtained by the distillation of garlic with water; it also occurs to a smaller extent, in oil of onions. From the herb and roots of Allium the Thlaspi arvense, it can also be obtained together with sulphocyanohydrin, allyl, and oil of mustard. The leaves of the Sisymbrium Alliaceum, oil of garlic, and the seeds oil of mustard. A mixture of these two oils is likewise yielded by the following: Capsella Bursa-pastoris, Raphanus, and Nasturtium. In some cases the oils do not exist as such, for example, the seeds of Thlaspi arvense emit no odorous substances, and they must be macerated in water some time before distillation.” (Watts.) “Allyl sulphide is a colourless oil of sharp unctuous odour, lighter than water. The crude oil has a most intense odour, and garlic.” (Surgeon Warden, Prof. of Chemistry, Medical College, Calcutta.)

Properties and Uses—

Oil.—The seeds yield a medicinal oil, clear, colourless, and aromatic. Dr. Ainslie remarks that an expressed oil is prepared from the seed which is called Valley punau unnay; it is of a stimulating nature, and the Vytians prescribe it internally to prevent the occurrence of the fits of intermittent fever; externally, it is used in paralytic and rheumatic affections. (Cooke.)

Medicine.—“As a medicine garlic was held in great repute by ancient physicians, and was also formerly much used in modern practice, but in this country it is now rarely prescribed by the regular practitioners.

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Opinions of Medical Officers.

although it is still employed to some extent in the United States. Garlic is stimulant, diaphoretic, expectorant, diuretic, and tonic, when exhibited internally, and rubefacient when applied externally. It is also regarded by some as anthelmintic and emmenagogue.” (Bent. & Trim., Med. Plants, 280.)

In India, Garlic is considered hot and aperient; given in fevers, coughs, piles, leprosy, being regarded as carminative, diuretic, stomachic, alterative, emmenagogue, and tonic, and much used by the natives in intermittent fevers. The bulb is given in confection for rheumatism. Externally, the juice is applied to the ears for deafness and pain. Garlic is, in fact, chiefly employed at the present day as an external remedy; it is resolvent in indolent tumours. Is largely used as a liniment in infantile convulsions and other nervous and spasmodic affections. It is also frequently used as a poultice, as, for example, in retention of the urine from debility of the bladder.

The properties of garlic depend upon a volatile oil which may readily be obtained by distilling the bruised bulbs. When purified this oil is colourless, and may be distilled without decomposition. When garlic has been eaten, the odour of the oil may be detected in the various secretions of the body.

Opinions of Medical Officers.—§ “Mixed with vinegar garlic is used as an astringent in relaxed sore-throat and relaxation of the vocal chords. It is also used in asthma, general paralyzing, facial paralysis, gout, and sciatica; is much thought of in the treatment of flatulent colic. Supposed to prevent the hair turning grey when applied externally.” (Surgeon G. A. Emerson, Calcutta.) “Eaten in its green condition by persons in the cold season, from an idea that it wards off attacks of rheumatism and neuralgia.” (Surgeon-Major J. Robb, Ahmedabad.) “Sometimes used for blustering purposes, but takes a long time before having any effect.” (Surgeon-Major C. F. McKenna, Cawnpore.) “Garlic is an excellent medicine in several forms of acute dyspepsia. It appears, like onions, to be useful in keeping up the temperature of the body. It is a good antispasmodic. In bronchial and asthmatic complaints it is decidedly benefi
cial.” (Surgeon-Major R. L. Dutt, M.D., Pubna.) “Mustard oil, in which garlic has been fried, is an excellent application for scabies, and for maggots infesting ulcers.” (Assistant Surgeon Nobin Chunder Dutt, Dacca.) “The juice or the whole bulb is used with salt as a poultice in bruises and sprains, also in neuralgia, rheumatism, gout, and rheum
toid arthritis, and to relieve earache.” (Brigade Surgeon J. H. Thornton, Moulky.) “The smell of garlic is said to kill snakes; they never come where it is kept. Garlic poultice is used for rheumatic pains and also in neuralgia; if kept long it is rubefacient. Garlic oil is stimulant and rubefacient, largely used in the bronchitis of children.” (Ant. Surgeon J. N. Dey, Jeypore.)

“A clove or two of garlic, boiled in half an ounce of gingelly oil, (Sesamin) and used as an ear-drop in atonic deafness, has proved very successful in my practice. The juice in elongated uvula is used with the same effect as that of nitrate of silver.” (Honorary Surgeon Easton Alfred Morris, Negapatam.) A necklace of the bulbs is worn by children suffering from whooping cough. The juice is sometimes given with hot water for asthma.” (Surgeon James McConaghey, Poona.)

“The expressed juice is a common application as a rubefacient.” (Native Surgeon Rathnam T. Moodelian, Chingleput, Madras.) “Expressed oil used for elongated uvula, is said to act better than nit. arg.” (Surgeon-Major J. J. L. Ratton, M.D., Salem.)

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Chives and Rocambole.

**Medicine.**

"Habitually eaten by many persons subject to rheumatism, or mustard oil, in which a few pieces of garlic have been boiled in scabies and other parasitic skin diseases." (Assistant Sur, Chunder Bhattacharji, Chanda, Central Provinces.) "The juice by the natives to destroy lice. It also acts as a blister, and is frequently used by native practitioners." (Surgeon S. H. Hoshangabad, Central Provinces.)

"The bulb is washed and applied to the temples, and, a counter-irritant, has been known to relieve severe hemicrania; forms of headache." (Surgeon-Major A. S. G. Jayakar, Muscat)

**Food.**

Food.—Used as a condiment in native curries throughout the

§ "The bulbs of garlic are eaten almost daily by the

(Brigade Surgeon G. A. Watson, Allahabad.)

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**Allium Schoenoprasum, Linn.**

**Chives or Céybs.**

A cultivated pot-herb, allied to garlic, with purple flowers; a North Europe. Its hollow grass-like leaves, forming clustered commonly seen in kitchen gardens in Scotland. It is indig Great Britain, and is accordingly very hardy, standing repeat off close to the ground; the leaves are used in salad and to f

Firminger says it is little known in India, but is propagated b

of the roots in October.

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**A. scorodosprasmum, Linn.**

The Rocambole.

A perennial, esculent lily, closely allied to garlic, but regarded milder in flavour. It is a native of Denmark and other parts of it is used in the same way as garlic and the shallot, but its sm are considered more delicately flavoured than either.

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**A. sphaerocephalum, Linn.**

Grows wild in Lahoul.

The root and dried leaves are eaten (Stewart).

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**A. tuberosum, Roxb.; Fl. Ind., Ed. C.B.C., 287.**

_Vern._—Bungaghaunderno, Beng.

Roxburgh says of this plant: "The natives use it as an article as leeks are used in Europe." Royle simply refers to this as a lected by Roxburgh. There seems to be some mistake reg however, for it appears not to have been collected since Ro time, and even Voigt in his Hortus Suburb. Calc. says this is " to us, as well as to our oldest native gardeners, who have been unsuccessful in their endeavours to procure it from the n

hood of the Calcutta Botanic Gardens, where Roxburgh most collected the plant.

The greatest possible confusion exists in India regarding the forms, and, indeed, regarding even the wild forms of the genu and it is probable that, in addition to all the preceding forms, ma are regularly known to the natives of India, and even cultivated a our bazars. Stewart enumerates the following unknown spec with on the Panjab Himalaya: _A. sp. (f odorum)—vern. in Jhel_
Pimento.

ALNUS dioica.

bhāk: in Ladāk, skōdne. A. sp.—vern. Jhelum, khan; Spiti, phāndā. A. sp.—vern. kīār in the Ravi Valley, and kōsā gōkā in Ladāk. Stewart also says that an unknown species is exported from Lahoul to Kūlī, to be eaten as a condiment by Hindūs. (See A. leptophyllum.)

ALLOPHYLLUS, Linn.; According to Gen. Pl., I., 396, reduced to Schmidelea.

Allophyllus Cobbe, Bl.; Fl. Br. Ind., I., 673; Sapindaceae.

Syn.—Orthotrope Cobbe, Wild.; Roxb., Fl. Ind., Ed. C.B.C., 338; Schmidelea Cobbe, Beddome, ixxxii.

Vern.—Thanukjaf, Burm.

Habitat.—A deciduous shrub of East Bengal, South India, Burma, and the Andaman Islands.

Structure of the Wood.—Grey, soft.

ALLSPICE.

Allspice or Pimento.—A small bush or tree. Pimenta acris, Wight, and P. officinalis, Linn., Myrtaceae.

Habitat.—Native of the West Indies. Oleghorn reports that several trees are in Madras, but that the climate of the Carnatic does not seem to suit them. Mason states that this large tree is repeatedly met with in Tāvōy, but it does not flower; he is probably mistaken, as the plant is a small tree.

It is much cultivated in the West Indies for the sake of its aromatic leaves and berries. They partake of the smell and flavour of the cinnamon, clove, and nutmeg. Largely cultivated in Jamaica in what are known as pimento-walks. The berries are highly spoken of as a substitute for tobacco, and are said to be very pleasant, but require to be smoked in a long pipe. They are also used as a spice to flavour food. An oil is obtained by distillation, equal to nutmeg oil; reputed to allay tooth-ache. The bruised berries are carminative, stimulating the stomach, and promoting digestion; they also relieve flatulence. P. acris is regarded as inferior to P. officinalis.

Almonds, Bitter and Sweet, see Prunus Amygdalus, Bail., Rosaceae.

Almonds, Country, see Terminalia Catappa, Linn., Combretaceae.


A genus of trees belonging to the tribe Betulææ, of the Natural Order Cupulifera, a tribe which formerly was viewed as a Natural Order. The genus contains some 14 species, inhabitants of Europe, temperate Asia, and America, chiefly delighting in a moist soil, and most of them preferring the northern or alpine regions to the warm southern tracts of the temperate zone.

Leaves alternate, deciduous, rounded, blunt, serate-pinnerved, and furnished with tufts of whitish down in the angles of the veins beneath. Flowers monoecious; male catkins long, pendulous appearing, in autumn; stamens 4. Female-spikes ovate cone-like, appearing in spring; after fructification the thickened scales of the cone open and allow the seeds to escape, the cone-like bodies remaining attached to the tree until next year. Compare with the 2-stamened condition of Betula with its caduceous cones.

Alnus dioica, Roxb.; Fl. Ind., Ed. C.B.C., 658.

A Euphorbiaceous plant. Syn. for Aporosa dioica, Müll.-Arg., which see.
Dictionary of the Economic

**ALNUS nepalensis.** The Nepal Alder.

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**The English Alder; Schwarzerle, Ger.; Aune glı Fr.; Ontanoneru, It.**

**Habitat.**—The English alder has apparently not been introduced into India.

**Properties and Uses.**—

Dye and Tan.—The bark is used in dyeing and tanning. It contains about 20 per cent. of a peculiar tannin.

Medicine.—The bark and the leaves are very astringent and bitter. The former has been used in intermittent fever, as an external remedy in the treatment of wounds and bruises. The leaves are also sometimes applied to the breasts for arresting the milk. A decoction of the cones is used as a gargle. The wood of Alder is also used for furniture. The wood is durable. There is no heartwood. Knotty trees often become beautifully mottled wood. The Alder is the badge of the Clan Crichton. The wood furnishes the best charcoal for gunpowder. Used extensively in Europe for herring-barrels.

The following are indigenous species:—

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A. nepalensis, D. Don; Brandis, For. Fl., 460; Wall., Pl. A. 1. 131.

**THE NEPAL ALDER.**

**Vern.**—Kahi, Ka, Pn.; Udish, Kumaon; Udia, udish, wista, &c.

**Habitat.**—A tall, sparsely-branched, deciduous tree, whose leaves become completely perforated by insects. It occurs from the Ranikhetward, between 3,000 and 9,000 feet in altitude, extending eastward to the Khasia and Nagá Hills (Wait), and to the Kakhyn hills in Ava (Burma).

**Botanic Diagnosis.**—The tree is easily recognised by its dark-coloured bark in young trees, becoming brown and fissured. Its leaves are oblong to elliptic on a slender petiole, obtuse at the base, acuminate. **Cathinks sessile**; **cones** ovoid, shortly stalked. **Nuts** winged, often broadest at the apex. **Fruit** ripe in March.

**Properties and Uses.**—

Dye.—The bark is used for dyeing and tanning. By the Nagá Manipuris it is used in combination with Rubia silkainensis and I. mutisii to deepen the colour. See Rubia. **The bark is used in tanning and dyeing.** It is also said to enter into the composition of native re (Madden).

Oil.—Said to yield an oil resembling birch oil.

**Structure of the Wood.**—Similar to that of A. nitida, but the rays are fewer and somewhat larger, and the medullary rays are very numerous. Weight 27 to 28 lbs. per cubic foot.

It is used for tea-boxes in Darjeeling.

This is perhaps one of the commonest plants in North Mán the Nagá Hills, extending into the mountains of North Burma, rare in Mánipur proper, owing to the prevalence of dry red clay, moist soil and river-bank in the region indicated from 3,000 to 5,000 altitude is, however, full of it, and so also are some portions of it try to the south and west of the valley of Mánipur, extending A. 800.
Northern Cachar hills. It might be propagated to an unlimited extent, and not only supply timber and fuel, but its bark might easily form an article of internal trade. How far it might prove practicable to extend the cultivation of this useful tree into the tea districts of Cachar, Sylhet, and Assam, remains to be proved, but if not already attempted, it seems worthy of a trial. It grows rapidly, stands being pollarded freely, and if not propagated for its light soft wood for tea-boxes, would form a valuable source of fuel, luxuriating in the damp, uncultivatable banks of rocky streams and river-beds.


**Vern.**—Shred, sawali, sawdili, silein, rikkhara, chhdp, chamb, toph, or chhupa, pldk, kansk, kansi, kankh, ni, kash, kori, rajn, kandash, Pa.; Paya, udesh, Kumaon; Gira, ghunabbe, Ng.

**Habitat.**—A large tree, 80 to 100 feet in height, met with in the Panjab Himalaya, ascending from 1,000 feet to 9,000 feet in altitude. **Brandis** says the largest trees are seen in the basins of the Jhelum and Chenab.

**Properties and Uses—**

**Dye.**—The bark is used for dyeing and tanning.

**Fibre.**—The young twigs are used for tying loads, rope-bridges, &c., and in the construction of baskets.

**Fodder.**—Leaves are sometimes used as fodder.

**Structure of the Wood.**—Reddish-white, soft, close, and even-grained tough to cut; annual rings distinctly marked by harder wood near the inner edge of each ring. Used for bedsteads and for the hooked sticks of rope-bridges.

The Indian Alders do not seem to possess, in the same degree at least, the properties of the English and American species. It is probable, however, that their properties are only unknown, and that they require to be made known in order to take an important place amongst the indigenous products of the country. "The bark of several alders is of great medicinal value, and a decoction will give to cloth saturated with it an indelible orange colour." (Porch.) "It contains a peculiar tannic principle. American alder has come into use for tanning; it renders skins particularly firm, mellow, and well coloured." (Easton.) "The bark contains 36 per cent of tannin (Muspratt)." (Baron F. Von Mueller, Extra-Trop. Plants.)

**ALOCASIA, Schott.; Gen. Pl., III., 497; Mono. Phaner., DC., II., 973;**

A genus of herbs, belonging to the Araceae in the tribe Colocasiae, containing about 20 species, inhabitants of the tropics in Asia and the Malay Archipelago. Tall herbs, with a succulent, sub-erect stem, marked with scars. Leaves, the younger all peltate, the older sagittate-ordate, the petiole elongated and possessed of a well-developed sheath. **Peduncles** often numerous and pointing upwards. Spathe-tube naked, ovoid or oblong, convolute, acrescent, and persistent. Spadix inappreciably. Flowers, the upper male, the lower female, **Fruitlet** absent. **Ovary** 1-locular, or at the apex 3-4-locular; **ovules** few, anhetrocarpous, erect from a basilar placenta; **micropyle** on the apex.

**Alocasia cucullatum,** Schott.; Syn.—Arum cucullatum, Lour.

A native of Bengal.

**A. fornicatum,** Schott.; Syn.—Arum fornicatum, Roxb.

Used medicinally (Roxb., Fl. Ind., Ed. C.B.C., 626).
ALOCASIA rapiformis.

Alocasia indica, Schott.

Syn.—Arum indicum, as in Roxb., Fl. Ind., Ed. C.B.C., cum, Roxb., in Wright, I., III., t. 794.

Vern.—Mānkhāna, Hind.; Mānkachā, Beng., Ass.; Mānak, Mar.

Habitat.—Generally cultivated around the huts of the poorer people of Bengal, its large leaves forming a striking feature of such localities.

Properties and Uses—

Food.—Its esculent stems and root-stocks are eaten in curries of all ranks. It is, in fact, an important article of food in the diet of the poorer classes. The tough outer skin is removed, the stems are cut into pieces, and boiled along with rice-flour until the moisture has evaporated, and is given to the patient, no other food being given. (Compare with Colocasia antiquorum.)

Opinions of Medical Officers.—"I have never used it as a medicine; but as food taken frequently, it seems to act as a laxative and diuretic. In piles and habitual constipation it is used. The growing in loose soils and ash-pits are best. The tough part is rejected, and the stems and root-stocks boiled and the sap drained away, otherwise they are likely to irritate the throat and palate. (D. Basu, Faridpur.)" The flour of old dried stems is a valuable food for invalids. It is an excellent substitute for arrowroot, in which I have used it in many instances." (Assis, Shri Chunder Bhattacharji, Chanda, Central Provinces.)

"The starch contained in the edible stem seems much more digestible than rice; and in the milk treatment of cases of malnutrition with anasarca, I have found this root useful to accentuate the urge to return to starchy food. It has no medicinal virtue. I have used it extensively in the Rungpur Jail." (Surgeon K. D. Ghose, Khulna.)

"Kuchā is a very agreeable vegetable in the convalescent period after bowel complaints. It is light and nutritious and somewhat laxative. I prescribe it often in such cases. The root-stock is cut and cut in small pieces and boiled in water. It is sometimes mixed with brinjal or other vegetable and made into a curry with turmeric and salt." (Surgeon-Major R. L. Dutt, M.D., Patna.)

"Root-stocks are largely used for patients; they are juicy and agreeable and can be mixed with honey, which is used in cases of aphthae. (Surgeon Anund Chunder Mukerji, Noakhali.)"

A. montana, Schott.

Syn.—Arum montanum, Roxb.

The natives of the Northern Circars use the roots to prepare a dish. (Roxb., Ed. C.B.C., 652.)

A. odorata, C. Koch.

Syn.—Arum odorum, Roxb.

Flowers are fragrant.

A. rapiformis, Schott.

Syn.—Arum rapiforme, Roxb.

A native of Pegu.

A. 814
Products of India.

History of the Drug Aloes.


A genus of plants with thick, succulent, and spiny leaves, belonging to the Natural Order Liliaceae, and comprising some 80 species, chiefly inhabitants of Africa, more particularly of South Africa and the Island of Socotra; now cultivated in all tropical and extra-tropical countries.

Stem absent or short erect, or arise from the roots and sometimes branched. Leaves succulent, forming a rosette on the extremity of the stem, often spiny at the apex and sparsely spinously serrate on the margin. Flowers forming spikes, axillary in the uppermost leaves or terminal, nodding, cylindrical, con- nivent by the short teeth. Stamens 6, hypogynous, as long as the perianth or longer; filaments subulate; anthers oblong dorusphed. Ovary sessile, 3-celled, many-ovuled, by loculiciped dehiscence. Seeds compressed.

The word Aloë is said to be derived from the Syriac, Ἀλώω, and the Greek derivative ἀλώεσ, but in the 10th century the drug was known as Succotrina. In India it is known by the generic name of Elua, Elib, or Mushiabhar. Several species yield a bitter juice which, when inspissated, forms a drug of varying commercial value, according to the care with which it has been prepared, and the specific peculiarities of the plants from which obtained. Indeed, it would seem probable that several species of Aloë afford each of the important commercial forms,—viv, Barbados, Socotrine, Cape Aloes, and Natal Aloes. This being so, it has been deemed the most satisfactory course to treat first of aloes as met with in the druggist's shop, and then to endeavour to discuss the principal facts known regarding the plants from which the aloes met with in Indian commerce are obtained.

History of the Drug Aloes.—The following abstract, taken chiefly from the Pharmacographia, will be found to contain the more important facts connected with the early history of this drug: Aloes appear to have been known to the Greeks in the 4th century B.C., for the Arabian historian Edrisi, accounting for the Greek occupation of Socotra, attributes this to Aristotle having persuaded Alexander to take possession of the island that produces aloes. The original inhabitants were removed and Ionians placed in charge of the island, and of its aloe plantations. In the 10th century aloes were produced only in Socotra, and it is reported that they had greatly improved under the Greek management. Aloes were known to Celsius, Dioscorides, and Pliny, as well as to the later Greek authors and Arabian physicians. Aloes were recommended to Alfred the Great by the Patriarch of Jerusalem, and it may therefore be inferred that the drug was not unknown in Britain as early as the 10th century. In 1516, Pires, a Portuguese apothecary, the first ambassador sent to China, reports to Manuel, King of Portugal, that aloes are found in the Island of Socotra, Aden, Cambyy, and other parts, the most esteemed being that of Socotra. In the 17th century a direct trade was established between Socotra and England. Wollastead, who travelled in Socotra in 1835, reported that it must once upon a time have been far more extensively cultivated than at present. He describes it as growing abundantly in parched and barren places on the sides and summits of limestone mountains, at an altitude of 500 to 3,000 feet. Mr. Wykeham Perry, in 1878, brought specimens of the Socotra aloe to Kew, London, when it was discovered that it was quite distinct from the plant which, by botanists, had come to bear the name of Socotra. This new species was, by Mr. Baker, named in honour of its discoverer, and this interesting fact regarding aloes has since been confirmed by Prof. J. B. Balfour, who has clearly shown that the plant A. Perryi is the true source of the Socotrine Aloes of commerce. From about the 10th century it seems the cultivation of the aloe became in all probability distributed over the tropical portions of the globe.
In the 17th century, Ligon, who visited the Island of Barbados, named the Aloe as if it were indigenous. This was about 20 years before settlers had taken up their residence. He mentions a number of plants which they had introduced into the island. Barbados aloe appeared in the London drug warehouses in 1693, Cape aloe and Natal aloes in 1870. (Flückiger and Hanbury’s Pharm. 1874, p. 33.)

For further particulars regarding the history of Indian aloes, reference is made to A. vera. (See page 186.)

**MEDICINAL PROPERTIES AND USES.**

**Cultivation and Manufacture.**—In Barbados, where the plant is naturally cultivated, the plants are set 6 inches apart, 1 foot wide, the ground having been carefully prepared and the plants are kept dwarf and free from weeds. The leaves are cut annually. The cut leaves are rapidly placed in rows in the cut ends downwards, and so arranged that they form all the leaves into a jar below. These troughs all over the plantation so as to be easily accessible to the cut time five troughs have been filled, the first is exhausted, then neither boiled nor pressed, and no use is made of them after drained off. The juice is next inxsipated by evaporation, injure by being left for some time in the jar. (Pharmagora 1873, p. 33.)

**Description and Properties of the Commercial Varieties.**

In a paper of much practical value, Dr. Squibb (1874, p. 38) discusses the commercial forms of Socotrine and Barbados aloes, describing its therapeutic effect as comparatively mild and gentle and unitonic and aromatic qualities, while the latter is harsh and draught, more irritation, and much more liable to over-action. He that only the better qualities of the so-called Socotrine are credited to human beings, while he regards the various for dos as better adapted to the medication of animals. While pecular distinction holds good—clearly separating the two that are a series of forms of the drug, which, in their external properties, blend into each other so completely that it requires less to distinguish them. The former class is light with a pleasant but feeble aromatic odour. It is mainly by the forms of aloes are valued by the dealers, and it is therefore describe this test: the inferior kinds of aloes are harsh, strong while the better qualities are faint and aromatic. Recent forms of Socotrine aloes have, in the trade, been referred to red Socotrine and yellow Socotrine, the former being held in esteem. Dr. Squibb made the curious observation that the first yellow, becoming red as it dries, while the yellow only deep but never becomes red. The term Hepatic Aloes is exceed and “appears to us unworthy to be retained.” (Flück. and applied to any sort of liver-coloured aloes, its opacity having it attributed to the presence of crystals, whereas it is now believed the presence of a feculent matter, the nature of which although it is most probably produced through the fermentation impurities such as pieces of sheepskin. Dr. W. Craig regards aloes should be administered only in the form of aloin. In opinion upon one or two important considerations:

1st. The resin of aloes, when thoroughly exhausted
Chemical Composition of the Aloe.

possesses no purgative properties, and therefore cannot be the active principle of aloe.

"3rd.—The resin of aloe is not the cause of the griping which sometimes follows the administration of the drug; it is a perfectly inert and harmless substance.

"4th.—Aloin is an active principle, and in all probability is the only active principle of aloe.

"5th.—Being uniform in strength, its dose can be more accurately determined.

"6th.—Its dose being only half a grain to one grain, it can easily be introduced into tonic pills without making these too large.

"7th.—By using the active principle all impurities are excluded which are apt to cause griping." (Year-Book of Pharm., 1875, p. 289.)

The Mabhuul-ul-Adwiyah mentions four kinds of aloe as met with in India, viz., Socotrine, Bokhára or Persian, Indian, and Arabian. The latter is said to be often adulterated with akakia and with gum arabic. The Bokháran is pronounced the worst kind, being full of stones.

Chemical Composition.

References.—Flüch. & Hanb. Pharmacog., 1876, 686; U. S. Dispens., 15th Ed., 155; Tilden, Year-Book of Pharm., 1875, 54; Schmidt, Archiv. der Pharm., V. No. 6, 1875; Pharm. Journ., 3rd Series, VII., 70; Year-Book of Pharm., 1877, 38.

All varieties of aloe have an odour very much of the same character, and a bitter, disagreeable taste. The odour is due to a volatile oil which the drug contains in minute proportions. The most interesting constituents of aloe, however, are the substances known under the generic term of aloin. Chemically, these principles appear to be complex phenols. The name aloin was originally used to designate the substance found in Barbados aloe, but this aloin is now named Barbaloin, and the aloins contained in Natal, Socotrine, and Zanzibar aloe are known respectively as Nataloin and Socaloin or Zanaloín. The three varieties of aloin are crystalline, and by chemical tests can be readily distinguished. Aloes also contain resins, certain of which are soluble and the others insoluble in water. By the action of reagents aloes afford a large number of derivatives. (Pharmacographia.)

The aloin which is met with in commerce is prepared chiefly, if not entirely, from Barbados aloe. Dr. Tilden recommends the following method for the separation of this substance. Crushed aloes is dissolved in nine or ten times its weight of boiling water acidified with sulphuric acid. After cooling and standing for a few hours the clear liquid is decanted from the resin and evaporated. The concentrated solution will be found to deposit a mass of yellow crystals which can be purified by washing, pressure, and by recrystallization from hot spirit. After repeated crystallization the aloin is obtained in the form of beautiful yellow needles, which are fairly soluble in water and in alcohol, but difficulty so in ether. Dr. Tilden recommends for the isolation of zanoloin Mr. Histed's process, which, though troublesome, is the only process at present known. Powdered aloes should be macerated in proof spirit to make a paste, and the liquid gradually expressed from the mass. The yellow cake remaining is purified by crystallization from water and afterwards from rectified spirit.

E. von Sommaruga and Egger and also Rochleder consider the aloins to form a homologous series, for which they have assigned the formula $C_{n}H_{2n}O_{2}$ barbaloin, $C_{n}H_{2n}O_{2}$ nataloin, and $C_{n}H_{2n}O_{2}$ socaloin—compounds derived from anthracene $C_{14}H_{10}$. This opinion has not, however, met with the support of subsequent experimenters, and Tilden is of opinion that, on the contrary, barbaloin and zanoloin, and in
ALOE.

CHEMISTRY.

all probability socaloin, are chemically identical and must be identified by the formula $C_{16}H_{20}O_7$. Tilden, speaking of barbaloin and socaloin, says "the two bodies resemble each other in appearance and in properties."

(a) Zanolain is slightly paler in colour; more soluble in water than barbaloin, and more of the crystallization than barbaloin. Moistened with nitric acid, it gives no immediate coloration, but on the application of nitric acid an intense orange-red is developed.

(b) Barbaloin gives with nitric acid an instant coloration which fades quickly to orange.

Both zanolain and barbaloin, under the prolonged action of nitric acid, give chrysammic acid, and both yield crystallizable chloroform solutions which resemble each other very closely and are believed to be identical with zanolain.

(c) Natalain is widely distinct from these crystalline principles, chiefly in its not forming chrysammic acid nor chloroform solutions. It is also much less soluble than either of the preceding principles.

On the main features of these opinions Dr. Schmidt and other writers have commented. Tilden, confirming the formula given for barbaloin and zanolain, gives the chemical data for the two principal forms of aloin. A drop of nitric acid placed on a slide with barbaloin and zanolain a bright crimson, but produces no effect on socaloin. Barbaloin is further distinguished from zanolain by adding a minute quantity to a drop of oil of vitriol, and noting the vapour from a rod moistened with nitric acid to pass through the surface of the solution. Barbaloin (and also socaloin) will leave a permanent stain, but zanolain will assume a fine blue colour. The reaction with barbaloin rapidly fades, but that with zanolain remains permanent unless heat be applied. These reactions may be conveniently performed with the crude drugs. "Aloes yields its active matter on dilution with water, and when good is almost wholly dissolved by boiling with the inert portion, or apothéôme of Berzelius, is deposited as a brownish-red oil. It is also soluble in alcohol, rectified or diluted. It is also soluble in alcohol, and its habit is such that it impairs its purgative properties by oxidising the aloin and making it insoluble. The alkalies, their carbonates, and soap, alter in so far as its chemical nature, and render it of easier solution. It is a characteristic that it swells up and decrystallises when it burns, and gives off a smoke which has the odour of the drug." (U. S. Dispens.).

Fact that heat affects the properties of the drug must be clearly borne in mind; since the heat used in melting, straining, and drying out bears the account of the presence of impurities, often becomes necessary, and can be used medicinally, will, unless carefully performed, inordinably affect the action of the drug.

Trade Returns of Aloe.

<table>
<thead>
<tr>
<th>Years</th>
<th>Imports</th>
<th>Exports and</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quantity</td>
<td>Value</td>
</tr>
<tr>
<td></td>
<td>Cwt.</td>
<td>£</td>
</tr>
<tr>
<td>1870-71</td>
<td>792</td>
<td>21,330</td>
</tr>
<tr>
<td>1871-72</td>
<td>1,029</td>
<td>24,721</td>
</tr>
<tr>
<td>1881-82</td>
<td>1,023</td>
<td>25,750</td>
</tr>
<tr>
<td>1882-83</td>
<td>1,345</td>
<td>29,314</td>
</tr>
<tr>
<td>1883-84</td>
<td>1,011</td>
<td>31,639</td>
</tr>
</tbody>
</table>

A. 817
Products of India.

Jafferabad Aloes.

ALOE abyssinica.

Detail of Imports, 1883-84.

<table>
<thead>
<tr>
<th>Provinces into which imported</th>
<th>Quantity.</th>
<th>Value.</th>
<th>Countries whence imported</th>
<th>Quantity.</th>
<th>Value.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bombay</td>
<td>1,593</td>
<td>30,709</td>
<td>Aden</td>
<td>1,102</td>
<td>15,591</td>
</tr>
<tr>
<td>Sindh</td>
<td>18</td>
<td>930</td>
<td>Arabia</td>
<td>489</td>
<td>15,768</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>China—Hong-Kong</td>
<td>20</td>
<td>280</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,611</strong></td>
<td><strong>31,639</strong></td>
<td><strong>Total</strong></td>
<td><strong>1,611</strong></td>
<td><strong>31,639</strong></td>
</tr>
</tbody>
</table>

Detail of Exports, 1883-84.

<table>
<thead>
<tr>
<th>Provinces from which exported</th>
<th>Quantity.</th>
<th>Value.</th>
<th>Countries to which exported</th>
<th>Quantity.</th>
<th>Value.</th>
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</thead>
<tbody>
<tr>
<td>Bombay</td>
<td>520</td>
<td>20,758</td>
<td>United Kingdom</td>
<td>341</td>
<td>18,097</td>
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<tr>
<td>Madras</td>
<td>90</td>
<td>878</td>
<td>Straits Settlements</td>
<td>229</td>
<td>2,745</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Other Countries</td>
<td>49</td>
<td>833</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>610</strong></td>
<td><strong>21,676</strong></td>
<td><strong>Total</strong></td>
<td><strong>610</strong></td>
<td><strong>21,676</strong></td>
</tr>
</tbody>
</table>

The following are the principal forms of Aloe met with either in cultivation in India, or in the drug of which a large import and internal trade exists:—


Jafferabad Aloes.

Syn.—A. maculata, Forsh.; A. vulgaris, var. abyssinica, DC. Plantae Grasses sub. t. 27.

Habitat.—Dr. Dymock informs me that this plant is common on the coast of Bombay and Gujarât, and that it furnishes the round cakes known as Jafferabad Aloes. It is a native of Abyssinia and Central Africa.

Botanic Diagnosis.—Stem simple, 1-2 feet in height, 2-3 inches in diameter. Leaves ensiform, 1 1/2-2 feet long, broad-acuminate, green, often white spotted, base rounded. Raceme dense oblong; bracts lanceolate-acuminate, 3-4 lines long. Flowers yellow, base green, tube short, teeth long. Stamens often exerted. Introduced into Europe in 1777.

Medicine.—It seems probable that this species may contribute, along with the two following, to the so-called Moka Aloes imported from the Red Sea coast into Bombay, or by way of Zanzibar from Socotra, and re-exported to Europe.

Under the heading Aloe abyssinica, Baker, Dr. Dymock, in his Materia Medica of Western India, p. 667, gives an interesting history of the Indian Aloes. The Mohammedans, he informs us, learned the preparation and uses of the drug from the Greeks. Its manufacture spread from Africa and Arabia, ultimately reaching India. He further states that the Hindús, through unaware of the method of preparing the inspissated sap, have long been in the habit of using the plant medicinally under the name Ghirta kumari. In Eastern and Southern India, the Ghirta kumari is one of the forms of A. vera, probably an indigenous plant to India, while A. abyssinica seems to have been introduced. It may be the case, however, that all wild A. 820
or cultivated Aloe of India go by the name of Ghirta kumari. (See A. vera, var. officinalis.)

Pickled Aloe.—Dr. Dymock says that the leaves and flower-stalks of Aloe abyssinica, A. succotrina, are pickled by the natives of Gujerat after having been soaked in salt and water.

§ "The aloe cultivated in the Kanara district are more succulent, yielding larger quantities of viscid juice. The fresh leaves are used as emollients in lieu of linseed poultices, meal, flour, &c., for abscesses and ulcers. The leaf is first roasted and then laid open on its inner side and applied whilst warm. It hastens suppuration." (Sergeon-Maj.-Gen. W. Nolan, M.D., Bombay.)

Aloë ferox, Miller, is one of the principal plants from which Cape Aloe are obtained.

A. spicata, Thunb., is also one of the Cape Aloe plants.

A. succotrina, Lam., and A. Perryi, Baker.

The Socotrines Aloe of Commerce; the Yamani of Mecca; the Aloe of Bombay.

In the present state of our knowledge of the subject it has been deemed advisable to discuss the various forms of the drug, commonly known as Socotrines aloe, under this head, without attempting to separate the two species mentioned above. Recent discoveries in the Island of Socotrâ itself made by Mr. Perry, and later by Professor Bayley Balfour, have shown that A. Perryi to be the species from which the pure Socotrines aloe is derived, but much of what is sold commercially as Socotrines aloe is doubtless grafted from other species, and chiefly from A. succotrina. This is specially true of the Socotrines aloe not obtained from the Island of Socotrâ.

Syn.—A. perforata, var. succotrina, Curt.; A. vera, Miller. See Baker in Linnæan Journal, XVIII., 1793.

Verum.—In the chemist's shop Aloe goes by the same names as are given to the next species, viz., Síbar or Sabir, Arab.; Boldi, vête, Pers.; Musambâr-stó, yále, Hind.; Meshâbbâr, Beng.; Bolda, elvis, musâbâr, Duk.; Musambârâbî, Mar.; Koriya pomâ, Tam.; Masâmâbâm, Tel.; Chennadâyâkam, Mal.; Eliyâ, Cutch; Yelîbâ, Guj.; Mus.; and Burm.; Kalu-âlam, kurilâbâm, Singh. The name of the Socotrines aloe is Sîbâ-agârîtâ, Arab. Met with in all the bazaars of India.


Habitat.—Dr. Trimen writes me that he regards A. succotrina as indigenous to South Africa and not Socotrâ or the Red Sea district; this is the modern opinion, although, as the name implies, it was formed as a native of the Island of Socotrâ. A. Perryi, as far as it has been discovered hitherto, is peculiar to Socotrâ, and the presumption is that it is the species from which the Socotrines aloe is obtained in the Island of Socotrâ itself.

Botanic Diagnosis.—A. succotrina, Lam.—Stem woody, often 5 feet in height, strongly ridged with scars of the fallen leaves, often becoming dichotomously branched. Leaves crowded, the rosette 2 to 3 feet in diameter, ensiform, falcate, sessile, amplexicaul, 15 to 20 inches long, tapering to an acute point. Scape exceeding the leaves, angled, purplish green.
Socotr ine Aloes.

ALOE
succotrina.

green; flowers numerous, forming a narrow, erect, spike-like raceme; pedicels erect, curved so that the flowers are pendulous; bracts shorter than the pedicels. Flowers about 1½ inch long, red below, orange-red or pinkish in the middle, with greenish white tips, deeply cut into 6 obtuse segments. Stamens 6, 5 sometimes exceeding the perianth.

A. Perry, Baker.—Stem simple, 1 inch in diameter, scarcely rising above ground. Leaves crowded, much shorter than in the preceding and rounded at the base. Racemes dense; bracts lanceolate, sub-equal to the pedicels. Flowers red, 9-10 lines long; segments oblong, three times the length of the tube. Stamens included.

Medicine.—In small doses, the drug aloe, prepared from the juice of the leaves, is stomachic, tonic; in larger doses, purgative, and indirectly emmenagogue. It is a remedy of great value in constipation caused by hysteria and atony of the intestinal muscular coat. It is also very useful in atonic dyspepsia, jaundice, amenorrhoea, and chlorosis. Locally applied, dissolved in glycerine, it is valued as a stimulant application in skin diseases. (Pharm. Ind.)

Dr. Dymock informs me that a mixture of aloes and myrrh is known in the Deccan as musabah, and that Socotr ine aloes is largely imported into Bombay. It appears that Dr. Dymock (pp. 660 and 670) regards the Socotr ine aloes as distinct from the moka. He may be correct in this opinion, but it seems doubtful if any Socotr ine aloes can be said to be the product of but one species even when imported direct from Socotra, and it is more than probable that the purer forms of African aloes are regularly sold under the former-immemorial reputation of the Island of Socotra, the more so since all the imports from Socotra, preserving the old trade route, come by way of Zanzibar to Bombay and England. The distinction which it is possible to establish is that pure Socotr ine aloes is the product of A. Perry, while the aloes to which the name moka or Arabian aloes may in the future be restricted, is the product chiefly of A. succotrina and one or two allied species inhabiting the Red Sea coast and the Arabian coast of the Persian Gulf. It may accordingly be found convenient to refer Socotr ine aloes of commerce to two great sections:—

(A) The Pure Forms of Socotr ine Aloes (contain Socaloin).

Speaking of these separate forms Dr. Dymock says of Socotr ine aloes: "This drug is imported into Bombay viai Zanzibar and the Red Sea ports. It is packed in skins, the packages varying much in size and shape, and often containing a large proportion of rubbish, such as pieces of hide, stones, &c. In Bombay the skins are opened, and the aloes repacked in boxes for exportation to Europe. The best Socotr ine aloes is of a reddish-brown colour, hard externally, soft internally; the odour is aromatic and peculiar; when powdered or in thin fragments it is orange-brown; sometimes it is almost fluid."

Flückiger and Hanbury, in their Pharmacographia (1879, p. 684), say of this form: "The Socotr ine, so-called Bombay, East Indian, or Zanzibar aloes, which when opaque and liver-coloured is also known as Hepatic aloes, is imported from Bombay into England in kegs and tin-lined boxes. When moistened with spirit of wine, and examined in a thin stratum under the microscope, good Socotr ine aloes is seen to contain an abundance of crystals. As imported it is usually soft, at least in the interior of the mass, but it speedily dries and hardens by keeping, losing about 14 per cent. in the process. "Some fine aloes from Zanzibar, of which a very small quantity was offered for sale in 1867, was contained in skin." When it is fluid it is known as Liquid Socotr ine Aloes. This was at one time supposed to be different from Hepatic A. 827
Aloe vera.

Indian Aloe.

Aloes, and that the latter owed its opacity to crystals. But it has been shown that the opacity is due to some feculent matter, and that therefore opaque aloeos, from whatever plant derived, equally deserves the commercial name of hepatic aloes.

Bentley and Trimen say the colour of Socotrine aloe varies: "the reddish tint is also liable to great variation; thus sometimes the masses are garnet-red, at other times they are much paler, and when quite dry are golden-red, and yield a golden-yellow powder. By exposure to air the colour is deepened. The fracture is usually smooth and resinosus, but sometimes rough and irregular."

(B) The Impure Forms, or Yamani or Moka Aloes (contain Zanaloïn?)

This, Dr. Dymock informs us, is imported from Arabia into Bombay. It is the kind of aloes most in use by the natives of India. "It varies much in quality. It is of a black colour in mass, and somewhat porous, but thin fragments are translucent and yellowish brown; the odour is powerfully astringent, without the aroma of Socotrine or Jaffarabad aloes; medicinally it appears to be sufficiently active. With nitric acid it gives a deep-red colour, like Barbados; the solution in sulphuric acid is not affected by nitric acid fumes." (Mat. Med., W. Ind., 570.) The Pharmacographia says: "A very bad, dark, festerd sort of aloes is brought to Aden from the interior. It seems to be the Moka Aloes of some writers."

Special Opinions.—§ "Useful in combination with sulphate of iron in cases of irregular or suspended menstruation, also in hysteria, headache, constipation, and flatulence." (Brigade Surgeon J. H. Thornton, B.A., Moughyr.) "In sprains and inflammations, applications of aloes and opium are found to be very beneficial in allaying pain, &c." (Assistant Surgeon Doyal Chunder Shome, Campbell Medical School, Sealdah, Calcutta.) "Purgative, and emmenagogue when applied externally over the abdomen in puffiness of the abdomen. The tincture, in combination with simple soap liniment, when applied over the abdomen of children who cannot tolerate aperients by the mouth, acts freely on the bowels." (Surgeon W. Barren, Bhuj, Cutch, Bombay.)

"Given internally by the hakims in bronchial catarh and jaundice; externally applied with lime-juice in contusions and sprains." (Surgeon-Major J. T. Fitzpatrick, M.D., Coimbatore.) "Formed into a paste with hot water, it is useful when applied to severe sprains and contusions." (Surgeon-Major J. T. L. Ratton, M.D., M.C., Salem.) "Aloes rubbed up with opium, myrrh, and white of egg, applied to any swelling, causes absorption, soothes and relieves pain." (Surgeon-Major Henry Davi Cook, Calicut, Malabar.)

Aloe vera, Linnaeus.

Barbados Aloes, Indian Aloes, Eng.; Aloe, Fr.; Aloe.

Germ. — Ghi-kavoer, Ghî-kavanar, or ghîgûr, komûrî, Hind.; Ghi-kumûrî, gîrta-kumûrî, Beng.; Ghîrta-kumûrî, kanyd, Sans.; Sâh umâbrisûbi, Arab.; Durakkhi-esûr, Pers.; Elsed (the resin), Korî (the plane), kumàrî, ghî-kavanar, kavanar-patha, Duk.; Korâphud, Maw.-Kumûr, Guj.; Kavoer, kora kundu, kora-phad, lephee, Sind.; Kattrau, or Kattalai, shôût-kattrainoi, or shôût-kattrainoi, or kattulai, Tam.; Kaliandha, Tr.; Kattrewoûka, or lettola, Mal.; Lalvarû, Kâ; Komarka, Singh.; Jozâvon-le-pâ, or shadam-le-pâ, Burm.

The resinous extract is generally known as Sîrûr, Pers. (See also under A. succotrina.)

Mr. J. G. Baker, in the Linnaean Society's Journal, Vol. XVIII. —

A. 829
Indian Aloes.

176, has established the synonyms above given, and formed under this species two varieties. Bentley and Trimen, in their *Medicinal Plants*, reduced all the names for the forms of this species to mere synonyms, under the name of *A. vulgaris*, Lam. Mr. Baker seems correct, and the varieties formed by him are well known to the natives of India, and their individual properties have been recognised in native practice from almost time immemorial.

Habitat.—There are many sub-varieties of this plant met with in cultivation throughout India, some of which have run wild, as, for example, on the coast of South India. All the forms of this species must, however, be described as natives of Northern Africa, from Morocco eastward; of the Canary Islands and of Southern Spain. They have long been cultivated in the West Indian Islands, Jamaica, Antigua, and Barbados, where they were probably introduced at an early date from the Canary Islands.

Botanic Description.—*Stem* short, 1-2 feet, 2-3 inches diameter. *Leaves* ensiform, densely crowded, 1/4 to 2 feet long, broad at the base, attenuated at the apex to a blunt point, pale green, glaucous, distantly dentate. *Scape* 2-3 feet long, simple or branched. *Racemes* dense, 1/4 to 1 foot long; *bracts* lanceolate-acute, 3-4 lines long. *Perianth-tube* yellow, cylindrical, 9-12 lines long; *segments* three times as long as the tube; *stamens* and style distinctly exserted.

Properties and Cultivation of Barbados Aloes.

The plant is readily cultivated, growing in the driest situations and poorest soils. The bitter juice of the aloe is contained in vessels placed just below the epidermis. It escapes when the leaves are cut off close to the stem; it is at first colourless, but quickly acquires a brownish tinge on exposure to the air. Its activity seems to vary with the age of the leaves from which it is drained, and the season of the year. In Barbados, where this species is systematically cultivated, the leaves are cut annually in March and April, during the heat of the day. The better quality of aloes is that obtained by allowing the leaves to drain naturally, for if the leaves be artificially pressed, the juices of the leaf are mixed with the latexiferous fluid and the quality of the drug greatly impaired. The natural heat of the sun is also the best means of drying the insipid sap, for if artificial heat be used, the active property of the drug is weakened. (Bentley & Trimen.)

General Character.—In addition to the forms of *A. vera*, the following are also cultivated in Barbados: *A. succotrina*, *A. purpurascens*, and *A. arborescens*, all of which and many hybrids between them yielding the Barbados Aloes of commerce.

In colour Barbados aloes is not uniform; it varies from a deep reddish brown or chocolate to almost black. It has usually a dull waxy fracture, and is almost perfectly opaque even at the margins. When it presents a smooth glassy fracture it is known as “Capey Barbados.” Its odour is disagreeable and even nauseous; the powder of Barbados aloes is of a dull olive-yellow. It is much more powerful than Socotrine aloes, but more subject to produce gripping pains. It is almost entirely soluble in proof spirit, and under the microscope the solution exhibits numerous crystals. It is said to give in aqueous solution a fine rose colour with chloride of gold or with tincture of iodine, a reaction which does not take place with other aloes.

Dye.—In *Spots' Encyclopedia* there occurs an account of the preparation of the dye “Chrysammic Acid.” It is prepared by heating 8 parts of nitric acid with 1 part of aloes. After the violent action has subsided, a second proportion of aloes is added to the mixture until the fumes of nitric acid are well suppressed.
hypo-nitric acid subside. The mass is then poured into water, when chrysammic flakes settle in the bottom of the vessel. These are washed several times in water. The crystals change their colour under varying circumstances, giving a purple colour to silk, black to wool, and pink to linen. A French firm has recently used it to give a beautiful brown known as vegetable brown, which is produced through the agency of sulphuric acid. This dye is bright; it resists strong alkaline action; it combines with most of the anlines and other dyes, economising them and rendering them thoroughly fast; and it is not expensive.

It would be exceedingly interesting to know if the existence of this dye or dye auxiliary be known to the cultivators of Indian aloes, and if it has ever been extracted in India. The uses of the dye are likely to be greatly developed, and it therefore seems desirable that it should receive the attention of the Indian authorities.

Fibre.—The leaves yield a good fibre. It seems highly desirable that the idea of combining the preparation of the drug aloes with the separation of the fibre should be brought before the public. In the account of the preparation of the drug practised in Barbados (given in the preceding page), it is stated that after the sap has drained off the leaves are rejected and no further use made of them. This seems an unnecessary waste of material, since from these rejected leaves a most useful fibre could be prepared.

Medicine.—As a medicine the *inspired* juice from the forms of this species is in India regarded as but little inferior to the imported Socotrana aloes. It is an aperient, and deemed highly beneficial to persons predisposed to apoplexy. The *fresh* juice from the leaves is said to be cathartic, cooling, and useful in fevers, spleen, and liver disease, enlarged lymphatic glands, and as an external applicant in certain eye diseases. The *pulp* of the leaves is, in native practice, applied to boils, and is regarded as acting powerfully on the uterus, and useful as an emmenagogue. It is also largely used in veterinary medicine. The root is supposed to be efficacious in colic.

Var. *littoralis*, sp., Koening.

Verá.—Chhátá-gí-kavan, chháté-kavár, Hind. Duk.; Chhátá-langánán, BENG.; Shiuru-katísh-ai, or shiu-kattais, TÁM.; Chimé- kalakavará, TEL.; Cheru-katuva-racchi, MAL.; Shiure-kattais, KAT.; Dhakátu-kavár, BOMB.; Nühun-kavan, GUJ.; Lakhir-kumári, MÁT.; Ainslie gives the plant the Sanskrit name of kómarí. *Kóyangal* is a Burmese name for a species of *Cirium*, but it is also sometimes applied to this plant.

Syn.—” This, in my opinion, is a stunted variety of *A. indica*, Regi. (Deputy Surgeon-General Bidie, C.I.E., Madras.)

Habitat.—This is altogether a much smaller form than the typical species, having yellow flowers in simple spikes, with bases of the leaves not half so broad as in the preceding, and always pale green colour. It has become quite naturalised on the southern coast of the Madras Presidency.

Botanic Diagnosis.—Leaves 15-18 inches long, 1½ broad; scape sinuate, 2 feet long.

Medicine.—Ainslie says: “The pulp of the leaves of this small very succulent plant, when well washed in cold water, is prescribe as a refrigerant medicine in conjunction with a small quantity of sugar. The same pulp so purified, and with the addition of a little burnt native practitioners consider as a valuable remedy in ophthalmia.” The opinion of Madras officers as to this local form would be most acceptable. Dr. Waring, in the *Pharmacopoeia of
Indian Aloes, var. officinalis.

says: "By inspisissating the viscous juice of the leaves of A. littoralis collected at Cape Comorin, where the plant is in great abundance, the editor in 1853 prepared several ounces of excellent aloe, which proved actively purgative in the same doses that the officinal aloe is usually prescribed in. Dr. W. Dymock, of Bombay, corroborates the statement that this plant yields very good aloes, adding that he has tried it both in the fresh and dried state. It appears certain that, with a little care, aloes of good quality might be obtained from this source, in considerable quantities, at a cost far less than that of the imported article. The aloes procurable in the bazaars (chiefly imported) is generally of a very inferior description. "The freshly-expressed juice is in almost universal use as an external refrigerant application to all external or local inflammations."

Dr. Dymock (Mat. Med., W. Ind., 668) gives an interesting account of Indian aloes from the pen of Garcia de Orta, a Portuguese physician, who, in 1534, accompanied Admiral Martin Alfonso de Souza to Goa. From this it would appear that the juice and fresh plant were at that time used in South India, and the species was most probably the var. littoralis. In Clusius' translation of de Orta's work occurs a prescription for the use of the fresh plant, viz., aloe leaves sliced, 3 ozs., salt 3 drms., heat to boiling, strain, add 1 oz. of sugar: to be taken cold early in the morning.

§§"Laxative, tonic; useful in diseases of the spleen. The decoction of the root is prescribed as a febrifuge." (Surgeon W. Barron, Bhop, Cutch.)

"Very largely used in Mysore as an aperient and emmenagogue."

(Surgeon-Major John North, Bangalore.)

Var. officinalis, sp. Forsk.

Syn.—A. rubescens, DC.; A. indica, Royle.


Habitat and Botanical Diagnosis.—This is the form met with in a semi-wild condition in Bengal and the North-West Provinces. It has beautiful reddish and orange flowers, with the bases of the leaves purple-coloured and so dilated as to have in all probability suggested the name A. perfollata, given by popular writers to this and many other species of aloe.

Medicine.—§ In cases of chronic fissures and ulcers about the rectum, indigenous aloes have been largely used by the natives both internally and externally. It acts also as an emmenagogue and anthelmintic. It is a favourite medicine for intestinal worms in children. As an aperient it is generally given in combination with turkud or scammony. Dissolved in oil of roses it is used in various affections of the eye. Mixed with banyans it is said to be very useful in chronic discharges from the nose or ears. Dissolved in spirit it is used as a hair dye, and it is said that it also stimulates the hair to grow. Dissolved in warm water and spread over a bathe-leaf and applied while hot to the belly of a child, it is said to act as an aperient." (Asst. Surgeon Gholum Nabi.) "A sweetmeat, halwa, is prepared from the pulp of the leaves and given in cases of piles, and apparently with very good effect." (Surgeon-Major C. W. Calthropp, M.D., Morar.)

"The resinous extract obtained from this plant is applied to swellings
in the form of a paste to cause absorption. It is used internally by
native practitioners in melancholia and brain diseases, complicated with
gastric symptoms. It produces griping, to correct which is
added confection of
roses and mastich. Given as a night pill in haemorrhoids. A paste of
fresh aloe and turmeric relieves the pain of contusions." (Surgeon G.A.
Emerson, Calcutta.) "The pulp with a solution of alum is very extensively
used by native practitioners in every form of ophthalmia, but especially
in catarrhal and purulent ophthalmia." (Asst. Surgeon Jaswant Rai,
Mooltan.)

"The inspissated juice, in combination with gum asafoetida, is applied
as a warm plaster in colic and the pneumonia of infants. It is also given
internally in these cases in doses of 1 grain with borax in the same
quantity with the mother’s milk." (Lal Mahomed, Hoshangabad, Central
Provinces.) "I have seen the juice
applied over the abdomen for constipation and tympanitis." (Surgeon-
Major Robb, Ahmedabad.) "I have seen the juice administered with
powdered turmeric by village native practitioners in
enlarged spleen." (Assistant Surgeon Shib Chunder Bhattacharji, Chandua,
Central Provinces.) "Aloes have been found useful in piles, mixed in
small quantities with sulphur. It is applied by natives externally in the
form of paste—paste—in pleurisy." (Assistant Surgeon Bhugwan Das,
Ranmal Prind.) "A sort of pickle, prepared with aloe, salt, and ajowan,
is very useful in colic and dyspepsia." (Surgeon J. C. Penny, M.D.,
Amritsur.)

"Inspissated juice, mixed with sugar, frequently given in gonorrhoea
with great advantage." (Brigade Surgeon S. M. Shirkore, Moorshedabad.)
"The fresh juice of the leaves is taken with milk and water as a remedy
for gonorrhoea and mephritis. It acts as a mild purgative, emollient,
and demulcent." (Brigade Surgeon J. H. Thornton, Monghyr.) "Hospital
Assistant Gopal Chunder Gangooey, of the Noakhally Dispensary,
reports that he has used the fresh pulp of the leaves, mixed with sugar,
in cases of gonorrhoea, with good results; it acts as a demulcent." (Sur-
geon Anund Chunder Mukerji, Noakhally.) "The fresh juice from the
leaves is cooling, diuretic; largely used by the natives in gonorrhoea.
The tender pulp is eaten in rheumatism." (Assistant Surgeon J. N. Day.
Joyapore.)

"I have used it as a stomachic purgative in veterinary practice with
much effect. It makes a good adjunct to sulphur, for internal use, in ba
cases of mange. In the human subject, in cases of chronic cough due to
dyspepsia, and in cases of foul evacuations, I have given it in 5-grain
doses with ghi, in the former with sulphate of iron, in the latter two
times a day, with much benefit." (Surgeon K. D. Ghose, Khulna.)
"The indigenous drug, known in the bazaars as Musubbar, has all
properties of the Soocotrine or Barbados aloe." (Surgeon R. D. Marr.
M.D., Burdwan.)

"A piece of the fleshy pulp (peeled), about two inches square, with
grains of turmeric, and 10 grains of burnt borax, is a favourite remedy
enlargement of the spleen associated with constipation of the bowe
(Surgeon-Major E. C. Bensley, Rajshahury.)

"One grain of bazar aloe, with 1 grain of bazar sulphate of iron
1 grain of asafoetida, is often used by natives in the form of a pill
spleen enlargement." (Surgeon K. D. Ghose, Basirbhur.)

Food.—The pulp of the leaves is eaten by the poorer people in time
of famine; the seeds also are eaten.


A genus of grasses belonging to the Tribe Phalarideae, comprising in all
some 20 species, inhabitants of Europe and temperate Asia.

A. 841
The Alpinia or Galangal.

**ALPINIA.**

*Spike compressed, one-flowered, peduncled in the sheaths of the upper leaves; glumes 3-4, the 2 exterior empty, compressed, connate below, membranous and awnless. Pale 1, scariosis, 5-veined, awned on the back; stamens 3; style long; stigma filiform, elongated, shortly hairy.**

**Alopecurus agrestis, Linn.; Duthie’s List of Grasses, 25; Gramineae, Slender Fox-tail Grass; Black Grass.**

**Habitat.**—Found in the Punjab in cultivated ground.

**Botanic Diagnosis.**—Stem erect, 1 to 2 feet high, roundish above; panicle tapering, slender. Glume glabrous, but with a row of short cilia on the back, acute, connected below; awn from near the base of the pale and projecting half its length beyond. A troublesome weed.

**Fodder.**—Duthie, quoting Parlatore, describes it as a good fodder grass, fresh or dry.

**Augeniculatus, Linn.; Duthie’s List of Grasses, 25.**

**Fox tail-Grass.**

**Vern.**—Pamilo, N.-W. P.

**Syn.**—A. FULVUS, Sw.

**Habitat.**—Inhabits the plains of Northern India, in wet places ascending the Himalaya to Kumaon and Kashmir valley.

**Botanic Diagnosis.**—Stems ascending, smooth, knotted and swollen at the joints, about a foot long, branching below, knots generally fleshy. Panicle cylindrical, 1-2 in. long. Glume blunt, connected below, ciliate, exceeding the pale; awn from near the base of the pale and projecting half its length beyond it. Pale when opened out oblong, blunt, slightly notched. Anther ultimately violet-yellow. Styles mostly combined.

**Fodder.**—Mueller describes it as a good fodder grass for swampy land. A variety, *A. pamilo*, was found by Royle on the banks of the Jumna.

**A. pratensis, Linn.; Duthie’s List of Grasses, p. 26.**

**Meadow Fox-tail Grass.**

**Habitat.**—Inhabits the North-West Himalaya, 5,000 to 8,000 feet, ascending in Lahoul to 13,000 feet; also found in Kashmir and on the Punjab plains. Is fond of rich pasture lands.

**Fodder.**—A perennial pasture grass, considered one of the best of its class. Sheep thrive well on it. Loudon mentions it as an excellent fodder grass in England.

Since it requires two or three years to attain perfection, it is disqualified from becoming part of a rotation of crops. For fallow and waste lands it is, however, very valuable, especially in damp soils. It has been ascertained that if mixed with white clover, this grass, after the second year, will support five ewes and five lambs on an acre of sandy loam, especially if the soil contains lime. For permanent pastures in warm temperate climates this grass is one of the best.

**ALPINIA, Linn.; Gen. Pl., III, 648.**

A genus of Scitamineæ belonging to the tribe Zingiberææ, containing some 40 species, inhabiting the tropical and sub-tropical regions of Asia, Australia, and Pacific Islands.

*Rhizome thick, often aromatic, horizontal, creeping. Inflorescence a thyrsate, dense-flowered raceme, rarely a lax panicle. Calyx superior, forming a loose tube cut into 5 lobes. Corolla with the tube nearly as long as the calyx or sometimes a little longer. Androecium of six stamens, A. 848.*
### ALPINIA Galanga.

The Greater Galangal and Galangal Cardamom.

in two rows of 3; outer row inserted at the mouth of the corolla, the two posterior or abortive stamens small, forming thickened, glandular, horn-like bodies or absent, the anterior forming the labelium or inner and fourth petal; inner row with the two anterior staminodes reduced to glands, inserted upon the apex of the ovary, and the posterior developed into the solitary fertile stamen. Stamen equal or nearly equal to or only half the length of the corolla; filament generally flattened, concave, embracing the style; connective flattened, not prolonged beyond the anthers, or if prolonged forming a short, broad, rounded, entire or bish appendix. Ovary inferior, 5-celled, many-seeded; style fleshy, passing between and behind the anthers, within the staminal sheath, often compressed below by the glandular staminodes; stigma capitate. Fruit globose, an indehiscent berry or rarely bursting into 3 valves.

The genus is named in honour of the Italian botanist Prospero Alpinus.

### Alpinia Allughas, Roxb.

**Vern.**—Taro, taruuko, Beng.

**Habitat.**—A native of Bengal, Assam, Burma, and Ceylon; also of Konkan in Western India.

**Medicine.**—The aromatic rhizomes are used by the natives medicinally.

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### A. calcarata, Roxb.; Fl. Ind., Ed. C.B.C., 23.

**Habitat.**—A native of China, cultivated in gardens in India; introduced in 1799.

**Botanic Diagnosis.**—Leaves linear-lanceolate, polished. Spikes compound, erect. Flowers large, in pairs or more, expanding at different times. Outer petals 3, linear, equal; labelium ovate-oblong, apex curved bifid.

**Medicine.**—Dr. Moodeen Sheriff says that this is sold as a substitute for galangal in Haidarabad and other parts of India. The rhizome, however, possess no pungency.

### A. Cardamomum, Roxb., see Eleotaria Cardamomum, Maton.

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### A. Galanga, Willd.

The Rhizome.—The Greater Galangal, or Java Galangal, E. Galangal, Port.

The Fruit.—The Galangal Cardamom.

**Syn.**—Amomum Galanga, Linn.


Many of the names for this root-stock indicate an erroneous idea that it is the root of the betel-leaf plant, viz., pan-ki-jar. Hanbury suggests that the Arabic word khaljanjan may have been derived from the Chinese kliang-kliang (wild ginger), which in Europe became further corrupted into galangal, garlangal, and in German galgant.

**Habitat.**—A perennial plant, native of Java and Sumatra, now cultivated in East Bengal and South India.

**Botanic Diagnosis.**—A perennial with broad, lanceolate, sessile, shining leaves, having a short, rounded, ciliate ligule, from 12-24 inches long.

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**A. 853**
The Greater Galangal and Galangal Cardamom.  

**ALPINIA Galanga.**

4-6 broad; stem, when in flower, 6 feet high, the lower half embraced by the smooth leaf-sheaths. *Panicle* terminal, erect, oblong, composed of numerous spreading, simple, dichotomous branches, each supporting 2-3-6 pale-greenish white, faintly fragrant flowers. *Calyx* scarcely the length of the corolla-tube. *Labellum* oblong, stalked, arching towards the stamen, lip bifid. *Capsule* the size of a cherry, deep orange-red; seeds often only one in each cell. (Roxb.; Hance, Linn. Journ., XIII.)

**Description of Bazar Products.—The Rhizome.—The Greater Galangal.**—Recognised from the Lesser Galangal by its larger size, feebler odour and taste, and by its deep orange-brown skin, contrasting prominently with the pale buff hue of the internal structure.

**The Fruit.—The Galangal Cardamom.**—About half an inch long, oblong, somewhat constricted in the middle, or at times even pear-shaped, obscurely three-sided. Often shrivelled on one side from being collected when immature. In colour from pale to deep reddish brown; externally and internally whitish. Seeds united in a three-lobed mass, invested by a white integument, each mass consisting of two seeds, one above the other. Seeds ash-coloured, three-cornered, finely striated towards the hilum; connected to the auxiliary placenta by a long, broad funiculus. Aril tough, closely surrounding the seed; seeds pungent, burning, with an aroma resembling that of the rhizome. (D. Hanbury, Science Papers, 107.)

**History.—Garcia de Orta,** physician to the Portuguese Viceroy of India at Goa in 1563, was the first writer who pointed out that in India there were two forms of Galangal, the lesser and more powerful root-stock imported from China, and the larger a native of Java. The former is that met with in Europe, a rhizome partaking of little medicinal tinctures that are not possessed by ginger, but which, nevertheless, enters into many ancient prescriptions still in use.

**Dye.—Mr. Buck** says that this root-stock is imported into the North-East Provinces from the Panjáb, and is used in calico-printing along with myrabolans.

**Medicine.**—The rhizomes of this species are aromatic, pungent, and bitter, and are used in the form of an infusion in fever, rheumatism, and catarrhal affections. As a drug they are supposed to improve the voice, and poisonous aromatic tubers are sometimes used as carminative or fragrant in complex prescriptions, but they have nothing peculiar in their properties or action. (U. C. Dutt.) How far these properties may have been intended to be attributed to this root-stock or should have rather been given to *A. officinarum* cannot be accurately determined. The statements of Indian authors have to be accepted for the present, but it seems probable that future enquiry may show that, while both the greater and the lesser galangals are regularly imported into India, as far as their medicinal properties are concerned, the former is only used as a substitute for the latter, being commercially less valuable and less active in its therapeutic properties. It is, however, difficult to determine in many cases to which species authors refer. Dr. Irvine, in his *Medical Topography of Ajmere,* says: “Root of this plant is hot and stimulating; used in unction, has a sweet scent; is put into bazar spirits to make it more intoxicating.” This habit of flavouring spirits with galangal also prevails in Russia, see under *A. officinarum.* The seeds also possess similar medicinal properties.

**Dyes.**

Hakims use it in impotence, bronchitis, and dyspepsia. It is disinfectant, used to destroy bad smells in the mouth or any other part of the body. It is also advocated in diabetes mellitus.” (Assistant Surgeon J. N. Dey, Jeypore.) “In Mysore a domestic medicine, much used by old people with bronchial catarrh.” (Surgeon-Major John North, 857.

**Medicine.**

**Rhizome.**

**Galangal Cardamons.**

**Seeds.**

857.
**Alpinia Khulanjan**

**Habitat.**—§ "This plant is found growing in several parts of Madras, and its rhizome, when dried, bears the greatest resemblance to the Lesser Galangal (A. chinensis). The root is not sold as such in Madras, but when sent there, it was recognised by the same native of the Lesser Galangal.

"A few years ago, when I first found the plant, I thought it was a new species of Alpinia, not hitherto described, and have therefore named it Khulanjan, after its native appellation khulanjan, and have described it minutely as I could in the *Supplement to the Pharmacopoeia of India*, 1859."

**Description.**—"If the root of this plant is cut into pieces, it presents the following characters: Tuberosous, about the size of a little finger, somewhat thicker at one end than at the other; it is about a half to three inches long, often knotty and forked, externally and greyish internally, annulated or marked with slightly wrinkled, semi-smooth, and aromatic, and taste strong and pungent. This root is somewhat smaller and lighter in weight than the Lesser Galangal of the shops, but slightly stronger in smell."

**Medicine.**—"With regard to the medicinal properties of A. Khulanjan, it is not only stimulant, carminative, stomachic, pectoral, and of a stimulating nature, but also a very good stimulant tonic for the nervous disorders, as neuralgia, functional impotence, nervousness, &c. It has also proved useful in several cases of incontinence of the bowels. Its preparations and doses are the same as those of ginger."

It is also preferable in another respect, viz., that it is not destroyed by insects, nor rendered in any length of time, but is best preserved as a powder and tincture, the latter being prepared exactly in the same manner as the tincture of ginger, except the quantity of alcohol is to be four ounces instead of two and a half. Doses often from 10 to 30 grains, and of the tincture, from 30 to 90 drops, or drachms."

(Honorary Surgeon Moodeen Sheriff, Khan Apothecary's Dispensary, Madras.)

I have not seen a specimen of the plant referred to as *A. chinensis* by Dr. Hance, but from his description (which was published in the *Supplement to the Indian Pharmacopoeia*, 1859), it is the same plant which Dr. Hance described in the *Linn. Trans.*, XIII., p. 6, 1871, under the name of *A. officinarum*. If this conjecture is correct, according to the rule of priority, the information given by Dr. Khulanjan, and that which, further on, has been given under the name of *A. chinensis*, it would seem, should be reduced to one place under the new name of *A. chinensis*."

**A. Khulanjan, Moodeen Sheriff.** The difference between the Madras plant and the imported Chinese specimens might be due to the former being cultivated in India. Dr. Moodeen Sheriff's description is not a botanical one, but the honour of associating this plant with the Chinese species Alpinia chinensis is deserved recognition of his distinction in the field of economic science. I have left the information on Madras garden plant is in reality the Chinese species, *A. chinensis*.
The Lesser Galangal.

**Alpinia officinarum**

**ALPINIA officinarum**

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**The Lesser Galangal; Alpinia chinensis of Chemists.**

**Vern.**—This is the article which is most frequently sold in the bazaars under the names of *kulunjàn* and *koliýana*, or *pān-ki-jor* or *chandaýyushí*. *Chátula-pān-ki-jor*, *chuta* or *chuti-kulunjàn*, *hindu*, *beno*, and *boma*; *Shittuarattn*, *tam*; *Chátél-pān-ki-jor*, or *kālē-pān-ki-jor*, *dix*; *Sammeluparūsh trakam*, *tel*.; *Khulunjàn*, *arab*.; *Khusrao-dur*, *pers*.

**Habitat.**—The root-stock is a native of China, and is largely exported to Europe and India.

**Botanic Diagnosis.**—Leaves 9-14 inches long, narrowly lanceolate, much attenuated at the apex, leathery, bright green; *ligule* oblong, subsacate, decurrent at the base, and along the margin of the sheath. *Flowers* sessile, closely packed in an erect, dense, terminal spike; *bracts* three, longer than the flowers, the outer green, the inner white; *calyx* and *corolla* finely pubescent. *Labellum* about 1 inch long and broad-ovate, entire, acute or bi-lobed, crispid and denticulate, white striated with dark-red veins which coalesce into a distinct fan-shaped spot near the apex.

**Medicine.**—This is the Galangal of the European shops. In India it is generally known as the *Pan-ki-jar*. It is stomachic, tonic, used by native practitioners to reduce the quantity of urine in diabetes. Is said to correct foul breath when chewed, and the juice swallowed is reputed to arrest irritation in the throat. It is considered a nerve tonic and an aphrodisiac.

The botanical source of this plant—the true or official Galangal—was determined in 1870 by Dr. Hance, who published an account of it in the *Journal Linn. Society, 1873*, Vol. XIII, 6. (Compare with *A. Khulanjin*.) Although a native of China, it has been imported into India and used by the Hindú and Mohammedan physicians from time immemorial. Meer Muhammad Hussain says that if given to infants it makes them talk early, and that a paste of the powdered drug made with oil or water will remove freckles. "Galangal is one of the ingredients of *Warburg's Tincture*. It is not used in English medicine, but there is a considerable demand for it in Russia." (Dymock, *Mat. Med.*, *W. Ind.*, 637.) B. Hanbury (*Linn. Soc. Journ.*, 1871, and in his "Science Papers," p. 73) says: "As a medicine, the manifold virtues formerly ascribed to it (the lesser Galangal) must be ignored; the drug is an aromatic stimulant, and might take the place of ginger, as, indeed, it does in some countries. That it is still in use in Europe is evident from the export from China, and from the considerable parcels offered in the public drug sales of London. The chief consumption, however, is not in
Dictionary of the Economic

ALPINIA officinarum.

Flavouring the Liqueur Nastilla.

364. Spices.

865. Cattle medicine.

England but in Russia. It is there used for a variety of pur for flavouring the liqueur called Nastoilla. The drug is also brewers, and to impart a pungent flavour to vinegar." "medicine and spice it is much sold in Livonia, Estonia, in Russia; and by the Tartars it is taken with tea. It is also in Russia as a cattle medicine; and all over Europe there isumption of it in regular medicine."

In concluding his interesting paper upon this drug, he

"According to Roudot, writing in 1848, the trade in this decline; and the statistics which I have examined tend show that this is the fact." The foregoing notes may thus be sur

"1. Galangal was noticed by the Arab geographer, Ibn in the ninth century, as a production of the region musk, camphor, and aloes-wood.

"2. It was used by the Arabians and later Greek physicians known in Northern Europe in the twelfth century.

"3. It was imported during the thirteenth century with spices by way of Aden, the Red Sea, and Egypt, to whence it was carried to other ports of the Mediterranean.

"4. Two forms of the drug were noticed by Garcia de these are still found in commerce, and are derived res Alpinia Galanga, Willd., and A. officinarum, Hance.

"5. Galangal is still used throughout Europe, but is chiefly largely in Russia. It is also used in India, and is shi in the Persian Gulf and Red Sea."

Galangal (Foreign Trade by Sea).

<table>
<thead>
<tr>
<th>YEARS.</th>
<th>IMPORTS.</th>
<th>EXPORTS.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quantity</td>
<td>Value</td>
</tr>
<tr>
<td></td>
<td>Cwt.</td>
<td>£</td>
</tr>
<tr>
<td>1879-80</td>
<td>3,129</td>
<td>25,503</td>
</tr>
<tr>
<td>1880-81</td>
<td>2,889</td>
<td>19,603</td>
</tr>
<tr>
<td>1881-82</td>
<td>3,813</td>
<td>29,625</td>
</tr>
<tr>
<td>1882-83</td>
<td>3,354</td>
<td>30,932</td>
</tr>
<tr>
<td>1883-84</td>
<td>3,870</td>
<td>35,982</td>
</tr>
</tbody>
</table>

Detail of Imports, 1883-48.

<table>
<thead>
<tr>
<th>Province into which imported.</th>
<th>Quantity</th>
<th>Value</th>
<th>Countries whence imported.</th>
<th>Quart</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cwt.</td>
<td>£</td>
<td></td>
<td>Cwt.</td>
</tr>
<tr>
<td>Bengal</td>
<td>686</td>
<td>7,831</td>
<td>China—Hong-Kong</td>
<td>1,2</td>
</tr>
<tr>
<td>Bombay</td>
<td>1,750</td>
<td>14,897</td>
<td>Straits Settlements</td>
<td>2,5</td>
</tr>
<tr>
<td>Madras</td>
<td>1,434</td>
<td>13,254</td>
<td>Other Countries</td>
<td>1</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>3,870</td>
<td>35,982</td>
<td></td>
<td>3,8</td>
</tr>
</tbody>
</table>

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Products of India.

The Dita Bark.

ALSTONIA scholaris.

Detail of Exports, 1883-84.

<table>
<thead>
<tr>
<th>Province whence exported</th>
<th>Quantity</th>
<th>Value</th>
<th>Countries to which exported</th>
<th>Quantity</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bengal</td>
<td>51 Cwt.</td>
<td>329 R</td>
<td>United Kingdom</td>
<td>480 Cwt.</td>
<td>3,840 R</td>
</tr>
<tr>
<td>Bombay</td>
<td>1,544 Cwt.</td>
<td>12,596 R</td>
<td>Arabia</td>
<td>397 Cwt.</td>
<td>3,736 R</td>
</tr>
<tr>
<td>Madras</td>
<td>75 Cwt.</td>
<td>371 R</td>
<td>Persia</td>
<td>249 Cwt.</td>
<td>1,471 R</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Other Countries</td>
<td>544 Cwt.</td>
<td>4,259 R</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,670 Cwt.</td>
<td>13,306 R</td>
<td><strong>Total</strong></td>
<td>1,670 Cwt.</td>
<td>13,306 R</td>
</tr>
</tbody>
</table>

Note.—It is impossible to say how far these trade returns refer to the Greater and Lesser Galangal respectively.

**ALSEODAPHNE, Nees.; PERSEA, Gartn., in Gen. Pl., III., 157.**

**Alseodaphne, ? sp.; Laurinææ.**

**Vern.**—Domki poma, Ass.

**Habitat.**—A tree met with in Assam.

**Structure of the Wood.**—Soft, red, even-grained.

Used for boats, furniture, and building.

**ALSTONIA, R. Br.; Gen. Pl., II., 705.**

A genus of trees or shrubs belonging to the Apocynaceous (the Dogbane family), in the tribe Cesèberææ. There are about 30 species in the genus, inhabitants of tropical Asia, the Malaya, and Australia.

**Leaves** 3-4-nately whorled, rarely opposite. Calyx short, 5-lobed or parted, glandular within. Corolla salver-shaped; throat naked, annulate or with reflexed hairs; lobes overlapping to right or left. Stamens near the top of the tube included; anthers subacute. Carpels two, distinct. Follicles 2-linear; seeds many and many-seriate in each carpel, oblong flattened, peltately attached, often ciliate (or comose) on both ends; cotyledons oblong flat; radicle superior.

The generic name is in honour of Alston, once Professor of Botany, Edinburgh.

**Alstonia scholaris, R. Br.; Fl. Br. Ind., III., 642.**

Commercially known as DITA BARK.

**Vern.**—Chatman, chhatin, chatum, Beng.; Satiin, chatiin, satwin, satni, Hind.; Sapa-parna, Sans.; Chhatnia, Urya, Santal and Mal. (S. P.); Chaten, bomdu, Kó. Chatwin, Nepal; Purbo, Lepcha; Satiana, chatian, Ass.; Sarim, Bom., Már.; Sainni, Cachan; Bekalip-pala, modas, Tám.; Edakula-pala, palu-garuda, Ídākula-arit, Ídākula-polma, Tel.; Mukamal, palu, Mal.; Jantilla, Kan.; Ruk-attana, Singu.; Chaîe, chaliijn, Magh.; Lai-top, tounyimagbeng, Burm.

Dr. Rice thinks that Sapa chhada and Sapa parna (seven-leaf) are ancient Sanskrit names for this tree. Dr. Moodeen Sheriff says the Singhalese name rük-attana is sometimes given to it; attana is, however, the name for Datura. Dr. Trimen informs me, however, that rük-attana is the correct Singhalese name for this tree.

**Habitat.**—A tall, evergreen tree, widely cultivated throughout India.

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and found in the Sub-Himalayan tract from the Jumna eastward, rising to 2,000 feet; in Bengal, Burma, and South India. Distributed in Java, Tropical Africa, and Eastern Australia. An exceedingly useful tree, it is a highly ornamental tree.

**Botanic Diagnosis.**—Leaves 4-7 in a whorl, ovate or elliptic obovate, 4 by 1 to 2½ inches, nerves 30-60 pairs joining a marginal one, base acute, tip obtuse or obtusely acuminate; cym- duncled or sessile, umbrellately branched or capitulate; corolla white, cent, throat villous, lobes rounded. **Follicles** very long and slender.

**Properties and Uses**

**Caoutchouc.**—It yields a superior quality of Caoutchouc or percha, the *Gutta-percha* of Singapore, which see under **Caoutchouc.**

**Medicine.**—The bark is used medicinally as an antineuralgic, anthelmintic, alterative, and antiparasitic. It is a valuable remedy for the chronic diarrhoea and the advanced stages of dysentery. It is useful in catarrhal fever. The milky juice is applied to ulcers, mixed with oil, is put into the ear in earache. It has also been found most useful in restoring the tone of the stomach in debility and fever. **Ditain**, the uncrystallizable substance obtained from the bark, is reported to be equal in efficacy to the best sulphate of quinine in being free from the disagreeable secondary symptoms of that drug.

**Description of the Bark.**—The bark consists of irregular fragments of bark ½ to 1 inch thick, easily breaking with a short fracture. The outer layer is fissured, dark grey or brownish, sometimes with black spots, readily separates when handled. Inner substance of a bright red has no smell, is bitter but not disagreeable when chewed. (Report of the Bombay Committee regarding a future edition of the Pharmacopoeia of India.)

**Official Preparations and Dose.**—Preparations. An infusion, tincture and the dry powdered bark, also the active principle **Ditain.**

**Dose.**—Of the powder 3-5 grains combined with ipecacuanha and the infusion of gentian used for bowel complaints. Of the infusion 1 fluid ounce; or of the tincture 1-2 drachms. The active principle may be given from 5-10 grain doses, repeated every 3-4 hours, not exceeding 1 per day.

**Chemical Composition.**—**§** The bark of *A. scholaris* has been free of examination. **Gruppe,** an apothecary of Manilla, separated an uncrystallizable bitter principle which he called **Ditain,** and to which he ascribed febrifuge properties of the drug. **Sorup-Bosanerj** obtained from a crystallizable substance, which possessed all the properties of an alkaloid. The bark was next examined by **J. Jobst** and **O. Hesse,** who isolated the following: an alkaloid, **Ditania,** another substance the nature of which was not clearly established, a crystallizable acid, as a fatty acid, and fatty resins and substances. The fatty resins have been named *Echinoucinth, Echicerin, Echitin, or Echitinin* and *Echinrin* and other resins subsequently discovered two other alkaloids, in addition to **Ditain,** *Echitamine* and **Echitinin.**

The *A. constricta,* an Australian species, and the *A. spectab- poell* bark of Java, have also been examined by **Hesse.** From it of the first-mentioned variety he isolated *Alstonine* or *Chloro- Porphyrine,* *Porphyroine,* and *Alstonidine.* The alkaloids contain a yellow, bitter principle. The bark is thus present in the *A. scholaris,* together with **Alstonidine.** In a report on the Centennial Exhibitions, presented to the American Pharmaceutical Association, 1877, it is stated that **Ditain,** from the *A. scholaris* and sulphate of quinin possess the same medicinal effects, while the disagreeable secondary symp-
The Marsh Mallow.

which so frequently follow the administration of a large dose of quinine are absent.

"The results arrived at in the Manilla hospitals and in private practice with dtain are described as simply marvellous. The report further adds that in military hospitals and in penitentiary practice (Manilla) dtain has perfectly superseded quinine, and is now being largely employed with most satisfactory results in the Island of Mindanso, where malignant fevers are prevalent." (Surgeon Warden, Professor of Chemistry, Calcutta.)

Special Opinions.—§ "The tender leaves, roasted and pulverised and made into poultices, act as a useful local stimulant to unhealthy ulcers with foul discharges." (Surgeon-Major D. R. Thompson, Madras.)

Structure of the Wood.—White, soft, even-grained; seasons badly, and soon get mouldy and discoloured. It is not durable, but is easily worked. Weight about 28 lbs. per cubic foot.

It is used for boxes, furniture, scabbards, coffins, &c. In Burma it is made into blackboards, and in Darjeeling, Assam, and Cachar is occasionally used for tea-boxes.

ALTERNANTHERA.

Alternanthera sessilis, R. Br.; Amaranthaceæ (which see).

Vern.—Maké-ná-wanna, Singh.

Food.—Dr. Trimen writes me that this is largely eaten in Ceylon as a vegetable, especially by mothers to increase the flow of milk; also used as a wash for the eyes.


A genus of sub-bushy, herbaceous, erect, or procumbent plants, belonging to the Natural Order Malvaceæ, inhabitants of the temperate regions: 12 known species.

Althaea, classical Latin name for the Marsh Mallow; ðáhúla, Gr.

Althaea officinalis, Linn.; Fl. Br. Ind., I., 9; Malvaceæ.


Habitat.—A native of Kashmir and the Panjáb Himálaya.

Dye.—Often cultivated in Indian gardens for its flowers, rarely for its dye,—a rich blue, obtained from the leaves. A. rosea, Linn., the Holly-buck, yields the dye even more freely than A. officinalis, L.; it is met with plentifully in Kashmir.

Information as to whether this dye is actually prepared in India would be exceedingly interesting.

Medicine.—This plant was held in great esteem by the Greeks and Latins for its healing properties. The Mohammedans also describe it as a purgative and emollient; they use the leaves in the form of poultice. The leaves and flowers mixed with oil form an application to burns and venomous bites. A decoction of the root with sugar is given in cough and irritation of the intestines and bladder. (Dymoch.)

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§ "The juice of the leaves, boiled to a proper consistence with oil in equal parts, is given internally in parasitic affections of (Surgeon Major R. Thompson, M.D., Madras.) "The boiled in common use in Ceylon as a local application to sprains, or other injuries." (Surgeon W. H. Morgan, Cochín.) "The boiled are used as an emollient and suppurative by native hakims.' An excel lent coughing for ulcers." (Surgeon W. Barren, Dhaj, Cutch.) "Is to the inhabitants of Kashmir as medicinal, but I have ther leaves in a poultice. Very common in the Sind Valley nea (Surgeon George Cumberland Ross, Delhi.) "The leaves are fomentation to relieve pain and itching." (Surgeon Major Ha Cook, Calicut, Malabar.)

"The powdered seeds are employed in cases of gravel from. Chewing the leaves is said to allay thirst. Root-bark acts as a diuretic and is used in colic. An infusion of root-barks has also been u eye-wash with success. Seeds dissolved in vinegar are employ ally to remove toothache." (Assistant Surgeon Gholam Nabi.) Food.—Is used as a green vegetable.


The English Holly-hock, Eng.; Guimaude, Fr.

Habitat.—Largely cultivated in Indian gardens, flourished in all hill stations; it probably bears the same vernacular names as given above for the MALLOW.

Medicine.—The seeds of this plant are demulcent, diuretic, and fuge. The flowers have cooling and diuretic properties. The supposed to be astringent and demulcent, and are much used to form demulcent drinks. Boiled with sugar they yield a largely used in India in the treatment of coughs and irritable of the intestines and bladder. (Dymock.) The leaves are usec tice or fomentation, and, mixed with oil, are applied to burn caused by snake-bites.

§ "Althaea officinalis and A. rosea are cultivated in mas in Madras for medicinal and ornamental purposes. The free stems, and roots of both plants yield a mucilage when bruised and shaken in water. The mucilage is cooling, demulcent, a useful adjunct to other medicines in dysentery. In mild cases it by itself to relieve some dysenteric symptoms, and tenesmus. Dose of the mucilage, from one ounce to If used alone it should be repeated frequently. (Honorat Mooden Sheriff, Khan Bahadur, Madras.)

Altingia, Noronha; Gen. Pl., I., 669.

A genus of trees, containing only 2 species (belonging to the Natu Hamamelidæ).

Leaves alternate, persistent petioloed, ovate or oblong, glandularly stipules deciduous or persistent. Flowers in dense heads; heads en a large bract, males racemose, females solitary. Male heads a mas with very short filaments; anthers obverse-pyramidal, the val young three inwards so as to become pseudo-celled, dehiscing lally. Female heads of 12-20 flowers. Calyx confluent, teeth abs with rudimentary anthers inserted on the rim. Ovary inferior, capsels prolonged into 2 distinct deciduous styles; styles numerous axile placenta. Fruiting-head globose, harsh, many-capsuled; see fect, the lowest winged and fertile, the upper without wings and steri
The genus is named after the botanist Altingia; there is only one species met with in India:—

**Altingia excelsa**, Noronha; Fl. Br. Ind., II., 429.

**Syn.**—Liquidambar Altingia, Bl.

**Vern.**—Siláras, Hind. and Duk. ; Jutili, Ass. ; Mbahe-sáyleh, Arab. ; Asle-luurli, Pers. ; Neriurispal, Tam. ; Shilá-rasam, Tel. ; Rasa-mula, Mal. ; Siláras, Guj. ; Shiláras, Mar. ; Nan-ta-yok or nan-layu, Burm.

**Habitat.**—A magnificent tree of the tropical evergreen forests of the Indian Archipelago, Burma, Assam, and Bhután; abundant in the Tenasserim Province of Burm.

**Gum.**—In Java it yields in small quantity an odorous resin, known in Europe under the name Storax, which is obtained by incisions in the trunk; the tree is not regularly cultivated. In Burma, it is said (in the Pharmacographia) to afford a fragrant balsam of two varieties: one pellucid and of a light-yellowish colour, obtained by simple incision; and the other, dark, opaque, and of a terebinthinous odour, procured by boring the stem and applying fire around the trunk.

**Medicine.**—Yields a form of the resin known in Europe under the name "Storax." For medicinal properties see Liquidambar orientalis, Miller.

§ "In orchitis a very thin layer of storax is laid on a tobacco leaf and applied to the inflamed part." (Surgeon Joseph Parker, Poona.)

**Structure of the Wood.**—Soft, reddish-grey, with lighter streaks. Annual rings marked by a narrow belt of firm wood without pores. Weight 46 lbs. per cubic foot.

Used in Assam for building and ordinary domestic purposes.

**ALUMEN.**

**Alumen or Alum.**

**Vern.**—Phatkari, Hind.; Phatbiri, Beng.; Sphattikari, Sans.; Shib, zéi, Arab.; Zhak, siah-sahaf, Pers.; Phatké, turti, patakri, Mar.; Piti-karam, Tam.; Patí-kadóm, Tel.; Patikáram, Mal.; Koo-khin or kyanchin, Burm.

**Preparation of Indian Alum.**—Alum is prepared from alum shale in Behar, in Cutch, and in the Panjab. It is often met with in different shades of colour—white, yellow, red, and black, depending upon impurities.

In the Bombay Gazetteer, Vol. V., pp. 19-20, is given an interesting account of the manufacture of alum in Cutch. It is said to have been carried on for the past two or three centuries. During certain months of the year a large quantity of alum is made at Madh. The material used is pyrous dark-grey or black shale, closely associated with a soft aluminous pseudo-breccia of the sub-nummulitic group. This appears to overlie or enclose the shale or to have invaded it. The native burrowings give a poor chance of studying the relations of the rocks; the air in them is exceedingly bad and it is difficult to obtain light, and much of the ground may have been disturbed by "old men's" workings, which, according to Colonel Grant, fall in every year. Each work is entered by a narrow passage, the sides cut vertically, the floor sloping. About 20 feet below the surface the open air passage stops, and an underground gallery, about 6 feet high and from 3 to 4 feet wide, slopes down to the alum bed, through which, owing to the accumulation of water, no passage has ever been driven.
The alum earth is dug out and exposed for months in heaps. It is then spread in squares and sprinkled with water. After about 12 days, it consolidates into efflorescent and milled crystalline plates of sulphate of alumina, called alum seed, *phatahri-kahon* or *turu*. These plates are boiled in water mixed with salt-potash, and the sulphate of alumina is converted into six times as much of the sulphate of alumina to six times the salt-potash. Before the salt-potash has time to dissolve, the fluid is ladled into small earthen vessels, again boiled to concentrate the solution, which is finally ladled into large bladder-shaped earthen jars, *maláks*, sunk in the ground to prevent breaking. The alum in each jar forms a solid crystal in about four days.

In 1867 the yearly outturn of Cutch alum was estimated at about 294 tons. But after 1867, owing partly to an idea that Cutch alum injures cloth, and partly because the working of the mines was mismanaged, the demand for the Cutch alum almost entirely ceased. The Bombay Chemical Examiner analysed Cutch alum in 1878, and according to him it is better than either English or Chinese alum, as the Cutch alum contains only 13 per cent. of impurities and 10.73 per cent. of alumina, being 0.12 per cent. less than the theoretic quantity. The Cutch State has lately discontinued the monopoly of the mines and begun to sell the alum on its own account.

Irvine, in his *General and Medical Topography of Ajmere*, published in 1844, says that alum “comes from Sind, where it is made; about 300 camel-loads annually arrive; red alum is brought from Lahore; used in calico-printing, it is an astringent; but chiefly employed in dyeing. One maund for Rio. Baden Powell, in his *Panjâb Products*, says that “European alum is white and pure, and is on that account preferred to Indian alum in medicine. Butuminous shade, yielding more or less alum, is abundant, all through the Salt-range in the Panjâb, although the manufacture is confined to two places—Kalâbâgh and Kutki. The alum made at Kalâbâgh is always of a pinkish colour, due to the presence of chloride of iron. It is remarkable that the alkaline base of Kalâbâgh alum is soda, while that of English alum is potash. The shale strata at Kalâbâgh are nearly 200 feet thick. The shale is very soft, and contains a large amount of iron pyrites in crystalline nodules. The red mound-like alum kilns form a striking feature at Kalâbâgh. In making an alum kiln, layers of brushwood generally “jhu” or “pitch” (*Tamarix*) are spread on the ground, and on them more brushwood, and so on. The salt-formed pile is lighted first, and subsequently more layers of salt and brushwood are added, till the pile reaches a height of from 20 to 60 feet. A pile takes 6 or 8 months to burn. The calcined shale is next mixed with water in large tanks of baked earth about 12 feet square and 18 feet deep. The liquid is at a lower level, where it deposits by its own weight and impurities, and is again drawn off into a third vessel. It is then poured into iron evaporating pans and mixed with a dirty-looking salt, called "jamisar", which appears to be similar to the saline efflorescence of red lands, and consists of sulphate of soda with a little common salt, and a very little carbonate of soda. The alkali contained in *jamisar* converts the solution into a clear brown fluid, and is drawn off to be evaporated in various shallow pans called "sirk", grass, after which they are liquefied by heat in iron pans. The liquid is poured into earthen jars, where it again crystallizes.
Alum as Medicine.

ALUMEN.

Kutki.
905

Burma Shale.
906

Burma Alum.
907

MORDANT.
908

MEDICINE.
909

Contents of the jar, broken into lumps, form the alum of commerce. The manufacture appears to have been carried on at Kālābāgh for many generations.

The alum works at Kutki across the Chichallī range is of much more recent date than at Kālābāgh. The cost of manufacture at Kutki is less than at Kālābāgh, owing to the shale being cheaper and the fees lower at the former place.

There is no difference in the quality of the alum produced at Kālābāgh and at Kutki, but the value of Kālābāgh alum is R2-3 a maund on the spot, while Kutki alum sells at R2-8. About 12,000 maunds of alum are made annually at Kālābāgh, and 10,000 maunds at Kutki. It is exported to all parts of India. (Baden Powell, Panjab Products, Vol. I., p. 84.)

§ "According to Dr. Brandis, alum can be obtained from shale which exists in abundance in the Shweygin district in Burma." (J. C. Hardinge, Esq., Secy, Agri.-Horticultural Society, Rangoon.)

Mordant.—It has been found difficult to obtain any very definite information regarding the Indian trade in this valuable salt. Mr. E.C. Buck says it is imported into the North-West Provinces from Calcutta, and is much used as a mordant in dyeing, especially with madder and turmeric. Potash-alum is largely imported into Bombay from Europe. (Dymock.)

Medicine.—In the Indian Pharmacopoeia this substance has been described as astringent, styptic, and antiseptic. Used internally in passive haemorrhages, atomic diarrhoea, infantile cholicla, catarhal affections of the stomach, colica pietomum, whooping-cough, and bronchorrhea; in the form of lotion or powder, as a local application for catarhal ophthalmia, granular eyelids, and many other diseases of the eye, in leucorrhoea, gonorrhoea, menorrhagia, prolapsus of the uterus and rectum, and ulcerations. Burnt powdered alum is used as a snuff to stop bleeding from the nose.

Chemical Note.—"The official alum of the Indian Pharmacopoeia is a double sulphate of alumina and ammonia. Several other alums are known, of different bases, such as potash, soda, iron, &c., replacing ammonia in the salt. It is probable that the burnt alum which so frequently enters into native doctors' nostrums is often useless from too high a temperature having been employed in its preparation. Above 400° F., alum is decomposed—inert and insoluble alumina remaining." (Surgeon C. F. H. Warden, Professor of Chemistry, Calcutta.)

Special Opinions.—§ "It is useful in a phthis, ulcerated sore-throat, spongy gums, salivation, chronic ulcers." (Brigade Surgeon J. H. Thornton, B.A., M.B., Madrhy.) "It has been recommended as useful in relieving the pain caused by a curious tooth." (Surgeon G. F. Poynder, Meerut.) "The domestic use of alum is to clear water. It is a strong cement when liquified by boiling." (Assistant Surgeon T. N. Ghose, Meerut.) "It is used as a gargle in relaxed and inflamed throat." (Brigade Surgeon G. A. Watson, Allahabad.) "Burnt alum is sometimes very effective as an external application to scorpion-bite." (Surgeon Joseph Parker, M.D., Poona.) "If, after the umbilical cord has dropped off, there be any ulceration of the navel, a little burnt alum sprinkled over the part will effect a speedy cure." (Surgeon W. Wilson, Bagha.)

"Found beneficial in early abortions, where a difficulty exists to extract the debris; it also lessens haemorrhage. Should be used in the following manner: finely-powdered alum placed in a muslin bag (the size of a walnut or large-sized marble), with a long thread attached to hang out of the passage. This is introduced into the vagina as far as the os uteri and left there for 24 hours. Should no irritation be felt, the bag can..."
AMARANTACEÆ. Amarantaceous Herbs.

MEDICINE.

be left for another 24 hours, after which, in its removal, the caused liquid lying in the passage and can easily be removed." (Surgeon Peter Anderson, Guntur, Madras Presidency.) "This a mixture of babul bark is useful in dysentery, used as injection. Major P. N. Mukerji, Cuttack, Orissa.) "A piece of as applied to the part stung by a scorpion allays the pain rank alum mixed with lime-juice is useful remedy in ophthalmia. Major John Lancaster, Chittore.) "Alum is one of the best whooping-cough, but it seems to have gone out of use last purpose, it should be given in doses of from 10 to 20 grain a day." (Surgeon-General William Robert Cortis, F.R.I.

"Useful in doses of 5 grains in diarrhoea and latter stages combined with opium. Useful astringent; lotion made out of purulent ophthalmia (alum 4 grains, rose-water one ounce); rhoea and gleet." (Assistant Surgeon Shib Chunder Chanda, Central Provinces.)

ALYSISARPUS, Neck.; Gen. Pl., I., 522

A genus of annual or biennial spreading or erect herbs, about 15 species (belonging to the Natural Order LEGUMINOSÆ).

Leaves simple, rarely 3-fooliolate, stipulate, subcoriaceous. Copious axillary racemes. Calyx glumaceous; teeth deep, often the two upper frequently connate. Corolla, not exerted; stamens keel obtuse, adhering to the wings. Stamens diadelphous; anther ovary nearly or quite sessile, many-ovuled; style incurved; stigma Pod terete or turged, composed of several indehiscent 1-seeded pods.

Alysicarpus vaginalis, DC., var. ummulariifolius; Fl. 158.

Vern.—Náy bala (Stewart's Ph. Pl. 57). Sakháram Arj Bombay Nág bala is the name for Sida Alba.

Habitat.—Himálaya to Malacca and Ceylon, ascending in the North-West Provinces.

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—This may be the official plant referred authors; information very imperfect.

AMARANTACEÆ.

A Natural Order of herbaceous or suffruticosus. glabrous or woolly plants; erect, sparsely branched or scendent. Ls or alternate, simple, usually entire, membranous or fleshy. Flowers small, scarious, diclinous or hermaphrodite, rarely sessile, solitary or in glomerulate heads or spikes, the latter times arrested or developed only into crests, awns, or Bracts three, the lateral smaller, often keeled, the central and sometimes leafy. Calyx 4-5, sepals (in Mengoa) distinct or co- base, erect, equal or sub-equal (2-3 interior sepals smaller), gap rarely petaloid, persistent, imbricate in stivation. Corolla with mens hypogynous, inserted at the base of the sepals, 1-5, fertil early exserted, opposite the sepals (rarely fewer), with or with staminodes, all free or united below, forming a cup or tube filiform, subulate or dilated, sometimes 3-fid; staminodes flat or rarely concave, sometimes very small and toothed; an 1-2 celled, dorsifixed, dehiscing longitudinally. Ovary free, base compressed, rarely depressed, 1-carpenelled and 1-celled; simple, sometimes obsolete; stigma capitatum-emarginate, or lobed or 2-3-fid. Ovule solitary, erect or suspended from funiculus. Fruit usually enveloped in the calyx, sometimes a 2- or more-seeded utricle, bursting by circumcisss dehiscen
Amarantaceous Herbs.  AMARANTACEÆ.

larly, rarely a berry. Seeds usually compressed, reniform, testa crustaceous, black, shining; hilum naked or early arillate, albumen abundant. Embryo perispermic, annular or curved; cotyledons incumbent, radicle near the hilum, inferior or sub-ascending.

Affinities of the Order.—The Amaranthaceae have their closest affinity with the Chenopodiaceae, the latter differing chiefly in habit, and in having distinct styles and a herbaceous calyx.

Its Habitat.—There are 420 species, in the whole world, referred to this Natural Order, and they are mostly tropical or extra-tropical plants, taking the place in the tropics of the Chenopodiaceae, which extend into the temperate regions. In India there are a little over 80 species, chiefly extra-tropical, or if met with in the tropical regions they are annuals, which appear, or are cultivated in the plains, during the cold season only. A few species are strictly tropical, and these, compensating for the sparsity of forms, make up in abundance of individuals, since they are perhaps the most plentiful weeds on roadsides and waste places met with in the plains of India. The Indian species are referred to 15 genera; of these the genus Amaranthus contains 27 species, and 17 occur in Aruga and Acrithya.—two genera, the species of which are undoubtedly the most usual and prevalent Indian representatives of the order. It is not far from correct to say that the Amaranthaceae attain their maximum development in the tropical regions of the New World, the greatest number of species per-haps occurring in Mexico. There are few species in the temperate zone, and none in cold countries, some 5 or 6 species only being met well in Europe.

De Candolle (in L’Orig. des Pl. Cult.) very truly remarks that all the species of Amaranthus spread themselves on cultivated lands, among rubbish-heaps and on roadsides, and have thus naturalised themselves in most Am countries as well as in Europe; hence great difficulty exists in distingushing the species, and above all in guessing or proving their origin.

The following brief classification of the Indian genera may be found useful; it will at least serve to direct attention to the respective alphabetical positions where fuller details will be found regarding the more important members of this order. It is necessary to explain, however, that the information given is of the most meagre kind, since there is perhaps no family of Indian economics regarding which greater confusion exists. Most writers give the information published by them under vernacular names only, and the few authors who do associate these vernacular names with the scientific names for the plants referred to, are unfortunately most conflicting in their statements, so that it has been found next to impossible to arrive at any satisfactory conclusion. It is hoped that this confession, which must of necessity run through the greater portion of the present work, but which is specially true with regard to the Amaranthaceae, may call forth new material, based upon the present attempt at grouping scientifically the available economic information. For museum purposes it is absolutely necessary that all collections of Amaranthaceous food-stuffs or drugs be accompanied with dried specimens of the plants from which they are obtained, together with the various vernacular names given to these plants. Were such collections to be made by the local authorities there would then be no difficulty in having the present confusion regarding the Amaranthaceae completely removed, and this much-to-be-desired result would, without doubt, prove most convenient and valuable both to the cultivator of the soil and to the administrator, since, in times of scarcity and famine, few sources of food are more valuable than the various forms of Amaranthaceous grains. They reach maturity in little more than two months, and require scarcely any rain, so that they often succeed when other crops fail. That confusion and ambiguity should exist in official
correspondence regarding plants of such importance to India, it is to be regretted. The conflicting opinions in vernacular and botanical works, and the conflicting names of economic interest render it impossible to apply the species to which the Indian farmers refer in their vernacular names. For example, it may be mentioned that in the Indian vernacular, the names of the crops are found under the title "ramdana (Amaranthus frutescens)." This name is used for two different species: the "amarantoides," a plant apparently not met with in India, which is placed under "Species non satis notae." According to DeGandolfo (1759), it is one of the rabi crops of the North-West Province.

CLASSIFICATION OF THE INDIAN AMARANTHACEÆ

[Note.—Fuller details of the genera marked * will be found in the alphabetical positions.]

TRIBE I.—CELOSIEÆ.

Anthers 2-locular. Ovary 2, many-ovuled. Leaves alternate.

SECTION 1ST.—Fruit a berry, perianth spreading, stalked.

1. Deeringia.—Flowers racemose.

This genus is now made to include the species formerly known as Deeringia and Cladostachys. The following are the common species:

D. baccata, Moquin; Wight, It. 1, 728.

Syn.—D. indica, Spreng.; D. celosioideae, R.B.; Roxb., C.B.C., 229.

Vern.—Latman, Hind.; Golamohani, Beng.

Habitat.—An extensive climber, very common in Bengal, babul trees with its racemes of small scarlet berries, which ripen from December to January. Apparently not put to any economic uses.

D. muricata, formerly Cladostachys muricata, Moquin, and muricata, Linn.

D. tetragyna, Roxb.; Wight, It. 1, 729.

SECTION 2ND.—Fruit membranous, perianth erect.

2.* Celosia.—Filaments connate at the base, fruit circumsciss dehiscence.

TRIBE II.—AMARANTEÆ.

Anthers 2-locular. Ovary 1-ovuled.

Sub-tribe I. Euamaranteæ.—Ovule erect, funicle short, fertile. Leaves alternate.

SECTION 1ST.—Flowers hermaphrodite or dioecious. Perianth spreading in fruit.

3. Rodetia.—Flowers 2-4—bracteolate.

SECTION 2ND.—Flowers hermaphrodite. Perianth segments fruit.

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AMARANTUS. The Amarant.

12. Æruga.—Perianth segments hairy. Teeth short. He under-shrubs (lanate), leaves opposite or alternate.

13. Achiyanthes.—Perianth, after flowering, deflexed ments and bracts spinescent. Herbs with opposite leaves, flowers lax spikes. This genus is now made to include Achiyanthes and trostachya.

TRIBE III.—GOMPHRENAE.

Anthers 1-locular. Ovule suspended from the apex of a prol funiculus which ascends from the base of 1-celled ovary. Leaves get opposite.

SECTION 1ST.—Stigma simple, capitata.

14. Alternanthera.—Flowers herbaphrodite, capitata, as rarely terminal, solitary or 2-5. Staminal tube nearly as long as ovary; stamens 3 (rarely 5); staminodia nearly as long as the filar. Ovary orbicular compressed. (See page 109.)

The above definition has been restricted to the characters of Indian representatives of the genus, which form a small section of the genus by themselves.

A. denticulata, R. Br.


A. sessilis, R. Br.; Wight, Ic., t. 727.


Vern. — Sanjhi, Beng.; Mokh-mokhanna, Singh.

SECTION 2ND.—Stigma 2-subulate or filiform.

15. Gomphrena.—Perianth often softly hairy or lanate, seg free or united at the base. Staminal tube elongated, antheriferous to Infracrescence capitulate or hemispheric; bracts lateral, concave, 1 crest on the back. Under-shrubs with opposite generally semi-am caul leaves.

G. globosa, Linn.

THE GLOBE AMARANT.

Common in Indian gardens. There are two varieties—Lal-gulma Beng., or the crimson form; and Safed-gul-makmal, the yellowish form.

The Globe Amaranth is one of the most prolific and ornamental flowers in the Indian flower garden, largely cultivated by natives. Flowering time the rainy season.


A genus of tropical plants, belonging to the Natural Order AMARANTACE, comprising some 45 species, of which 27 are most probably natives of India. Leaves alternate, contracted at the base, ovate-lanceolate or linear entire or rarely sinuate-lanceolate, apex often mucronate. Flowers usually monocious or polygamous, bracts, arranged in dense axillary or terminal panicles spikes. Perianth segments 5, rarely 1-3, membranous, equal or unequal, in the male ovate-lanceolate, in the female oblong, white or colour generally purplish red, thickened at the base, erect in fruit. Stamens 5, ran 1-3, filaments subulate free. Ovary ovoid, compressed; style short or wanting stigma 2-3, subulate or filiform and papillose. Ovary 1, sub-sessile, erose.

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fruit often included by the persistent perianth, orbicular or ovoid, compressed, indesecent or opening by a circumscissis, membranous, or coriaceous apex, simple or 3-4 dentate.

This genus, according to the Genera Plantarum, includes the species formerly referred to Euxulus, Mengea, and Amblogyne, as well as to Amaranthus proper.

The generic name is derived from the poetic flower, the Amacea, supposed never to fade. Amaranth, Gen.; Amaranthe, Fr.; Amara 17, Sr., and Port.; Amaranthus, Linn., and ἀμπαοκος, Gr., non-fadu (from ᾱ and παπαίνων, to quench).

O'Shaughnessy says that nearly all the species of Amaranthus "may be used as emollients for enemas, cataplasms, dinitens and drinks. These properties doubtless depend upon the amount of nitrre which they contain. Boutin found that A. Blitum yielded for 100 parts of the plant 1178 grains of nitrre of potash (Journ. Pharm. and Chem., 4th series).

The following brief classification of the more important forms of Amaranthus met with in India may assist the reader to recognise the species as defined by botanists:

(A.) Spikes branched, terminal and axillary. Stamus 5.

**Amaranthus Anandana.**—Erect-branched. Leaves oblong. Spikes erect, cylindrical obtuse. Calyx shorter than the bracts; sepals oblong-elliptic, mucronate.

**Afrumentaceous.**—Stems and branches erect. Leaves broad lanceolate. Spikes adpressed, crowded. Calyx longer than the stamens. Capsule wrinkled; seeds pellucid with a white margin. (This may prove to be kait a form of a A. paniculatus.)

**A. tristis.**—Erect, very much branched near the ground. Leaves rhomboid-ovate, obtuse. Spikes long erect, sparsely branched, green.

**A. spinosus.**—Erect, much-branched, with round spikes in the axils. Spikes terminal, almost simple, with sessile axillary glomeruli.

**A. paniculatus.**—Erect-branched. Panicle 1-2 feet long, decompoundly branched, crimson. Leaves long petioled, broad lanceolate, concave. Sepals obtuse, shorter than the capsule.

(B.) Spikes simple and terminal; axillary ones very short and distant. Stamus 3.

**A. panzericus.**—Erect-branched above the middle. Leaves rhomboid-ovate. Glomerules axillary or spicate; terminal spikes very often ovate obtuse rigid, axillary glomerules ovate. Calyx longer than the slightly rugose capsule and shorter than the bracts.

**A. lanceolatus.**—Straight, erect. Leaves long petioled, lanceolate, tapering at both extremities. Glomeruli axillary scarcely spiked. Calyx 3-5mmembranous, with green keel. Anthers sagittate.

**A. clerens.**—Erect, sparsely branched. Leaves broad, rhomboid-ovate lanceolate. Calyx cuspidate, longer than the rugose capsule.

**A. angostus.**—Terminal spike oblong or sub-globose, very obtuse subulate, axillary glomeruli round. Fruit shorter than the calyx.

**A. lividus.**—Erect, smooth. Leaves long petioled, sub-ovate retuse. Calyx 3-5, shorter than the compressed capsule.

**A. virens.**—Leaves elliptic-emarginate. Glomeruli on the ends of axillary twigs. Sepals obtuse, much shorter than the rugose capsule.

**A. fasciatus.**—Leaves rhomboid-ovate. Panicles terminal, composed of a few cylindrical branches. Bracts minute, shorter than the obtuse sepals, which are shorter than the rugose capsule.

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Indeed, from the fact that it rarely branches, it seems probable that the plant would be injured were the young tops or leaves to be lopped as vegetable. The unbranched habit is, however, the result of thick, broadcast sowings. When grown singly it seems to branch. It is perhaps one of the most elegant crops cultivated by the hill people. Wj young, the large leaves (seen at a distance) remind the traveller of turnip-field, but when the terminal golden-yellow or red crowded spikes flowers appear in the centre of each terminal rosette of leaves, it becomes truly lovely.

Dr. Roxburgh records the following facts: "In the Botanic Garden 40 square yards of ground sown with this plant in June, yielded 211 weight of the clear ripe seed in September. It also grows well during the cold season, viz., from October till February, inclusive." My friend Mr. Campbell, of the Santal Mission, informs me that the plant is specially cultivated by the Santals and eaten as a pot-herb.

Atkinson says: "It is sown in May and June first and second crop unirrigated land, and yields about twenty loads to the acre. The produce of an acre is worth about Rs. 16, and the estimated cost of land is about Rs. 10. The yield and the shortness of the period required for production of this food-supply, seem to justify the opinion already indicated, that this, as also several other species of Amaranthus, might with advantage be resorted to, when, through want of rain, scarcity or ev famine is threatened.

**Amaranthus gangeticus, Linn.**

Vern.—Lālīśāg, HIND.; Ranga-shāk, HIND.; Dāngā, BENG.; Ar-ghandhari, SANTAL; DeCandolle (in L. Orig. Pl. Cult.) says that forms of this plant are called in Telugu Tōta-kēra, with an adjective denote the special form. These are the names that Roxburgh gives to plant he calls *A. oleraceus*, and it is quite probable that the South Indian forms of lālīśāg belong to *A. gangeticus*. Until, however, this has been clearly established, it has been thought advisable to leave the Madras plant in the position assigned them by Roxburgh. Wight, *Ic.*, t. 715; see *oleraceus*.

In India cultivated as a vegetable. There are a large series of forms of this species varying as to colour and shape of leaf, but referable to two sections—those which may be placed under *A. gangeticus* proper, the lālīśāg, and those which would more naturally fall under—


Vern.—Bāns-pātē-nātiyā, BENG.


**Habitat.**—A small annual plant common in Bengal and Assam. Dr. Roxburgh says: "The varieties of this useful species cultivated in Bengal alone are endless." "They are in more general use among the natives of Bengal than any other species or variety. The varieties are tolerably permanent, and differ in colour chiefly, which varies from green with the slightest tinge of red, to rufous, liver-coloured, and bright red. One variety has particularly broad leaves, with the margins green, and the centre dark purple." Most probably this species was originally indigenous to India, but it is now extensively cultivated in many parts of the world, and even claimed as a native of Egypt and Abyssinia. From the fact that all the species allied to *A. gangeticus* are indigenous to Asia it may be presumed that it is a native of India.

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Forms of Amaranthus in India.

**AMARANTUS melanocholicus.**

**FOOD.**

This and *A. frumentaceus* are perhaps the two most important species of Amaranthus met with in India. But while the latter is cultivated entirely for its seed, *A. gangeticus* is grown as a green vegetable only. It is extensively cultivated by the natives of Bengal, sown broadcast, under what is commonly known as garden cultivation, by professional vegetable-producers. The plants are pulled up when young and sold in the bazaars entire; the leaves and tender stalks are the parts of the "lāhūshāk" chiefly used; they are made into curry by all classes of natives. Largely cultivated in Chutia Nagpur. De Candolle (*L'Orig. Pl. Cult.*) says the young stems are sometimes used as a substitute for asparagus on the English table. He also states that several species of annual Amaranthus are cultivated in Mauritius, Bourbon, and Seychelles under the name of Brède de Malabar, of which *A. gangeticus* seems to be the chief species. The Japanese cultivate as a vegetable the variety *melanocholicus* amongst many others, such as *A. polystachyus, Blume.*

**MEDICINE.**—Used in India in the form of an emollient poultice.

**maranthus hypochondriacus, Linn.; DC. Prod., XIII., 2, 256.**

**THE PRINCE'S FEATHER.**

An exceedingly handsome annual, common in Indian gardens, the leaves as well as the spikes being of a rich crimson.

"The leaves are said to be astringent, and to be used internally and topically in the complaints to which astringents generally are applicable." (*U. S. Dispens., 15th Ed., 1868.*)

**lanceolatus, Roxb.**

See *A. gangeticus, var. angustifolius.* There seems quite as much ground for this being kept up as a distinct species as for any other species; but most authors seem to place it under *gangeticus,* and it has therefore been deemed advisable to adhere for the present to that view.

**lividus, Linn.**

**Syn.**—*Euxolus lividus, Moquin; DC. Prod., XIII., 2, 273.

**Vern.**—*Gobura-nati, Beng.*

A native of America: cultivated in India.

O'Shaughnessy says it is "held in great esteem by the natives."

**mangostanus, L.; DC. Prod., XIII., 2, 261.**

**Vern.**—*Chaulai, ganhar, Upper India; Sé, Beng.* "Sāg is a generic name for pot-herbs: Chaulá is in South India applied to *Portulaca quadrifolia.*" (*Moodeen Sheriff.*)

**Habitat.**—Occasionally cultivated in the plains.

**Food.**—The leaves are used as a pot-herb.

**Medicine.**—Mr. Baden Powell gives *Amaranthus,* sp., *Chaulá* (p. 225), amongst his rare medicinal oils. No other mention can be found of this or any other oil made from Amaranthus, and the fact is therefore of considerable interest. It would be exceedingly interesting to have fuller particulars, and also samples of the oil, and of the plant from which it is made. The name *chaulá* is applied to this species, as also to at least a half of all the known Amaranthuses, and it may be quite wrong to refer this curious oil to *A. mangostanus.*

**melanocholicus, Linn.; Moquin, DC. Prod., XIII., 2, 262.**

**Syn.**—*A. tricolor, Linn.*

There are numerous cultivated forms of this species, which have received

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gardeners' names, many of which are highly ornamental. In *L'Orig.*
*Cult., DeCandolle* says that the forms of this species should all be re-
ferred to *A. gangeticus.* This may be correct, but if so the definition of t-
species will have to be enlarged, since in inflorescence and num-
ber stamens they do not agree. See classification of species of *Amaranthus.*

*Amaranthus oleraceus,* Linn.

**Syn.**—EUXOLOS OLERACEUS, Moquin; DC. *Prod.*, XIII., 2, 272.

**Vern.**—Sada-nathia, natiyā-sāg, Beng.; Bhājī and tāmbālāndī; Mar.; Tākākīra, erra-tōta-kāra, tella-tōta-kāra and pedda-tōta-bā-

**Tel.; Tanda-kirai, kirai-tand, Tam.; Dat, dant-kē-bhājī, Duk.; Dem-
GuJ, and Mar.; Mārīstā, Sans. Compare with the note under var-
cular names of *A. gangeticus.*

This plant, if it really exists in India, must have been introdu-
and the various forms attributed to it seem to take the place in Sou-
the India of *A. gangeticus* in Bengal. The descriptions of these two spe-
numerably on the coast of Coromandel. The most conspicuous after t-
common green sort are—

"1st.—Erra-tōta kāra of the Telingas, a very beautiful variety, wit-
a clear, bright red stem; branches, petioles, nerves, and veins
and the leaves themselves, rather ferruginous. (*Lāl-dāt,* Duk.)

"2nd.—Tella-tōta kāra of the Telingas; here all the parts that ar-
red in the last variety are of a clear, shining, white colour.
(Sofē-dāt, Duk.)

"3rd.—Rosa or Pedda-tōta kāra of the Telingas, is a very large
variety, which Konig called *A. giganteus.* In a rich soil it
grows to from 5 to 8 feet high, with a stem as thick as a man's
wrist. The tender succulent tops of the stem and branch
are sometimes served up on our tables as a substitute for
asparagus. (*Gulādī-dāt,* Duk.)

"The other varieties are more changeable and not so well marke
I will not therefore take notice of any more of them."

*A. paniculatus,* Miq., var. cauntiat; DC. *Prod.*, XIII., 2, 257.

**Vern.**—Rājagaro, GuJ.; Tējr-khārsā, Pers., Peshawar; Bāstān-e-pers., Kasmīr; Rājgīrā, Duk.

**Habitat.**—Most probably a native of China, cultivated in India.

**Medicine.**—Used medicinally for purifying the blood and in piles;

As a diuretic in strangury. (Baden Powell, *Ph. Prod.*, I., 373.) (:
*A. frumentaceus."

*A. polygamus,* Linn.

**Syn.**—EUXOLOS POLYGAMUS, Moquin; DC. *Prod.*, XIII., 2, 272; A. P

**Vern.**—Châmpā-natiya, or lāl-châmpā-natiya (or mātī), Beng.; Chā-
sāg, chowmāi-kē-bhājī (according to Murray). (see note under
mangostamus), Hind.; Doggālī-kāra, Tel.; Tanduliya, Sans. (see
ing to U. O. Dutt).

A. 941
**Prickly Amaranth.**

Products of India.

Cultivated throughout the peninsula of India as a pot-herb. It admits of being freely lopped. Roxburgh says both the green and red "sorts are extensively cultivated all over the southern parts of Asia." Atkinson says it is a common species grown as a pot-herb along the edges of fields in the sub-montane tracts.

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<th><strong>AMARANTUS spinosus.</strong></th>
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<td><strong>AMARANTUS polygonoides, Linn. ; Wight, Ic., t. 512.</strong></td>
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<tr>
<td><strong>Syn.—A. POLYGONOIDES, Willd. ; Roxb., Fl. Ind., Ed. C.B.C., 667 ; Am-</strong></td>
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<td><strong>Vern.—Cheri-natiya, cheli-natipha, Beng. ; Chira kura, Hind.</strong></td>
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<td>Though not cultivated, the natives use it as a pot-herb, as it is considered very wholesome, especially for convalescents. (Roxburgh : O'Shaughnessy : &amp;c.)</td>
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**A. spinosus, Willd. ; DC. Prod., III., 2, 260.**

**PRICKLY AMARANTH.**

| **Vern.—Kánta nati or kánta nutia, kánta-maris, Beng. ; Choli, Hind. ;** |
| | **Janum arak, Santi, ; Kánta-máli, Mar. ; Mulluk-birai, Tam. ; Kánta-** |
| | | **m-dant, Guj. ; Mundla-töta-kura, malla-doggali, erra-mula-gantanta,** |
| | | **Tel. ; Mullan-chira, Mal. ; Mulla-dantu, mularatunpata, Kan. ;** |
| | | **Tandiliya, Sans. ; Hinhanor-sóka or hinnow-sók, Burm.** |

**Habitat.**—Frequent in the plains of India, chiefly in Bengal and Malabar.

**Dye.**—Dr. McCann, in his Report on the Dye-stuffs of Bengal, states that in Cuttack the ashes of this plant are used in dyeing with **Mallotus philippinensis.**

**Food.**—The leaves make a good spinach and pot-herb, though the sharp spines in their axils are troublesome to pick. The poor among the natives use the leaves as pot-herbs, especially in times of scarcity.

**Medicine.**—The whole plant is used as an antidote for snake-poison, and the root as a specific for colic. The root has been found useful in the treatment of gonorrhoea: it is said to arrest the discharge.

"The Hindó physicians prescribe the root in combination with other drugs in menorrhagia. A poultice of the leaves was official in the Bengal Pharmacopoeia" (Dymock's Mat. Med., W. Ind.). It is also considered a lactagogue, and, boiled with pulse, is given to cows.

§ "The root has lately been introduced into European practice as a remedy for gonorrhoea, and is advertised by some of the London druggists." (Surgeon-Major Dymock.) "Roots made into poultices are applied to buboes and abscesses for hastening suppuration." (Surgeon Anund Chunder Mukerji, Naakhally.) "Supposed to be an excellent remedy for gonorrhoea. Dose of the decoction of the root one to two oz.," (Surgeon W. Barren, Bhuj, Cutch.) "Kánta nutia is a cooling diuretic. An infusion in hot water I have used in some cases of gonorrhoea. It lessens burning and relieves pain." (Surgeon R. L. Dutt, M.D., Pabna.)" "Used frequently for colic pain and for scorpion-bite." (Surgeon C. F. W. Meadows, Barreals.) "Emollient and used in the form of poultice." (Deputy Surgeon-General G. Bidie, Madras.) "Given to cows as a lactagogue." (Asst. Surgeon Shib Chunder Bhattacharji, Chanda, Central Provinces.)

In a recent correspondence, however, with the Government of India in regard to the proposed issue of a revised edition of the Pharm. Ind., the Surgeon-General of Madras expressed the opinion that **A. spinosus** should be excluded from the future edition of that work.

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<table>
<thead>
<tr>
<th>AMBER.</th>
<th>Amber.</th>
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<tbody>
<tr>
<td>949</td>
<td><strong>Amaranthus tenuifolius</strong>, Willd.; <em>Wight, Ic.</em>, t. 718.</td>
</tr>
<tr>
<td></td>
<td><strong>Syn.</strong>—Menga tenuifolia, Moquin; <em>DC. Prod.</em>, XIII.</td>
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<tr>
<td></td>
<td><strong>Vern.</strong>—Ghénti-nati, jilchumli, Beng.</td>
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<tr>
<td></td>
<td>Cultivated in Bengal in the neighbourhood of Calcutta spreading plant (<em>O'Shaughnessy</em>).</td>
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<tr>
<td>950</td>
<td><strong>A. tristis</strong>, Linn.; <em>Wight, Ic.</em>, t. 514 &amp; t. 713.</td>
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<tr>
<td></td>
<td><strong>Syn.</strong>—A. campestris, Willd., sp., 282; <em>Pond-gandhari, Santal; Mekhanda, ganna; khaje, Duk.; Sirru-kiari, koppi-kiiri (Roxburgh); si kirai, Tam.; Sirru-khra, koyya-tola-khra, Tel.</em></td>
</tr>
<tr>
<td></td>
<td><strong>References.</strong>—<em>DC. Prod.</em>, XIII., 2, 260; <em>Roxb., Fl. Ind.</em></td>
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<tr>
<td></td>
<td><strong>Habitat.</strong>—An erect herb, branching freely even from the are probably many sub-species met with in cultivation in India (especially of the south and west portions of the peninsula) A. campestris is by some authors regarded as a distinct species.</td>
</tr>
<tr>
<td></td>
<td>Medicine.—The roots have attributed to them demulcent properties.</td>
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<tr>
<td></td>
<td><strong>Food.</strong>—Roxburgh says of this plant: &quot;It is held in all ranks of the natives, and is much cultivated by them; it is all the year round if watered.&quot; It has &quot;always terminal sals of the kind may be cut down several times without destroying the plant; the shoot out vigorously again. This renders it much the poorer natives, who are possessed of but a very small and little time to spare for its culture; besides, it is high to <em>A. ciliaris</em>, which yields but one crop.&quot;</td>
</tr>
<tr>
<td></td>
<td>§ &quot;Used also as diuretic in form of <em>A. ciliaris</em> combi with other medicines.&quot; (Surgeon-Major J. T. Fitzpatrick, M.B)</td>
</tr>
<tr>
<td>952</td>
<td><strong>A. viridis</strong>, Linn.</td>
</tr>
<tr>
<td></td>
<td><strong>Syn.</strong>—Eucolus viridis, Moquin; <em>DC. Prod.</em>, XIII., 2, 27; most authors but not of Linn.</td>
</tr>
<tr>
<td></td>
<td>Roxburgh says of this plant: &quot;A native of various parts of the island, mostly frequent as a weed in gardens during the seasons. The tender tops are eaten by the natives, though esteemed as the cultivated sorts.&quot; (Fl. Ind., III., 605.)</td>
</tr>
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</table>

**AMARYLLIS.**

**Amaryllis grandiflora**, Amarilyde, the subhdarta lused to by both Stewart and Baden Powell. It is a medicinal oil. If this plant has been correctly identified, cultivated in gardens; its modern name is *Bransig* Stewart says: "A correspondent of the Agri.-Hort. Society said that if it were reduced to a pulp with water, it existed as a vernacular name for this plant, however, it: that the authors mentioned above have given incorrect names. *Amaryllis grandiflora* to some other Amaryllidaceous plant *san* is a well-known Hind. name for a species of *Orin.* Sheriff."

**AMBER.**

| Vern.—Kahrud, Hind., Duk., Pers.; *Inqiriyán, qarn* Ambeng, Burm. |
| A fossilised resin, yielded by trees, chiefly pines, (f) whic |
the cretaceous period of geologists, usually found in connection with
tertiary lignites. It is hard, brittle, easily cut, of various shades of
yellow, and semi-transparent. It is very useful to the physicist, becoming
negatively electric by friction. The amber supply is chiefly from the
Baltic region, Samland being the great centre. Crude amber occurs
in commerce in irregular pieces. When ground or heated it emits a
pleasant odour. It is completely soluble in alkaline solutions containing
camphor. On being boiled for 20 hours in rape or linseed oil, it becomes
transparent and ductile, and may then be moulded into any desired form.
It is chiefly used for ornamental purposes such as necklaces, bracelets,
and brooches, for mouth-pieces of pipes and cigar-holders, for the prepa-
ration of a varnish, and for the manufacture of amber-oil and succinic
acid. See Varnish and also Gum Copal.

Irvine, in his *Materia Medica of Patna*, says that it is used as an
aphrodisiac in native medical practice, and in his *General and Medical
Toepography of Ajmere* (published in 1841) he says that the natives of
Ajmere do not know real amber, but that they use a mixed sort of scent
called amber, which is of the consistency of plaster, and seems an imita-
ton of ambergris. It is chiefly used as an aphrodisiac, and costs Rs 5
to Rs 6 a tolah.

**AMBERGRIS.**

*Ambergris, Anbar, anber, or araba* of the Indian bazars, is produced
from ambergris. "Ambergris is found in pieces floating in the sea near
the coasts of India, Africa, and Brazil; it is of an ash-grey colour, spot-
ted like marble with black spots; but it appears to vary considerably in
colour, some pieces being white, some black, and some grey with yellow
spots. It is very light and easily takes fire. It is most probably a con-
cretion formed in the stomach or intestines of the sperm beaked whale,
*Physeter macrocephalus*. Several specimens have been found full of the
embedded beaks of a species of sepia which is the food of the *Physeter*;
it is supposed by some to be formed only during disease, as the speci-
mens of the whales in the stomach of which ambergris was found were
says that ambergris is brought from Singapore. It is used as an aphro-
disiac. It costs Rs 80 to 1 lb. (Mat. Med., Patna, p. 10.)

"Ambergris has a peculiar aromatic, agreeable odour, is almost com-
pletely volatile by heat, and is inflammable. It is insoluble in water,
but readily dissolved, with the aid of heat, by alcohol, ether, and the
volatile and fixed oils. It consists chiefly of a peculiar fatty matter
analogueous to cholesterol in the brain and called by Pelletier and Caventou
*ambrin*. This may be obtained by treating ambergris with heated
alcohol; filtering the solution and allowing it to stand, crystals of amber
are deposited. It is incapable of forming soaps with alkalis. When pure
it has little or no odour." (U. S. Disp., 15th Ed., 1868.)

Amglogina polygonoides, Rafin.; Syn. for *Amaranthus polygonoides*,
*Amurintaceae*, which see.

**AMMANNIA, Linn.; Gen. Pl., I., 776.**

A genus of annual glabrous herbs, belonging to the Natural Order
LYTHRACEAE. Stems square; leaves opposite and alternate, sometimes whorled,
entire; stipules wanting. Flowers small, axillary, solitary and sub-sessile, or in
small trichotomous cymes; bracteoles usually 2. Calyx membranous, campanu-
late or tubular-campanulate, 5-toothed, often with minute teeth or lobes. Petals
3-5 or 6, small, inserted between the calyx-teeth. Stamens 2-8, inserted on
the calyx-tube. Ovary enclosed in the calyx-tube, 1-5-celled, the septa often

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AMMANNIA
vesicatoria.

Blistering Ammania.

absorbed; style filiform or short; stigma capitate; ovules many; placenta axile. Capsule membranous, dehiscing irregularly or by a circinate orcoliculose mouth. Seeds many.

A genus of sub-aquatic herbs, named after John Ammann, of Botany, St. Petersburg.

**Ammannia baccifera**, Linn.; Fl. Br. Ind., II., 509.

**Blistering Ammania.**

*Syn.*—A. vesicatoria, Roxb.

*Vern.*—Dád-mári, Hind.; Ban-march, dád-mári, Beng.; Bagáin-báli, Curen, Bhr jambol, Agiya, Bomb., Dusk.; Kolla rici, "Ner-"nłącz, Tam.; Agniendapáku, Tel.; Kálövanchi, Mal.

Dr. Sakhárám Arjün says that in Bombay the dād-mári is *Cassia*.

**Habitat.**—A small, herbaceous plant, generally met with on wet places in the plains of the Panjab and the North-West Provinces, ascending to 5,000 feet in altitude.

**Botanic Diagnosis.**—Leaves opposite, elongate-oblong, sessile, auriculate at the base. Calyx peduncled, compound. Capsule globular, dehiscing by a ring.

**Medicine.**—Used as a blistering agent.

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*Vern.*—Faugli mehndi, dđd-mári, Pn.

**Habitat.**—Grows in wet places in the plains of the Panjab and the North-West Provinces, ascending to 3,000 feet in altitude.

**Botanic Diagnosis.**—Leaves opposite, elongate-oblong, sessile, auriculate at the base. Cymes peduncled compound. Capsule globular, dehiscing by a ring.

**Medicine.**—Used as a blistering agent.

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**A. vesicatoria**, Roxb.; *Syn. for A. baccifera*, Linn., which see.
Products of India.

Sal Ammoniac.

AMMONIUM chloride.

Ammoniacum, see Dorema Ammoniacum, Don; Umbelliferae.

Ammonium chloride.

Sal Ammoniac, Eng.; Hydrochlorate d’Ammoniac, Fr.; Salmiak, Germ.


This substance is largely manufactured in the Panjāb and used in tinning and forging metals, in the formation of freezing mixtures, and also in the separation of ammonia.

Baden Powell gives an interesting account of the manufacture of sal ammoniac in the Panjāb. He states that sal ammoniac has been, for ages, largely manufactured by the potters (Kamhāre) of the Kurnāl district, chiefly in the village of Gumallah. The process of the manufacture, which is similar to the Egyptian method, is as follows: From 15,000 to 20,000 bricks, made of the dirty clay to be found in certain ponds, are put all round the outside of a brick-kiln, which is then heated. When these bricks are half burnt, there exudes from them a substance of a greyish colour which resembles the bark of a tree. This substance is of two sorts: (a) an inferior kind, called the mittkhām of nausddar, produced at the rate of 20 to 30 maunds for each kiln, and sells at 8 annas a maund; (b) the superior kind called papri, of which not more than 1 or 2 maunds is obtained from each kiln, and sells at Rs 2 to 2½ a maund. Merchants who deal in sal ammoniac buy both sorts. The kūm mitti is passed through a sieve, and then dissolved in water and allowed to crystallize, the solution being repeated four times to clear away all impurities. The pure substance that remains is then boiled for nine hours, to allow the liquid to evaporate, and the resulting salt has the appearance of raw sugar. The papri is next taken and pounded, after which it is mixed with the first preparation. The whole is put in a large pear-shaped vessel made of thin black-coloured glass, having a neck 2½ feet long and 9 inches round. The vessel is closed at the mouth, or, more properly speaking, the vessel has no mouth,—the composition being inserted by breaking a hole in the body of the vessel near the neck. This hole is eventually closed by placing a piece of glass over it. The vessel is then coated over with seven successive coatings of clay. It is placed in a large earthen pan filled with nausddar refuse to keep it firm. The neck of the vessel is further enveloped in a glass cover and plastered with fourteen different coatings of clay to exclude all air. When thus arranged it is placed over a furnace kept burning for three days and three nights, the cover being removed once every twelve hours to insert fresh nausddar so as to supply the place of what has been sublimed. After three days and three nights the vessel is taken off the furnace, and when cool the neck is broken off, and the rest of the vessel calcined. A substance called phali is produced by the sublimation of the salt from the body of the vessel into the hollow neck. There are two kinds of phali; the superior kind is that produced after the nausddar has been on the fire for only two days and two nights, in which case the neck is only partially filled with the substance and the yield is about 5 or 6 seers. This is sold at the rate of Rs 16 a maund. The inferior kind is produced by the nausddar being kept on the fire three days and three nights; the neck of the A. 962
vessel is completely filled with phāli when it yields 10 or 12 s, the salt is sold at Rs 13 a maund.

"That portion of the sublimed nauśdar which is formed in the neck and not in the neck of the vessel, is distinctively called phāli, and not
it is used in the preparation of surma, and is esteemed of great
selling at Rs 40 a maund. The production of nauśdar in bulk is probably owing to the decomposition of watery vapours by
hot bricks in presence of the nitrogen of air and of common salt.
Amount of sal ammoniac manufactured in the Kurnāl district is
at 2,300 maunds, valued at Rs 34,500. The merchants buy it on
from the manufacturers on an average at Rs 8 a maund, who export
Bhāwāni, Dehli, Farakakabad, Mirzapur in the North-Western P
and to Firozpur and Amritsar in the Panjāb, and who also sell
a maund. "It is also occasionally extracted from brick-kiln districts of the Panjāb than Kurnāl, but in small quantities.
It in Europe near burning beds of coal, in England and Scotland,
near the volcanoes of Vesuvius, Etna, &c."

"It is used as a freezing mixture with nitre and water, and in
in tinning and soldering metals, and in the operation of iron compound iron used for making gun-barrels by native smiths.

Powell, Panjāb Products, I., pp. 89, 90.

Medicine.—In medicine it is prescribed in inflammation of the
and spleen. According to Dr. Irvine, it is not used internally in
practice. (Mat. Med., Patna, p. 74.)

§ "Dissolved in oil or yolk of eggs, it is used as a local applica
cases of leucoderma."
(2) "Useful in congested liver, in bronchitis, and in glandular enlargement external application."
(3) "Useful in guinea-worm, both internally and externally." (Surgeon G. Y. Hunter, Karachi.)
"Largely imported into Bombay from
(Surgeon-Major Dymock, Bombay.)
"An excellent remedy in all
of the bronchial tubes. Relieves hemicrania if given in 10 or 20 doses." (Surgeon-Major W. Barren, Bhuj, Cutch, Bombay.)
"In neuralgic headache in doses of 20 grains. I have used it largely in diseases of the liver with benefit. As obtained in the bazar it
impure and should be recrystallized." (Assistant Surgeon Shih (Bhyonarduij, Chanda, Central Provinces.)
"It is useful when at
is not procurable. This and quicklime can be procured in any
in cases of sudden fainting or hysterical fits mix the two in 4
with gentle heat ammonia will be given off." (Surgeon K. D. Khulna.)
"Invaluable in neuralgia, 20-grain doses every 3 hours after 3 doses or not at all; also in laryngeal cough or spray. In cases
Bhyonic and of the urinary tract, in whooping-cough, migraine.
(Surgeon who has not signed his contributions.)
"Mixed with halvā (Helleborus niger) and softened with water, applied to the temp
forehead in the form of a paste in cases of hemicrania." (Assista
geon Anund Chunder Mukerji, Noakhally.)
"In 10-grain doses 4 times a day, I have found the medicine to be of the greatest use in
alternative in different affections of the liver." (Assistant Surgeon Chunder Shome, Calcutta.)

A genus of herbaceous plants belonging to the Natural Order Scleroti
A. 964

ner, and the Tribe Zingiberem, comprising some 50 species, chiefly inhabit
the tropical regions of Asia and Africa, a few extending to Australia
the Pacific Islands.

Root-stocked horizontal, thick or elongated, rooting. Leafy branch
ascending from the ground, destitute of flowers. Leaves lanceolate, spreading distichously, sessile sheathing. Spike short-oblong, crowded spike with the flowers expanding spirally (strobiliferous), or elongated, leafless, with a few scales, ascending in spring from the rhizome, very rarely terminating the leafy branches (compare with inflorescence in *Alpinia*); bracts imbricate, solitary or 2-3 flowered. Calyx tubular, dilated upwards (spathaceous) obliquely 3-fid, the posterior sepal very much larger than the others. Corolla-tube most frequently exceeding the calyx; limb 3-lobed, equal and prominent or the posterior very much larger, erect and hooded, the lateral ones long, narrow, spreading. Stamens theoretically 6, in two series; the outer petaloid, of which the two posterior are reduced to two small awn-shaped teeth, inserted upon the mouth of the corolla-tube, and the anterior one developed into a large labillum or spreading lip, entire and undulate on the margin or more or less trilobed, convolute at the sheathing base. Filament of the fertile stamen short, ascending from the mouth of the corolla, posterior and within the erect-hooded petal; connective more or less dilated, concave, upon which the two large diverging anthers are inserted, prolonged beyond into a small appendage which may be entire or variously cut or produced into a crest, entire or trilobed and often highly coloured. Ovary inferior 3-locular, many-ovuled; style thin, prostrate, included behind the anther-cells; stigma subglobuse, fitting into the space formed through the anthers diverging upward. Fruit globose or oblong, embraced by the fleshy receptacle, pericarp fleshy rough or echinate, indehiscent or bursting irregularly or into 3 valves. Seeds many, globose or obovoid-truncate. 

A genus closely allied to *Alpinia*, differing chiefly in the habit and inflorescence, and in the diverging anther-cells, and the prolonged or crest connective.

**Amomum aromaticum**, Roxb.; Sctaminex.

**The Aromatic Cardamom Plant.**

**Vern.**—Mürang-tläch, Beng. and Hind.; Veldede, Mar.

**Habitat.**—“A native of the villages on the eastern frontier of Bengal.” (Roxb.)

**Medicine.**—The Pharmacopoeia of India refers the Greater Cardamom to this plant, following apparently an error which exists in all the earlier works on Indian Economic Science. Mr. Hanbury made the same mistake. See *A. subulatum*.

“The fruit ripens in September; the capsules are then carefully gathered by the natives, and sold to the druggists, who dispose of them for medicinal and other purposes, where such spices are wanted, under the name of mürang-tläch or cardamom, though the seed-vessels of this species differ in form from all hitherto-described sorts of this drug; however, the seeds are similar in their shape and spicy flavour.” (Roxburgh.)

Apparently this fruit is not now used, or there was some mistake on the part of Dr. Roxburgh as to this being the Greater Cardamom of Bengal. He does not call it by the name of Greater Cardamom; but the plant which is sold and used at the present day as the Greater Cardamom of Bengal, and presumably the mürang-tläch of Roxburgh, has been identified as the fruit of *A. subulatum*.

“[Astringent and tonic, used as a tooth-powder; and said to be a good dentifrice.” (Surgeon John McConaghey, M.D., Shahjehanpoor.)

**A. dealbatum**, Roxb.

**Habitat.**—A native of Eastern Bengal and the adjoining frontier; a stately species, flowering in March and April, and ripening its insipid seed in September and October.

**Food.**—According to Mr. Baden Powell (Ph. Prod., 180), this is the species which yields the Cardamom, the *tläch bari* or *kudin* of the
AMOMUM subulatum. The Greater Cardamom.

Panjáb bazara. He says of it: "Said to be more powerful than smaller kind, but to resemble it in other respects. An agreeable stimulant." It seems probable that this is a pure case of identity, and that the above quotation should be referred to A. sulcatum, Thu.; En. Cy. Pl., 317.

Food. Common in the forests of the central provinces of up to an elevation of 4,000 feet.

A. masticatorium, Roxb. Food.——The Singhalese chew the rhizomes of this plant with betel.

Habitat.——A native of Java. This was supposed by Dr. Parei to be the Greater Cardamom of Bengal. Dr. Roxburgh says it was introduced into Bengal from the Malay Islands by the late Colonel Kyd.

Food.——The flowering time is the hot season, and the seed three or four months afterwards; they possess a warm pungent tans what like that of Cardamoms, but by no means so grateful. (Re: 972)

A. Melegueta, Roxb. Food.——Grains of Paradise or Melegueta Pepper are the part of this species. They are carminative, aromatic, and are used to cordials, and to give false strength to beer and other liquors.

Medic Divine.——They are also used in cattle medicines. (Smith: I cographia; Bent. & Trim.) About 1,000 cwt. are annually exported to Great Britain from the Gold Coast, which is chiefly consumed in preparation of cattle medicine.

"Used commonly as carminative." (Nehal Singh, Saharanpo 975)

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Amomum subulatum, Roxb. The Greater Cardamom.


The meaning of almost all the vernacular synonyms is, acco Moodeen Sheriff, the Larger Cardamom. The Greater Cardamom readily obtained in Calcutta, Hyderabd, Bombay, and other under the Arabic name Qahilahai-kibór; in Madras it is to be found under the names Jangli-illichí, Duk.; Kattu-yelakhéy, Tam.; and A káy, Tur.—all signifying the wild Cardamom.

Habitat.——A native of Nepal. The Greater Cardamom has a fruit about the size of a nutmeg, gularly obcordate, flattened antero-posteriorly, having 15 to 20 dentate-undulate wings, which extend from the apex down to two-thirds of the length of the Cardamom. Dr. King, in the Journ. Vol. XVII., p. 3 (reproduced in Kew Report, 1877, p. 27) showed that the larger Cardamoms were the produce of this species of A. aromatica, Roxb., to which plant Dr. Roxburgh at them, but he preserves that it may be possible the latter plant in Roxburgh’s time, though out of use now.

A. 976
Amorum xanthioides, Wall.

Vern.—It is the seeds, Itáyechi-dáné, Hind. and Duk.; Ilám, Tam.; Ela-kulú, Tel.

Habitat.—It is the seeds (not entire capsules) are imported from China and Singapore, and sent with in every large bazaar of South India.

Description.—"They are angular and very irregular seeds, generally inclining to be triangular, and sometimes compressed or flat; smaller in size than the common cardamom seeds, colour pale brown; odour strongly aromatic and agreeable, and taste aromatic and slightly pungent. Although the smell and taste of these seeds are stronger than those of the common or Malabar cardamom (Elettaria Cardamomum), yet they are more agreeable, and there is the same difference between the tinctures prepared from these drugs.

Medicine.—"The seeds are stimulant and carminative, and are useful in all the affections in which the common cardamoms are indicated. They are also of great service in relieving torments and tenesmus, and even frequency of motions, in some cases of dysentery, and for this purpose they must always be used in powder with butter. They are administered in simple powder and compound tincture, the latter being prepared in the same way as the Tincture Cardamom Co. of the Pharmacopoeia of India. Dose of the powder, from 20 to 40 grains, and of the tincture, from 51 to 52."


A genus of trees belonging to the Natural Order Meliaceae, comprising some 15 species, inhabitants of the tropical and extra-tropical regions of Asia and Australia; 12 occurring in India, and 1 being endemic to Australia.

Leaves usually unequally pinnate; leaflets oblique, quite entire. Inflorescence subdiascous, paniculate, female spike or racemose. Calyx 3-5-partite or 6-fld. Petals 3-5, thick, concave, imbricated, rarely slightly combined at the base. Staminal tube sub-globose or campanulate, inconspicuously 6-10.
AMOORA
Rohituka.

Creata; anthers 6-10 included. Disk obsolete. Ovary sessile; short 3-5-celled cells 1-ovuled. Stigma sessile or style elongated. Capsule sub-globose conicaceous, 3-4-celled and seeded, locally dilated 3-5-valved. Seeds with a fleshy aril; hilum ventral.

The generic name is derived from the Bengali vernacular Amur.


Syn.—Andersonia cucullata, Roxb.; Fl. Ind., Ed. C.B.C., 310.

Vern.—Amur, latml, natml, Beng.; Thitsee, Burm.

Habitat.—A moderate-sized, evergreen tree, met with on the coasts of Bengal and Burma: in Nepal and in the Andaman Islands.

Botanic Diagnosis.—A large tree of slow growth with cinereous sub-glabrous, leaflets 3-13, opposite or sub-opposite, obliquely-obtuse at both ends, terminal one often hooded at the apex. Fl. panicked, not spike; males drooping, about as long as the leaves, numerous diverging branches, sparingly lepidote; female racemes flowered. Petals 3. Anthers 6-8. Style short, ovary 3-celled, 2-ovuled. Fruit sub-globose, 3-lobed, 3-celled, and 3-valved.

Structure of the Wood.—Red, hard, close-grained, but apt to split easily. Weight 44 lbs. per cubic foot. Used for posts and other purposes in Lower Bengal, and for firewood in the Sunderbans.

TIMBER.


Vern.—Tangark, Lepcha.

Habitat.—A large, spreading tree, found in the Eastern Himalayas, Nepal, Sikkim, from 2,000 to 4,000 feet.


Structure of the Wood.—Pinkish white, hard.

TIMBER.


Syn.—Andersonia Rohituka, Roxb.; Fl. Ind., Ed. C.B.C., 311.

Vern.—Harin kora, harin khana, Hindi; Tikta-cii, pitoi, &c; Sekhu, Kol.; Sohga, Oudh; Bandriphul, Nep.; Tangark, La; Lota amari, amora amari, Ass.; Oshoamun, obhayang, Magh.; maram (the red-wood plant), Tam.; Choa-a-manu, rohitakah, Khen-maram, Mal.; Rohituka, Sank.; Hingal guss, Singh.; Chayan-kou-you, Burm.

Habitat.—An evergreen tree with large crown of branches, met with in Oudh, Assam, Sylhet and Cachar, Northern and Eastern Bengal, Western Ghats, and Burma, the Andaman Islands, and Malacca.

Botanic Diagnosis.—Leaves 1-3 feet long, leaflets 9-15, in size 3 to 4 inches; young parts tawny, closely pubescent, early glabre. Flowers white, bracteate, sub-sessile; male spikes panicked, female spikes racemose, petals 3. Anthers 6. Ovary 3-celled with 2 supero-ovules in each cell.

Oils.—In Bengal an oil is expressed from the seeds. The na oil where the tree grows plentifully, extract this oil, which they use for our purposes. (Roxburgh's.)

Medicine.—The bark is used as an astringent.

§ The ripe seeds yield an oil which is burnt by the poorer classes.
The Amorphophallus.

**AMORPHOPHALLUS campanulatus.**

and is used as a stimulating liniment in rheumatism. The seeds are fried and bruised, then boiled with water, when the oil floats on the top. (Surgeon D. Basu, Faridpur, Bengal.)

**Structure of the Wood.**—Reddish, close and even-grained, hard. The concentric bands in this species are remarkable, since they are absent from the two other species. Average weight 40.5 lbs. per cubic foot.

The timber is of good quality, but is little used. In Chittagong canoes are sometimes made of it.

**Amora spectabilis, Miq. ; Fl. Br. Ind., I., 561.**

**Habitat.**—Amarit, Ass.

**Botanic Diagnosis.**—Leaflets 11-13, opposite or sub-opposite, oblong, acutely acuminate base obtuse, glabrescent, shining, glaucous beneath, petiolate. Male panicles pedunculate, with alternate unequal branches. Calyx stellately puberulent, obtusely 3-lobed, short. Petals 3, imbricate, sub-stellate, velutinous along the back. Staminal tube urceolate, glabrous, shortly and obtusely 8-dentate. Anthers 8. Fruit ovoid-pyriiform, 1½ to 1½ by 1 to 1½ inch. Some doubt exists in botanical works regarding this species.

**Structure of the Wood.**—Red, hard, close-grained, durable, and takes a good polish. Weight 48 lbs. per cubic foot.

Used for boat-building and furniture in Assam.

**AMORPHOPHALLUS, Blume ; Gen. Pl., III., 970 ; Monogr. Phanerog., DC., II., 308.**

A genus of tuberous-rooted herbs belonging to the Natural Order AROIDEAE. Tribe PYTHOIDEAE. There are in all some 25 species, inhabitants of tropical Asia and Africa, of which 7 are met with in India and Ceylon.

Leaves generally solitary, ascending from the flattened corn after the spathe has faded; petiole erect, variously spotted; blade large, primarily 3-keeled and bulbiferous; segments pinnatifid or bipinnatifid or dichotomous, ultimate divisions oblong-sacate. Spathe broad-ovate, base infundibuliform or campanulate-convolute, spreading above and exposing the spadix. Spadix erect, fleshy, as long as the spathe, appendix dilated fungus-like. Male flowers crowded, forming a funiform section placed immediately above the female cylindrical section, neuter flowers none. Perianth none. Female flowers, ovary globose, 1-4 celled; style short or elongated; stigma entire, 2-4-lobed; ovules solitary in the cells, anatropous or half anatropous, decurved, funiculus short or sub-elongated, placenta basal, micropyle inferior.

The word Amorphophallus is derived from ἀμορφος and φαλλος in allusion to the shapeless form of the plant, or rather to the barren appendix of the spadix, which is not only devoid of flowers, but assumes an irregularly crumpled form.

**Amorphophallus bulbifer, Blume ; AROIDEAE.**

**Syn.**—ARUM BULBIFERUM, Roth; Fl. Ind., Ed. C.B.C., 310.

**Vern.**—Umila bela, Beng.

**Habitat.**—A native of Bengal, plentiful in the neighbourhood of Calcutta, where it blossoms in May, the leaves appearing in the rainy season.

**A campanulatus, Blume; Wight, Ic., t. 785.**

**Syn.**—ARUM CAMPANULATUM, Roth.

**Vern.**—The tuber, Zamindand, Pers. and Hind.; Ol, Beng.; Kanda, arsagha, Sans.; Janghi-san, Bom.; Cutch; Saran, Mar.; Karon-α.

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AMORPHOPHALLUS campanulatus

The Amorphophallus.

naikt-bhangung or karuna-kalang, nalore-karuna-karang (a variety Kanda-goddal, kanda, pota-banda, durada-kanda-goddal, man or ghenas-kanda (variety), Tel.; Karuna-kahannah or karun Mal.; Kandé, Dux., Hwng.; Wa, Bokh.

It seems probable that one of the forms of this plant aff madan-mast of Bombay druggists, described by Dr. Dymock (M. W. Ind., 685) under the name of Amorphophallus sylvaticus. A native of Dr. Dymock has kindly supplied would seem to justify this while, on the other hand, it is possible that the tubers of Arum sy Roxb. (now known as Synantheria silvatica, Schott.—see Engels Phaner. DC., 340) affords the drug referred to by Dr. Dymock, so since that species is a native of Bombay. The name madan-mast appears, however, to be also given to Amorphophallus camp Blume. "and in Madras to Artabotrys odoratissima. R. Br." (Sheriff.)

Habitat.—A native of India and Ceylon; cultivated through peninsula, in rich moist soils.

Medicine.—The corm (or tuber) and the seeds are used as irritate and relieve the pain of rheumatic swellings when applied external considered a hot carminative in the form of a pickle.

Mr. Baden Powell says: "The roots contain a large amount inacuse matter, mixed with acid poisonous juice, which may be removed by washing or heat. When fresh it acts as an acid stimulant pectoral, and is used in acute rheumatism." U. C. Dutt says tubers contain an acrid juice, which should be got rid of by thorough washing, otherwise the vegetable is apt to cause trouble in the mouth and face. Medicinally sirana is co serviceable in hemorrhoids; in fact, one of its Sanskrit synonyms is arsoghna, or the curer of piles. It is administered in this drug of various forms. The tuber is covered with a layer of earth and in a fire; the roasted vegetable is given with the addition of oil and

§ "The dried corm sliced is sold in Bombay, under the madan-mast, as a restorative, tonic, and carminative." (Surgeon W. Dymock, Bombay.) "The tubers, first boiled with tamarind is paddy husk, and then made into a curry with the usual condiments, efficacious in bleeding piles. It produces intense itching of the skin when tasted, and it is to remove this irritating quality that the tamarind is largely used when cooking it." (Honorary Surgeon F. Kinsley, Madras.) "The cultivated or pinkish white variety is used as for tuber is cut into small pieces, boiled in water to get rid of the skin and then used as a "bhurta" or in curry, or is fried with coconut. Medicinally I have seen its benefit in bleeding piles. It should be in the form of "bhurta." (Surgeon-Major R. L. Dutt, M.D. Bengal.) "Recommended by native physicians in piles. It is in various forms without success." (Assistant Surgeon Shab Chand tachayar, Chanda, Central Provinces.) "It is used externally in of poulitce in the bites of insects, scorpions, &c. Internally in of a pickle, it is used as a laxative in hemorrhoids." (Brigade J. H. Thornton, B.A., M.B., Monghyr.) "Used as a stimulant in ophthalmia." (Surgeon W. Barren, Bluf, Cutch, Bombay.) "Used in

Speaking of the jangli siran, Dr. Dymock says the tuber and cut into segments, and in that condition is sold in the Bombay druggists' shops as madan-mast. "The segments are usually upon a string, and are about as large as those of an orange, of a brown colour, shrunk and wrinkled, brittle and hard in dry the surface is mammilated. When soaked in water they swell

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become very soft and friable, developing a sickly smell." "Madan-mast has a mucilaginous taste, and is faintly bitter and acrid; it is supposed to have restorative powers, and is in much request." The above extract may probably be describing the properties of a plant quite distinct from *Amorphophallus campanulatus* (see remarks under vernacular names and also under *Synantherias silvatica*, Schott.).

**Food.**—The corms or solid bulbs are considered nutritious and wholesome when cooked, and are accordingly in common use as an article of food. They are boiled like potatoes and eaten with mustard; they are cooked in curries; they are cut into slices, boiled with tamarind leaves, and made into pickles; and they are also cooked in syrup and made into preserves.

The larger corms have small lateral tuberosities; these are separated and form cuttings for propagation. They are planted immediately after the first rains (say May and June) in loose, rich soil, repeatedly ploughed. In twelve months they are fit to be taken up for use. If cultivated under favourable circumstances, each corm will weigh from 4 to 8 lbs., and they may be preserved for some time if kept dry. The average outturn is about 200 to 400 maunds per acre, and the price is about Rs. 1 a maund.

§ "When cultivated the tuber becomes large and loses much of its irritant properties, and when boiled or otherwise cooked makes a substantial starchy vegetable. It is sold largely in the Calcutta bazaars." (Surgeon K. D. Ghose, Khulna.) "Used as food, possessing most of the properties of *Alocasia indicia*. If not properly cultivated in loose soil it becomes irritant in its action." (Surgeon D. Batu, Faridpur, Bengal.) "When cooked the tubers are wholesome and nutritious." (Deputy Surgeon-General G. Budde, Madras.)

*Amorphophallus dubuis*, Blume.
A native of Ceylon and the Malabar Coast of India.

*A. giganteus*, Blume.
Syn. for *Conophallus giganteus*, Schott.
A native of Malabar, Ceylon, Java, &c.

*A. lyratus* (Arum lyratum, Roxb.)
Imperfectly known; said to be a native of the Circars, Madras.

*A. margaritifer*, Kunth, and *Arum margaritiferum*, Roxb. (Dymock, *Mat. Med., Western India*, 664); Syn. for *Plesiomanium margaritiferum*, Schott., which see.

*A. tuberculiger*, Schott.
A native of the Khâsia Hills and of Sikkim.

*A. zeylanicus*, Blume.
A native of Ceylon and Java.

**AMPELIDÆ.**

"Small trees or shrubs, usually climbing by means of tendrils, more rarely radicant (sometimes herbaceous in *Leo*); juice copious, watery. Stems angled, compressed or cylindric, with numerous very large proper vessels. Leaves alternate, usually petiolate, simple or digitately or pinnately foliolate, rarely pinnate or decurrent. Flowers umbellately-pedunculate or spicate-cymose. Peduncles often transformed into simple or compound tendrils or adhering to rocks or trees by viscid pads.
terminating the ultimate segments, or expanded into a broad floriferous membrane (Pterisanthes). Flowers regular, hermaphrodite, rarely unisexual. Calyx small, entire or 4-5-toothed or -lobed. Petals 4-5, distinct or cohering, valvate, caducous. Stamens 4-5, opposite the petals, inserted at the base of the disk or between its lobes, filaments short-subulate anthers free or connate, 2-celled, intorse. Disk free or connate with the petals, stamens or ovary, annular or variously expanded. Ovary 2-celled; style short, slender, conical or o; stigma minute or large and flat sublobed; ovules 1-2 in each cell, ascending, anatropous, raphe ventral. Berry 1-6-celled; cells 1-2-seeded. Seed erect, often rugulose, albuminous, cartilaginous; embryo short basal, cotyledons ovate. Distrib.—Spec. about 250, inhabiting the tropical and temperate regions of the whole world.

Scandent shrubs, usually bearing tendrils. Flowers racemose or cymose. Ovary 2-celled, cells 2-ovuled.

1. Vitis.
Flowers sessile on the dilated membranous peduncle. 2. Pterisanthes.
Erect shrubs destitute of tendrils, petals and stamens connate with the disk. Ovary 3-6-celled, cells 1-ovuled.

3. Leea."

(Flora of British India, I, 645)

The above extract has been published here with the object of suggesting the names of the genera of this family; the economic information will be found under these in their respective alphabetical positions.

Distribution of the Ampelidæ.—There are in all some 250 species belonging to this order, chiefly met with in the tropics, extending to the temperate regions. They are rare in America, and exceedingly rare in the Pacific Islands; none are indigenous to Europe. The vine-grape appears to have been originally a native of Georgia and Mingrelia, but it is now cultivated in all countries with a mean summer temperature not below 60° F. Whence the temperature falls below 60° F. the grapes never become sweet; where it is much above that temperature they do not mature, although the plant may flourish, as in Indian gardens.

In India there are in all 94 species, grouped in three genera. Of these 52 or 55.3 per cent. are confined to the plains, 34 or 35.1 per cent. are found up to an altitude of 5,000 feet, and 8 or 8.5 per cent. up to an altitude of 10,000 feet. Geographically, 50 or 53.1 per cent. are confined to East India, 10 or 10.6 per cent. to West India, 8 or 8.5 per cent. to South India, and 3 or 3.2 per cent. to North India, all three being in the Upper Gangetic Sub-Division. Of the remaining 23 species, 8 or 8.5 per cent. are found in two or more regions not including North India, and 15 or 15.9 are found in North India as well as in one or more of the other divisions. All these 15 species are found in the Upper Gangetic Sub-Division; 3 of them are also found in the West Punjab, and 2 in the dry tracts of the Panjāb and Sind Sub-Division of North India.

Amygdalus communis, Linn., see Prunus Amygdalus, Bail., Rosaceae.

Amyris commiphora, Roxb., see Balsamodendron Roxburghii, Aris. Burseraceae.


Anabasis multiflora, Moq.; Chenopodiaceæ; DC. Prod., XIII., 7.

Vern.—Ghaiere, lana, metra lana, gera lana, dana, shor lana, bhā, chā, Via.

Habitat.—Met with in the Panjāb, a short distance east of the Subj.

A. 1005
### Classified List of the Anacardiaceae.

**ANACARDIACEÆ.**

**Medicine.**—Mr. Baden Powell mentions this plant amongst his drugs, but says nothing of its medicinal property.

**Fodder.**—Camels are fond of the plant.

**ANACARDIACEÆ.**

"Trees or shrubs; juice often milky and acrid. Leaves alternate, opposite in *Bouea*, extispulate, simple or compound. Inflorescence various; flowers small, regular, unisexual, polygamous, or bisexual. Calyx 3-5-partite, sometimes accrescent, spathaceous in *Gluta*. Petals 3-5, alternate with the sepals, free, rarely O, imbricate or valvate in bud, sometimes accrescent. Disk flat, cup-shaped or annular, entire or lobed, rarely obsolete. Stamens as many as the petals, rarely more, inserted under, rarely on, the disk; filaments usually subulate; anthers 2-celled, basi- or dorsi-fixed. Ovary superior, half inferior in *Holigarna*, 1- or 2-6-celled, rudimentary or 2-3-nd in the 4; of 3-6 free carpels in *Buchanania*; styles 1-4 or stigma sub-sessile; ovules solitary in the cells, pendulous from the top or wall or from an ascending basal funicle. Fruit usually a 1-5-celled 1-5-seeded drupe; stone sometimes dehiscient. Seed exalbuminous; embryo straight or curved, cotyledons plano-convex, radicle short. Distr. —Chiefly tropical; genera about 45; species about 450.

"*Sorindeia madagascariensis*, DC. (Wall. Cat., 891), is cultivated in gardens in India.

"Tribe I. Anacardiæ. Ovary 1-celled, or if 2-celled, with one cell early suppressed.

(A.) Ovules pendulous from a basal panicle.

* Sepals and petals not accrescent.

1. **Rhus.**
2. **Pistacia.**
3. **Mangifera.**
4. **Anacardium.**
5. **Bouea.**
6. **Gluta.**
7. **Buchanania.**
8. **Melanorrhoea.**
9. **Swintonia.**

(B.) Ovules pendulous from the top of the cell or from the walls of the ovary above the middle.

* Leaves 3-foliolate or pinnate.

1. **Solenocarpus.**

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### FODDER.

1007

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**Distribution of the Anacardiaceae.**

| Calyx not accrescent. Petals imbricate. Stamens 10. Style 1 | 10. Taph... |
| Calyx not accrescent. Petals imbricate. Stamens 5, with 5 staminodes. Style very short | 11. Penta... |
| Calyx not accrescent. Petals imbricate. Stamens 8-10. Styles 3-4 | 12. Odio... |
| Calyx accrescent. Petals 4. Stamens 4. Style 3-fid | 13. P괴... |

**Leaves simple.**

| Petals imbricate. Stamens 5. Style 1. Drupe superior | 15. Drinx... |
| Petals valvate. Stamens 5. Styles 3. Drupe inferior | 16. Holi... |
| Petals valvate. Stamens 5. Style 1. Drupe superior | 17. Mela... |
| Petals imbricate. Stamens 4. Style 1, short. Drupe superior | 18. Noth... |
| Petals imbricate. Stamens 6-10. Style 1. Drupe superior | 19. Casy... |

**Trifl II. Spondize. Ovary 2-5-celled; ovules pendulous. Leaves pinnate.**

| Flowers polygamous. Stamens 8-10. Styles 4-5, free above | 20. Spo... |
| Flowers bisexual. Stamens 10. Style 5, thick, connate at the lips | 21. Drace... |

**Doubtful genus.**

| Calyx 3-fid. Stamens 3. Ovary 3-celled. Leaves entire | 22. ? Rę... |

(Fl. Br. Ind., Vol. II., 1009)

The above analysis of the genera of Anacardiaceae will be useful, in enabling the reader to recognise the plants of economic which belong to this family; for fuller details consult their alphabetical positions in this work.

**Distribution of the Anacardiaceae.**—There are in all some 4 belonging to the Anacardiaceae as defined by the Genera 1. They are chiefly inhabitants of the tropical regions of the O but are fairly represented in tropical America, and less in Australia. Only a few species (but these abundant in individual South Europe, South Africa, or North America. There are in species, referred to 23 genera. Of these 83 or 71.5 per cent. a to the plains, 28 or 24.8 per cent. ascend to 5,000 feet in altit or 4.3 per cent. reach higher altitudes. In their distributic peninsula of India they show a corresponding preference for the extra-tropical regions. Sixty-eight species or 58.6 per cent. are the eastern division of India, 17 or 14.6 per cent. to South Ceylon; 7 are peculiar to North India (3 of these in the Uppe basin, 1 in the South-Eastern Panjab and 3 diffused over sub-divisions of North India, but none of the endemic No species seem to pass into the drier and desert tracts of t Panjab and Sind). The remaining 12 Indian species are less 1 diffused through at least two or more of the divisions of India.

A. 1009
Properties and Uses of the Anacardiaceae. ANACARDIUM.

passing to Upper India, of which 3 occur in the East Panjáb and Sind, and one species follows the coast of India, appearing to require the sea atmosphere.

Aaffinities of the Anacardiaceae.—They are placed in most works on systematic botany before the Leguminosae and after Rutaceae, Zygophyllaeæ, Simarubeeæ, Burseraceae, Rhamneeæ and Sapindaceæ, to which they bear their closest relations. Through Leguminosæ they have many features of resemblance to the Amygdalææ in Rosaceæ, especially in habit, woody stems, alternate leaves, perigonous stamens, and polypetalous corolla, the solitary carpel, drupaceous fruit and exalbuminous seed. They have a strong affinity to the Juglandææ; indeed, certain authors (Kunth, Endlicher, &c.) have combined the latter with the Anacardiaceæ (or Terebinthaceæ). De Candolle, while retaining Burseraceæ, excludes Juglandææ from them. They are also closely related to Connaraceæ and Burseraceæ, the latter, by Baillon and other authors, being viewed as a tribe; they differ chiefly in the two-ovuled condition of Burseraceæ, the ovule having also a superior micropyle. Baillon, in addition to the above tribes, places the Mappiceæ and Phytoerencææ as tribes under this family. Most modern authors, including Sir J. D. Hooker, exclude Burseraceæ, Sabiææ, and Juglandææ, these forming respectively independent natural orders, while Anacardiaceæ has been restricted to the tribes Anacardiææ and Spondiææ.

Properties and Uses of the Anacardiaceæ.—They yield food, medicine, oil, gum, and resin, turpentine, varnish, dye, tan, and useful woods. The Pistachio nut, the Mango, the Cashew-nut, the Spanish Plum (Spondiææ), and the nut of Semecarpus Anacardiæ are regularly eaten and prized as amongst the best of Indian fruits. The barks, leaves, young fruits, seeds, and oils obtained from these plants, as also many others, are regarded as possessing remedial properties. The resin is often very valuable. Pistacia Lenticus yields the resin mastic, much used in the East to perfume the breath, strengthen the gums, as also to flavour wines and confectionery. In England it is used for varnishing pictures and in dentistry. P. Terebinthus, a Mediterranean tree, yields Cyprus turpentine. Melanorrhoea usitatissima yields the celebrated black varnish of Burma. Rhus succedanea, Japanese vegetable wax; R. Vernix, Japanese varnish; the Indian Holigarna longifolia also yields a good varnish. A large number of Indian species yield gum at certain seasons of the year; Odina Woodæ is simply covered with its brown gum streaking down the stem and ultimately becoming black.

Rhus coriaria and R. cotinus, the Sumach, are much-prized tans, the wood of the last species yielding a good orange dye. In Europe a tincture is chiefly used for this purpose; with Cochineal or Prussian blue it gives chamois or green tones. The juice of the pericarp of Semecarpus gives an indelible black ink, used for marking linen.


A genus of shrubs or trees belonging to the Natural Order Anacardiææ, comprising 6 species, natives of America, one of which has been naturalised in India.

Leaves alternate, simple, quite entire. Panicles terminal, bracteate. Flowers small, polygamous; sepals and petals not accrescent. Calyx 5-partite; sepals erect, deciduous; disk erect, filing the base of the calyx. Petals 5- linear-lanceolate recurved imbricate. Stamens 8-10, all or only a few fertile; filaments connate and adnate to the disk. Ovary obovate or obcordate; style filiform, excentric stigma minute; ovule 1, ascending from a lateral funicle. Nut kidney-shaped, seated on a large pyriform fleshy body formed of the enlarged disk and top of peduncle; pericarp cellular and full of oil. Seed
ANACARDIUM occidentale.

The Cashew-nut.

Kidney-shaped, ascending; testa membranous, adherent; cotyledons sex radicle short-hooked.

The generic name is derived from áva, resemblance, and heart, in allusion to the form of the nut.


The Cashew-nut.

 Vern. — Káju, Hind., Guj., Dec.; Híjíl-bódám, káju, Beng.; kályá, Bomb.; Kásácha-bi, káju, Mar.; Mundiri, hi mundiri, Tam.; Yídi-mámidí vittu, muntámámidí-vitt yídi pumá (fruit), Tel.; Yídi vittu, kómpy gránu bítá, ger vittu, gerá tía, kan.; Paranki-máva kuru, kóppal-chidum- mávaduru, Mala.; Káju or káju-alla, Singh.; Tha-noh, kal, khosayesi or tithiya-si, Burm.

Habitat. — A tree, 30 to 40 feet; originally introduced into America, now established in the coast forests of India, Penang, and the Andaman Islands, and over South India. "The local name káju appears to be restricted to the Konka region, and is indigenous to the West Indies. It is probable that the Po its introduction to the west coast of India called it káju as a result of the Brazilian name acajou. The French, by a similar process, called it Cashew." (Bomb. Gaz., X., 38.)

Properties and Uses.

Gum. — Rai Kanaal Lal De Bahadur, in his Indigenous Drugs, mentions that the bark of this plant yields a gum.

§ "This gum occurs in large stalactitic pieces; it is yellow and only slightly soluble in water. It is obnoxious to insects." Major Dymock, Bombay.

The sap. — The sap issuing from incisions in the bark is in an indelible marking ink. (Br. Burm. Gaz., I., 176.) The astrigent is used by native workmen as a flux for soldering metals. (I. X., p. 38.)

Dye. — The bark may be used for tanning. The pericarp is called Cardol, which is very astringent, and is used by the A to tan or colour fishing-nets, so as to preserve them. Dr. Dymock mentions that this oil is called Dkh in Goa, where it is much used in boats and nets.

Oil. — From this plant two distinct oils are obtained:

Cardol, Cardol or oil from the shell.

Oil from the nut.

Cardol or oil from the shell.

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Cardol, or Cardol or oil from the shell.

The pericarp of the nuts produces a black acrid oil, Cardol.

Medicines. — The medicinal uses of this plant are many. It is used as an anesthetic in leprosy, and as a blister in warts, ulcers. Between the laminae of the shell of the kernel there is a caustic fluid, which contains an acrid, oily principle, Cardol.
peculiar acid, *Anacardic Acid*. It possesses powerful rubefacient and vesicant properties. The spirit distilled from the expressed juice of the fruit may be used as a stimulant.

"Fruit eaten as a remedy for scurvy. The juice of the nut is used as a substitute for iodine, locally." (Surgeon W. Barren, Bhuj, Cutch, Bombay.) "The oil I have used with benefit in the anaesthetic variety of leprosy." (Assistant Surgeon Bolly Chand Sen, Calcutta.) "The oil obtained from the shell by maceration in spirit is the very best application for cracks of the feet, so common with natives." (Brigade Surgeon C. Feynt, M.D., Poona.) "It is locally applied to the sole of the foot as a remedy for cracking of the cuticle." (Surgeon-Major Henry David Cook, Calicut, Malabar.) "The oil is efficacious when faintly brushed as a local stimulant in psoriasis." (Assistant Surgeon Devendra Nath Roy, Calcutta.)

**Food.**—Produces a small fruit, within which is the nut known as the Cashew nut, commonly eaten roasted,—a process which improves the flavour. § "The ripe fleshy stalk or torus of this plant is eaten as a fruit. In Puri they used to call it lankā ām. The kernels are fried and eaten; they are also made into confectionery with sugar. They are sold in the markets in Puri under the name of Ḥiḍājī ṭadam." (U. C. Dutt, Serampore.) "The seeds deprived of their shell are eaten." (Deputy Surgeon-General G. Bidis, Madras.)

**Structure of the Wood.**—Red, moderately hard, close-grained. Weight 38 lbs. per cubic foot.

Used in Burma for packing-cases, for boat-building, and charcoal.


*Anacharis* or American duckweed. A delicate, much-branched, aquatic plant, belonging to the Natural Order *Hydrocharideae*. By the *Genera Plantarum* this genus has been reduced to *Elodea, Mich.*

This curious plant made its appearance simultaneously in various parts of Great Britain, about 30 years ago, and its spread from lake to lake has attracted much attention. How it was introduced is unknown, and it is equally difficult to know how it is propagated with such rapidity; for the plant is dioecious, and only female flowers have been discovered in Great Britain; it cannot therefore produce fertile seeds. The date of its introduction into India seems equally difficult to determine; but at the present moment most of the tanks and lakes of the plains have become almost impossible of navigation from the immense masses of this plant which choke every piece of water under 8 to 10 feet in depth. It affords rare feeding-ground for aquatic birds, both from the tender leaves, which are greedily eaten, and from the multitude of insects and snails which live amongst the portions of the plant which reach above the surface of the water. I have failed to discover any vernacular name for it, other than the generic appellation to all aquatic weeds. It is sometimes used along with *Vallisneria* in the native process of refining sugar.

**ANACYCLUS, Linn.; Gen. Pl., II., 419.**

*Anacyclus* *Pyruthrum*, DC.; *Compositae*; *DC. Prod.*, VI., 15.

**The Pellitory of Spain.**

_ver._—Akbarkarā, HIND., BENG., BOMB.; Akkalkarā, akkakarā, tam. and Tel.; Akkalkākā, Mar.; Akkala-karā, Kan.; Akorkarā, Guj.; Agal-gūrā, DUR.; Akki-karukā, akkalkarā, MUL.; Aṣqaqarqā or aṣqaqarqā, aṣqaqarqā, aṣqaqarqā, ARAB.; Akara karawa, akurkarra, rabba, SANS.

A. 1026
ANADENDRON.

Habitat.—Indigenous to North Africa, whence it has been introduced into South Europe. "The root is collected chiefly in Algeria and is exported from Oran, and to a smaller extent from Algiers." A large amount is also shipped from Tunis to Leghorn and Egypt. (Dymock.)

Medicine.—The root of this plant has stimulant properties, and when locally applied, acts as an irritant and rubefacient. It is also used as a sialogogue. In India it is often given to parrots, with the idea of helping them to make them talk. It is imported into India, chiefly from Algeria. A. H. (Mat. Ind., I., 306) gives a long account of this medicine. He insists that vegetarians prescribe an infusion of it, in conjunction with lesser galangal and ginger, as a cordial and stimulant in lethargy or in palsy, and in certain stages of typhus fever, and that it also helps to be chewed as a masticatory for toothache. It certainly possesses powerful stimulant properties, and is scarcely ever employed in Europe as an internal remedy; though it has been found useful as a sialogogue and as such, Dr. Thomson says, has been given with success in cases of headache, apoplexy, chronic ophthalmia, and rheumatic affections of the face.

Special Opinions.—"The root is used by natives as a nervine in cases of facial palsy, paralysis, hemiplegia, epilepsy, and cholera. It is employed in rheumatism, sciatica, and dropsy. As a sialogogue it is useful to allay toothache. Aphrodisiacs, emmenagogues, and diuretic properties have also been assigned to it. Its local application to the forehead is said to remove headache. A gargle is reputed to be very efficacious in affections of the teeth, throat, and tonsils. In a drachm-and-a-half of it is said to act as a purgative. Dissolved in olive oil and rubbed over the skin, it is reported to produce profuse perspiration, and thus cut short an attack of fever. As an expectorant it has been employed to benefit in cases of chronic bronchitis." (Assistant Surgeon Ghol Naht.) "It is used in toothache, in which it sometimes gives instantaneous relief." (Surgeon J. C. Penny, M.D., Amritsar.) "It is expectorant." (Surgeon-Major J. T. Fittspatrick, M.D., Coimbatore.) "Decoction used in bronchitis as an expectorant." (Surgeon-Major J. F. Ratton, M.D., Salem.) "Decoction of it is used by native practitioners as a gargle for sore throat." (Brigade Surgeon S. M. Shirove, Moorshed.) "It is a powerful sialogogue, and I have seen it give relief in rheumatic pains in the face." (Surgeon-Major John North, Bangalore.) "It is frequently given to infants in the Deccan and the Konkan from the ide of its assisting to make them talk. As a stimulant the dose is one to two grains." (Surgeon W. Barren, Bhuj, Cutch, Bombay.) "It is used by natives of India as an aphrodisiac. Applied in the form of a powder, a carious tooth, it is said to remove toothache; useful in flatulent pepticia as a carminative." (Assistant Surgeon Jiwant Rai, Mooltan.


Anadendron, sp.; Araliaceae.

Vern.—Yolha, And.

Fibre.—In the Andaman Islands, bow-strings are made from the fibre of the bark of this plant, to which, to increase strength, a coating of bees' wax (Tobuk-tobuk) is frequently applied. Netted reticules are prepared from this fibre, which are used by women for carrying objects. (Mr. Mann's Andaman and Nicobar Islands Catalogue, cutia Exhibition.)
**ANAGALLIS, Linn.; Gen. Pl., II., 637.**

Genus of slender herbs belonging to the Natural Order Primulaceae, containing some 12 species, inhabitants of the north temperate zones, growing on the temperate Himalaya.

Generic name is derived from अनाग, again, and गल्ल, to make, or to cause mirth, from its fabled virtue to remove sadness. It was most probably suggested from the beauty of the flowers, the fact that as the sun rises and sets, so the sparkling Anagallis ad closes, hence the popular name Poorman's weather-glass.

s arvensis, Linn., var. cerulea; Fl. Br. Ind., III., 506.

*Fonkhamari, fainghani, N.-W. P.*

Tat.—Found on the mountains of Bengal and of the North-Sia, and the Himalaya generally, from Nepal westward, ascending 1200 feet; common in the neighbourhood of Simla, on rubbish-nd walls around fields; Central India, the Nilgiri Hills, and perhaps introduced.

*icine.—Used to intoxicate fish and to expel leeches from the body. (For this purpose the juice of the various species of Begonia is said to be very efficacious, see Leech.) It is used in cerebral oes, leprosy, hydrophobia, dropsy, epilepsy, and mania. Formerly used in Europe in epilepsy, mania, hysteria, delirium, enlargement of spleen, dropsy, emaciation, stone, the plague, bites of serpents and animals, and in numerous other diseases. It is said to be poisonous to dogs, producing inflammation of the stomach, Powell, Punjdo Products, I., 368.)

**ANAMIRTA, Celebr.; Gen. Pl., I., 35.**

Climbing shrub (belonging to the Natural Order Menispermacae), of Eastern Bengal, the Khasia hills, and Assam; and from the Konkan to Ceylon.

Mers.—*Sphen 6, with 2 adpressed bracts. Petals O, Mole* antlers sessile, many, arranged upon a vertical column, 2-celled, bursting easily. Female flowers: staminodes 9, clavate, 1-seriate. Gynoecium 3 on gynophore; stigma subcapitate reflexed. Dropus on a 3-lobed gynophore ovate, dorsally gibbous; style scar sub-basal; endocarp woody. Seed, embracing the sub-globose, hollow, intruded endocarp; albumen composed of horny granules; embryo curved; cotyledons narrow-oblong, winged.

a Cocculus, W. & A.; Fl. Br. Ind., I., 98.

**Cocculus Indicus of Pharmacy.**


*icine.—A climbing shrub of South and East India, Burma, and Ceylon.

The fruit contains a large quantity of fixed oil. The fat extracted from the seeds, which amounts to about half their weight, is used for industrial purposes.

**Cocculus Indicus of the Plant.**

**MEDICINE.**

OIL.

*Fat from Seeds.*

**OINTMENT, MEDICINE, Berries.**

**ANAMIRTA Cocculus.**

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**Cocculus Indicus of the Plant.**

**MEDICINE.**

OIL.

*Fat from Seeds.*

**OINTMENT, MEDICINE, Berries.**

A genus of almost stemless plants, with a rosette of lanceolate leafs belonging to the Natural Order Bromeliaceae, and comprising six species, inhabitants of tropical America. Inflorescence densely crowded and spirally arranged into a strobilus head. Bracts and ovary with the receptacle, developing into a succulent pound fruit. Sepals and petals distinct on the apex of each ovary.

The generic name is supposed to be a Latinised form of the South American name Nanas.

ANANAS sativa, Linn.

THE PINE APPLE.


Habitat.—This and all the other members of the same order met with in India have been introduced from America. From the vulgar names of this species, one would suppose it had reached Persia.

History.—A perennial universally cultivated in all tropical and tropical countries. The pine apple was unknown to Europe, Afric Asia, prior to the discovery of the Western Continent. It is app. a native of Brazil, and it was first made known to Europe by G. Hernández in 1513; it was introduced by the Portuguese into. in 1594. “Its introduction is expressly mentioned by Indian authors such as Abul Fuzi in the Aysen Aksar, and again by the author of Shekhi (Robert). The rapidity with which it spread through E. Asia, and Africa is unparalleled in the history of any other fruit seems to have met with universal acceptance; hence, apparent purity with which its American name Anasú or Nanas has passed t
so many languages. The Asiatic recipient of a living plant seems to have carried off, and adopted as his own, the name by which so valuable a treasure was made known to him. The first pine apples which appear to have reached England were those presented to Cromwell. The next notice is of the “Queen pine” presented to Charles II., on the 19th July 1688, having been sent from Barbados, and the first pine apple grown in England seems to have been reared from the rejected crowns of these. It was first systematically cultivated in Europe by M. Le Cour, a Dutch merchant near Leyden. It was first fruiting in England in the year 1712; since then its cultivation may be said to have become universal over all Southern Europe. The largest pine apple on record was reared in England, and it weighed over 14 lbs.

**Properties and Uses**

**Fibre.**—The leaves, which require to be steeped in water for 18 days, yield a beautiful fibre, which, but for the difficulty of extraction, would be largely used. This fibre is in request in India for threading necklaces, as it does not rot, and is very strong. Both the wild and cultivated pine apple yield fibres which, when spun, surpass in strength, fineness, and lustre those obtained from flax. It can be employed as a substitute for silk, and as a material for mixing with wool or cotton. For sewing-thread, twist, trimmings, laces, curtains, and the like, its particular qualities render it specially applicable. (Chambers’ Journal.) In 1839, Miss Davey, in answer to an advertisement published by the Agri-Horticultural Society of India, submitted some thread made from pine apple leaves, of which she remarked that it was equal to the finest flax thread manufactured in Europe, and considered it comparable to the best cambric thread. This lady, with some difficulty, owing to the conservative objections of the Dacca weavers, whom she tried to induce to make some cloth from this fibre, manufactured handkerchiefs, cuffs, and some cloth which are alluded to in the Proceedings of the Society as “elegant specimens.” Some thread was sent home, but the English spinners seem to have been as prejudiced against this fibre as the Dacca weavers were. In the Agri-Horticultural Society’s Journal for 1853, some trials of various fibres made by Harton & Co., Calcutta, are published: a $\frac{3}{4}$-inch in circumference rope made of pine apple fibre easily bore a weight of 42 cwt., and broke only with a weight of 57 cwt. (Tropical Agriculturist, III., 52.) In Royle’s Fibrous Plants of India will be found some interesting information regarding the pine apple, of which the following may be given as an abstract of the more important facts. It has become quite naturalised in some parts of this country. It flourishes in Assam and is very abundant on the Khāsia hills. Captain Turner found it plentiful at the foot of the Himalaya. According to Dr. Welfer, the pine apple is so abundant in Tenasserim as to be sold in Amherst Town, in June and July, at the rate of one rupee for a boat-load. The natives know it only by the American name, which they transform into Nana thi or Nanna fruit. The pine apple of the Phillipine Islands is much valued for its fine hair-like fibres, of which the famous pine apple cloth is manufactured. M. Perottet considers this to be a distinct species and has named it Bromelia Pigna. Mr. Bennett visited a plantation near Singapore made by a Chinaman, who prepared the fibre for export to China, where it is used “in the manufacture of linens.” The leaves, in the green state, were laid upon a board and the epidermis removed with a knife. The fibres were then easily detached by the hand on being raised with a broad knife. The separation of the pine apple fibre is practised in many parts of the East Indies. The natives of Burma, however, do not seem to have been acquainted with the Ananas fibre, although the plant is very abundant there. From some experiments...
ANANAS
sativa.
The Pine Apple.

which were made by Dr. Royle, it appears that a certain quantity of the fibre prepared at Madras bore 260 lbs., and a similar quantity prepared in Singapore bore 350 lbs., while New Zealand flax bore only 260 lbs. Mr. Zinke took out a patent for the manufacture of thread from this fibre. Bleaching destroys the adhesion between the bundles of fibres, and renders it fit to be spun in the same way as flax. Twine, cord, and fishing-lines are also sometimes made of it. Pine apple rope are said to bear constant immersion in water, a property which is increased by the natives in some places by tanning the fibre. (Fibrous Plants India, pp. 37-41.)

Mr. Thomas Christy, in his New Commercial Plants (No. 6, page says that "The fibre shoemakers bought up the fibre for twine, that the plant is chiefly cultivated there for its fruit, the fibre being little appreciated. He also says: "The filaments of pine apple are very fine and flexible and also resistant. They are easily divided into treatment in the alkaline bath, and after being submitted to trituration. The isolated fibres are very fine, of a tolerably regular diameter from and to the season of very different size. The fibre canal, which is very perceptible in the largest, is not so in the smaller ones. They are very flexible, curling and crispimg readily under mechanism. The points are rarely sharp, and taper gradually to the extremities. They are rounded, or rather blunt, at the end."

Medicine.—In India the fresh juice of the leaves is regarded as a powerful anthelmintic, and that of the fruit as an antiscorbatic. A friend informs me that the natives regard the fresh juice of the fruit as poisonous if hypodermically injected.

Special Opinions.—§ "The pure juice of the ripe fruit is said to allay gastric irritability in fever. The fresh juice of the leaves given with sugar is said to relieve hiccups." (Surgeon-Major Bankabehari Gupta, Purbi.) "Raw pine apple is used to produce criminal abortion." (Surgeon-Major Henry David Cook, Calicut, Malabar.) "It is antiscorbatic, chromagogue. The green fruit is emmenagogue, produces abortion." (Assistant Surgeon Devendra Nath Roy, Calcutta.) "The fresh juice of the white portion of the leaves, mixed with sugar, is used as a purgative and anthelmintic. The juice of the ripe fruit is diuretic, diaphoretic, and refrigerant. Large quantities is it believed to have the property of causing strong uterine contractions." (Brigade Surgeon J. H. Thornton, B.A., M.D., Mumbai.) "The fruit is antiscorbatic, and the fresh juice of leaves anthelmintic. (Surgeon C. F. W. Meadows, Burrisal.) "The juice of the ripe fruit is useful in jaundice." (Assistant Surgeon K. N. Acharji, Dacca.) "Use in animal abortion, fruit eaten." (Surgeon-Major J. J. L. Rattal, Salem.) "In the Straits of Malacca the juice of the leaves is used to produce abortion, also as an emmenagogue. The ripe fruit eaten freely has same effect in a less degree." (Honorary Surgeon P. Kintley, Gajap.) "Besides its value as an antiscorbatic, it seems to have irritant action on the uterus, as it is reported to have caused abortion in weakly or predisposed women." (Surgeon-Major R. L. Dutt, Lahore.) "Its preserve is much employed by the Hakims as an excellent nutritive and tonic." (Surgeon Mokund Lal, Agra.)

Food.—The pine apple is generally regarded as one of the delicious fruits met with in tropical regions. To avoid the dangers consequences attributed to it, however, many persons will only eat it when stewed, while others prefer to eat it fresh, with a little sugar or even salt. During the season in Calcutta good pine apples can be purchased for a pice each (i. e., less than a halfpenny.). The pine apples of Burma and of the Straits are, of the Indian forms, those most prized.
Products of India.

Andrographis.  ANDROGRAPHIS.

the Malabar coast near Mahé, and in British Burma, near 7, the pine apple is remarkably abundant. In the former tract s have a prejudice against eating the fruit, from an idea that nous, and they consequently destroy it, or give it away. In 7, Monsieur d’Avera is trying to make use of the large that grow there to manufacture champagne. I am in corres- with him on the subject, and he seems hopeful of success. e experiment succeed, it could be repeated on the Malabar Mr. L. Liode.)

al Note.—"The oil or essence of pine apple, used for flavour- ses in confectionery, is a solution of ethylbutyrate in alcohol. Ound has also been employed to give the pine apple flavour to sm." (Surgeon Warden, Prof. of Chemistry, Calcutta.)

n muricatum, Rets., see Andropogon muricatus, Rets.

ANCHUSA, Linn.; Gen. Pl., II., 2, 855.
tinctoria, Linn.; Boragineae.
for Alkanna tinctoria, Taush.
adon Powell mentions an oil as obtained from this plant. enences to the root of this plant occur in works on In Indian Science ; it is incorrectly described as yielding the Ratan- nooms echinoidea, Linn.). Anclusa is not indigenous to India, only occur in gardens at hill stations.

ANCISTROCLADUS, Wall.

dus Vahlii, Arn.; Fl. Br. Ind., I., 299; Dipterocarpeae.
2.—Gonda, SINGH.
2—Central and Southern parts of Ceylon up to an altitude of

—Dr. Trimen informs me that the long tough stems are used as

cordifolia, Müll.-Arg.; Euphorbiaceae.
2.—Kerkini, gurguli, kurkuli, PB.; Kérkni, gorgôli, Jhelam; Bertu, henab; Bardetri, madare, Raví; Mêlkar, chirnâti, pin, Bras; Têsîn, jîlî.
—A small shrub, met with in North-West Himâlaya, from the leafal, ascending to 8,000 feet.
—"The twigs and leaves are said to kill cattle when browsed y morning on an empty stomach." (Dr. Stewart.)
re of the Wood.—White, moderately hard, close-grained. lbs. per cubic foot.
2a, Roxb.; Fl. Ind., Ed. C.B.C., 703.
2a for Bischoffia javanica, Bl. (Gamble’s Man. Timb., 335), which see.

ian genus of annual herbaceous or shrubby plants, erect or procum- ning to the Natural Order Acanthaceae, and comprising some 19

A. 1063
ANDROGRAPHIS
paniculata.  The Cret.

Leaves entire. Corolla small, tubular, 2-lipped white or pink, with purple lower lip, pubescent. Ovary 6-12-ovuled, thinly hairy; style at tip minutely bifid. Capsule linear-oblance or elliptic, compressed cost the septum, 6-12 seeded. Seeds oseous, sub-quadrilateral or oblong, or pressed, rugose-pitted, glabrous.

The generic name is derived from ἀνθός, a stamen, γραφής, style, in allusion to the form of the filaments.

Andrographis paniculata, Nees; Fl. Br. Ind., III., 501

Et., f. 518; Acanthaceae.

THE CRET.

Synt.—Justicia paniculata, R. et. Ind., Ed. C.B.C., 40.

Vern.—Kiryati, charadjet, mahātā, hinned.; Kāmeh, mahātā; Oenokriyati, mar.; Kiriety, olīkryati, kiriyee, koryee, Gub.; etah, calafaneh, Duk.; Nila-wimhu, shirat-kuchki, Tam.;’

Tel.; Nila-vospu, kiriyatu, Mala.; Nela-bevinigida, kran Kirata, buhuirb, Sams.; QusahevarBH, qasuhwee, Arab; havandi, Pers.; Nin-bin-kohomba, Sing.

Dr. Mooden Sheriff says that kara-kannirim or "cara c" is the Malayam name found in Hortus Malabaricus, which he considers as neither nor safe to be applied to this plant.

Habitat.—An annual common in hedgerows throughout the India, from Lucknow to Assam and Ceylon. Cultivated in some parts of India.

Botanic Diagnosis.—Leaves lanceolate glabrous. Racemes late-divaricate, pedicles manifest. Capsules thrice as long as broad glabrous.

MEDICINE.

Alui. 1065

Roots. 1066

Leaves. 1067

Expressed Juice. 1068

Infusion. 1069

Tincture. 1070

A. 1070

Dr. Carter, Dymock, and Sakhārām Arjūn reported on the follows: "A bitter tonic and stomachic. It is used in general in convalescence after fevers, and in advanced stages of dysentery also used as a tonic, stimulant, and gentle aperient in the treatment of dyspepsia, and in the torpidity of the alimenta. The expressed juice of the leaves is a common domestic remedy for bowel complaints of children. Dose: 1 to 2 ounces of the infusion to 1 to 4 drachms of the tincture." (Home Department Official pendence.)

It is official in the Pharmacopoeia of India, where direction found as to the preparation of a compound infusion and tincture. Irvine, in his Mat. Med. of Patna, says that the root i
The Lemon Grass Family.  

ANDROPOGON.

Stomachic bitter; and in the "drogue amère." The dose is from 3 to 6 in infusion.

Chemical Composition.—The intensely bitter taste appears to be due to an indifferent non-basic principle, since the usual reagents fail to indicate the presence of an alkaloid. Tannic acid produces an abundant precipitate. The infusion is but little altered by salts of iron. It contains a considerable quantity of chloride of sodium. (Flüch. & Hanb., Pharmaco., Bent. & Trim., 195.)

§ "The Yanadees, a wandering gipsy tribe in the Madras Presidency, constantly carry a supply of pills made of Creat fresh leaves, and the pulp of the ripe tamarind, which they consider antidotal to the venom of the cobra. A pill made into a paste with water is applied to the bitten part, and some of it is put into the eyes; two pills are given for a dose every hour or two internally." (Honorary Surgeon P. Kinsley, Chicacole, Gungam, Madras.) "Creat leaves with the leaves of Indian birthwort (Aristolochia indica) and the fresh inner root-bark of country sarsaparilla, ground into an electuary, is used by native hakims as a tonic and alternative in syphilitic cachexia and foul syphilitic ulcers. I have seen many cases successfully treated by this electuary." (Honorary Surgeon Easton Alfred Morris, Negapatam.) "The green leaves are given with aniseed (4 to 20) as stomachic and anthelmintic." (Assistant Surgeon Devendra Nath Roy, Calcutta.) "This is called Indian Chireeta, and is used as a tonic." (Surgeon-Major Lionel Beech, Cocanada.) "Decoction of all parts of the plant acts as a mild antiperiodic." (Surgeon-Major John Lancaster, M.B., Chittore.) "It is efficacious in certain forms of skin diseases, especially in eczema," (Assistant Surgeon J. N. Dey, Fyepore.) "Febrifuge, used in infusion." (Surgeon-Major J. J. L. Ratton, Salem.)


A genus of grasses (Gramineae) belonging to the tribe ANDROPOGONAE, of which about 25 species are met with in India.

Spikes polygamous, arranged in pairs (or many) on a common slender peduncle, at the base basal node of which occurs a large leafy bract which in bud encloses the pair of spikes; pedicelles arising from the zig-zag flattened branches of a panicule. Panicles pendulous, single or clustered from the axis of the upper leaves. Spikelets articulated to the rachis of the spike in pairs, the one sessile and hermaphrodite (or rarely feminine), the other pedicellate, exserted and masculine, rarely hermaphrodite, sterile, or reduced to empty glumes. Terminal spikelets often in threes, the middle fertile, one lateral male and the other neuter. Glumes sub-equal, often longer than the hermaphrodite flowers; the lowest largest; those of the stalked spikes many-veined, often sterile; the lower glume is flattened on the back against the rachis and veinless. Fales very small, the lowest deeply bined, from the sinuses of which arises a long awn.

The species of economic interest met with in India belong chiefly to the section which corresponds to the sub-genus CYMBOPOGON, characterized by their large bracts, and by the veination of the glumes. The generic name is derived from ἀρδης, a stamen, and πεπαγωύς, a beard, in allusion to the bearded appearance of the stamen.

The greatest confusion exists in the identification of the plants yielding the essential oils from this genus. In all collections intended for museum specimens, the plants (in flower) should, if possible, accompany the oils, so as to secure accurate identification. In fact, until such collections have been made it will be impossible to remove the unavoidable errors which must creep into all pure compilations of the literature of a subject so difficult as that of the economic uses of the Indian species of Andropogon.
ANDROPOGON citratus, The Lemon Grass.

   Syn. for Chrysopogon acicularis, Retz.; Duthie’s LIs chora-kanta of Bengal.

1074 A. ampliflorus, Stend. Met with in the North-West Himala

1075 A. ariani, Edgew. Met with in the sandy deserts of the Par

1076 A. Bladhi, Retz.
   Syn.—Leproceris ‘Bladhi, Nees.
   Vern.—Leori, Beng.; Denda or dhunda, nilon, janwar (gate’s Report for 1876 on the grass farms of Allahbad am N.W. P.
   Habitat.—Described by Roxburgh as a native of hedges sides, but chiefly of old pasture grounds. Duthie says it is fit plains of the North-West Provinces and the Panjáb.

FODDER. 1077

1078 A. brevifolius, Sw.
   Syn.—A. exsertus, Stend.; Pollinia brevifolia and vagin
   Collected at Hazaribagh (altitude 2,000 feet) by Mr. O. B.

1079 A. citratus, DC.
   THE LEMON GRASS.
   Syn.—Cymbopogon citratum, DC.; A. Schomanteus, B.
   Vern.—Gandha bená, Beng.; Gandha trina, Hind.; Hreewc.

   The vernacular names Gandha-bená, Beng., and Malu bhástriná, Sanskrit, are by Roxburgh given to a plant h as A. Schomanteus, Linn. This may probably be A. citratus, seems to agree equally well in certain respects with A. lansiger.

   Habitat.—A large, coarse, glaucous grass, found under various islands of the Eastern Archipelago, and in gardens extensive tract of country in India and Ceylon; it rarely or r flowers. It is also largely cultivated in Ceylon and in Singa odoriferous oil. “I have seen it in flower more than once.” (1 Bombay.)

1080 Oil. The lemon grass yields lemon-grass oil, verbena oil, molisso oil.

A. 1080
The Lemon Grass.

oil is chiefly employed in Europe in adulterating true verbenas. It is largely employed to perfume soaps and greases. The annual amount of otto of lemon grass in Ceylon is above 1,500 lbs., valued at 12 cents a pound. There is a large consumption of this otto in the manufacture of Eau de Cologne. This oil is said to be more costly and less readily produced than citronella; it is chiefly manufactured in Ceylon and Singapore. More than half the annual exports go to America. Ceylon exported 13,315 ounces of this oil. In India it is used in perfumery.

A.—The leaves are often resorted to in flavour tea, and the centre of the stems are cooked in curries.

icin.—In the Indian Pharmacopoeia this oil is regarded as officinal; hence pure it is of a pale sherry colour, transparent, with an exquisitely pure, and a peculiar fragrant lemon-like odour. The uses attributed to it are stimulant, carminative, antispasmodic, and astringent; locally applied it is a rubefacient. It is recommended to be taken in flatulent and spasmodic affections of the bowels and in irritability. In choleretic it has been spoken of as a remedy, allaying and arresting the vomiting, and aiding the process of digestion. Dr. Waring, in the appendix to the Indian Pharmacopoeia, states that amongst the Indo-Britons of South America it is one of their most highly esteemed remedies in cholera.

Dr. Waring's report, which was made in 1840, described the oil as having a lemon-like smell and a warm, penetrating taste. It is used externally in the treatment of skin conditions and internally as a carminative and antispasmodic.

Dr. Waring reported that the oil was recommended for use in intestinal disorders, particularly in cases of colic, flatulence, and diarrhoea. It was also used as a rubefacient and to relieve the symptoms of cholera.

Special Opinions.—"Infusion of the leaves (tea) is largely used as a substitute for coffee in the treatment of fever, and as a medicinal beverage in the case of Indian authors. It is used externally in the treatment of skin conditions and internally as a carminative and antispasmodic.

Infusion. 1087

Roots and leaves. 1088

Infusion. 1089

A. 1089

Perfumery.

Verbena oil. 1081

Otto of Lemon Grass. 1082

Soaps and Greases. 1083

Food.

Leaves. 1084

Stems. 1085

Medicine.

Oil. 1086
ANDROPOGON
laniger, M.D., M.R.C.P. Lond., Ahmednagar.) "It is used as a stomachic on children, and also as a diaphoretic. Externally it is used for ringworm (Surgeon H. W. Hill, Mafhboom.) "The oil is used to conceal the
of iodine in the Dispensary of the Royal Infirmary, Edinburgh," Forsyth, Dinajpore.)

1090

Andropogon contortus, Linn.
The Spear Grass,
Vern.—Sarwála, sarída, sarúri, Pr.; Parba parbi, parwa, band
cha, sarwar, musel, lap, N.-W. P.; Paní-pullu, Tam.; Edd
gaddi, Tel.

Habitat.—Grows on pasture grounds; a very troublesome weed introduced to Heteropogon contortus, R. & S., which see.

1091

A. Hookeri, Munro.

Habitat.—A native of the Panjáb (at Pathankot), altitude of 700 feet. (C. B. Clarke.)

1092

A. Ischemum, Linn.

Syn.—A. Angustifolium, Sibth. & Sm.

Vern.—Palmal jarga, N.-W. P.

Habitat.—"Grows (at Aligarh) on barren wet soil and is eaten by cattle and horses." (Lang.) Excellent for hay; the seeds are not
This is considered (at Murtra) one of the best fodder grasses." (C
Dutch's List of Grasses, 2d.)

1093

A. laniger, Desf.
The Juncus Odoratus and Herba Scheniani of
macists.

Syn.—A. Iwarancusa, Roxb. (in part); Cymbopogon laniger, A. Olivieri, Blous.

Vern.—Lámjá, bár, khár, or khá, khó, gánm, solári, san, tib
cha, karan kuska, ghat-gári, Hind. and Pr.; Kirmánshá, Pathar
Beng.; Miríya ban, ganguli, bud, jóríya, N.-W. P.; Lámbja, Iskhir, Arab. and Bomb.

The Makhshan-ul-Adwiya describes two forms of the plant Iskhir and gives their synonyms, from which it would appear that
the first form it confuses A. Schenanius and A. laniger as one
second form is apparently A. muricatus, the khar-khar of India.
pare with note under the last species.

Habitat.—Native of the Lower Himalayan tract (said to o
Thibet at an altitude of 11,000 feet), extending through the plains
North-West Provinces and Panjáb, to Sind. An inhabitant
desert tracts.

History.—"It is particularly mentioned by Arrian in his ac
Alexander's journey through the Panjáb and Sind, and was g
by the Phoenician followers of the army in Lus, who called it sp
It is common about Kurrachee, and is used as a scent by the n
(Dela. & Gibt., Bomb. Fl., 303, under A. Iwarancusa, Roxb.) "Th
has a wide distribution, extending from North Africa, through
and North India to Thibet; it is the exèvov òuìpàritia ccorides, and the Herba Schenanius and Juncus odoratus o
writers on Materia Medica. It has also been named Fennium car
from its use as a forage for camels. The Arabic name Iskhir i

A. 1093
in the best lexicons as derived from the root ذخیره, the same root furnishes the derivative Zākhīrah, a common term in India for stored-up forage, &c." "Western India is supplied from the Persian Gulf ports. (Dymock, Mat. Med., W. Ind., 601.) "Mr. Tolbert has sent us specimens under the name of Khāsd gathered by himself, in 1869, between Multan and Kot Sūltān, and quite agreeing with the drug of pharmacy." (Flück. and Hanb., Pharm., 728.)

Medicine.—Used to purify the blood, and in coughs, chronic rheumatism, and cholera. It is recommended as a valuable aromatic tonic in dyspepsia, especially that of children; it is also used as a stimulant and diaphoretic both by natives and Europeans, in gout, rheumatism, and fever. (Baden Powell.) "The grass has an aromatic, pungent taste, which is retained in very old specimens. We are not aware that it is distilled for essential oil." (Flück. and Hanb., Pharmacog., 728.) U. O. Dutt says of this species: "Its virtues seem to reside in the larger roots marked with annular cicatrices."

Fodder.—Roxburgh says it grows in large tufts, each tuft composed of a number of plants adhering together by their roots. The roots are aromatic. Cattle are said to be very fond of the grass. The plant has been called Fænum camæorum from its use in dry desert tracts as a forage for camels.

§ "A jungle grass, does not grow about cultivation. Is grazed when tender, but not when full grown; may be stacked, and is then useful in times of scarcity; will last 10-12 years in stack. When cattle eat much of this grass the milk becomes scented." (Mr. Coldstream, Commissioner, Hissar.)

Andropogon millicaeus, Roxb.

The Hill Grass.

Syn.—A. millicaeus, Stend.

Habitat.—An erect grass, from 6 to 10 feet in height, inhabiting the mountains north of Oudh.

Roxburgh writes: "The seeds of this most beautiful stately grass were sent me from Lucknow by the late Gen. Claude Martin, under the name of Hill Grass." It blossoms during the latter part of the rains.

A. muricatus, Retz.

Cuscus, Khus-khus, or Koosa.

Syn.—A. squarrosus, Linn.; Vetiveria odorata, Virrey; Anatherum muricatum, Retz.; Rhaphis muricata, Nees; Phalaris zizanioides, Linn.

Vern.—(The plant) Khas, bend, panni, satuhe, gauvar, onei, balak, or bala, Hind.; Panni, Po.; Bāleka-khāns, Duk. (the root); Khas-khas, shanadej shar, vald bālā (the root), Bēng., Hind., and Duk.; Siron, Santal.; Tin, Oudh.; Valā Gūj.; Vālā, Mar.; Vālā, khasa-khas, Bomm.; Vālā, Cutch.; Vettri-ēr, nishalēr, nilamāch-ērā, nīramā, Pam.; Vettērēr, avvevā-gaddi-īvērē, lamay-jakmu-ērē, vidāval-ērē, owu-ōrē, Tel.; Lōvānchē, Kan.; Vettri-ēr, ramaksham-ērē, Mal.; Uṣirā, virāmā, Sans.; Uṣir, Arāb.; Khas, Pīre.; Senandrumē, Sing.; Mīpo-īsā, Burm.

According to Moodeen Sheriff, the lowest parts of the culms of this grass, with or without a portion of its roots, are sold under the Arab name Iskhir in South India, while in Haidarabad, Calcutta, &c., Iskhir is used for A. Schenonanthus. The true Iskhir of Arabia does not, according to him, exist in India. He seems also to regard the name khas-khas as being...
doubtfully a true Bengal synonym. It is the name by which the roots are universally known in Bengal, and there seems no possible chance of confusing them with khas-khas, the poppy seed. Dr. Dymock (Mat. Med., W. Ind.) gives Iskhir as the Arab and Bombay name for A. lasige, which see.

Habitat.—A perennial, tufted grass, very common in every part of the coast (Coromandel, Mysore), and in Bengal and Burma, where it grows with a low, moist, rich soil, especially on the banks of water-courses, &c. (Roth.) It covers large tracts of waste land in Cuttack. It inhabits the plains of the Panjâb and North-West Provinces, and ascends into Kumaon, 1,000 to 2,000 feet in altitude. (Duthie) Cultivated in Râjputana and Chûtia Nagpur (Gobindpur). This plant is alluded to on some copper-plate inscriptions discovered near Etawah (dated A. D. 1170 and 1174) as being one of the articles on which the kings of Kanaúj levied import duties.

Resin.—The roots contain a resin and volatile oil, which is rather difficult to extract. (Dr. Bidie’s Paris Exhibition Catalogue, p. 47.)

Fibre.—The roots are extensively made into aromatic scented mats, hung over doors, and kept wet to cool the atmosphere during the hot season, and are also in great demand for making fans, ornamental baskets, and other small articles, &c. The grass is suited for the manufacture of paper, and it is estimated that from 60,000 to 70,000 maunds are annually available in the Hissar district of the Panjâb alone. In the Gazetteer of the Central Provinces the grass is described as a “nuisance to the cultivators, as it grows on the rich soils, and is very difficult to eradicate.”

Mr. Baden Powell says the fibre is much used as a packing material.

Oil.—The roots, when distilled with water, yield a fragrant oil, which is used as a perfume, and as such it deserves the extended attention of European perfumers. Dr. Irvine, in his Medical Topography of Ajmer, mentions the preparation of attar from the roots of this plant, which he says is used in sherbet.

Medicine.—An infusion of the roots is given as a febrifuge and a powder in bilious complaints. Khas-khas is regarded as stimulant, diaphoretic, stomachic, and refrigerant. The essence (or otto) is used as a tonic. The roots are regarded as a cooling medicine, and are given mixed with other medicines having similar properties. A paste of the pulvured roots in water is also used as a cooling external application in fevers.

The Pharmacopoeia of India says of this plant: “Antispasmodic, diaphoretic, diuretic, and emmenagogue properties have been assigned to it; but beyond being a gentle, stimulant diaphoretic, it seems to have no just claims to notice as a medicine. An account of the uses to which it has been put in Europe is given by Pereira (Mat. Med., Vol. II., Pt. i., p. 132). Its uses in native medicine are detailed in the Taleef Shereef, p. 144. No. 47. According to the analysis of Gager, it contains a resin, a bitter extractive, and a volatile oil. The dose of the powdered root is about twenty grains, or it may be given in infusion (two drachms of the bruised root to ten ounces of boiling water) in doses of an ounce or more. As a medicine, as far as is at present known, it is an article of minor importance.” U. O. Dutt says: “It is described as cooling, refrigerant, stomachic, and useful in pyrexia, thirst, inflammation, irritability of the stomach, &c. It enters into the composition of several cooling medicines, as, for example, the preparations called Shadanga pâmya. A weak infusion of the root is sometimes used as a febrifuge drink. Externally it is used in a variety of ways. A paste of the root is rubbed on the skin to remove oppressive heat or burning of the body. The use of this drug appears to have been popular with the ancients.”

“An aromatic cooling bath is prepared by adding to a tub of water the following substances in

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The Citronella.  

**ANDROPONOG Nardus.**  

fine powder, namely, root of *Andropogon muricatus*, *Pavonia odorata* (bâla), red sandal-wood, and a fragrant wood called *padma kashtha.*" (Hindi Mat. Med., 271.)  

**Chemical Composition.**—"Khas-khas has been analysed by Vanquelin, who has obtained from it, 1st, a resinous substance of a deep red-brown colour having an acrid taste and an odour like myrrh; 2nd, a colouring matter soluble in water; 3rd, a free acid; 4th, a salt of lime; 5th, a considerable quantity of oxide of iron; 6th, a large quantity of woody matter. (Vanquelin, Annales de Chimie, t. LXXII., p. 302.)" (Dymock's Mat. Med., W. Ind., 692.)

4th "The grass with its roots is boiled in water and used as a steam bath in fevers of a continued type, producing speedy and profuse diaphoresis. The otto is given in two minims doses to check the vomiting of cholera." (Surgeon-Major F. M. Houston, Trivandrum.)

"Used in the form of cigarettes with benzoin, it relieves headache; a cold infusion is refrigerant." (Surgeon-Major John Lancaster, Chittore.)

"Infusion of the root is used as a febrifuge." (Surgeon-Major J. J. L. Ratton, Salem.)

"Refrigerant." (Surgeon C. M. Russell, Sarum.)

**Fodder.**—The grass when young affords good fodder. After the rains are over it is cut as bedding for horses at Saharanpur.

"Principally used for thatching; not grazed upon except in times of excessive drought. Cattle will eat the young leaves after the stems have been burned down." (Mr. Coldstream, Commissioner, Hisar.)

**Domestic Uses.**—*Tin,* a grass in universal use for thatching purposes, the reeds being made into brooms. The roots of it supply the "khas" with which our hot-weather tatties are made. It grows on the banks of rivers and marshes, and is generally strictly preserved, as it takes time to spread. Proprietors are averse to its being dug up for the khas. (Oudh Gazetteer, III., 176.) The fibre is made into fans, ornamental work-boxes, and other small objects.

**Andropogon Nardus, Linn.**

**The CITRONELLA.**

**Syn.**—A. flexuosus, Nees; A. coloratus, Nees; A. martini, Thw. (En. Ceylon Plants, 361, not of others); A. Iwarancusa, Roseb. (in part); Cympogon flexuosus, Nees; C. Nardus, Linn. (in Pharm. Ind.).


**Habitat.**—A grass common in the plains and lower hills of the North-West Provinces and Panjâb; extensively cultivated in Ceylon and Singapore for the production of oil of citronella. Abundant about Travancore. As cultivated in Ceylon it often rises to the height of 6 or 8 feet. It is most readily recognised from all the other species by its rufous colour, short spikes, and narrow leaves.

**Oil.**—The leaves are distilled with water, and yield over 3 ozs. of essential oil from 1 cwt. The pure oil is thin and colourless, with a strong aromatic odour, and an acrid, citron-like flavour.

The average exportation of citronella from Colombo is about 40,000 lbs., valued at £6,000, valued at about 42. 1d. per lb. It is largely used to give the peculiar flavour to what is known as "Honey-soap."

The extract published below, giving a mode of detection of admixture of other oils with citronella, taken from the *Year-Book of Pharmacy* for A. 1108.
ANDROPOGON
Nardus.

The Citronella.

1875, will be found useful, since doubtless the same process applicable to all the grass oils. It may be remarked, howe- author is incorrect in attributing citronella to A. Schenautz adulteration of the Indian *ruta* oil (the oil from A. Scho- daily becoming more and more serious, and an easy mode of c adulsations is thus very important. This same mistake Dr. Wright (*Year-Book of Pharm.*, 1874, 637), who gives som chemical information regarding citronella oil, which he appe as obtained from A. Schenanthus.

Chemical Composition.—Dr. Wright informs us that the of citronella mainly consists of an oxidized substance boilin which becomes to a certain extent resinized, losing partially t of water, by continued heat. On analysis it gave quantities: agree with the formula $C_{10}H_{16}O$, a formula corroborated by i with bromine, zinc, chlorine, &c. Prof. Gladstone, who e with citronella oil some time previous to Dr. Wright (18 at the conclusion that it owed its peculiar property to an which he called Citroenol. This he separated by fractions into two portions, the one boiling at 200-205° C. and the 202° C. The composition of each portion as arrived at b; would be represented by the formula $C_{10}H_{16}O$.

The chemistry of Citronello oil would thus seem to rec investigation to remove the slight disparity in these opinions. "Estimation of Fixed Oil in adulterated Citronelle (Chem. 297).—The following method yields constant results when m care, and when taken in conjunction with the specific gr sample, may give a good approximation as to the quantity i of the adulterating oil:—

(a.) Dissolve about one ounce of caustic potash in an alcohol in a flask; put on a sand bath, and leave to boil.

(b.) Take an eight-ounce beaker, and weigh into it 400 t of the citronella; add two volumes of alcohol; boil on a sand

(c.) When (a) and (b) are both boiling, add one volume of solution of potash to the three volumes alcohol and citronella minute or so, and then fill to within an inch of the top w water. Stir gently, and let boil for half an hour, or until it perfectly clear, and the under-fluid semi-transparent. Then:

(d.) When quite cold, siphon off the under-fluid [conta alcohol, potash, and soap, if any fixed oil was in the sample] into another beaker, and boil gently. Acidify with dilute H50 or 100 grams of wax, continue gently boiling till the perfectly clear, and then allow to cool gradually.

(e.) When cold remove the cake of fat, dry and weight, less 50 or 100 grams of wax, is the amount of fatty ed in the fixed oil. A simple calculation will show the am of the adulterant in the citronella." (*Year-Book of Pha p. 302.)

Cultivation of the grass and distillation of Citronella. Oil the citronella grass is raised from seed and planted like; and will give two or three crops a year. When fit to cut, carried to a large boiler and the oil is distilled. It is estim about three dozen bottles of oil to the acre, but the demand price fluctuates from 2s. 6d. to 4s. 6d. a bottle. At the latter handsomely, while at the former it little more than covers A still, capable of turning out a dozen bottles a day, costs £6 by Major Wimberley, Officiating Deputy Superintenden, For the Tropical Agriculturist, Vol. III., p. 58.)

A. 1110
**Products of India.**

### Geranium Grass. ANDROPOGON Schœnanthus.

**Citronella Grass—stuff as a Paper Fibre.**—A correspondent, writing in the Ceylon Observer, suggested the use of citronella grass as paper material. In extracting oil from the grass, it is boiled or subjected to steam, under pressure, and as this is one of the first operations to which the raw material is subjected in paper manufacture, grass which has been thus treated should be much more easily utilised than material not previously boiled. Citronella grass, like esparto, can be supplied entirely free from knots, which is a great advantage in paper manufacture. At present about 3,500 tons of citronella are available for export in Ceylon. *(Tropical Agriculturist, Vol. III., p. 83.)*

**Medicine.**—This is regarded as official by the Indian Pharmacopoeia; the essential oil of citronella used medicinally being imported from Ceylon. In its properties it closely approaches that from *A. citratus*.

**Dr. Trimen** writes that *Materia Medica of Patna*, says that the infusion of the leaves in doses of 1 to 2 ounces is used as a stomachic.

**Domestic Uses.**—Dr. Trimen writes me that this grass is in Ceylon largely used for thatching.

### Andropon pertusus, Willd.


**Vern.**—Pulwah, pulshah, rakar, N.-W. P.; Pulwán, or pula na minyará, Pus.

**Habitat.**—Found on old pasture grounds, generally shaded by trees, in the plains of the Panjáb and North-West Provinces, and at lower elevations of the Himálaya. Abundant in Hissár.

**Fodder.**—Dr. Stewart, writing under *A. annulatus*, Forsk., says: “It is considered excellent fodder for bullocks, &c., and for horses, when green.” In Australia it is regarded as one of the best grasses to withstand long droughts, while it bears any amount of feeding. *(Baron Von Mueller.)*

“Good for stacking, will remain for 12 or 13 years; much stacked at the Hissár farm is especially grazed by buffaloes.” *(Mr. Coldstream, Commissioner, Hissár.)*

### A. scandens, Roxb.

**Habitat.**—Found in the Panjáb, in Kashmir, and Bundelkhand. It is a coarse grass growing commonly in hedges. It flowers during the rains.

**Fodder.**—Cattle are apparently not fond of it.

### A. Schœnanthus, Linn.; Royle, Ill. Him., t. 97.

**The Geranium Grass; Rusa Oil Grass; Oil of Ginger Grass.**

**Syn.**—*A. Martini*, Roxb.; *A. Naedoide*, Nees; *A. Calamus aromaticus*, Royle; *A. Pachnodis*, Trin.; *Cymbopogon Martini*, Munro.

**Vern.**—Pha chú, rusa chú, rusa-hám, musul, mircia gánd, hind.; Ágáy-gád, gandha bema, Beng.; Bujina, phál-chhári, N.-W. P.; Raáns, Pu.; Mircia-gánd, Siwálik; Rusegavat, rohisha, Bomb., Mad.; Kusa-katrél, roshel (the oil).

In Mooden Sheriff’s Supplement to the Pharmacopoeia of India the vernacular names for the Lemon grass are given under *A. Schœnanthus* instead of *A. citratus*.

**Habitat.**—This grass is wild in Central India, the North-West Provinces, and the Panjáb. Dr. Roxburgh first saw the plant from seeds, forwarded to him by General Martin, collected in Balaghat during the last war with Tippu Sultan. This is the roussa paper grass, abundant everywhere in the Deccan.

A. 1117
Oil.—The oil obtained from this plant has come to bear a number of names, which appear for the most part to be of modern origin, and indicate the use to which it is put. Perhaps the name by which it is most generally known is rsa oil, *raso* (rusa-ka-tel). As pointed out by the distinguished authors of the *Pharmacographia*, these names look exceedingly like a corruption from rose oil, the more so since the principal consumption is as an adulterant for attar of roses. It is curious however, that, as stated by Dr. Dymock (Met. Med., W. Ind., 690), the Indian distillers and dealers know nothing of this use. About 40,000 lbs are annually exported from Bombay to the Red Sea ports, chiefly to Jeddah; a small amount finds its way to Europe, but the great bulk is sent to European Turkey. In Arabia and Turkey it appears under the name of *tirds yaghi*, and in the attar-producing districts of the Balkans, it is known, at least to Europeans, as geranium oil or Palmarosa oil. The name Geranium oil, which has caused much confusion with the true geranium oil or oil from the geranium plant, has apparently come into existence from the fact that the so-called geranium grass oil is used to adulterate the true geranium oil, which in its turn is used as an adulterant for attar of roses. Piesse says that true geranium oil is worth 3s. an ounce whereas geranium grass oil is not worth more than that sum per lb.

The *Pharmacographia* gives some interesting information regarding the mode by which *raso* oil is refined so as to prepare it for admixture with the attar of roses. The *raso* oil is shaken with water, acidulated with lemon-juice, and then exposed to the sun and air. By this process it loses its penetrating after-smell and acquires a pale-straw colour. "The optical and chemical differences between grass oil thus refined and attar of roses are slight, and do not indicate a small admixture of the former. If grass oil is added largely to attar, it will prevent its congealing" (p. 728). "It was formerly added to the attar only in Constantinople, but now the mixing takes place at the seat of the manufacturer. It is said that in many places the roses are sprinkled with it before being placed in the still. As grass oil does not solidify by cooling, its admixture with rose oil renders the latter less disposed to crystallize" (p. 267). The degree of admixture with grass oil is thus determined by the crystallizing of the attar.

From the fact of one of the largest supplies of Indian grass oil being in Nimmer district, Khândesh, Bombay Presidency, the oil has come to bear the commercial name of Nimar (or, as it is commercially written, Nammar) oil. Dr. Dymock gives some interesting information regarding this industry. The first mention apparently of the oil is by Maxwell in 1825 (*in the Calcutta Med. Phys. Trans.*, Vol. I., p. 397). It was afterwards described by Forsyth, 1827 (*ibid.*, Vol. III., p. 273). It is only within comparatively recent times that the oil has become an article of commercial value. Dr. Dymock thus describes its manufacture: "It is now chiefly distilled in the Nimar district, an iron still being used and a very small quantity of water; when the still is carelessly worked, the grass burns and communicates a dark colour to the oil which should be of a pale sherry colour. I am assured by the Bombay dealers that all the oil of commerce is more or less adulterated; a comparison of the commercial article with some oil distilled by myself supports this statement; the adulteration is said to be practised by dealers, who, I am informed, are regularly supplied with oil of turpentine from Bombay. The grass flowers in October and November, and then fit for cutting: 373 lbs. of grass received from Khândesh, and submitted to distillation under my own superintendence in Bombay, yielded 1 lb. 5½ ozs. of oil." It appears that the chief substances used to adulterate the Khândesh *raso* oil are turpentine, ground nut, rape and...
Geranium Grass, ANDROPON
Schenaanthus.

linseed oils. With the two first the turbidity passes off in a day or two, hence they are preferred, and turpentine is chiefly used, because it cannot be detected by the evaporation test. Dr. Dynock adds: "The genuine oil is dextrogyre; the ray is rotated 30° to the right by 100 min.; 200 min. rotate it 78°. Some samples of the commercial article rotate the ray about 13° to the right; some have little or no effect upon it."

Medicine.—The oil is used as a liniment in chronic rheumatism and neuralgia, and is believed to have the property of curing baldness. It resembles, in quality and appearance, the lemon-grass oil. The oil is seldom taken internally by the natives, but is considered a powerful stimulant when applied externally.

Ainslie calls A. Nardus (7) ginger grass or spice grass, and says that an infusion of it is used as a stomachic, and that occasionally an essential oil is prepared from it which is useful in rheumatism; but the plant he refers to is probably A. Schenaanthus. Similar confusion exists in the writings of most Indian authors. "There is a grass about Bombay which smells like fresh ginger. I think it must have been introduced, as it is only found about fields and gardens." (Surgeon-Major W. Dynock.)

It seems probable this is Ainslie's plant, which may prove a distinct species from A. Schenaanthus.

The Bombay Gazetteer gives an interesting account of the manner in which ruza oil used to be prepared at the Panch Mahals. Paper, soap, and grass oil were formerly prepared, but these industries have almost entirely disappeared: "The grass oil made from the large-bladed aromatic grass known as ruza, which used to grow over large stretches of waste land, was, at the rate of 4s. (Rs) a pound, bought in considerable quantities, and used partly as a remedy for rheumatism, partly to mix with attar of roses. The oil was extracted by distillation. A rough stone oven was built by the side of a stream, and in it a large metal caldron was placed and filled with bundles of grass and water. When full, a wooden lid was put on, and sealed with a plaster of ground pulse, adad. Through a hole in the lid one end of a hollow bamboo was thrust and the other end passed into a smaller metal vessel securely fixed under water in the bed of the stream. The oven was then heated, and the vapour passing through the hollow bamboo was, by the coldness of the smaller vessel, precipitated as oil." (Bombay Gazetteer, III., 251.)

Mr. Baden Powell appears to be referring to this plant, under Cymbopogon aromaticus (Vern.—Khas, usar, balam). He says: "Considered by natives cool and astrigent, useful in skin diseases, bilious affections, and special diseases. It is an aromatic stimulant, useful in fever, and to make tattles. The roots are dug up in March and April. Used as an aromatic in fever. Gives a fragrant oil." (Panjab Products, Vol. I., 583.)

This quotation might, as far as its facts are concerned, be equally applicable to A. muricatus; but since in another part of his work Mr. Baden Powell alludes to the khas-khas under its correct botanical synonym, and the more so since A. Schenaanthus is a native of the Panjáb, it seems a just inference that by Cymbopogon aromaticus is meant A. Schenaanthus. If this be correct, the above vernacular names become of interest as those in use in the Panjáb for this species. Dr. Stewart describes two species as common in the plains of the Panjáb, but he gives their characters and vernacular names jointly, and it is therefore impossible to separate them. The scientific names which he gives to these Panjáb forms are equally confusing—Cymbopogon Iwaram-
cus, Schult., and C. laniger, Defl. Regarding the latter there seems little or no doubt it is Andropogon laniger, Defl., the species which inhabits the dry, sandy, and desert tracts of the Panjáb, Sind, &c. The former seems to be A. Schenaanthus, Linn., which by Stewart has been

A. 1119
ANEILEMA | scapiforum.

incorrectly named *Cymbopogon Iwarancus*, *Schult*. The oil which *Stewart*, on the authority of *Vigne*, says is prepared near Hassan Abad, would, according to this view, be a form of rusa or Nimar grass. *Stewart* adds the exceedingly interesting fact, which does not appear to have been observed by other authors: "A spirit" (arach), he says, is "also distilled from the grass with spices, &c., and is said to be useful in indigestion and fever." *Madden* mentions that the roots are sometimes luminous.

§ "The decoction of it is a febrifuge, and I have used it in cases of cold and feverishness with benefit." (Assistant Surgeon Bolby Chand Se Re Calcutta.) "Excellent external application in rheumatism." (Assistant Surgeon Nehal Singh, Saharanpur.) "Mixed with tea in equal proportion and infused, is sometimes used as a diaphoretic in fevers." (Surgeon-Major C. F. McKenna, Caunpore.)

Fodder.—Duthie writes: "The grass is a favourite fodder for cattle, and Mr. Miller tells me that at Banda (North-West Provinces) it is grown in meadows kept for the purpose and sold in the bazar."

General Martin collected seed of this grass in the high-lands of Baluchistan, while there with the army during the war with Tippoo Sultan; and after growing it in Lucknow sent specimens to Dr. Roxburgh, with the remark that he had noticed the cattle were voraciously fond of it, but that it had so strong an aromatic and pungent taste that the flesh of the animals fed upon it, as also the milk and butter, were strongly scented with the plant. There seems some mistake in this account of General Martin having collected *A. Schomannus* on high-lands; it frequents swamps. *A. laniger*, *Desf.*, is found on dry places. § "Not very good for grazing. Grows in swamps, but not abundant in Hissar. A tall grass, too coarse to stack but used for thatching and screens." (Mr. Coldstream, Commissioner, Hissar.)


A genus of herbaceous perennials, belonging to the Natural Order Commelinaceae, and the Tribe Commelineae, comprising 60 species, chiefly Asiatic and African, only 5 or 6 occurring in America. In India there are 28 species met with in the plains, one or two ascending to 2,500 feet in altitude. *Stem* erect, delicate rather robust, simple or branched. *Leaves* scattered or crowded and radical. *Peduncles* often terminal or in the axils of the upper leaves, simple or branched. *Inflorescence* a many-flowered panicule with the middle branches the longest, or corymbose, or few-flowered, rarely 1-flowered *bracts* few, rarely herbaceous and sheathing; in a few species they resemble the spathaceous condition of Commelina. *Stamens* 6, of which 3 are fertile, free filaments, tapering, hairy or glabrous; of these 2 are opposite the laterals and interior sepals and have large anthers, the cells of which are parallel and united throughout their length; 1 opposite the anterior petal general fertile, but with the anthers diverging; the other 3 stamens have sterile anthers. *Ovary* sessile, 3-locular, arranged in 1 or vertical series.

**Anelema scapiforum**, *Wight*, *It.,* t. 2073.

*Syn.—Commelina scapiflora*, *Rosch.*, *Fl. Ind.,* Ed. C.B.C., 59; *A. Teescum,* *Buch., Ham. in Wall.,* Cat.; *Murdannia tuberosa*, *Regel.,* *It.,* t. 95.

*Vern.—Kureli, Beng.; Siyah mästi, or mästi-e-siyah, Pers., *Hind.;* Siam.*

The above (Hindustani) vernacular names are by authors said to be applied to the tubers of this plant, but it would seem that this cannot be the case when used as substitutes for the true *Siyah mästi* — the real...
The Anemone.

ANETHUM
Sowa.

Arculigo orbitoides, *Gartn.;* it is difficult to discover whether it pos-
s any properties of its own or not.

References.—De Candolle, *Monog. Phaner.* by C. B. Clarke, III., 308;
Clarke's *Comet et Cyrt., Beng.* t. 14; Stewart's *Ph. Pl.* 236.

Habitat.—A native of the Himálaya from the Jumna to the Khásia;
Tenasserim, and south to Cape Comorin, ascending to 1,000 feet in

Botanical Diagnosis.—Roots perennial fascicled, tuberous-fusiform,
composed of dichotomous elongated pikes, branches angled; bracts
sheathing or spathaceous, often ochrate. Petals equal, rounded,
avi, blue. Stamens 3 perfect, with 3 sterile alternating ones; filaments
airy; anthers blue. Capsule 3-angled ellipsoid, apex acute or mucro-
Seeds white, minutely reticulated and very minutely glandular.

Properties and Uses—

Medicine.—Said to have astringent and tonic properties, and con-
et by natives to be hot and dry; useful in headache, giddiness, fever,
dice, and deafness. It is also regarded as an antidote to poisons, and
for snake-bite.

"The roots of this plant bear no resemblance to the Siyak Máli of
zara." (Surgeon-Major Dymoch, Bombay.) "The dried powder,
with sugar, is used as an aphrodisiac. With the juice of the *tulsii*
is it is administered for pains in the kidneys, and is one of the chief
cides used by hakims for spermatorrhea." (Surgeon Emerson, Cal-
l.) "Root-bark dried in the shade is said to have been employed
benefit in cases of asthma. It is a remedy of great repute for im-
nce and spermatorrhea. It is used also in colic, piles, and infantile
ulsions. In combination with Daríflí it is employed in bites of mad
both internally and externally." (Asst. Surgeon Ghulam Nabi.) "It
ed for incontinence of urine." (Surgeon-Major C. W. Calthrop,


A genus of perennial herbs, belonging to the Natural Order RANUNCU-
Leaves radical, lobed or divided. Flowers occurring in 1 or more-
ered simple or branched scapes; involucr 3-partite, bracts free or connate.
ala O. Stamens many, outer deformed or petaloid, Carpels many, ovules
, dulose. Fruit a head of sessile achenes, with naked or bearded styles.
here are some 80 species, natives of the cold and temperate regions,
15 occur in India.

Ione obtusiloba, Don; *Fl. Br. Ind., I., 8.

Vern.—Rattanjag, padar, Pá.

Habitat.—Temperate and Alpine Himálaya, from Kashmir to Sikkim;
ide 9,000 to 15,000 feet.

Chemical Composition.—Several varieties of Anemone contain a
ipple, anemone or anemone camphor, which is stated to be an acrid.
Anemone acid is also contained in the fresh herbs.

Medicine.—In Hazará the pounded root, which is acrid, is mixed with
and given internally for contusions. In Bissahir it is said to be
as a blister, but to be apt to produce sores and scars. (J. L.
Art, Ph. Pl.)

"The seeds (which are as sweet as almonds), if given internally,
ce vomiting and purging. The oil extracted from them is used
Peucedanum graveolens, *Benth.*; *Umbelliferá.*

A. 1126
ANISOMELES malabarica. The Gao-zubán.

1127


Angelica glauca, Edgew.; Fl. Br. Ind., II., 706; Umbelliferae.

Vern.—Chora or Chur, Pus.

Habitat.—From Kashmir to Simla, altitude 8,000 to 11,000 ft. found also in the Dhania Dhar Range, above the Kangra Valley.

Medicines.—A cordial and stimulant remedy, formerly used for flatulence and dyspepsia. It is also used in obstinate feces and in bilious complaints.

Food.—Its aromatic root is added to food to give it a flavor of celery.

Angustura Bark, see Galipaea Casparia, St. Hil.; Rutaceae.

Anise-seed, see Pimpinella Anisum, Linn.; Umbelliferae.

Anise, Star, see Illicium Anisatum, Linn.; Magnoliaceae.

1130


Anisochilus carnosus, Wall.; DC. Prod., XII., 61; Labiateae.

Vern.—Panjiri-kā-pāt, stē-kā-panjiri, Hind.; Chorā, chora-an BOMB., MAR.; Ajman-wālīn, ajama, Guj.; Ajman-kā-pattā patti, DUK.; Korppā-walī, TAM.; Korppā-wali, Yommā; chettu, Tel.; Chōmaru, kattu-kurkā, kurkā, pātu-kurkā, da-pātri, KAN.

Habitat.—Found in the North Circars and Malabar.

Medicines.—Ainslie says that the fresh juice of the leaves is a sugar-candy is given by the Tamil doctors in cynanche, and, sugar and gingelly oil, is used as a cooling liniment for the fevers and stomach are given in infusion in coughs and colds expectorant, especially for children. The plant yields a volatile oil is said to be stimulant, diaphoretic, and expectorant. (Dymott Ind.; Bidie, Madras Quart. Med. Journ., 1863.)

"The juice of the leaves mixed with sugar and honey in Mysore a popular domestic remedy for coughs in children." Major (North, Bangalore.)

"Juice used in catarrh." (Surgeon-Major J. J. L. Ratliff, Salem.)

Anisodus luridans, Linth. & Otto., see Scopolia lurida, Solanaceae.

1132


Anisomeles malabarica, R. Br.; DC. Prod., XII., 436; Labiateae.

Vern.—Chodhara, MAR.; BOMB.; Mogār-kā-pattā, DUK.; Pātā, atti, ātā, marutti, TAM.; Mogā-rākā, mogā-rāka, mahā-kārūka-rākā-kāru, Tel.; Pātā-marutti, karūkāme, MAL.; Bētān-kākā, SANS.

"This plant, in Bombay, is known as Chodhara (four-are) is aromatic, but is not the Gule-guo-subān, which is much

Dr. Birdwood mentions this as one of the plants which it

A. 1132
The Anodendron.

Anodendron paniculatum.

are sold as gao-subán, but this seems to be a mistake. I have, however, received that as the name by which it is known in Cutch; the true gao-subán is imported into India from Persia,—see Echium; but doubtless many other plants are sold under that name.

Habitat.—Found in South India. Dr. Dymock says it is pretty common on the Ghâts in the Bombay Presidency, but appears to be better known in South India.

Medicine.—“Few plants are held in higher esteem, or are more frequently employed in native practice than this. An infusion of the aromatic bitter leaves is in common use in affections of the stomach and bowels, catarhal affections, and intermittent fevers. According to Dr. Wight, in addition to its internal use in the cure of fevers, patients are made to inhale the vapour of a hot infusion so as to induce copious diaphoresis.” (Pharm. Ind.) Ainslie tells us that an infusion of the leaves is given to children in colic, dyspepsia, and fever arising from teething. A decoction of the plant, or the essential oil distilled from the leaves, is used externally in rheumatism. (Dymock.)

§ “A handful of the leaves is used in Mysore with a vapour bath when profuse diaphoresis is required.” (Surgeon-Major John North, Bangalore) “Diaphoretic, dose of infusion 1 to 2 oz.” (Surgeon W. Burren, Bhuj, Cutch.)

Anisomeles ovata, R. Br.

Vern.—Gahura.

Habitat.—Found in Ceylon, Coromandel, Bombay, Bengal, and Nepal.

Medicine.—The whole plant has a strong camphoraceous smell. In Ceylon a distilled oil is prepared from it, and found useful in uterine affections. It has also carminative, astringent, and tonic properties.


A genus of trees or shrubs, belonging to the Natural Order Rhiophorae.

Leaves alternate, ex-stipulate. Flowers minute, in axillary simple or fascicled spikes, chroateate or minutely bracteolate, bis- or uni-sexual. Perian 4, small, involute. Stamens 5; filaments short, subulate; anthers small, didymous. Ovary inferior 4-celled; styles 4. Embryo exalbunimous.

Anisophyllea zeylanica, Benth.; Fl. Br. Ind., II., 442.

Vern.—Welligayne, SINGH.

Habitat.—A tree of the southern and central parts of Ceylon, ascending to 1,500 feet.

Structure of the Wood.—Greyish brown, moderately hard.


Anodendron paniculatum, A.D.C.; Fl. Br. Ind., III., 668; Apoc.

Vern.—Dál, SINGH.

Habitat.—An immense climber, occurring from Sylhet to Martaban; the Deccan Peninsula; Western Ghâts from the Konkan southward; Ceylon; altitude from the plains up to 4,000 feet.

Fibre.—The stem yields a fine and very strong fibre, much used by the Sinhalese (Thwaites; Trimen.)

A. II42
The Bullock's Heart.

**Anona reticulata.**

**II53**


Syn.—Conocarpus myrtifolius, Wall.

*Vern.*—Dhau, dhakura, kala dhakura; Meywar; the lesser e Ulwar; Kardaki, Hind.

**Habitat.**—A small, gregarious tree, with pendulous branches, fou the arid and northern dry zones of Rājputana-Malwa plateau, as the Nerbudda, in Nimar, and in the Mandla District.

**Botanic Diagnosis.**—Leaves small, elliptic or obovate-acute or of always narrowed at the base; peduncles, solitary simple; fruit subulate, ultimately glabrous; beak much less than half the height of nucleus.

**Structure of the Wood.**—Hard, yellowish white, with a small, irregular blackish-purple heartwood. Weight 59 lbs. per cubic foot.

It coppices well, but the wood is not in general use.

**TIMBER.**

**II54**

**ANONA, Linn.; Gen. Pl., I., 27.**

A genus of trees or shrubs, belonging to the Natural Order Anonaceae, comprising some 50 species, inhabitants of America and Africa, a few being naturalised in Asia. Three species are met with in India, of which two may be described as naturalised.

Flowers solitary or fascicled, terminal or leaf-opposed. Sepals 3, small valvate. Petals 5-6, valvate, 2-seriate, the inner series sometimes wanting, outer triquetrous, base concave. Stamens numerous; anther-cells narrow, dorsal, contiguous, top of connective ovoid. Ovaries many, subconnate; styles oblong, ovule, erect. Ripe carpels confluent into a many-celled ovary, globose, many-seeded fruit.

The word Anona is said to be derived from the Malay name M, pronounced in Banda Islands Menonna. Some authorities derive it from Annona, Lat., the year’s produce or grain; annus, a year, difficult to see what could have suggested the name if this derivation be correct.

**FOOD. Fruit.**

**II56**

Anona Cherimolia, Miller. A native of America, and of Jamaica, the other West Indian Islands, nearly allied to A. squamosa, is regarded by the Creoles as the most delicious fruit in the world—an opinion generally confirmed.

A. muricata, Linn.; DC. Prod., I., 84.

**THE SOUR SOP.**

The fruit of this tree is sometimes to be seen in India, for, although not so common as either of the following species, it is occasionally cultivated. It often attains a weight of upwards of two pounds, is greenish and covered with prickles; the pulp is white, and has a agreeable, slightly acid flavour. Drury says this species is sparingly cultivated in Madras; “the fruit is muricated with soft prickles.”

**II57**


**THE BULLOCK’S HEART, OR TRUE CUSTARD APPLE OF THE INDIAS.**

*Vern.*—Louné, rám-phal, Hind.; Nína’brang; Gém, Santal; Rám Bomb., Duk., Mar., Guj., Kan.; Rám-phal or rám-phalam, T Ráma-pandu, rám-phalom or róma-chandar-pandu, Tel.

**Habitat.**—A small tree, supposed by some authors to be a native of Asia, naturalised in some parts of India, extensively cultivated; occurs everywhere in Bengal, Burma, and South India.

A. **II58**
The Custard Apple.

Dye.—The dry unripe fruit yields a black dye, and the fresh leaves a fairly good quality of indigo.

(Tan.—"The leaves and young twigs are largely used for tanning."

(E. A. Fraser, Râjputana.)

Fibre.—A good fibre is prepared from the bark of the young twigs.

Food.—The fruit, which resembles a bullock’s heart, ripens during the latter part of the rainy season, and is eaten by natives, but only rarely by Europeans.

Medicine.—The bark is said to be a powerful astringent and to be much used as a tonic by the Malays and Chinese. The fruit is reported to be used in the West Indies, and by the natives of America, as an anti-dysenteric and vermifuge.

Timber.—Very little has been written regarding the timber obtained from this small tree. Skinner gives 40 lbs. as the weight per cubic foot.


CUSTARD APPLE of Europeans in India; SWEET-SOP or SUGAR APPLE of the West Indies and America.

Vern.—Sharifah, dt or dtâ sîlphâl, or sîlphâl, HIND., DUK., GUJ., MAR.; Sharifâ, bêli, N.-W. P.; Atri, lánâ, BENG.; Atri, bâdûl, ASS.; Mandar gôm, SANTAL; Sirpha, dtâ, MAL.; Sîlô-palâm, or sîlô-pâhâm, TAM.; Sîlô-pâmâ, TEL.; Atto, CÎNGH.; Asê, or âwô, BURM. The fruit is called Sharifah and Kêj in PERSIAN.

Habitat.—A small tree, naturalised in Bengal and the North-West Provinces. It is common in Râjputana (Râj. Gaz., p. 27). Abundant in many places in Burma, but principally at Prome, where the neighbouring hills are covered with orchards of this fruit (British Burma Gaz., Vol. I., 430). “Cultivated as far north as Gurdaspur in the Panjâb. Almost wild in the Central Provinces and Bundelkhand (near old forts) and in swamps near Burmdeo in the Kumaon Bhâdár.” (Brandis). “Grows wild in the Deccan up to Sholapore. In Sind it is also cultivated, but the fruit is inferior.” (Murray). “Grows in a semi-wild condition in Kaira, and in the Panch Mahâls, Bombay.” (Gossettier).

Botany.—Custard apples have been identified among the sculptures of the Ajanta caves as well as of the Bhûrût Stupa. This identification is opposed to the theory that the custard apple is an introduced tree. On this subject General Cunningham remarks: “My identification of this fruit amongst the Mûhûra sculptures has been contested on the ground that the tree was introduced into India by the Portuguese. I do not dispute the fact that the Portuguese brought the custard into India, as I am aware that the East India Company imported hundreds of grindstones into the fort of Chunâr, as if to illustrate the proverb about carrying coals to Newcastle. I have now travelled over a great part of India, and I have found such extensive and such widely distant tracts covered with the wild custard apple, that I cannot help suspecting the tree to be indigenous. I can now appeal to one of the Bhûrût sculptures for a very exact representation of the fruit and leaves of the custard apple” (Bhûrût Stupa, 55). “The names of the two varieties of custard apple, Râmûphâl and Sîlphâl, are in themselves almost enough to show that from very early times the trees have been grown and honoured by the Hindûs.” (Bomb. Gaz., XII., 430).

Botanical evidence is opposed to General Cunningham’s opinion on this subject; indeed, there seems hardly any doubt as to Anona squamosa, Linn., being an introduced plant (see account given under Anonaceæ); the date of its introduction is, however, very obscure. Anona reticulata.

A. 1167
ANONA squamosa.

The Custard Apple.

Linn., is wild in Cuba, Jamaica, and the West Indies, and, together with A. squamosa, has been naturalized in India. It is impossible, however, to point to any forest where either species shows the slightest indication of being indigenous. The representations referred to by General Cunningham might be associated with a large number of plants; they may prove to be conventional representations of the jack-fruit tree or some other allied plant: they are not unlike the flower-heads of the sacred Kadamba or Anthocephalus. It may be remarked that the Bengali names nova and ata are as much opposed to the custard apple tree being indigenous to India as are the names referred to by General Cunningham in favour of that idea. We know that the natives of India have adopted pre-existing names for introduced plants (an indefinite series of examples of this might easily be produced), and there is no evidence to show that this is not the case with the vernacular names now given to the custard apple. (See Argemone.)

Properties and Uses—

Fibre.—An inferior quality of fibre may be prepared from this species.

Medicine.—The ripe fruit is medicinally considered a maturant, and when bruised and mixed with salt, is applied to malignant tumours to hasten suppuration. The seeds, leaves, and immature fruits contain an acid principle fatal to insects, and the dried unripe fruit, powdered and mixed with gram flour, is used to destroy vermin. An infusion of the leaves is considered efficacious in prolapsus ani of children. The root is regarded as a drastic purgative; natives administer it in acute dysentery. It is also employed internally in depression of spirits, and spinal diseases.

"The Makhaan notices the poisonous action of the seed upon the uterus; they cause abortion." (Surgeon-Major Dymock.) "The leaves are applied for the extraction of guano-worm in Secunderabad." (Surgeon-Major John North, Bungalow.) "Green leaves pounded and made into a paste, and without admixture of water, are applied to unhealthy ulcers." (Surgeon Anand Chunder Mukerji, Noabally.) "Leaf used for anthelmintic." (Surgeon-Major C. M. Russell, Saraon.) "The leaves pounded with tobacco leaves and a little quicklime are frequently used by the natives in ill-conditioned ulcers to destroy maggots in the inferior animals." (Honorary Surgeon Barton Alfred Morris, Nigapattam.) "The leaves are applied to sores infested with maggots." (Brigade Surgeon G. A. Watson, Allahabad.) "Fruit good for digestion." (Surgeon-Major J. J. L. Ratton, M.D., Salem.) "The seeds are used to destroy lice. The bark is employed internally in depression of spirits, in asthma and fever." (Surgeon W. Barren, Bhum, Cutch.) "The fresh leaves made into a pulp are applied to abscesses to hasten suppuration." (Surgeon-Major C. J. W. Meaden, Bullrata.)

Chemical Composition.—"The seeds yield an oil and resin; the latter appears to be the acid principle." (Dymock, Mat., Med., W. Ind., 18.)

Fruit.—The plant may be described as completely domesticated in Indian gardens. The fruit ripens in summer, is of a more delicate flavour than the fruit of A. reticulata, and is eaten with relish by both natives and Europeans. The opinion formed of this fruit in India is much more favourable than in the West Indies, a fact which would seem to indicate that it is much superior in quality in India than in the country where it is supposed to be indigenous. In the West Indies an agreeable fermented drink, like cider, is made from the expressed juice; in India the juice is chiefly used to flavour ice-puddings. The fruit has, in times of famine, literally proved the staff of life to the natives of some parts of India. Its extended cultivation should be encouraged.

A. 1176
Structure of the Wood.—Soft, close-grained. Weight 46 lb per cubic foot.

ANONACEÆ.

A Natural Order of shrubby or arborescent Thalamiflorals, comprising some 400 species, inhabiting the tropical moist regions of Asia, America, and Africa, rare in the extra-tropical zones, and almost absent from dry regions. They extend over the whole world for about 40° on each side of the equator; in Africa to about 20° north latitude. None are indigenous to Europe. In India there are in all 192 species grouped into 26 genera, of which 199 are referred to the following genera: 9 species in Uvaria, 18 in Unona, 25 in Polyalthia, 17 in Genothalamus, 16 in Melodorum, and 14 in Xylopia. Of the whole Indian species only 14 or 73 per cent. ascend above the level of the plains; 18 species of the majoritv are confined to the warm moist plains and lower hills of the eastern side of India, extending to the Straits, viz., 124 species or 64½ per cent. South India, including Ceylon, naturally stands next in importance, containing 43 species or 22½ per cent.; 16 are met with in the Western Peninsula, or 9 per cent., while 9 occur, chiefly in cultivation, over the greater part of India. None are met with, however, as endemic to the dry tracts of India, such as Sind, Rajputana, Central India, or the Panjâb, and, except as stunted plants under garden cultivation, they do not exist even in these regions. This remarkable isolation in the type vegetation of the eastern and southern from the western and northern divisions of India, is borne out by many other Natural Orders, suggesting forcibly a strong resemblance to the moist tropical regions of America. Not only in the tropical and extra-tropical regions is this idea borne out, but also in the assemblages of temperate and even alpine plants which occur on the mountain tracts of the eastern division of India. Sir J. D. Hooker, in his Himalayan Journals (Vol. II., 30), says: "At first sight it appears incredible that such a limited area" (Lachen valley, Sikkim), "buried in the depths of the Himalaya, should present nearly all the types of the flora of the north temperate zone." After enumerating the trees which are common to Europe and North America, which occur also in the Lachen valley, Sir Joseph Hooker adds: "Of North American genera not found in Europe were Buddleia, Podophyllum, Magnolia, Sassafras, Tetrastigma, Hydrangea, Dicytra, Arais, Panax, Symplocos, Trillium, and Clitonia. The absence of heaths is equally a feature of the flora of North America."

This idea of the similarity of the flora of the eastern division of India to many of the features of the new world has a remarkable confirmation in the distribution of the species belonging to the Magnoliaceous genus Litchus, the Star Anise. Commencing in China and Japan, they extend through the Straits to the mountains of northern Mânipur and the Khâsia Hills, and passing almost round the globe they re-appear again in the basin of the Mississippi. The ease with which tropical American plants become naturalised in India, until they almost appear as indigenous to the Ganges plains, must largely depend on the causes which have given birth to the similarities indicated. No better example of this could possibly be given than the distribution of the species of Anona now met with in India. The pine apple has also in eastern India and the Straits, become a troublesome weed. Anona belongs to the series Duguetia, Rollinia, Cymbopetalum, Bocagea, and Anona, a group of genera characteristic of the eastern side of America from the United States to the south of Brazil; only 1 or 2 species of Anona are supposed to be indigenous to Africa or occur outside the region indicated. Dr. Martius (Fl. Bras. Anonace., 51) in his history of the Anonaceae is of opinion that the cultivated species are
natives of the Antilles, from whence they were introduced into America and the Old World. According to De Candolle, the common apple is a native of the West Indies; no Anonaceae with a united calyx occur in Asia. (See account of Anona squamosa.)

For a definition of the Natural Order Anonaceae the reader is referred to the Flora of British India (Vol. I., 45), where will also be found the following analysis of the genera:

1. Tribe I. Uvarieae.—Petals 2-seriate, one or both series imbricate in bud. Stamens many, close-packed; their anther cells concealed by the overlapping connectives. Ovaries indefinite.

   Flowers 1-sexual; ovules many; torus conical.
   Flowers 2-sexual; ovules many, rarely few; torus almost flat.
   Flowers 1-2 sexual; ovule solitary.

2. Uvaria.
3. Elipeta.

4. Tribe II. Unonieae.—Petals valvate or open in bud, spreading flower, flat or concave at the base only, inner subimbricate. Stamens many, close-packed; their anther-cells concealed by the overlapping connectives. Ovaries indefinite.

   Ovaries 1-3, many-ovuled; peduncles not hooked.
   Ovaries many, 2-ovuled; peduncles hooked.
   Ovaries many, ovules 4 or more; peduncles straight.

5. Artabotrys.
6. Deepanthes.

** Petals flat, spreading from the base. Ripe carpels indehiscent.

7. Camanga.
8. Cythochesmis.
11. Anaxagorea.
12. Popowia.

*** Inner petals valvate tip incurved.

13. Oxymitra.

15. Gondotheissis.

17. Tribe IV. Xylopieae.—Petals valvate in bud, thick and rigid, or concave, inner dissimilar, concave, convolute, arching over the stamens and petals. Stamens many, close-packed; anther-cells concealed by the overlapping connectives. Ovaries indefinite.

   Ovaries solitary; fruit fleshy, of many connate carpels.
   Ovaries 2—many; outer petals broad; torus convex.
   Ovaries 2—many; outer petals narrow; torus flat or concave.

18. Xylopia.

19. Tribe V. Millieae.—Petals imbricate or valvate in bud. Stamens often definite, loosely imbricate; anther-cells not concealed by the overlapping connectives. Ovaries solitary or indefinite.
**Properties and Economic Value of the Anonaceae.**

<table>
<thead>
<tr>
<th><strong>Ovaries indefinite.</strong></th>
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<tr>
<td>Petals valvate, inner largest; ovules definite</td>
</tr>
<tr>
<td>Petals valvate, inner largest; ovules indefinite</td>
</tr>
<tr>
<td>Petals valvate, subequal; ovules 4-8</td>
</tr>
<tr>
<td>Petals valvate, inner shortest; ovules 2-4</td>
</tr>
<tr>
<td>Petals imbricate, subequal; ovules 2-8</td>
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</tbody>
</table>

**Ovaries solitary.**

| Outer petals valvate, inner imbricate | 24. Kingstonia. |
| All the petals valvate | 25. Lonchomera." |

(\textit{Fl. Br. Ind.}, 4, 46.)

**Affinities in Structure of the Anonaceae.**—They resemble the Myristicaceae in the 3-partite valvate perianth, exstrose anthers, solitary erect unisexual ovaries, copious ruminate anuomen, minute basilar embryo with inferior radicle, woody aromatic stem and alternate more or less distichous leaves, folded lengthwise in bud. They are separated by the fact that the Anonaceae have usually hemaphrodite flowers, petaloid, with indefinite stamens, and generally numerous carpels, with exarillate or only imperfectly arillate seeds. The ternary arrangement of the parts of the flower bring them also very near to the Menispermaceae and to the Magnoliaceae. From the former they differ in habit, size of the flower, the inflorescence, the structure of the stamens, and the fruit; from the latter by the leaves being stipulate, the testa of the seed fleshy and the albumen not ruminate. They also approach very near to the Dilleniaceae, but in the latter the leaves are often stipulate, the flowers terminal and quinary, and the albumen not ruminate.

**Properties and Economic Value of the Order.**—The bark is usually aromatic, stimulant, and astringent, the inner layer affording a useful bast fibre. The leaves also possess the aromatic properties of the bark, being often acid and sometimes even nauseous. The non-aromatic fruits are generally edible. The flowers are sometimes strongly perfumed, and some species being used in European perfumery, such as the \textit{Hang Bang (Canna \textit{odorata})}, which is also used in India to perfume coconut oil, and by rubbing over the skin to bring back the heat of the body in the cold stage of fever. The species of \textit{XYLOPIA} are most useful. \textit{X. \textit{athyopica}} supplied the ancients with the so-called Ethiopian pepper. The wood of the species of \textit{XYLOPIA} is exceedingly bitter, and from the Brazilian species strong ropes are made from the bark.

The fruit of some of the American \textit{Uvarias} is edible; \textit{U. triloba} affording the Papaw of the United States, from which an alcoholic drink is prepared. Other species are used as stimulant drugs. \textit{Blume} has shown that the barks of certain species are efficacious in affections arising from obstruction of the portal vein, but they require to be used with caution.

The leaves of \textit{Arctabotrys suaveolens} afford an aromatic medicine, said to be efficacious in inducing reaction during the cold stage of cholera. The flowers of \textit{Arctabotrys odoratissima} are used in native perfumery, while the roots of \textit{Polyalthia macrophylla} are strongly aromatic, an infusion in Java being used in eruptive fevers. Many species of \textit{Anona} yield edible fruits. The timber is often extremely light, as, for example, in the genus \textit{Polyalthia}, such as the lance-wood; timber extensively used by coach-builders. \textit{Polyalthia longifolia} is valued in India as an avenue tree, because of the rapidity of its growth and the dense mass of graceful undulated leaves; in spring this tree produces a flush of pale delicate green leaves, becoming at this season one of the most elegant of Indian roadside trees.

A. 1180
ANTHETMIS
nobilis.

The Common Chamomile.

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ANT-GREASE.

Ant-grease is prepared by boiling white-ants and skimming off the oil which floats on the surface. An oily substance is also obtained by expression. Ant-grease is reported to be an article of food.

§ "Red-ants are eaten by the Santals." (Rev. A. Campbell.)


A genus of annual or perennial composite, belonging to the Tribe Anthemideae, and comprising some 80 species, chiefly inhabitants of the temperate regions of Europe, Asia, and Africa.

Heads radiant, receptacle convex or conical, scaly throughout. Flowers of the ray female or neuter, ligulate, in one row; flowers of the disk perfect, tubular. Bracts of the involucre of few rows. Fruit terete or bluntly tetragonal, without pappus, but with a more or less prominent margin.

Anthemis nobilis, Linn.; DC. Prod., VI., 11.

Common of True Chamomile.


Dr. Dymock says: "The Persian name Bābānāh is said to be derived from the name of a village in Irak-Arabi; this the Aràbians convert into Bābānaj."


Habitat.—A perennial herb, indigenous in England, but is also plentiful in France, Spain, Germany, and Russia. Imported into India and also cultivated in the gardens of the rich.

Chemical Composition.—§ "The flowers yield about 15 per cent. of essential oil, first of a pale blue colour, becoming yellowish brown in the course of a few months. The researches of Demarcay show this oil to be a mixture of butylc and amylc angeliac acid and valerate. A bitter crystalline acid has been isolated from double chamomile, which is regarded as identical with anthermic acid from Anthemis arvensis. According to Flückiger and Hanbury, the bitter acid principle is apparently a glucosid; they also state that no alkaloid principle is contained in the flowers. According to Bley, the seeds contain a bitter substance, which appears to be an alkaloid." (Surgeon C. F. H. Warden, Professor of Chemistry, Calcutta.)

According to Kopp (Liebig's Annalen, CXCV, 81-92), the oil saponified by boiling with alcoholic potash and after fractional distillation was found to contain angelic (C₉H₁₂O₃) and tiglic (C₅H₈O₃) acids in about equal proportions, isobutyric acid in much smaller amounts, and a fourth acid, most probably methacrylic. He also confirms the statement made by Demarcay that by gentle heat angelic acid is transformed into isonomic tiglic acid.

Medicine.—The medicinal properties of this imported drug are too well known to require a detailed account in a work on the Economic Products of India. The dried flower-heads are official in the Indian Pharmacopoeia. They are described as stimulant, tonic, and carminative, and useful in constitutional debility, hysteria, and dyspepsia. Formerly they were employed in intermittent fevers, but this usage has been superseded.

A. 1185
Products of India.

The Anthocephalus.

ANTHOCEPHALUS.

Introduction of cinchona. In large doses they act as emetic. Containing hot moist chamomile flower-heads are sometimes usedually on account of their retention of heat. Chamomile oil possesses ant and antispasmodic properties, and is considered a valuable remedy for flatulence. Persian chamomile is obtained from Matricaria chamomilla, Linn. (M. matricaria, Linn.), which see. "Flower-tops by boiling in hot water are used by natives as an anal application and fomentation in rheumatic and other painful affec-

"tions. (Assistant Surgeon Bhagwan Das, Rawal Pindi.)

"I have found a warm infusion of dried chamomile flower-heads a soothing application in cases of conjunctival irritation; a poppy e or two is a useful addition." (Surgeon Joseph Parker, Poona.)

Institutes and Adulterations.—In Europe the following plants are used for this purpose: Matricaria Parthenium, Linn.; Matricaria recutita, Linn.; Matricaria chamomilla, Linn. The single chamomile flowers did to be yield more oil than the double. (Bent. & Grim. Med. Pl.)

mis Pyrethrum, Linn., see Anacyclus Pyrethrum, DC.; Compositae.

ANTHISTIRIA, Linn.; Gen. Pl., III., 1136. A genus of grasses belonging to the Tribe ANDROPOGONEAE; GRAMINEAE.

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A genus of grasses belonging to the Tribe ANDROPOGONEAE; GRAMINEAE.
ANTIARIS toxicarum.

The Poisonous Upas


Syn.—Anacalce Cadamba, Roxb., Fl. Ind., Ed. C. B. C., 1723; Beddome, I., 35; Sarcocephalus Cadamba, Kuru, II., 65.

Vern.—Kadam, kadamb, Hind.; Kadam, Beng.; Bol-kadamb, Chittagong; Sanbo, Kgl.; Pandur, Lepcha; Kadam, Mechi; Rook, Ass.; Kadamba, Urvia; Kadamba, naky, Bomb.; Kadam, kadamb, nile, Mar.; Kalam, niko or nia, Panch Mahals; Kadamb, Guj.; Vella cadamba, Tam.; Kadamba, rudraksha-kamba, Tel.; Holtega, aranatega, Mysore; Kanada vaisu, kodaga, kadwal, Kan.; Kadamba, nipa, Sams.; Kadamba, Singh.; Ma-a, sanyapang, Magh.; Mas, makkathan, Burm.

Habitat.—A large, deciduous tree, wild in Northern and Eastern Bengal, Pegu, and the Western Coast; cultivated in Northern India.

It grows very fast. During the first two or three years, the rate about 10 feet a year, the girth increasing at the rate of 1 inch a month. After 10 or 12 years, however, the growth becomes very slow. (Ind. Fo X., 246.) It grows to a large size in the forest of the Panch Mahals, Bombay.

Medicine.—The bark is used medicinally as a febrifuge and tonic.

§ "Decoction of the leaves is used as a gargle in cases of aphthous and stomatitis." (Assistant Surgeon Anund Chunder Mukerji, Noakhali.)

Food & Fodder.—The fruit is eaten, and the foliage sometimes used as fodder for cattle.

Structure of the Wood.—White, with a yellowish tinge, soft, even-grained. Weight about 40 lbs. per cubic foot.

It is used for building; in Assam, Cachar, and occasionally in Darjiling, for tea-boxes. Cunningham (1854) says that it is used for beams and rafters, on account of its cheapness and lightness, and is good for joiner’s work, but is a brittle wood. If a little less heavy, it would be much valued for gun-stocks. (Bomb. Gaz. XI., 24.)

Domestic Uses.—The flowers are offered at Hindoosh shrines; they are sacred to Siva. Often cultivated for ornament and for the great shade it makes; the foliage affords. (Brandis.)


A small genus of trees containing 5 or 6 species, belonging to the Natural Order Usticgeraceae and the Tribe Arctocarpae.

Leaves elliptic, obtuse, rough, on short petioles; sap milky; leaves distichous; stipules in pairs, axillary. Flower-heads axillary, clustered, monoeious, the males crowded within an imbricated involucre opening into a convex receptacle; female flowers solitary within a many-bracteated involucre and devoid of a perianth. Male perianth segments and stamina 4, rarely 3; segments spathulate and imbricate with the stamens placed opposite. Ovary connate to the involucre with a solitary pendulous ovule; style short 2-cleft, the stigma 2-fid, form recurved. Fruit a fleshy purple drupe, the pericarp formed of the enlarged fleshy involucre. Seed pendulous; testa leathery; albumen wanting.

A. toxicaria, Lesh.; Wight, Ic., t. 1938.

The Upas Tree.

According to some authors, these are kept up as distinct species; and by others reduced to one. The former occurs in Burma and the Indian Archipelago, and the latter on the Western Ghâts and in Ceylon.

Verd.—Chândâla, chând kundo, charûr middi, karoot, or karot, B., Mar.; Karow, Konkan; Alli, nettûvûl, nettûvûl marum, Tam.; ya, deva.

A. 1200

A. 1200
or Sacking Tree.

**ANTIARIS toxicaria.**

*Ajanapatte, jagurí, KANJ; Araya-angely, nettével, MALA; Ríti, Singá; Hmyassít (formerly Myah-átit), BURM.*


**Habitat.---** A large evergreen tree of Burma, the Western Ghats, and Ceylon. § “The 'Upas tree' of Java grows all along the eastern slopes of Pegu Yoma, Martaban, and down to Tenasserim.” (J. C. Hardinge, *Rangoon.*) **Beddomes** says it is the largest tree of the western forests, attaining a height of 350 feet.

**History.** The most absurd accounts of the properties of this tree have become current. While it cannot by any means be regarded as harmless (the juice forming a deadly arrow-poison), still it has been freed from the superstitious ideas which lingered around its very name. The following extract from the *Treasury of Botany* will be found both interesting and instructive: “The Upas tree, when pierced, exudes a milky juice, which contains an acrid virulent poison, called antiaricin. Most exaggerated statements respecting this plant were circulated by a Dutch surgeon about the close of the last century. The tree was described as growing in a desert tract, with no other plant near it for the distance of 10 or 12 miles. Criminals condemned to die were offered the chance of life if they would go to the Upas tree and collect some of the poison. They were furnished with proper directions, and armed with due precaution, but not more than two out of every twenty ever returned. The Dutch surgeon, **Foerch**, states that he had derived his information from some of these who had been lucky enough to escape, albeit the ground around was strewn with the bones of their predecessors; and such was the virulence of the poison, that ‘there are no fish in the waters, nor has any rat, mouse, or any other vermin been seen there; and when any birds fly so near this tree that the effluvia reaches them, they fall a sacrifice to the effects of the poison.’ Out of a-population of 1,600 persons, who were compelled, on account of civil dissensions, to reside within 12 or 14 miles of the tree, not more than three hundred remained in less than two months. **Foerch** states that he conversed with some of the survivors, and proceeds to give an account of some experiments that he witnessed with the gum of this tree, these experiments consisting principally in the execution of several women, by direction of the Emperor! Now, as specimens of this tree are cultivated in botanic gardens, the tree cannot have such virulent properties as it was stated to have; moreover, it is now known to grow in woods with other trees, and birds and lizards have been observed on its branches. It occasionally grows in certain low valleys in Java, rendered unwholesome by an escape of carbonic acid gas from crevices in the ground, and which is given off in such abundance as to be fatal to animals that approach too closely. These pestiferous valleys are connected with the numerous volcanoes in the island. The craters of some of these emit, according to *Reinwardt,* sulphureous vapours in such abundance as to cause the death of great numbers of tigers, birds, and insects; while the rivers and lakes are in some cases so charged with sulphuric acid, that no fish can live in them. So that doubtless the Upas-tree has had to bear the approbrium really due to the volcanoes and their products; not that the Upas is by any means innocent, for severe effects have been felt by those who have climbed the tree for the purpose of bringing down the branches and flowers. The inner bark of the young trees, which is fabricated into a coarse garment, excites the most horrible itching. It clings to the
The Poisonous Upas or Sacking Tree.

Skin, if exposed to the wet before being properly prepared. The dried juice, mixed with other ingredients, forms a most poisonous poison, in which the natives dip their arrows.

Resin.—It exudes a white resin, used for poisoning arrows. On cutting the stem or unripe fruit, a white milky viscous fluid exudes in large quantities, which shortly hardens, becoming of a black and shining colour. This inspissated sap is probably the so-called resin of authors (Br. Birm. Gaz., i., 135).

Fibre.—The natives strip the bark of this tree into large pieces, soak them in water, and beat them well, when a good white fibre is obtained—a natural cloth worn by the natives. It is in Western India well known as the sacking tree, on account of the tough, inner, fibrous, felted bark, being removed entirely, thus forming natural sacks. Small branches are made into legs of trousers and arms of coats, the larger ones forming the bodies of the garments. In this way felt costumes are made which require no more sewing than is necessary to connect the parts together. If passed through rollers, and at the same time dyed and tanned, these natural cloths or felt are very interesting. The samples exhibited at the late Calcutta International Exhibition (contributed by the Bombay Committee) were very much admired, and proved very attractive. In making sacks sometimes a disk of the wood is left attached to the fibre as to form the bottom of the sack. At other times a vertical incision is made on the tree and a transverse cut around the stem at the top bottom of this vertical one. The bark is then peeled off, and after being beaten in water and dried, the top and bottom are sewed up (forming the sides of the sack). These sacks are extensively used for storing rice. In Ceylon ropes are made of the bark. “The bark yields strong fibre suited for cordage, matting, and sacking. In making sacks a branch or trunk is cut to the required length, soaked in water, and beaten. The fibre separates from the wood. It is then turned inside out, the wood being swelled off, except a small piece at the bottom.” (Bombay Gazetteer, XV., Part i., 62, Konkan District.) There seems every likelihood that the bark of this tree may come into use as a paper fibre.

Medicine.—The bitter seeds contain a peculiar principle, which may prove an active medicinal agent. Information regarding the properties of these seeds would be desirable. (Pharm. Ind.)

§ “The seeds are used as a febrifuge and in dysentery; dose 1 4th seed three times a day.” (Surgeon-Major W. Dymock, Bombay.)

Chemical Composition.

“Upas Antiar and Upas Tiute.—Under these names, two poisons have long been used by the natives of Java and other East India islands for poisoning their arrow-heads; and very exaggerated notions have prevailed among the people of the Western World in relation to the tremendously destructive power over animal life of the Upas tree in Java, from which it was supposed that the poison was derived. The tale was told that birds and animals perished when within the influence of its exhalations, and that man came into its near vicinity at the peril of life. All such accounts have proved to be fabulous; but there is no doubt to the exceedingly poisonous character of the arrow poison to which reference has been made. It seems now to be pretty well determined that the active ingredient of the Upas Antiar is a gum-resinous exudation proceeding from incisions in the trunk of the Antiaris toxicaria, a large tree belonging to the Urticaceae, growing in Java, Celebes, and the neighbouring islands, and described in Lindley’s Flora Medica (p. 39). Like certain species of Rhus, this plant exhales an aeriform matter, whi
very unpleasantly affects many of those who approach it, causing eruptions upon the skin and exterior swelling, while others seem altogether insensible to its influence. The juice is mixed with various substances, which probably have little other effect than to give a due consistency to the poison. This, whether taken internally or introduced into the system through a wound, acts with extreme violence, producing vomiting, with great prostration, a feeble irregular pulse, involuntary evacuations, and convulsive movements, which are soon followed by death, which Brodie ascertained to be due to cardiac paralysis. From a chemical examination by Pelletier and Caventou it appears that the Antiarin owes its activity to a peculiar principle antiarin, crystallizable, soluble in water and alcohol, but scarcely so in ether, and consisting of carbon, hydrogen, and oxygen \( \text{C}_{11}\text{H}_{16}\text{O}_{6} \) (see A. J. P., 1855, p. 474). Antiarin appears to act directly as a paralyzant on the cardiac muscle, diminishes the irritability of the peripheral vagus, and stimulates the vaso-motor centres (N. R., 1875, p. 306”).

[“I failed to obtain antiarin from the seeds of this plant; they contain a bitter principle.” (Surgeon-Major W. Dymock, Bombay.)]

“...The upas tiente is even more poisonous than the antiarin. This is said to be obtained from a climbing woody plant growing exclusively in Java, and belonging to the genus Strychnus especially designated by Leschenault as Strychnus Tiente. It is from the bark of the root, according to this author, that the poison is prepared. A decoction of the bark is concentrated to the consistence of syrup, then mixed with onions, garlic, pepper, &c., and allowed to stand till it becomes clear. Leschenault, having dipped the point of an arrow in the poison, and allowed it to dry, pricked a chicken with it, which died in a minute or two in violent convulsions. MM. Deile and Magendie found that the poison had not lost its strength in four years.” (Hammond, Am. Journ. of Med. Sci., 1850, p. 366.) Three grains have produced very violent symptoms resembling those caused by strychnine, which alkaloid has indeed been found in the poison. (Chemist and Druggist, May 15, 1865.)

“Dr. Wm. A. Hammond made some experiments with a poisonous substance brought by Dr. Ruschenberger from Singapore, which proved to have the combined effects of the two poisons above mentioned, both diminishing directly the power of the heart, and causing tetanic spasms of the muscles, suggesting that it might be a mixture of the antiarin and tiente; but Dr. Hammond seems, from other considerations, to have been led to the opinion that it had a different origin from either. (Am. Journ. of Med. Sci., 1860, p. 371.)” (U. S. Dispensatory, 15th Ed., 1771.)

**Structure of the Wood.**—Pale brown, very coarse, fibrous (Kurz), hite, soft, even-grained, annual rings faintly marked.”

**ANTIDESMA, Burm.; Gen. Pl., III., 284.**

A genus of trees or shrubs belonging to the Natural Order Euphorbiaceae, comprising some 60 species, inhabitants of the warm temperate regions of the world.

Leaves alternate, entire, stipulate, penninerved. Flowers dioecious, numerous, small, the male flowers in decussate spikes, the female racemose. Calyx 5-5, truncate. Petals none. Stamens opposite the calyx-lobes, inserted round a rudimentary ovary; filaments free. Disk of distinct glands, alternating with the filaments and calyx segments. Ovary 1-celled, with 1 pendulous ovule; styles 3-5, short, united at the base. Fruit inedible, generally 1-seeded drupe. (Wight's Ic., lit. 706, 768, 819, and 821.)

**Antidesma Bunias, Mull.-Arg.; D. C. Prod., XV., 2, 262.**

**Vern.**—Himal cheri, NEPAL; Kantjer, Lepcha; Nolai-tali, TAM.; Nalitahi, MAL.

A. 1212
ANTIMONIUM.  

Habitat.—A small tree of North and South Bengal, South Tenasserim.

Botanic Diagnosis.—Branchlets and buds tawny pubescent, ovate-cordate. Flowers small, green, sessile, forming robust anthers in the axils of the leaves. Calyx obesolutely 3-toothed. Drupes elliptic, red, becoming black; stone compressed.

Food.—According to Mr. Gamble (List of Darjeeling Shrubs, &c., p. 60), the leaves and fruits are eaten. Dr. Trimen informs the fruits are also eaten in Ceylon.

Structure of the Wood.—Reddish, hard; weight 46 lbs. per foot.

Antidesma diandrum, Tulasiya; DC. Prod., XV., 2, 266.


Vern.—Aumãri, sarohi, gâr-musâreya, ban-musâreya, dha, Mutta, Beng.; Numâri, Uriya; Kantî; Lechâ; Pel-musârâgarai, Gond.; Pella-tunna (i), Tel.; Matha, Sant-sog, Mal. (S. F.); Patimad, Nâl, Kimpâlin, Burm.

Habitat.—A small tree found in Garhâwâl, Kumaon, Oudh, South India, and Burma, common in the hill forests of the Sarghanas.

Botanic Diagnosis.—Branchlets, petioles, and under-side of the midrib with scattered rust-coloured hairs. Flowers Calyx cup-shaped. Stamens 2-3.

Food.—The leaves are acid; they are eaten. They are perhaps made into chutney; the fruit is also eaten. (Gam.)

Structure of the Wood.—Pinkish grey, hard, close-grained wood; weight 41 lbs. per cubic foot.

A. Ghaesembilla, Müll.-Arg.; DC. Prod., XV., 2, 251.


Vern.—Khâdi, jamb, limbod, Beng.; Umtod, Hazaribagh Kol.; Pulûr, pelari, jhânda-palûra, pellai, Tel.; Jondri, umbilla, Singh.; Bapûsin, Burm.

Habitat.—A small, deciduous tree, met with in Nepal, Oudh, Burma, Chanda, and South India.

Botanic Diagnosis.—Branchlets, young leaves, and in soft-tomentose. Flowers sessile. Calyx deeply 5-cleft. Stamens 2-3.

Food.—The leaves are eaten in Bengal. The berries are black and with a pleasant sub-acid flavour.

Structure of the Wood.—Hard, close-grained wood; weight 49 lbs. per cubic foot.

A. Menasu, Müll.-Arg.

Vern.—Kumbyâng, tungcher, Lechâ; Kin-ja-lin, Burm.

Habitat.—A small tree, found in Sikkim, Khalsa Hills, Burma, and Andaman Islands.

Food.—The fruit is eaten; it is of a red colour.

Structure of the Wood.—Hard, similar to that of A. glabra, but the pores smaller and the medullary rays finer. Weight 54 lbs. per cubic foot.

ANTIMONIUM.  

Antimonium or Antimony, Black.

Vern.—Surma-kâ-patthar, surma, Hind.; Surnâ or surmâ, Surnâ-kâ-isâhâni, Bomb.; Surmo, surmâ-no-patro, Gu.
Products of India.

Celeri.

anjan-kó-patthar, DUR.; Anjanak-kálén, TAM.; Anjana-rávē, TEL.; Ananak-kálén, MÁL.; Anjana, SANS.; Jamad, Kókál, ARAB.; Surmá, sánjg súrmá, PERS.

black ore of antimony, a tersulphide, and called surma, occurs in us parts of the Panjáb. The ore is imported from Kandahár and An, but is also obtained in great abundance in the Himalayan. This tersulphide is often confused by natives with galena, as can be reduced to a black powder. Iceland spar (carbonate of) is also called surmá, but is distinguished as surma-súafid or white antimony. Natives do not seem to be acquainted with the use of this as an alloy, or even as a pure metal, for scientific purposes. It is only used as a cosmetic for the eye. It is also supposed to act as a tonic to the nerves of the eye and to strengthen the sight. But much antimony sold by druggists is really galena and is imported from Mán and Bokhára. (Baden Powell, Panjáb Products, Vol. I, p. 10.)

"It is called Surmái Ishqahni in Bombay to distinguish it from a, but it is by no means common in Bombay; a few Persians only get it when there is a demand." (Surgeon-Major W. Dyneke, Bombay.)

"Largely used by women in India as an application to the edges of the eyelids to improve personal appearance." (Surgeon-Major G. Nerven, Calcutta.)

"It is also used to prevent the injurious effects of glare of light on the eyes, which it does by absorbing the rays." (Surgeon G. A. Watson, Allahabad.)

"It is supposed to have a tonic effect on the eyes, protecting them from the glare of the sun." (Surgeon K. D. Ghose, Bankura.)

"Very good tonic for horses." (Surgeon H. D. Masani, Karachi.)

Phinum glaucum, Linn., see Linaria glauca, Spreng.; Scrophulariaceae.


A genus of glabrous herbs (belonging to the Umbelliferae), comprising 14 species, scattered over the world; one met with in India.

Leaves pinnate, 5-partite or compound. Umbels compound, often leafless. Bracts and bracteoles absent in the Indian species. Flowers white. 

Tooth obsolete. Petals ovate-acute, tip inflexed. Fruit orbicular or obovate, slightly longer than broad, laterally sub-compressed; carpels semi- 

fleshy, subpentagonal, plain on the inner surface; primary ridges distinct, fine; secondary absent; furrows transverse; carpophore undivided or shortly 

4. Seed semi-terete, dorsally sub-compressed.

A genus very nearly allied to Carum. The word Apium was properly the Latin name for parsley; it literally means water plant, the 

a, ab, and an, in various languages, meaning water,—a, Panjáb, 

waters.


Wild and Cultivated Celery.

Vern.—Aýmád, bori-aýmád karafa, Hind.; Chaná, rándkuní, Beng.; Borr- 

a-yamoda, or aýmád, Bomb.; Aýnánkópátta, budigwar, Cutch; Karafa, 

Arab.; Karáf, Pers.; Báká jháta, Pá. Vága, Saleri in the bazaars of 

India. "The Hindi, Arabic, and Persian names here given are more 

generally applied to the fruit of Carum Roxburghianum." (Mooteen 

Sheriff.)

Habitat.—A native of England and other parts of Europe. Cultivated 

different parts of India during the cold weather, chiefly as a garden 

p in the vicinity of towns, for the use of the European population, by 

it is eaten as a salad and pot-herb, or made into soup. It is also 

erved sometimes in Bengal for its seed, and in the Panjáb for its root.

A. 1227
Botanic Diagnosis.—Peduncle short, leaf-opposed

Medicine.—The officinal root is considered antivertigo and diuretic, and

given in anasarca and colic. The seeds are also given as stimulant and

cordial.

§ "As an antispasmodic celery is used in bronchitis and asthma, and
to some extent, by natives, for liver and spleen diseases; it is regarded as

an emmenagogue." (Surgeon G. A. Emerson, Calcutta.)

"Celery is a diuretic and is used by hakims for the expulsion of

stones." (Asst. Surgeon J. N. Dey, Jaipur.)

"Carminative, useful in colic; dose 1 to 2 leaves." (Surgeon W. Bann

ren, Bhuj, Cutch, Bombay.)

Food.—The seed is eaten as a spice by the natives, and the blanched

stems and leaf-stalks by Europeans. In the wild state it is to a certain
degree poisonous, but under cultivation it becomes a wholesome salad

pot-herb. In the Levant it is not blanched; the green leaves and stalks

used as an ingredient in soups. A form met with in France and Germany

(and occasionally in India) is eaten as a vegetable after being boiled;

it is known as the turnip-rooted celery. The seeds tied into a piece

of cloth are sometimes used to flavour soup.

Apium involucratum, Roxb., see Carum Roxburghianum, Umbellifer.

A. petroselinum or Parsley, see Petroselinum sativum, L.

A variety of this plant called fusiiformis is grown chiefly as a vege-
table; the tap-roots being boiled and eaten like parsnip.

APORTAXIS, DC., Gen. Pl., II., 472.

A genus of Compositae chiefly found on the temperate Himalaya; by

modern botanists reduced to Saussurea.

Aplotaxis auriculata, DC., see Saussurea hypoleuca, Spreng.

A. candidans, DC., see Saussurea candidans, C.B.C.

A. gossypina, DC., see Saussurea gossypifera, Don.

A. Lappa, Decne., see Saussurea Lappa, C.B.C. (The Costus).


Apluda aristata, Linn.; Gramin.,

Syn.—A. rostrata, Nees; Roxb., Fl. Ind., Ed. C.B.C., 109.

Vern.—Bhanjari, Bhanjra, sando, Bundelkhand; Barn, Samrat

Gorama, Beng.; Patastra-guli (8), Tel.

Habitat.—A creeping, perennial grass, commonly found in

oppressive or other shady places, in the plains of northern India, and in the

lakes, ascending to 7,000 feet in altitude.

Fodder.—Used for fodder in the Banda district. (Duthie

Grasses, p. 24.)

A. communis, Nees.

Habitat.—Plains of the Panjáb and North-West Provin-

cing to low altitudes on the Himalaya.

A. 1234
The Dogbane Family.

**APOCYNACEAE**

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<th>Description</th>
<th>Distribution</th>
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**APOCYNACEAE** — The Dogbanes.

Twining shrubs, rarely herbs or trees. Leaves opposite or whorled in *Cerbera* and *Plumeria*, quite entire, exstipulate, terminal or axillary cymes, hermaphrodite, regular. **Calyx** in 5, rarely 4, imbricate, often glandular within at the base. 4 or salver-shaped; lobes 5, rarely 4, spreading, contorted, wisted in bud, very rarely valvate. **Stamens** 5, rarely 4, on or at mouth of the corolla, filaments usually short; anthers x or sagittate, conniving, connective, sometimes adhering to cells 2, dehiscent lengthwise, sometimes produced down in empty spur; pollen granular. **Disk** annular, cupular or glands, or o, sometimes concealing the ovary. **Ovary** 1-celled at placenta, or 2-celled with axile placenta, or of 2 distinct ovariate carpels; style simple or divided at the base only; d; stigma 2-fid, acute or obtuse. **Ovules** in each cell 2, or y and 2-8-seriate, rarely solitary. **Fruit** a dry or fleshy capsule, or samara, or of 2 drupes, berries or follicles. **Seeds** varied, or with a terminal pencil of long silky hairs (Coma); c, fleshy, or scaly or o; embryo straight, cotyledons flat, volute or contorted, radicle usually superior. **Distrib.** — Specious, chiefly tropical.

**Carissa.** Anthers included, free from the stigma; cells the base. **Ovary** of 2 wholly combined carpels, 1-2-celled, usually fleshy or pulpy within. **Seeds** without wing or s. **Corolla-lobes** overlapping to the left in all.

- **Ovary** 1-celled, with parietal ovules.
- **Ovary** 2-celled, with axile ovules.

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<th>Species</th>
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<td>5. Winchia</td>
<td><strong>Ovary</strong> 2-celled, with ovary ovules.</td>
<td>5. Winchia.</td>
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**Plumeria.** Anthers included, free from the stigma, at the base. **Ovary** of two distinct carpels united by the various. **Seeds** peltate. **Corolla-lobes** overlapping to the **Ochrosia.**

**Rauwolfia.** **Calyx** eglandular within. **Carpels** 1-2, rarely **Fruit** of 2 1-seeded drupes or berries, rarely moniliform (of drupes).

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<th>Species</th>
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A. 1236
Dictionary of the Economic

Subtribe 2. Cerberas. Calyx glandular within. Carpels 2—or rarely 4-ovuled; ovules on opposite sides of a thick placenta. 1-seeded or 2-seeded, the seeds separated by the enlarged placenta.
10. Cerbera.


* Ovules 2-serial.
Disc annular or obscure. Seeds winged.
Leafless shrub.
Disc of 2 scales. Seeds truncate at both ends.

13. Rhexya.

** Ovules 6-serial.
Erect trees. Leaves scattered, alternate.
Seeds winged.
A climber. Leaves opposite or whorled.
Seeds winged.
Erect trees or shrubs. Leaves whorled.
Seeds comose. Style distinct.

17. Dyera.


Subtribe 4. Tabernemontaneae. Calyx glandular within. Carpels 6-ovuled. Fruit fleshy or coriaceous, dehiscent or not. Erect trees or shrubs.

19. Tabernemontaneae.

Tribe III. Echitidis. Anthers included or exserted, connecting in a cone around the top of the style, and adherent to it by a point on the connective; cells produced downwards into a subulate empty spur. Ovaries of 2 distinct carpels united by the style. Fruit of 2 follicles. Seed comose at one or both ends. Exceptions, see Parsonisia.

Subtribe 1. Parsonsiæ. Corolla rotate or salver-shaped, throat naked except Wrightia. Anthers more or less exerted.
Corolla-lobes valvate. Carpels connate in flower.
Corolla rotate, mouth naked. Connective thickened at the back.
Corolla salver-shaped, mouth naked.
Corolla rotate or salver-shaped, mouth with scales.

20. Parsonia.


22. Pottasia.

23. Wrightia.

Subtribe 2. Nerisæ. Corolla-throat broad, with 5-10 scales. As included.

Shrubby, erect. Leaves whorled.
Corolla-lobes short. Follicles erect.
Shrubby or twining. Leaves opposite. Corolla-lobes long or tailed. Follicles spreading.


25. Strophanthus.

The Dogbane Family.  

**Subtribe 3. Euechilidina.** Corolla various, mouth naked. Anthers included.

* Corolla-lobes valvate, overlapping to the left.
  Flowers small or minute. Corolla urceolate, lobes valvate 27. Urceola.
  ** Corolla-lobes overlapping to the right.

a Corolla very large.
  Immense climbers, corolla bell- or funnel-shaped 29. Beaumontia.

β Corolla minute, urceolate, lobes very short.

γ Corolla small or medium-sized, salver-shaped, lobes nearly straight or slightly twisted to the left in bud.
  Ovary hidden or not in the disc. Seeds ovate or oblong 33. Aganoema.

δ Corolla small, salver-shaped, lobes sharply twisted to the left in bud, tips not deflected.
  Ovary hidden in the disc. Seeds slender 34. Epigymum.
  Ovary exerted from the disc. Seeds beaked 35. Rhynchosia.
  Ovary exerted from the disc. Seeds not beaked 36. Trachelospermum.

ε Corolla small, salver-shaped, lobes sharply twisted to the left in bud, with the tips deflected.
  Seeds ovate, beaked 38. Ichnocaarpa.

(Flora of British India, III., 621.)

The above extract from the *Flora of British India* has been published in the hope that it may be found useful in suggesting the genera belonging to *Apoecyneæ*, many of which will be found described in greater detail in their respective alphabetical positions.

**Distribution.**—The Natural Order *Apoecynæ* contains in all some 30 species, chiefly inhabiting the intertropical zones of the Old and New Worlds. Few species are indigenous to the extra-tropical or warm temperate zones, and still fewer are truly temperate.

In India there are 147 species, (some 15 of which are doubtfully distinct or are introduced), arranged in 40 genera. Of these 99 or 67.3 per cent. are confined to the plains; 44 or 27.9 per cent. occur on the lower hills, 7 or 4.7 per cent. ascend above 5,000 feet in altitude. In the Eastern Peninsula 97 or 66 per cent. occur; South India and Ceylon have 14 or 9.5 per cent.; in the Western Peninsula only 8 species are met with or 5.4 per cent., and in North or Upper India only 2 species appear to be peculiar to the drier tracts or 1.3 per cent.; while in cultivation in India or wild in two or more of the four preceding divisions...
some 26 species are met with, equal to 177 per cent. of the entire Indian Apocynaceae. Of these less local species the Eastern Peninsula and South India take the greater number. South India and the Western Peninsula are next in importance; few only extend from the other divisions into North India.

From this analysis it appears that in the Eastern Peninsula (and on the plains of that division) of India the vast majority of the Apocynaceae occur; the eastern region thus preserving its feature as the home of Indian tropical plants, it is consequently the division of India most suited for introduced Apocynaceae. (Compare with the account given under Annonaceae, Asclepiadaceae, &c.)

Affinities of the Apocynaceae.—They have their closest resemblance to Asclepiadaceae, Loganiaceae, and Gentianaceae on the one side, and to Oleaceae and Jasmineaceae on the other. From Asclepiadaceae they are at once separated by the position of the anthers, generally united together in the dogbane, with free filaments and free from, although embracing, the stigma—the anthers and filaments in Asclepiadaceae being completely united to the style and stigma. From Loganiaceae they are separated by the absence of intrapetiolar stipules; in most Apocynaceae the carpels are two, free from each other, except by the united and common stigma. When the fruit of the Apocynaceae, like that of the Loganiaceae, is a solitary capsule, berry or drupe, they are distinguished by the milky sap, always isostemum corolla and united anthers, and by the leaves being opposite or whorled and exstipulate. The Loganiaceae have winged but never comose seeds.

Through Loganiaceae they have an affinity to Rubiaceae from which the position of the ovary at once separates them, superior in Apocynaceae but inferior in Rubiaceae. From Gentianaceae they are at once distinguished by their woody stems or more or less arborescent habit with milky juice, the Gentianaceae being herbs with watery juice, free anthers and a one-celled ovary having two parietal placentas with many seeds.

From Oleaceae and Jasmineaceae they are at once separated by the anisostemum corolla of these orders.

Properties and Uses of the Apocynaceae.—Most of the species possess a milky sap, often rich in India-rubber and Gutta-percha. In India Alstonia scholaris, Chomemopha macrophylla, Parameria glandulifera, Urceola elatica, U. esculenta, Willoughbeia edulis, and other species yield India-rubber. A form of Alstonia scholaris at Singapore is said to afford part of the Gutta-puari, and two species of Dyera met with in the forests of Malacca, Singapore, and Sumatra yield the Gutta-jelutong of commerce. Other India-rubber genera, belonging to this order, are Vahea gunnifera, Lam., in Madagascar, Hancornia in Brazil, and Landolphia in West Africa. In other species the milky sap, while containing less caoutchouc, has often other properties. It is purgative and febrifuge in Allamanda, Carissa, and Plumea. It is mildly bitter and laxative in Corbera, and in the fruits of certain species it is acid and sweet; they are accordingly eaten as edible fruits, such as Carissa Carandas, Willoughbeia edulis, Urceola elatica, and Tabernemontana willia. At other times the sap is acrid and very poisonous, as in the Madagascar ordeal-plant, Tanghinia venenifera, a seed of which is sufficient to poison 20 persons. The wood, flowers, and leaves of the Oleander—Nerium odoratum and N. Oleander—are very poisonous. So also are the nuts of Thevetia nerifolia.

Some are medicinal; the Conessi Bark or the bark of Holarrhena antidysenterica and the bark of Thevetia nerifolia and of Alstonia scholaris are most valuable antiperiodics, useful in malignant fevers.

Structure of the Wood.—Most of the Apocynaceae are arborescent, but
The Aponogeton. | APOONOGETON monostachyum.
--- | ---

the timber is, as a rule, of poor quality. It is white, soft, without heartwood, the pores are small and the medullary rays fine and numerous. *Alstonia* is perhaps the only exception to this character, the pores being of moderate size and the rays distant.

Many are handsome, ornamental trees, bushes or climbers, much cultivated in Indian gardens. Amongst the most important may be mentioned the species of *Allamanda* and *Alstonia*—the latter are large shrubs or trees; *Beaumontia grandiflora*, a truly superb climber, with pendulous white flowers, 6-8 inches long, is also common. *Kopsia fruticosa*, with its rose-coloured flowers; *Euchites caryophyllata*, the clove-scented *Euchites* (*madlari*) and other species are elegant climbers, frequently seen rambling over trees. *Nerium odorum*, or Indian Oleander, with its pink, dark red, or white flowers, is a constant companion with the mango tree in the gardens of the natives, and justly deserves its great popularity. *Plumeria acutifolia* (*gul-i-china*) is less frequent in native gardens; it is a very ornamental small tree, when covered with its clusters of whitish pink flowers and large spreading leaves. Its long naked branches and gouty stem are perhaps its chief drawback; it is exceedingly plentiful in gardens in the neighbourhood of Calcutta. *Parsonia corymbosa* (*spiralis*, Wall.) is a beautiful scented shrub, its bright crimson flowers appearing in the hot season. *Rauwolfia serpentina*, of which Sir W. Jones says: "Few shrubs in the world are more elegant, especially when the vivid carmine of the perianth is contrasted not only with the milky-white corolla, but with the rich green berries which at the same time embellish the fascicles." *Thevetia nerifolia* (*sard kunél*) has made far more progress probably than any other introduced dogbane. Every garden wall in Bengal, one might almost say, is decorated with a few plants of this elegant, small, spreading tree or bush, which throughout the year is covered with its large, yellow, sweetly-scented flowers. The odour of these flowers, at first much too strong for most Europeans, becomes more delicate after a time, and, indeed, exercises such an influence over the olfactory nerves that they lose the power of smelling it. *Tabernanthea coronaria* (*chándula*) is probably alter *Nerium* the next most popular plant in Indian gardens. *Flowers* large, single or double, and pure white, delicately scented at night. *Wein. alba* and *rosea* must not be omitted from this list of garden Apocynaceae. Indeed, two or three varieties of the periwinkle are, perhaps, the most constant herbaceous favourites, and, associated with the balsam and the Indian yellow marigold (*gándhula*), abound in every native garden.

A few species of Apocynaceae yield dyes. *Wrightia tinctoria* is used in some parts of India for the manufacture of indigo, and *W. tomentosa* yields a yellow juice used as a dye.

**APONOGETON, Thunb.; Gen. Pl., III., 103.**

A genus of submerged aquatic herbs belonging to the Natural Order NAJADACEAE. Leaves on long petioles floating on the surface, very much like a Potamogeton, only green coloured. Spike solitary, generally bifurcating into two recurved portions. Flowers hermaphrodite, situated within two highly coloured bracts; perianth absent. Stamens 6-many, hypogamous; filaments unequal subulate, anther small. Ovary of 3-6 distinct carpels, oblique, sensile; stigma oblique, disciform. Ovules 2-many, erect, anatropous basilar; carpels 3. mature, or more.

Aponogeton monostachyum, Linn.

Vern.—Ghechu, Hind.; Khaangi, Sans.; Kotti-katang or kotti-kishang, Tam.; Kotti-gadda nama, Tel.; Kotti-kang, Duk.

Habitat.—A native of shallow, standing, sweet water, in Bengal, appearing during the rains.

A. 1242
AQUILARIA

Food.—The natives are fond of the roots, which are said to be nearly as good as potatoes. (Ross.) It is remarkable that this property should have been detected, while the tubers of its associate, Sagittaria, have escaped discovery.

1244

APOROSA, Blume; Gen. Pl., III., 282.

A genus of trees or shrubs (belonging to the Natural Order EUPHORBIACEAE), comprising some 20 species, inhabiting Asia, and chiefly the Malayan Peninsula.

Leaves alternate, simple, petiolate, entire, penninerved. Flowers dioecious, minute, enclosed by the bracts; forming spikes or racemes. Male forming clusters; females short, few-flowered. Calyx 3–6, often unequal, membranous, imbricate. Petaloid disk absent. Stamens 2–5, long, free, inserted around rudiment of the pistil; anther small; cells subglobose, distinct, united throughout their length to a more or less thickened connective, dehiscing by a longitudinal slit on each cell. Female flowers solitary within the involucre, sessile. Ovary 3, rarely 2–4-celled, with 3 ovules in each cell. Capsule fleshy indehiscent, endocarp referred to 3 one-seeded pyrenes.

1245

Aporosa dioica, Mull.Arg.; DC. Prod., XV., 2, 472; EUPHORBIACEAE.

Syn.—A. Roxburghi, Baill.; ALNUS dioica, Ross.; LEPIDOSTACHYS Roxburghi, Wall.

Vern.—Kobra, Beng.; Sanpau, Garo; Thanprengjan, Magh.

Habitat.—A tree of North and East Bengal and Burma.

Botanic Diagnosis.—“Style-lobes simple, short. Ovary thinly appressed pubescent, glabrescent.” (Kurz.)

Structure of the Wood.—Dark brown, very hard, close-grained with white sapwood, weighing 79 lb per cubic foot.

This has by botanists been identified as the tree which yields in the West Indies the Coco-wood of commerce. The Indian plant should be carefully examined to ascertain if the wood obtained from it is of equally good quality with that obtained from the West Indies.

1247

A. villosa, Baill.; DC. Prod., XV., 2, 471.

Vern.—Ya-mein, Burm.

Habitat.—A tree frequent in the Eng forests of Burma from Pegu to Martaban. (Kurz.)

Botanic Diagnosis.—“Leaves shortly and softly pubescent beneath. Ovary villous, tomentose, or pubescent. Berries densely velvety tomentose.” (Kurz.)

Resin.—Yields a red resin.

Dye.—The bark is used as a red dye.

1248

*Apple, The, see Pyrus Malus, Linn.; ROSACEAE.

Apricot, The, see Prunus armeniaca, Linn.; ROSACEAE.


A genus of trees belonging to the Natural Order THYMELÆACEAE, comprising only 2 or 3 species, inhabitants of tropical South-West Asia—the Malaya and Borneo.

Leaves alternate, entire or nearly so; petiolate stipitate, penninerved, nerves close, parallel. Flowers pedunculate in subsessile umbels, axillary or terminal. Bracts absent. Flowers hermaphrodite. Perianth forming a distinct campanulate tube (sometimes described as the campanulate flora receptacle); (calyx) teeth 5 broad ovate-acute or obtuse, imbricate in bud. Squamules (or corona-like scales) equal in number to the stamens and alternate with them, inserted on the mouth of the tube, erect, very hairy. Stamens 10, inserted

A. 1250
below the squamules, and with the sepals therefore perigynous; filaments short, very rarely elongated; anthers basifixed, ovate or oblong, introrse. Goany sessile in the bottom of the tube, free, perfect or imperfect, hairy, 2-locular or 1-locular, the placentas being along the middle of the valves. Fruit drupaceous, becoming capsular, surrounded below by the persistent perianth tube. Seeds 1-3, often 2, ovoid, raphe-ventral, produced in a more or less spongy cone; cotyledons fleshy plano-convex; radicle short, inferior.

Aquilaria is derived from the Lat. Aquila, the eagle; hence the name Eagle-wood.

Aquilaria Agallocha, Roxb.; DC. Prod., XIV., 601.

Calabac, Agallochum or Aloe-wood, or Eagle-wood; Lignum-Aloes, AGLIA, Akyaw.

Vern.—Agar, Hind.; Agaru, agar, Beng.; Agaru, Sans.; Agare-hindi, ud; or ud, or udhę-hindi, or other-hindi, Arab.; Agare-hindi, agar, Pers.; Hindigara, Bourn.; Agar, Gu.; Agar, agalakhandana, Tam.; Agar, Tel.; Sāti, Ass.; Akyao, Burma.; Khay, sinnah, Singh.; Kayu, garu, Malay, Newah, Siam; Nyaw-chab, Chinese.

Habitat.—A large evergreen tree of Sylhet and Tenasserim; distributed to the Malay Peninsula and Archipelago.

Botanic Diagnosis.—"Capsules wrinkled, softly and densely tomentose." (Kurz.)

History.—Since the time Dr. Roxburgh described this plant scarcely any further information has been obtained. The conclusion he arrived at seems correct, namely, that the much-prized wood is obtained from eastern India, and from the forests to the east and south-east of Sylhet, extending through Manipur, Chittagong, Arakan, to Mergui and Sumatra. From India it finds its way to China, and from Cochin China, has first re-exported to Europe; hence, in all probability, the association of the plant with that country. Loureiro described a plant under the name of Aloexyon Agallochum, said by him to be a native of Cochin China, and to yield the true Calabac-wood or Agallocha. His description is incomplete, and his genus has therefore been set aside by Bentham and Hooker in their Genera Plantarum, while the plant has never since been identified or re-collected. De Candolle, in the Prodromus, refers it to Leguminosae.

Dr. Royle regards the Aloe-wood of the Scriptures as the Akila or Akhilm of the East, so famed for its fragrance, and that it is yielded by Aquilaria Agallocha. Gamble says that "Akyau (the Burmese name for Agallocha) is the most important produce of the forests of South Tenasserim and the Mergui Archipelago. It is found in fragments of various shapes and sizes in the centre of the tree, and usually, if not always, where some former injury has been received."

An enquiry into the history of Aloe-wood shows that an odoriferous wood bearing the name of Ahailet was known to the ancient Jews; the same substance appears to have been called agallochon by the Greeks and Romans. The early Arabs corrupted this term into Aghalakki, but subsequently adopted the terms Ood (or Add), meaning wood, and Ood-hindi (Indian wood), as the technical names for Aloe-wood. In Sanskrit it is called Agaru, from which is derived the modern Hindi name Agar. Upon the subject of Ood, Mir Muhammad Hosein has the following remarks: "Ood, in Hindi Agar, is the wood of a tree which grows in the Jaintiya hills near Sylhet, a dependency of the Suba of Bengal, situated towards the north-east of Bengal proper. The tree is also found in the islands to the south of Bengal, situated north of the equator, and in the Chatiian islands belonging to the town of Nawaka, near the boundaries of China. The tree is very large, the stem and
branches generally crooked, the wood soft. From the wood are manufactured walking-sticks, cups, and other vessels; it is liable to decay, and the diseased part then becomes infiltrated with an odoriferous secretion. In order to expedite this change it is often buried in wet ground. Parts which have undergone the change above mentioned become oily, heavy, and black. They are cut out and tested by being thrown into water; those which sink are called Gharki, those which partly sink Neem Gharki, or Samaleh-t-aala, and those which float Samaleh; the last kind is much the most common. Gharki is of a black colour, and the other qualities dark and light brown. According to other and older authorities, Ood is classified as Hindi, Samandooree, Kamari, and Samandali. Hindi is described as black, Samandooree as more oily than Hindi, Kamari as pale-coloured, Samandali as very odoriferous. Elsewhere it is described as Barree and Jabali, the latter having black lines in it, the former white; others again described Barree as having black lines, and Jabali white.

"Samandooree Ood is said to be called after the place whence it is obtained, also Kamari."

The best kind for medicinal use is Gharki Ood from Syllhet; it should be bitter, odoriferous, oily, and a little astringent; other kinds are considered inferior. In most receipts raw Ood (Ood-i-kham) is enjoined to be used to prevent the use of wood from which the oil has been abstracted by crushing and maceration in water, or by crushing and admixture with almonds, which are afterwards expressed. This precaution is the more necessary as Ood shavings are an article of commerce in India under the name of Choorah agar; they are often adulterated with chips of Sandalwood, or Tagger, an odoriferous wood much like Aloe and common in India. I have also heard mention made of the kind of Ood which is described by the author of the Ikhtidar-i-badii as coming from Bunder Cheeta, ten days' sail from Java, and esteemed equal in value to its weight of gold; this kind is said to have no smell until warmed. When taken in the hand it diffuses a delightful odour (possibly Bunder Cheeta has been written in mistake for Chaitiyan). There is another kind of wood common in India, which resembles Aloe in appearance, consistence, and oiliness; it is called Tagger, and is often sold for Ood. (Mahsaam, article [Ood or Add].)"

"Rumphius, Kaempfer, and others have written at some length on Aloe, but have not thrown much light upon the subject (Conf. Guibourt Hist. Nat., Tom. III., p. 330). Guibourt describes five kinds of Aloe wood, from the examination of specimens which he has met with in Europe. The first, a specimen in the Ecole de Pharmacie, he attributes to Aloe Agallochum; the second, which he considers to be the produce of an Aquilaria, is the ordinary Aloe wood of European commerce. The fifth, which is very heavy, oily, and resinous, he thinks must be produced by Exsccaria Agallocha; in this wood there are vities filled with a reddish resin. Guibourt's first and second kinds are more minutely described by Planchon. The varieties of Agar found in the Bombay market are three: Siam or Mawurthtee, Singapore, and Gigueue. Besides these we have Tagger from Zanzibar and a false Aloe wood."

No further evidence having come to light of the existence of Agallocha wood in Cochin China, it is probable that the odoriferous wood was not the product of the tree described by Loureiro, but was an importation obtained from India. There are many plants, however, which resemble the Agallocha in the odour of their wood, resin or sap, and it is therefore probable that Cochin China may possess one of these. The saps of Exsccaria Agallocha, L., a small tree found along the coast of

A. 1252
Burma from Chittagong to Tenasserim, is supposed to resemble Agallocha, hence the specific name (see *Excercaria*). So also the resinous excretions from various members of the Myrrh family have been erroneously associated with the Agar. This, in all probability, is the explanation of *Balsamodendron Agallocha*, W. & A., as in *Druzy*, the description of which most probably contains a compilation of the characters attributed to *B. Mukul*, *B. Roxburghii*, and *Aquilaria Agallocha*. Smith, in his *Dictionary of Economic Plants*, seems to lay stress upon Agallocha being the vernacular name for *Excercaria Agallocha*, but the name Agallocha does not appear to be of Indian origin.

**Resin.**—The wood of this tree is impregnated with a resinous principle, often found collected in masses here and there throughout the stem. This curious fact is in all probability due to some diseased condition, which might be artificially produced in order to increase the formation or collection of the resin. To obtain this sweetly-scented resin the trees are hewn down and cut to pieces while searching for the masses of resin.

The wood chips (chãrû.isPlaying-a-gar) are largely sold in the bazaars, and used, either by themselves or associated with *Bârellium*, as incense burned at Hindu temples. They are also boiled, and the water thereafter distilled, in order to prepare *Agar-atar* (or *agar-âd-eér*), a perfume much admired by the people of India.

**Fibre.**—"The bark is used in Assam for covers of unbound books." (Mr. H. Z. Darrah, Director of Agriculture, Assam.)

**Medicine.**—The fragrant resinous substance is considered cordial by some Asiatic nations. It has been prescribed in gout and rheumatism (*Amithe, ex Voigt’s Hortus Suburb. Calcutt.*). *Lourierio* observes that the Calambarc is a delightful perfume, serviceable in vertigo and palsy, and the powder is useful as a restrainer of the fluxes and vomiting. In decoction it is useful to allay thirst in fever.

Baden Powell says that aloes-wood is supposed to owe its fragrance to the rooting of the wood, and the best specimens are therefore buried in earth for some time. It was formerly much used in Europe in gout, rheumatism, diarrhoea, vomiting, and palsy. The name aloes-wood has nothing to do with aloes, but is a corruption of the Arabic term Al-âd (or al-âd). (Baden Powell, *Punjáb Products*, I. 337.) An essential oil prepared from the wood is also used medicinally.

§ "Internally in fevers, externally in colic." (Surgeon-Major D. R. Thompson, Madras.) "The otto of ood is considered cooling, and is an ingredient in many eastern perfumes." (Surgeon-Major A. G. Faya-kar, Muskat, Arabia.)

**Structure of the Wood.**—White soft, even-grained, scented when fresh cut. Weight about 25 lbs. per cubic foot. In the interior of old trees are found irregular masses of harder and darker-coloured wood, which constitute the famous Eagle-wood of commerce, called Kaya gurú by the Malays, and *Akau* by the Burmese (*agârd, Sans*.).

Kurz says of this wood: "very light, yellowish white, coarse, fibrous, but closely grained, takes a pale-brown polish. Used by the Karens for bows," The fragrant wood *Ood* is also largely used for making jewel-cases, and, indeed, precious stones are very frequently set in it. Aloes-wood is also largely used for making ornaments and rosary beads.

Eagle-wood is stated to bring about 130 per cwt. for 1st quality (Sumatran); 120, 2nd quality (Malaccan); and 120-10, 3rd quality (Malaccan and Indian). It should melt like wax and emit an agreeable odour. There seems considerable confusion in the use of the word Eaglewood. It apparently is applied to the masses highly impregnated with the gummy substance as well as to the timber.

A. 1258
ARACHIS hypogea. The Ground Nut.

1259 Aquilaria malaccensis, Lamk.; DC. Prod., XIV., 602.

Garode Malacca or Malacca Eagle-wood.

Habitat.—Said to be met with in Tenasserim.

Botanic Diagnosis.—“An evergreen tree, the young shoots of which are covered with adpressed hairs. Capsules smooth and glabrous.” (Kera)

Arabic Gum, see Acacia arabica and A. Senegal.


A genus of Brazilian herbaceous prostrate annuals (belonging to the Leguminosae, Sub-order Papilionaceae), comprising some 6 or 7 species, one of which is now cultivated throughout the tropical and extra-tropical regions of the globe.

Leaves abruptly pinnate, 2-jugate, or rarely 3-foliate; leaflets exstipulate; stipules adnate to the base of the petiole. Flowers in dense axillary spikes. Receptacle more or less concave lined by the disk. Calyx gamosepalous, either tubular or saciform at the base or else 2-partite, anterior sepal free to the base, 4 superior connate to a considerable height and membranous; lirach imbricate. Petals very unequal; standard suborbicular, scarcely tapering at the base, thickened gibose at the back; wings oblong, free, keel curved, beaked and tapering for a considerable distance at the apex. Stamens 9 or 10, 1-adnate; tube more or less thickened and fleshy at the base; anthers of 2 forms, 5 oppositipetalous shorter sub-globose, versatile, 5 alternipetalous elongated, basifixid. Legume sub-sessile, few-ovuled, oblong, thick, reticulated, sub-torulose.

The generic name is derived from the Greek name for a leguminous plant, ἀπάχος or ἀπάγος, referred to by Pliny, which had neither stem nor leaves. The specific name of the plant met with in India (A. hypogea) is derived from ἄροι όψις = subterranean.

1261 Arachis hypogea, Linn.; Fl. Br. Ind., II., 161; Leguminose.

The Ground Nut of Earth Nut of Pea Nut.


Habitat.—An annual of South America, now generally cultivated throughout India, but chiefly in South India and Bombay; also in certain parts of Bengal, and more rarely in Upper India.

This plant was not known in the Old World before the discovery of America. Dr. Dymock thinks the ground-nut reached India through China. It does not appear to have been cultivated for more than 50 years. It may have come to Western India from Africa.

Botanic Diagnosis.—After the flowers wither, the torus (which supports the ovary) becoming elongated in the form of a thick rigid stalk, and curving downwards, by alternately bending upon itself from one side to another, forces the pod underground, and in this position the peas are ripened. In India this curious plant often attracts to itself a large number of red-ants, which, in gardens in Bengal, seem regularly to rotten and pulverize the soil as if to facilitate the movement of the pod. It would be interesting to know whether the same fact has been observed in other parts of the world, and if so, to discover whether the plant feeds these useful insects in return for their assistance. They do not appear to eat the nuts or peas.

Cultivation.—Ground-nuts do not appear to require much care in
The Ground Nut.

They grow best on dry, sandy soil. Watering is not needed, particular observance as to the time when supplies of seed are put in or when they are reaped. With the close of the grain-reaping season on the Chingleput, South Arcot, parts of Tanjore and Trichinopoly districts, are sown broadcast with the nuts. (Trop. Agr., III., 774.) An average good crop will yield as 50 bushels from the acre. In 1879 the total area under the crop was ascertained to be 172,000 acres, and it is exclusively confined to Madras, Bombay, Berar, and Mysore. In the soil the crop proves objectionable, from the difficulty of removing the husks, many remaining and the plant thus becoming a troublesome one.

The seeds of this plant afford on expression a clear straw-colored, non-drying oil, which resembles olive oil in taste, and in India is largely used as a substitute for it in medicinal preparations. As a cooking oil it has for some time been used, and has the reputation of burning out giving a less luminous flame. It has, however, one important disadvantage over other lamp oils—it will keep for a longer time without becoming rancid. In North Africa it is reported to be used for adulterating olive oil, and in Pondicherry it is said to be mixed with cocoa-nut oil. In Europe it is now extensively used as a substitute for olive oil, both medicinally and for alimentary purposes. It has taken a place in the soap manufacture, and it is largely consumed for lighting machinery, as a lamp oil, and for dressing cloth. According to records, a Marseilles merchant was the first who experimented with this nut oil as a substitute for olive oil. The suggestion to do so is said to have been given by a French colonist, Joubert, in 1840. Little is known about the history of this oil, but it is said to be unknown to European commerce, and its annual consumption is perhaps little short of 100,000 tons. A yield of 20,000 tons a year. The chief emporiums of the European trade are Marseilles, and Genoa.

The quality of the oil is often as much as 50 per cent., the average Pondicherry 37 per cent., and the Madras 43 per cent. The quality of cold expression is much finer than when heat is employed, but in the case of the volume is much increased. Formerly this oil was extensively expressed in India than at the present date. In an official report from the Board of Revenue, Madras, to the Government, it is stated that, in 1877, 7,130 cwt. of nuts and 20,387 cwt. of oil were exported from Madras. With the increased trade in the nuts the price of the oil seems to have declined in India. The Suez Canal has shortened the time occupied on the voyage to Europe, the nuts can now reach Europe in a good condition; and this fact, together with the improvement in the machinery used on the Continent, have combined to render the nut a most important part of the trade in this product. The nuts, either in or not, constitute the chief export trade, and within the past few years its trade has rapidly increased, so that at the present moment it is viewed as a most important item in the exports of South India.

**Trade Returns.**

Resolution of the Government of India, Revenue and Agriculture, dated November 1877, will be found some interesting facts regarding the trade in ground nuts. The following extract shows the condition of the French trade in 1875: "Although the exports to foreign
## Dictionary of the Economic

### ARACHIS hypogea.

Trade Returns of Ground Nuts.

countries from British India are trifling, considerable quantities are sent from Pondicherry to France, as will be seen from the following figures, which have been extracted from the French trade returns of 1875:

<table>
<thead>
<tr>
<th>Kilogrammes</th>
<th>Francs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imports from Britain</td>
<td>1,231,803</td>
</tr>
<tr>
<td>&quot; French</td>
<td>6,404,699</td>
</tr>
</tbody>
</table>

The total imports into France in that year from all countries were 101,524,468 kilogrammes, or nearly 100,000 tons, worth 33,503,000 francs. Thus out of 33½ millions of francs, only 2½ millions stand against India. Nearly all the rest is imported from the West Coast of Africa.

### Exports of Earth-nuts from British India.

<table>
<thead>
<tr>
<th>YEARS</th>
<th>Weight</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cwt.</td>
<td>R</td>
</tr>
<tr>
<td>1876-77</td>
<td>25,472</td>
<td>1,58,920</td>
</tr>
<tr>
<td>1877-80</td>
<td>48,435</td>
<td>3,28,530</td>
</tr>
<tr>
<td>1880-81</td>
<td>188,381</td>
<td>10,07,855</td>
</tr>
<tr>
<td>1881-82</td>
<td>373,317</td>
<td>17,45,475</td>
</tr>
<tr>
<td>1882-83</td>
<td>265,743</td>
<td>15,13,615</td>
</tr>
<tr>
<td>1883-84</td>
<td>712,954</td>
<td>37,05,462</td>
</tr>
</tbody>
</table>

### Analysis of the Exports for 1883-84.

<table>
<thead>
<tr>
<th>Province from which exported</th>
<th>Weight</th>
<th>Value</th>
<th>Countries to which exported</th>
<th>Weight</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cwt.</td>
<td>R</td>
<td></td>
<td>Cwt.</td>
<td>R</td>
</tr>
<tr>
<td>Bombay</td>
<td>595,822</td>
<td>32,04,357</td>
<td>United Kingdom</td>
<td>24,211</td>
<td>1,10,426</td>
</tr>
<tr>
<td>Sind</td>
<td>15</td>
<td>85</td>
<td>Belgium</td>
<td>209,450</td>
<td>14,50,900</td>
</tr>
<tr>
<td>Madras</td>
<td>117,117</td>
<td>5,61,020</td>
<td>France</td>
<td>332,002</td>
<td>18,58,301</td>
</tr>
<tr>
<td>Total</td>
<td>712,954</td>
<td>37,05,462</td>
<td>Italy</td>
<td>15,013</td>
<td>83,81</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Egypt</td>
<td>32,750</td>
<td>1,73,716</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Straits Settlements</td>
<td>12,769</td>
<td>43,654</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Other Countries</td>
<td>4,359</td>
<td>16,411</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>TOTAL</td>
<td>712,954</td>
<td>37,05,462</td>
</tr>
</tbody>
</table>

### Exports of Earth-nuts from the French Ports in India.

<table>
<thead>
<tr>
<th>YEARS</th>
<th>Quantity in bags</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>R</td>
</tr>
<tr>
<td>1880-81</td>
<td>233,533</td>
<td>14,39,340</td>
</tr>
<tr>
<td>1881-82</td>
<td>355,121</td>
<td>14,70,970</td>
</tr>
<tr>
<td>1882-83</td>
<td>453,915</td>
<td>16,15,369</td>
</tr>
<tr>
<td>1883-84</td>
<td>453,366</td>
<td>29,08,969</td>
</tr>
</tbody>
</table>

A. 1263
Ground-nut Oil.

Analysis of the Exports for 1883-84.

<table>
<thead>
<tr>
<th>Spots from which exported</th>
<th>Quantity in bags</th>
<th>Value</th>
<th>Countries to which exported</th>
<th>Quantity in bags</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pondicherry</td>
<td>450,170</td>
<td>R</td>
<td>29,58,170</td>
<td>United Kingdom</td>
<td>43,066 R</td>
</tr>
<tr>
<td></td>
<td>3,196</td>
<td></td>
<td>10,522</td>
<td>France</td>
<td>403,064 R</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Réunion</td>
<td>50</td>
<td>329 R</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Straits Settlements</td>
<td>5,446</td>
<td>19,575 R</td>
</tr>
<tr>
<td>TOTAL</td>
<td>453,366</td>
<td></td>
<td>TOTAL</td>
<td>453,366</td>
<td>29,68,698</td>
</tr>
</tbody>
</table>

Accepting a mean between the discrepancies of the published figures of exports from British India, and of those of the imports from British India into other countries, we learn that the trade in ground-nuts has developed from 20,000 cwt, in 1875-76 to 700,000 cwt, in 1883-84. The above tables show that the United Kingdom is mainly supplied from French India, while the bulk of the British India exports are consigned to France and Belgium. Both in British and in French India the ground-nut trade has thus developed with marvellous rapidity, and this is doubtless due, in a large measure, to the action taken by the Government of India in the Resolution quoted above.

The following extract reporting the condition of the Pondicherry trade during May 1884 will be found interesting: "The ground-nut trade between Pondicherry and France is in full swing, and has been so since the month of February. The South Indian Railway Company has been running special trains with nuts from Punroooy to Pondicherry every day during the past nine weeks, and will probably continue to do so for two or three months longer. The ground-nut trade is the most important in the chief town of the French Settlements in India. Three ships are loading nuts in the Pondicherry Roads and more are expected. The European and Native merchants are fully engaged in this trade for at least six months in the year, and to facilitate shipments of nuts, the South India Railway has laid down a railway line from the Pondicherry railway station to the pier, so that the bags are shipped off as fast as they come in from the interior. Coolies find ample employment during the present season, and the price of labour is high. The European merchants in the port have entered heart and soul into the enterprise, and it is surprising how the South Arcot districts can produce such an immense quantity of nuts." (Madras Standard, quoted in the Tropical Agriculturist, III. 830.)

The oil known as gora-tl (gora-tel) or sweet oil of the Indian bazaars is obtained from a mixture of safflower, sesameum, and ground-nut seed.

Chemical Composition of Ground-nut Oil.

"The oil consists of the glycerides of four different fatty acids, the common Oleic acid C_{18}H_{34}O_{2}—that is to say, its glycerin compound is the chief constituent of Arachis oil. Hypogonic acid C_{11}H_{20}O_{2} has been pointed out by Gossmann and Scheven (1854) as a new acid, whereas it is thought by other chemists to agree with one of the fatty acids obtained from whale oil. The melting point of this acid from Arachis oil is 34° to 35° C. The third acid afforded by the oil is ordinary Palmitic acid C_{16}H_{32}O_{2}. The fourth constituent has also been met with among the fatty acids of butter and olive oil, and according to Oudemans (1866), in the
ARACHIS hypogaea. Ground Nut.

tallow of *Nephelium lappaceum*, *L.*, an Indian plant of the Order Sapindaceae.

When ground-nut oil is treated with hypotonic acid, which may be most conveniently evolved by heating nitric acid with a little starch, a solid mass is obtained, which yields by crystallization from alcohol Elaeïdï and Gedînic acids, the former isomeric with oleic, the latter with hypogaeic acid." (Pharm., by Füllk. & Hamb., p. 187.)

**Medicine.**—Arachis oil forms a good substitute in pharmacy for olive oil. It has now almost entirely superseded that of olive oil in India, both for pharmaceutical and other purposes. It is well adapted for the preparation of ointments and plasters. Dr. Dymock says that at the Government Medical Store Depot of Bombay the oil is expressed for pharmaceutical purposes to the extent of about 6,000 lbs. a year. It is used as a substitute for olive oil. For a good plaster 90 lbs. of the oil take 41 lbs. of oxide of lead.

"The oil is hardly known in South India. We use gingelly (*Sesamum*) oil in our dispensaries for olive oil. The ground-nuts are largely eaten by natives in the Madras Presidency." (Deputy Surgeon-General G. Bidis, C.I.E., Madras.)

"Oil of Arachis appears to me to be a very efficient substitute for olive oil in pharmacy, and is fully as useful." (Surgeon-Major H. W. E. Cuthan, Ahmadnagar.) "Useful in catarrh of the bladder." (Surgeon-Major Joseph Parker, M.D., Poona.) "Ground-nuts roasted are eaten freely by natives of South India. They are said to be very bilious." (Honorary Surgeon P. Kinley, Chicacole, Madras.) "The pod is largely grown in the sandy soil of the South Arcot District and is exported to France." (Surgeon-General William Robert Cornew, C.I.E., Madras.)

**Indian Prices.**—The price of ground nuts in South India is generally Rs. 15 to 19 per candy (=5 cwt.). But during the season of 1883, when every available bag was bought and shipped to France, it rose to Rs. 24 (Trop. Agri., III., 774, quoting Madras Mail). "In the Bombay market the price of the seeds ranges from Rs. 28 to 30 per candy, according as the supply is abundant or otherwise." (Dymock, Mut. Med., W. Ind., 202.)

**African Nuts.**

**African Trade.**—Ground nuts are also grown on the west coast of Africa, and a large trade exists between Senegal and the Mediterranean ports. The African trade has one very important advantage over the Indian trade, in that Genoa and Barcelona are only from fifteen to twenty days distant by steamer from Senegal. The African nuts can accordingly be landed in a far better condition than the Indian. The yield of oil is stated to be from 42 to 50 per cent. The *Pharmacopoeia* (p. 187) says: "The pods are exported on an immense and ever-increasing scale from the west coast of Africa. From this region not less than 66 millions of kilogrammes, value 26 millions of francs (£1,040,000), were imported in 1867 almost exclusively into Marseille. From the French possessions on the Senegal, 24 millions of kilogrammes were exported in 1876." One of the learned authors of the *Pharmacopoeia* regards Africa as the probable home of the ground nut, but most botanists are of opinion, as already stated, that it is more likely to have been originally a native of Brazil. It is nowhere met with in a wild condition at the present day.

**Food.**—It produces the well-known ground nut, so called because the pod attains maturity underground.

In India the nuts are sold in the bazaars or by the street hawkers either parched, with the shell on and put up in paper packets, or shelled and roasted in oil. They are eaten by natives of all classes, especially in South India. In Bombay they are a favourite food of the Hindus during...
ain fasts. They are occasionally seen roasted in shell as a dessert on European table, and are eaten with salt. Hand-shelled nuts are also sometimes made into confectionery. The roasted seeds may be used a substitute for chocolate. "According to Dr. Davey, they abound starch, as well as oil, a large proportion of albuminous matter, and o other instance had he found so great a quantity of starch mixed o 1 oil."

Chemical Composition of the Meal.—"Dr. Muter, after giving the wing analysis of ground-nut meal, urges its more general use as important article of food:—

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>9.6</td>
</tr>
<tr>
<td>Fatty matter</td>
<td>11.8</td>
</tr>
<tr>
<td>Nitrogenous compounds</td>
<td>3.19</td>
</tr>
<tr>
<td>Sugar, starch, &amp;c.</td>
<td>37.8</td>
</tr>
<tr>
<td>Fibre</td>
<td>4.3</td>
</tr>
<tr>
<td>Ash</td>
<td>4.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

"From this analysis it is evident," he observes, "that the residue from in, after the expression of the oil, far exceeds that of peas, and is even er than lentils in flesh-forming constituents, while it contains more and more phosphoric acid than either of them. On these grounds we justified in urging the adoption of the ground-nut meal as a source 2od, it being superior in richness of all important constituents to any vegetable products of a similar nature. Although in the raw state it sesses a somewhat harsh odour, similar to that of lentils, this flavour rely passes off in cooking, and when properly prepared it has a very seable flavour.

"This seed is held in such estimation for eating in the United States ere it is known as the 'pea nut'), that flourishing sale-stands are seen almost every street corner of New York. They are not much appre ed in England, except by children.

"There are fully 550,000 bushels sold annually in the city of New k alone. Previous to 1860 the product in the United States did not sun to more than 150,000 bushels, and of this total nearly five sixths e from North Carolina. Formerly it was largely imported into erica, now they are supplied by the home crops raised in Virginia l the Carolinas. (Tropical Agriculturist, P. L. Simmonds, pp. 403-4.)

Cattle Food and Fodder.—The leaves and branches of the plant are edily eaten by cattle, and form an excellent fodder. The hay is very rituous, much increasing the milk of cows. The cake holds a high ation as a food upon which cattle rapidly fatten.

**ARALIA, Linn.; Gen. Pl., I., 936.**

**Cachemirica, Dcne.; Fl. Br. Ind., II., 722; Araliaceae.**

**Vern.**—Banakhor, churial, Ps.

**Habitat.**—A rank plant growing in the basins of the Jhelum and the 

**Fodder.**—Eaten by goats.

ARALIACEÆ.

"Trees or shrubs, very rarely herbs, sometimes scandent or scandent en young, and finally self-supporting, not rarely prickly. Leaves

A. 1275
**Dictionary of the Economic**

**Analysis of the Araliaceae.**

Alternate the uppermost rarely sub-opposite, long-petioloed, large, simple compound; stipules adnate to the petiole, sometimes in conspicuous or flowers regular, small, sometimes polygamous, in umbels racemose, panicked heads; bracts and bracteoles small or conspicuous; pedicel continuous with the base of the calyx or there jointed. Calyx-tube adnate to the ovary; limb truncate, obsolete or with small teeth. Petals 5, rarely 6-7 or many, valvate or subimbricate, expanding or deciduous in a cup. Stamens as many as and alternate with the petals (very many in *Ficus grandifolia*), inserted round an epigynous disc. Ovary inferior, 2-celled, or cells as many as the stamens (in *Arthrophyllum* 1-celled); styles as many as the cells, distinct or united; ovules solitary and pendulous in each cell. Fruit coriaceous or drupaceous, usually small, one or more cells sometimes suppressed. Seed pendulous, albumen uniform or ruminated; embryo minute, radicle next the hilum. Distrib.—Species 340, chiefly tropical and sub-tropical, a few in the cool temperate zones."

**SECTION I. Araliaceae.** Petals imbricated (but only lightly). Pedicels jointed.

| Styles 2-5, free. Leaves compound | 1. *Aralia.* |
| Styles 5, combined | 2. *Pentapanax.* |
| Styles 4-3, free, leaves pinnatifid | 3. *Aralidium.* |

**SECTION II. Panaceae.** Petals valvate. Albumen uniform.

- *Ovary 2-celled.*
  - Pedicels jointed. Leaves deciduous
  - Pedicels continuous. Leaves digitate

- *Ovary 4-10 celled.*
  - Umbels sessile on the back of the leaf.
  - Pedicels jointed.
  - Pedicels continuous. Leaves not pinnate.

- Fruit angular the size of a pea.
- Fruit more than 1 in. long.
- Flower sessile embraced by 4 bracteoles.
- Leaves simple (except the lowermost).

**SECTION III. Hederaceae.** Petals valvate. Albumen ruminated.

- *Ovary 1-celled.*
  - Leaves pinnate or undivided

- *Ovary 2-celled.*
  - Pedicels continuous. Styles distinct
  - Pedicels continuous. Styles combined
  - Pedicels jointed. Styles combined

- *Ovary 5-4-celled; styles combined.*
  - Leaves simple lobed or pinnate.

- Pedicels continuous
- Pedicels jointed

- Leaves digitate.
  - Tree, Leaflets ciliate

**A. 1275**
Products of India.

The Arctostaphyllos.

IV. Plerandrae. Petals valvate. Stamens 20-50. A small tree, falling off in a cap. 18. Tupidanthus. (This is not found in the flora of British India by Sir J. D. Hooker, Vol. II., 720-21.)

In the Natural Order ARALEae there are in all 340 genera; they abound in both hemispheres, but not in the East Indies. They are particularly plentiful in the mountains of New Guinea and the Moluccas. They are rare in the parallel region of Europe. There are 54 species met with in India belonging to 19 genera. Of India there are 12 species or 22.2 per cent.; ascending to 5 species or 37 per cent.; up to 10,000 feet, 18 species or 33.3 per cent.; and above 10,000 feet, 4 species or 7.4 per cent. These are as follows: in the East Indies, 36 or 66.6 per cent.; in the West Indies, nil.; and peculiar to North India, 7 per cent. Besides these the following are met with: in the four regions of India, not including North India, 1 species or 1.8 per cent.; and including North India, 7, or 13 per cent. Thus India has in all 8 species, one being endemic and the other distribution. From these figures the Indian Araileae to have their headquarters in the warm temperate and the eastern division, while their entire absence from the western division is exceedingly remarkable. Dalzell and Gibson, of Bombay, mention a plant which they call Hedera as met with "at Mooloo, foot of the Râm Kháút, and other 5," but the Flora of British India takes no notice of this plant. The authors of the Bombay Flora mention, in addition, 7 species of Araleae which do not seem to have succeeded very well in one garden only, and others appear to be better known.

Preliminary Notes on the Arctostaphyllos are with Umbelliferae (with which in fact been combined by Baillon, with Ampelidæ, and with Cernæ). They are also closely connected to Corneæ, which in habitation in their drupaceous fruit and opposite leaves.

Agricultural Notes.—The family contains few species of any great value to man. The small tree, Fatsia papyrifera, a native of the north, yields the rice-paper of China. The young shoots of Helwingia are eaten in Japan, while Panax Ginseng is a celebrated medicine Ginseng, famed as a tonic and aphrodisiac. This is regarded by the Chinese as the most potent remedy, but to the European practitioner its remedial value is entirely overrated. The leaves of the Iv (Hedera Helix) have a remote antiquity, enjoyed the reputation of possessing relics, especially as a dressing for ulcers and to destroy vermin.

For this purpose an oil medicated with the Iv was used.


A large and handsome evergreen tree of Australia (Queensland) planted for ornamental purposes in Calcutta. Of the wood—Soft, light yellow, perishable.


A. 1281
ARDISIA, Swartz., Gen. Pl., II., 645.

A genus of shrubs or small trees belonging to the Natural Order Myrsine comprising some 200 species, native of tropical regions—45 being met with in India.

Leaves pelted. Flowers hermaphrodite, in axillary or terminal, simple compound umbels or racemes; bracts small, deciduous; calyx 5-lobed, persistent, often somewhat enlarged in fruit. Corolla red, white spotted, 5-petalled; segments acute, twisted to right in bud. Stamens 5 filaments generally short; anthers free, ovate-lanceolate, acute; ovary globose, narrowed upwards; style cylindrical, often much longer than the corolla. Stigma punctiform; ovules few. Fruit globose or sub-globose. Seeds solitary; globular; albumen pitted or ruminated; embryo horizontal.

A genus in which many of the characters are exceptionally variable in certain species. The generic name is derived from ἀρδίσια, a bundle, in allusion to the acute petals. The economic properties of the plants are very imperfectly known.


Habitat.—A shrub frequent in Cachar, Assam to (?) Malacca.

Medicine.—Saith to be the "dan" of Ceylon, the bark of which is used as a febrifuge in fever and in diarrhoea, and also applied externally to ulcers.


Vern.—Chamani, Nepal; Denyo, Lepcha.

Habitat.—"A small, erect shrub, met with in Eastern Hindustan 4,000 to 8,000 feet, and at Martaban at similar elevations." (Gamb.)

There seems to be some mistake regarding this species. Gamb. gives the above locality, while the Flora of British India says it is native of "Penang, Malacca, and Singapore, frequently distributed in Malaya, China, Japan." It seems probable that Gamble has alluded to another species, probably A. macrocarpa, Wall.

Structure of the Wood.—White, moderately hard. Very cowled under-growth in the hill forests.


Syn.—A. solanacea, Roxb., Fl. Ind., I., 480; Wight, I., 4. 1313; B. For. Pl., 287; Kurs., For. Fl., II., 110; A. umbellata, Roxb.; Fl. Ind., I., 582; A. littoralis, Ait.; Kurs., For. Fl., II.; Plocamphila, Wight, Ill., 1. 145; Climacandra littoralis, Four., As. Soc., 1871, Pt. II., 69.

Vern.—Bungje, Bendo.; Bist, Mal. (S.P.); Kudina, Uryia; Condor, Láki-nárdé, Tel.; Kantena, mayarama, C. P.; Bodina gikso; Gyengmaapo, Burm.; Bato-dan, Singh.

Habitat.—A small shrub, met with throughout India, ascending altitudes 5,000 feet. Not met with in North India and Ceylon. Distributed in Singapore, Malaya, and China.

A. 1288
Betel-nut Palm.

Dye.—The red juice of the berries yields a good though unknown yellow dye.

Structure of the Wood.—Grey, moderately hard, used as fuel.

Ardisia involucrata, Kurz; Fl. Br. Ind., III., 528.

Vern.—Deyok, Lepcha.

Habitat.—A small shrub, 3 to 6 feet, with yellow corky bark, altitude 2,000 to 5,000 feet, in Sikkim.

Structure of the Wood.—Pinkish white, with small, scanty pores, and broad, white, wavy, medullary rays.


A small tree of the Khäsia Hills and of Chittagong, with handsome pink flowers. The bark is thin, greyish brown, and the wood pinkish white, with small pores radially disposed between the short, broad, wavy, medullary rays.


A genus of PALMÆ belonging to the Tribe Areceæ, comprising some 24 species, inhabitants of tropical Asia, the Malay Peninsula, and Australia.

Stem tall, slender, attaining 60 feet or more with a diameter 12-15 inches; leaves terminal, equally pinnate; petiole on a long smooth green sheath; segments lanceolate, acuminate, plicate, with the margin recurved; base broad, with numerous parallel nerves; rachis angled, and convex below with an acute margin above. Spadix much-branched, pendulous, appearing from the axil of the lowest leaf. Spadix 3 or more, the lower enclosing the spadix, the upper generally bracteiferous. Flowers monocious, male and female on the same inflorescence, female flowers solitary, surrounded by numerous slender spikes of white fragrant male flowers. Male flowers compressed, small. Sepals small, imbricate, free or connate. Petals much larger, obliquely lanceolate, acute or acuminate-valvate. Stamens 3 or 6; filaments short or obsolete; anthers sagittate, basished, erect, surrounding a minute rudiment of the ovary. Female flowers much larger than the male. Sepals orbicular, concave, broadly imbricate. Petals much larger than the sepals, valvate. Staminodia minute or obsolete. Ovary ovoid, ovoidal; stigma 3, sessile, subulate, erect or recurved; ovule basilar, erect. Fruit orange-coloured, ovoid, surrounded by the persistent coriaceous perianth. Seed ovoid or sub-bispherical, truncated at the base; albumen ruminated; embryo basal.

Areca is said to be the Latinised form of the Malay name.

Areca Catechu, Linn.; PALMÆ.

The Areca- or Betel-nut Palm; Noix d’Arece, Fr.; Areka-nusse, Betelnusse, Germ.


Habitat.—A native of Cochin China, Malay Peninsula and Islands. Cultivated throughout tropical India; in Bengal, Assam, Sylhet, but will not grow in Mānippur, and only indifferently in Cachar, Burma, Siam. In Western India, below and above the Ghāts. Does not grow at any distance from the sea, and will not succeed above 3,000 feet in altitude. It flourishes, however, in the dry plateau of Mysore, Kanara, and Malabar. Most villages in Burma, Bengal, and South India have their clumps or avenues of betel palms. The betel-palm groves and pepper plantations are a part of the native system of agriculture.
betel-leaf houses are perhaps the most characteristic features of the riverbanks in Sylhet, and from these plantations the inhabitants of Cachar and Manipur obtain their supplies.

**Cultivation and Yield.**—In Mysore.—There are two varieties of the Areca in Mysore, the one bearing large and the other small nuts, the produce of both kinds being nearly equal in value and quantity.

The manner of Areca-nut cultivation is different in different districts of Mysore. The method followed in Channapatna is as follows. The seed is ripe about the middle of January to February, and is first planted in a nursery. Trenches are dug and half-filled up with sand, on the surface of which is placed a row of the ripe nuts. These are again covered with sand and rich black mould, and are watered once in three days for four months. The young palms are then transplanted to the garden, which had been previously planted with rows of plantain trees at the distance of about four feet. Two young Areca trees are set in one hole between every two plantain trees. When there is no rain, the plants are watered every third day. In the rainy season, a trench is dug between every third row of trees to carry off superfluous water, and to bring a supply from the reservoir when wanted. At the end of three years the original plantain trees are removed and a row planted in the middle of each bed and kept up ever afterwards in order to preserve a coolness at the roots of the Areca. The trees are five feet high in five years, and begin to produce fruit. The plantation requires no more watering except twice a month during the dry weather.

The methods followed in other parts of Mysore differ in some respects from the one above, but they agree in the essential point, namely, plantain trees are planted with the Areca palms, and in most districts trenches are dug to carry off superfluous water. The seedlings, except in one district, are first raised in a nursery and then transplanted. Manure is used in some districts, but watering is resorted to everywhere. A rich black mould or a black soil containing calcareous nodules is preferred for Areca nut cultivation.

The areca plantations in Mysore are interspersed with coconut, lime, jack, and other trees, which add to the shade and to the freshness of the soil. ([Mysore Gazetteer, Vol. I., pp. 125-131.])

**In Kolaba.**—In Kolaba, the betel palm is grown in large numbers in cocoa-nut plantations along the Alibag coast. The nuts are buried two inches deep “in loosened and levelled soil. When the seedlings are a year old, they are planted out in July and buried about two feet deep. The soil is then enriched by a mixture of salt and nāchni” (notes with the addition of cow-dung). No watering is required at first, but after four months the plant is watered either daily or at an interval of one or two days. If water is not stinted, the betel palm yields nuts in its fifth or sixth year. “The tree yields twice or thrice a year, about 100 nuts being an average yearly yield.” ([Bomb. Gaz., Vol. XI., pp. 97-98.])

**In Janjira or Shirvadha.**—In Janjira, the betel palm is the most important of garden crops. “Shirvadha” betel-nuts are known over the whole of the Bombay Presidency. The seed-nut is sown in February or March about half a foot deep and is carefully watered. After about four months the plant appears and is watered every second day. When it is four years old it is planted out about two feet and a half below the surface, a foot and a quarter of the seedling being buried under the ground, while a round trench of the same depth is left for the water.” When the tree is nine or ten years old, it begins to bear fruit, the yearly yield varying from 25 to 400 nuts. ([Bomb. Gazetteer, Vol. XI., 425.]) This variety fetches, relatively, a much higher price in the market than any of the others.
Betel-nut Palm.

In Thana.—The betel-nuts are grown largely in Thana, Bombay. The best nuts are carefully selected in October and dried in the sun; husked nuts are considered the best for seed. They are planted in well-ploughed plot of land in pits three inches wide and three inches deep, and at a distance apart of from six inches to a foot. For first three months the young palm is watered at least every fourth day, and afterwards every third day.” When the plants are a year or a half old, they are fit for planting out. “The selling price of young plants varies from 6 pices to 1 anna.”

“The betel palm usually grows in red soil, but it flourishes best in sandy soil that remains moist for some time after the rains. Before the young palm is about a foot high, the ground is ploughed, levelled, and weeded, a water-channel is dug six inches deep and a foot wide in the border, and two feet wide are dug at least four feet deep, nearly full of earth, but not quite full, so that water may lie in it. Where the soil allows, plantains are grown in the beds to shade young palms. Except during the rainy season, when water is not needed, the young trees are watered every second day for the first five weeks, and after that every third or fourth day. During the rains, manure sometimes given.” (Bombay Gazetteer, XII, pt. I., 298-309.)

The cost of betel-nut cultivation in Thana is calculated as follows: 100 per acre is given to betel palms, it is estimated, holds 1,000 trees. The total cost of rearing 1,000 betel palms for five years—that is, if they begin to yield—is about £127 13s., including compound interest at 9 per cent. After five years a thousand trees are estimated to yield 500 betel nuts, from which, after taking 18s. 11d. for watering, assessment of wages, and £11 9s. 11d., as interest at the rate of 9 per cent., there remains a net estimated profit of £19 16s. 3d., or 13s. 5d. per cent.” (Bombay Gazetteer, Vol. XIII, pt. I., 301.)

In Ceylon.—There are several varieties cultivated in Ceylon, but they are not so good as the Indian ones, and fetch the lowest price in the Ceylon market. In poor soil, the plant at first grows slowly. It can live among an undergrowth of weeds; in fact, clean weeding is not absolutely beneficial to its growth. Neither tree nor fruit is liable to attacks by enemies of any kind. Young trees are continuously produced on the plant, and nuts that have been allowed to drop and supply the place of those that have become worn out or unfruitful. Areca-nut trees can be planted very densely, 1,200 per acre being not at all too high an estimate; 12,000 were planted on an average one cwt. At 300 per tree, the average yield would be about 30 cwt. per acre.

The wholesale value at Galle or Colombo is usually R8 per cwt., giving 240 per acre, or leaving out R100 for expenditure, R140 per acre as net profit.

At Madras and Bombay, Ceylon nuts fetch about R13 a cwt. The mand for areca-nut is practically unlimited, as hundreds of millions of areca are consumed in China, India, &c., use it. (Notes by a Ceylon planter in Travels in Eastern Bengal, 701.)

In Bengal.—“The supari or betel-nut is common in Eastern Bengal, especially in Tipperah, Backergunge, and Dacca; and its cultivation is very profitable to proprietors of land. It bears fruit in the eighth year, and is most productive from that time to the twentieth year, when the produce falls off. The nuts are gathered in November.” (Administration Report of Bengal, 1882-83, p. 14.)

“The betel-nut cultivation is very extensive, especially in the police districts of Tubkibagar and Hajiganj. A considerable trade in this article is carried on with Dacca, Narayanganj, and Calcutta. The cultivation of the betel-nut palm or supari (Areca Catechu) usually own a large

A. 1295
ARECA
Catechu.

Betel-nut Palm.

piece of ground, slightly raised above the level of the surrounding country, and surrounded by ditches. In the centre of this they build their dwellings, and all around them they plant betel-nut trees. An acre of land will obtain about 3,000 trees. When first planted, the betel-nut requires to be protected from the sun; for this purpose rows of mādār trees are planted between the lines of betel-nut trees, and the growth of jungle is encouraged. When the betel-nut trees have grown strong, and no longer require the shade, the cultivators are too lazy and thoughtless to remove the jungle; and the result is that “whole parganas which were once fully cultivated are now covered with dense jungle,” in which even the betel-nut trees cannot grow; while “thousands of the inhabitants have been swept away by cholera and malignant fever of a very virulent type.” The unhealthiness of the neighbourhood of betel-nut plantations is variously attributed to the dense jungle and undergrowth above mentioned, to the exhalations from the trees, and to the malignant gases generated by decomposing vegetable matter in the ditches surrounding the plantations. The betel-nut trees grow to a height of about 60 feet; and in some parganas they are cultivated to such an extent as to almost entirely exclude rice cultivation.” (Dr. W. W. Hunter’s Statistical Account of Bengal, Vol. VI., pp. 391-92.)

Commerce.—The betel-nut palm is very largely cultivated on account of its seed (popularly called its nut). As stated in the previous page, the average yield per tree is about 300 fruits, each of which contains one large seed, about the size of a small hen’s egg. The chief trade seems to centre around Bombay. Ceylon and Madras export their nuts to the Western Capital, from which they are re-exported to the principal Asia centres, and diffused by land all over India. Sumatra and Singapore also export large quantities of nuts to Bombay. The following extract from Dr. Dymock’s Materia Medica of Western India will be found useful us indicating the chief trade classes of areca-nuts met with in Bombay:

“The kinds of betel-nut met with in Bombay are—

Gowai, from Goa, value R40 to R50 per cndy of 5½ cwt.
Mangalore, value R70 to R110 per cndy.
Rupasai, from Alp, R60 to R80 per cndy.
Calcutta, value R60 to R65 per cndy.
Asigree, from Singapore, value R60 to R70 per cndy.
Kanarese, value R80 to R100 per cndy of 5½ cwt.
Severdani (Shrivardhan, Ed.) value R4½ to R4½ per ½ cwt.

All these are known as white betel-nut. The following kinds of red betel-nut are met with:

Malabar, value R70 to R80 per cndy of 5½ cwt.
Kūmpta " 60  90 "  "
Marorkadi " 80  85 "  "
Goa " 65  90 "  "
Wasai from Bassein, value R6 to R8 per ½ cwt.
Sewali value R5 per maund of ½ cwt.
Malwan, value R60 to R65 per cndy of 5½ cwt.
Vingorla " 60  65 "  "
Calcutta " 50  60 "  "

A. 1296
### Products of India.

#### Betel-nut Trade.

The following are the imports and exports of Areca-nut:—

**Foreign Trade by Sea.**

<table>
<thead>
<tr>
<th></th>
<th>Imports</th>
<th></th>
<th></th>
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<th></th>
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<td>R</td>
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<td>466,722</td>
<td>34,417</td>
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#### Details of Imports—1883-84.

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<td>D</td>
<td>R</td>
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<td>6,393,388</td>
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<td>Strait Settlements</td>
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#### Details of Exports—1883-84.

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<td>13,171</td>
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<td>Other Countries</td>
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<tr>
<td>TAL</td>
<td>466,722</td>
<td>57,417</td>
<td>TOTAL</td>
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1.—Of the betel-nuts imported about 60,000 D, valued at Rs,000, are re-exported to foreign countries.

A. 1297
<table>
<thead>
<tr>
<th>Ports from which imported</th>
<th>Into Bengal</th>
<th></th>
<th></th>
<th>Into Bombay</th>
<th></th>
<th></th>
<th>Into Sind</th>
<th></th>
<th></th>
<th>Into Madras</th>
<th></th>
<th></th>
<th>Into British Burma</th>
<th>Total</th>
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<tbody>
<tr>
<td></td>
<td>Quantity</td>
<td>Value</td>
<td>Quantity</td>
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<td>British Ports in other Presidencies</td>
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<td>From Bengal</td>
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<td>17,978,376</td>
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<tr>
<td>Indian Ports not British—</td>
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<td>Travancore</td>
<td>1,680</td>
<td>163</td>
<td></td>
<td>3,955,345</td>
<td>3,02,922</td>
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<td>3,658</td>
<td>282</td>
<td></td>
<td>1,008</td>
<td>83</td>
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<td>2,93,420</td>
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<tr>
<td>Total</td>
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<td></td>
<td>3,955,345</td>
<td>3,02,922</td>
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<td>3,658</td>
<td>282</td>
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<td>1,008</td>
<td>83</td>
<td></td>
<td>3,906,731</td>
<td>2,93,420</td>
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<td>Total of all Ports</td>
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<td>17,251,453</td>
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### Products of India.

#### Betel-nut Trade.

**Frontier Trade by Land.**

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<th>YEARS</th>
<th>IMPORTS</th>
<th></th>
<th>EXPORTS</th>
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<tr>
<td></td>
<td>Quantity</td>
<td>Value</td>
<td>Quantity</td>
<td>Value</td>
</tr>
<tr>
<td>lb</td>
<td>lb</td>
<td>R</td>
<td>lb</td>
<td>R</td>
</tr>
<tr>
<td>7,280</td>
<td>560</td>
<td>1,408</td>
<td>6,876,128</td>
<td>6,558,552</td>
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<td>1,456</td>
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<td>141</td>
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<td>7,53,441</td>
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</tbody>
</table>

#### Details of Imports—1883-84.

<table>
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<th>Quantity</th>
<th>Value</th>
<th>Country whence imported</th>
<th>Quantity</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb</td>
<td>R</td>
<td>Nepal</td>
<td>lb</td>
<td>R</td>
</tr>
<tr>
<td>1,456</td>
<td>141</td>
<td></td>
<td>1,456</td>
<td>141</td>
</tr>
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</table>

#### Details of Exports—1883-84.

<table>
<thead>
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<th>Quantity</th>
<th>Value</th>
<th>Countries to which exported</th>
<th>Quantity</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb</td>
<td>R</td>
<td>Nepal</td>
<td>lb</td>
<td>R</td>
</tr>
<tr>
<td>5,824</td>
<td>873</td>
<td>675,368</td>
<td>61,572</td>
<td></td>
</tr>
<tr>
<td>and 26,432</td>
<td>3,799</td>
<td>246,624</td>
<td>21,226</td>
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<tr>
<td>896,474</td>
<td>58,644</td>
<td>356,104</td>
<td>38,512</td>
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<tr>
<td>194,554</td>
<td>69,925</td>
<td>448,572</td>
<td>59,434</td>
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</tr>
<tr>
<td>and 1,967</td>
<td>59,925</td>
<td>7,075</td>
<td>41,379</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Other countries</td>
<td>45,532</td>
<td>4-537</td>
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<td></td>
<td></td>
<td>TOTAL</td>
<td>6,078,240</td>
<td>7,53,441</td>
</tr>
</tbody>
</table>

**Decoction.**

A decoction of the nut yields an inferior resinous extract, sometimes as "Areca Catechu." The water in which areca-nuts are boiled becomes discoloured and this on being inspissated "forms Kossa, or the catechu of the st astringency; but the best catechu of a red or brown colour" is produced by boiling in fresh water nuts which have been previously treated by boiling in fresh water nuts which have been previously treated. (Baden Powell, Panjáh Products, I, 302.)

The ripe fruit is boiled for some hours in an earthen or a tinmed copper vessel, and the nuts, together with the boiling water, are poured over the rice. The boiled water is caught in a tinned copper vessel and is then thickened of itself or is thickened, by boiling, into a black, very thick, catechu. Sometimes these nuts are boiled a second time in

A. 1298
**ARECA Catechu.**

Fresh water, when the boiled water gives a yellowish-brown catechu. The refuse after boiling is sticky and is used for varnishing wood and for healing wounds. (Bombay Gazetteer, XIII., pt. I., 360.)

No definite information can be obtained as to the extent of the manufacture of this form of catechu. It is apparently rarely if ever exported from India.

**Dye.**—The preparation of Pán, acting chemically upon the saliva, colours it red. A decoction of the nut is used in dyeing, and a kind of inferior catechu is prepared from it. With tón (Cedrela Toona) is said to give a red dye. Pán is also used in Dinajpur as a subsidiary in red dyeing with *Morinda tinctoria.* (McCann.)

**Tan.**—Spont's Encyclopaedia says: "An astringent extract, prepared from Areca Catechu, is said to contribute to commercial cutch; if so, it is a totally distinct product" from the true catechu.

**Fibre.**—The spathe which covers the flowering axis may be used for paper-making, and so also might the fibrous pericarp which is removed from the nut. The spathe are largely used in India for packing and in the preparation of small articles for personal use. (See Domestic Uses.)

**Medicine.**—Young nut is said to possess astringent properties, and is prescribed in bowel complaints and bad ulcers. It contains a large proportion of tannic and gallic acids, and hence its astringent property. The burnt nuts when powdered form an excellent dentifrice. According to Dr. J. Shortt, the powdered nut, in doses of 10 or 15 grains every three or four hours, is useful in checking diarrhea arising from debility. It has also been found very useful in urinary disorders, and is reported to possess aphrodisiac properties. The dried nuts when chewed produce stimulant and exhilarant effects on the system.

"The powdered seeds have also long been held in some reputation as an anthelmintic for dogs, and Areca has now been introduced into the British Pharmacopoeia on account of its supposed efficacy in promoting the expulsion of the tape-worm in the human subject. It is also reputed to be efficacious against round worm (Ascariis lumbricoides). Dr. Bary, who appears to have been the first practitioner who called attention to the remedial value of the areca-nut in the expulsion of tape-worm, administered it, in powder, in doses of from four to six drachms, stirred up with milk." (Bentl. & Trin. Med. Pl.) Dr. Waring says: "Anthelmintic virtues have been assigned to the nut, but it can hardly have any claim to this character, as amongst the Hindus and Burmese, who use it habitually as a masticatory, intestinal worms (lumbrics) are almost universally met with."

The nut is regarded as a nerve tonic and emmenagogue, and is used as an astringent lotion for the eyes. The juice of the young leaves mixed with oil is said to be used externally in lumbago. The dry expanded petioles may be used as ready-made splints.

§ "Is useful in checking the pyresis of pregnancy.* Control experiments* made with tincture of catechu showed the superiority of the nut, and would seem to demonstrate that this is not merely due to astringent action; possibly its property as a nerve stimulant enhances its utility." (Surgeon G. King, Madras.) "Used as an astringent for bleeding gums; native women employ it both internally and locally for stopping watery discharges from the vagina." (Assistant Surgeon Jaswant Rai, Natan.) "Is very useful as a vermifuge in dogs. I have given half a nut powdered, mixed with butter, to terriers with remarkable effect." (Surgeon K. D. Ghose, Khulna.) "There are various kinds; some are stimulating when chewed and their juice swallowed, causing an agreeable sense of warmth generally felt in the ears, but sometimes a disagreeable

<table>
<thead>
<tr>
<th>Areca Catechu</th>
<th>Betel-nut Palm</th>
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<tbody>
<tr>
<td>DYE. 1299</td>
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</tr>
<tr>
<td>TAN. 1300</td>
<td></td>
</tr>
<tr>
<td>FIBRE. 1301</td>
<td></td>
</tr>
</tbody>
</table>
| MEDICINE. Nuts. 1302 | Medicine. Young nut is said to possess astringent properties, and is prescribed in bowel complaints and bad ulcers. It contains a large proportion of tannic and gallic acids, and hence its astringent property. The burnt nuts when powdered form an excellent dentifrice. According to Dr. J. Shortt, the powdered nut, in doses of 10 or 15 grains every three or four hours, is useful in checking diarrhea arising from debility. It has also been found very useful in urinary disorders, and is reported to possess aphrodisiac properties. The dried nuts when chewed produce stimulant and exhilarant effects on the system. "The powdered seeds have also long been held in some reputation as an anthelmintic for dogs, and Areca has now been introduced into the British Pharmacopoeia on account of its supposed efficacy in promoting the expulsion of the tape-worm in the human subject. It is also reputed to be efficacious against round worm (Ascariis lumbricoides). Dr. Bary, who appears to have been the first practitioner who called attention to the remedial value of the areca-nut in the expulsion of tape-worm, administered it, in powder, in doses of from four to six drachms, stirred up with milk." (Bentl. & Trin. Med. Pl.) Dr. Waring says: "Anthelmintic virtues have been assigned to the nut, but it can hardly have any claim to this character, as amongst the Hindus and Burmese, who use it habitually as a masticatory, intestinal worms (lumbrics) are almost universally met with."
| Dentifrice. 1303 |               |
| Powder. 1304 |               |
| Juice. 1305 |               |
| Petioles as splints. 1306 |               |
| Tincture. 1307 |               |
|               |               |
Betel-nut Palm.

sensation of constriction in the throat and chest with profuse flow of mucus. Powder of roasted nuts forms a good tooth-powder.” (Assistant Surgeon Shib Chunder Bhattacharji, Chanda, Central Provinces.)

“The powdered young bark is anthelmintic, used for tape-worm; useful in animals; supposed to be the principal ingredient in Naldire's worm tablets.” (Surgeon W. D. Stewart, Cuttack.) “It is a good anthelmintic, and expels thread-worms. I have often given half a nut to a dog mixed up in butter with very good effect. The worms are expelled after one or two doses.” (Surgeon K. D. Ghose, Bankura, Bengal.) “Is a good vermifuge for dogs in 3i doses (powdered).” (Surgeon-Major J. Byers Thomas, Waltair, Visagapatam.) “Nut cut small and soaked in milk is a good vermifuge for dogs.” (Surgeon-Major P. N. Mukerji, Cuttack, Orissa.)

“Very useful in worms in dogs and other domestic animals. A piece kept in the mouth allays thirst on long marches in sandy deserts where water is scarce.” (Surgeon H. D. Matani, Kuruchche.) “Most useful in the preparation of tooth-powder. The burnt nuts to be reduced to a fine powder, and mixed with powdered chalk, in the proportion of 3 of former to 1 of latter.” (Dr. S. M. Sircar, Moorshedabad.) “The young and undried nut is distinctly astringent; when well dried under the sun the astringency becomes less, and the softer portions become slightly sweetish in taste. The young undried nuts possess something which when chewed in excess gives rise to temporary giddiness.” (Surgeon D. Basu, Faridpur, Bengal.)

“Is a valuable vermifuge for dogs, especially for round-worms.” (Surgeon George Cumberland Ross, Delhi.)

Chemical Composition.—“We have exhausted the powder of the seeds, previously dried at 100° C., with ether, and thereby obtained a colourless solution which after evaporation left an oily liquid, concreting on cooling. This fatty matter, representing 14 per cent. of the seed, was thoroughly crystalline, and melted at 30° C. By saponification we obtained from it a crystalline fatty acid fusing at 41° C., which may consequently be a mixture of lauric and myristic acids. Some of the fatty matter was boiled with water: the water on evaporation afforded an extremely small trace of tannin but no crystals, which had catechin been present should have been left.

“The powdered seeds which had been treated with ether were then exhausted by cold spirit of wine (83°), which afforded 12.77 per cent. (reckoned on the original seeds) of a red amorphous tannic matter, which, after drying, proved to be but little soluble in water, whether cold or boiling. Submitting to destructive distillation, it afforded Pyrocatechin. Its aqueous solution is not altered by ferrous sulphate, unless an alkalai is added, when it assumes a violet hue, with separation of a copious dark purplish precipitate. On addition of a ferric salt in minute quantity to the aqueous solution of the tannic matter, a fine green tincture is produced, quickly turning brown by a further addition of the test, and violet by an alkali. An abundant dark precipitate is also formed.

“The seeds having been exhausted by both ether and spirit of wine, were treated with water, which removed from them chiefly mucilage precipitable by alcohol. The alcohol thus used afforded on filtration traces of an acid, the examination of which was not pursued. After exhaustion with ether, spirit of wine and water, a dark brown solution is got by digesting the residue in ammonia: from this solution, an acid throws down an abundant brown precipitate, not soluble even in boiling alcohol. We have not been able to obtain crystals from an aqueous decoction of the seeds, nor by exhausting them directly with boiling spirit of wine. We have come

A. 1308
therefore to the conclusion that Catechus (p. 243) is not a constituent of areca nuts, and that any extract, if ever made from them, must be essentially different to the Catechu of Decia or of Nau(nea), and rather to be considered a kind of tannic matter of the nature of Ratanha-red or Cinchona-red.

“By incinerating the powdered seeds, 2-26 per cent. were obtained of a brown ash, which, besides peroxide of iron, contained phosphate of magnesium.” (Pluck. & Hand., Pharmacographia, pp. 670-71.)

Food.—The nut is one of the indispensable ingredients which enter into the preparation of the pān or betel leaf, which is chewed so universally by natives of all classes. The betel nut is often chewed by itself in small pieces, and is sold in every bazar throughout India. It is said to stimulate digestion. Small pieces of the prepared betel nut are rolled up with a little lime, catechu, cardamoms, cloves and even rose water within the betel-pepper leaf. This combination forms the pān which gives to the lips and teeth the red hue which the natives admire. In the course of time it has the effect, however, of colouring the teeth black, at least along the edges, thus destroying the appearance of the teeth. The chewing of pān is supposed to prevent dysentery. “It is said to dispel nausea, excite appetite, and strengthen the stomach. Besides being used as an article of luxury, it is a kind of ceremonial which regulates the intercourse of the more polished classes of the East. When any person of consideration visits another, after the first salutations, betel is presented to omit it on the one part would be considered neglect, and its rejection would be judged an affront on the other.” (McCulloch’s Dictionary of Commerce and Commercial Navigation.)

Preparation of the Nut.—After the nuts are husked, they are boiled till soft, and taken out and sliced; the slices are rubbed with the inspisated water in which the nuts were boiled, which became impregnated with the astringent principle contained in the nuts; the slices are then dried in the sun, and in this condition sent to market. Instead of being sliced and boiled, the nuts are also largely sold entire (Baden Pomil). In Mânapur they are sold in the streets with the husk neatly opened up like a fringe to show that the nuts are fresh. In the Bombay and Mysore Gazetteers interesting details are given regarding the methods of preparing the nuts for the market. In Thâna the growers sell the fruit wholesale to a tribe called Vânis, who, by different treatment, prepare six classes of nuts. To prepare phulardi supâri, or those with flower-like fissures, the nuts are gathered when yellow but not quite ripe. The husk is stripped off, and the kernels are boiled in milk or water, in an earthen or tinned copper vessel. When the nut grows red, and the water or milk thickens like starch, the boiled nuts are removed and dried in the sun for seven or eight days. The red, tambdi, betel-nuts are prepared by boiling ripe fruits stripped of its husk, in milk or water, with a small quantity of pounded kath, lime, and betel leaves. “As soon as the boiling is over, the nuts and boiling milk or water are removed in a basket with a copper vessel under it to catch the droppings. To make chikni or tough betel-nut, “the nuts are gathered when they are beginning to ripen,” and when the boiling is over, the catechu-like substance left on boiling is rubbed on the nuts, when they are dried in the sun. “This process is repeated until the nuts grow dark red.” To make lavangachuri or clove-like betel nuts, the kernels of tender fruits are cut into clove-like bits, and after boiling in water are dried in the sun. Pandhri or white betel nut is made by boiling the ripe fruit with its husk, and afterwards drying in the sun till the husks are easily removed. To prepare dagdi or strong nut, the fruit is gathered when ripened into hardness, and after stripping it of the husk, it is boiled

A. 1320
The Areca-nut, *Areca*.

**ARENARIA holoosteoides.**

Kapkadi.  
**1321**

Mysore nuts.  
**1322**

**TIMBER.**  
**1323**

**DOMESTIC.**  
Caps.  
**1324**

Umbrellas.  
**1325**

Dishes.  
**1326**

Cups.  
**1327**

Bags.  
**1328**

and dried in the sun. To make kapkadi, or cut betel-nut, the kernels are cut out of the nut when tender, and dried in the sun without being boiled or soaked in water. (Bombay Gazetteer, Vol. XIII., Pt. I., pp. 299-300.)

In Mysore, after removing the husk, the nuts are boiled in water, then cut into pieces and dried in the sun; or they are first cut into pieces, then boiled in water with cutch, leaves of *Piper betel*, and afterwards dried in the sun, when they are fit for sale. (Mysore Gazetteer, Vol. I., pp. 126; 127.)

**Structure of the Wood.**—The areca nut is one of the most elegant of Indian palms, with thin straight stem and crown of leaves looking like an arrow stuck in the ground. It often attains 100 feet in height, with a slender, cylindrical, annulate stem, the inner part of which is generally hollow. The vascular bundles are brown, forming a hard rind on the outside of the stem. Weight 57 lbs. per cubic foot.

Used for furniture, trenails, bows, spear, handles, and for scaffolding poles in Ceylon. In the Bombay Presidency the trunk of the betel palm is used as roof rafters for the poorer class of houses, and for building marriage-booths; it is slit into slanting sticks for wattle-and-daub partition-walls, and it is hollowed into water-channels. In some places it is used for spear-handlers. (Bombay Gazetteer, Vol. XV., Pt. I., p. 300.)

**Domestic Use.**—"The soft, white, fibrous flower-sheath, called kacholi or poy, is made into skull-caps, small umbrellas and dishes; and the coarser leaf-sheath, called viri or wirhati, is made into cups, plates, and bags for holding plantains, sweet-meats, and fish." (Bombay Gazetteer, Vol. XV., Pt. I., p. 300.)

The nut is used in many religious ceremonies, and forms one of the chief articles of trade in Kanará. (Bomb. Gaz., Vol. XV., Pt. I., p. 62.)

**Areca concinna, Thw.; En. Cyl. Pl., 328.**

**Vern.**—Lainaterr, Singh.

**Habitat.**—A small palm indigenous to Ceylon.

**Food.**—The natives eat the nuts as a substitute for the ordinary betel nuts: it is never cultivated. (Dr. Trimen.)

**A. gracilis, Roxb.**

**Syn.**—Fisanga gracilis, Kurz.

**Vern.**—Gua safrari, ranggaa, Beng.; Khur, Lepcha; Ranga, Ass.

**Habitat.**—A slender-stemmed palm, often gregarious, found in under-growths of damp forests in Sikkim, Assam, Eastern Bengal, and Burma.

**Structure of the Wood.**—It is used for native huts and roofing in Assam. The outer portion is hard and closely packed with fibro-vascular bundles; the inner is soft, as the cane shrinks in drying.

**ARENARIA, Linn.; Gen. Pl., I., 149.**

**Arenaria holoosteoides,** Edgew.; Fl. Br. Ind., I., 241; Caryophylleæ.  
**Vern.**—Kakua, gandul, Pn.; Chikhi, Ládák.

**Habitat.**—A herb found in the Western Himalaya and Western Tibet, from Kumaon to Kashmir, altitude 7,000 to 12,000 feet, and distributed into Afghánistán.

**Food.**—Used as a vegetable in Chumba and Ládák.

A. **1333**
ARENGA saccharifera. The Malacca Sago Palm.

An erect palm, with simple stem, often 40 feet in height. Leaves terminal, and seen at a distance, somewhat resembling the crown of leaves of the date-palm, except that they are longer; petiole thick, leaflets sub-opposite, 3-5 feet long, ensiform, the base dilated into 1 or 2 ears, upper half dentate serrate, apex somewhat obliquely cut, white beneath, green above. Flowers unisexual, monocious, numerous, sessile, bracts 2 or more to each flower imbricate in buds; spadices several, 6-10 feet long, coming from among the leaves and developing downwards, the tree dying when the last and lowest spadix is ripe. Male flowers with 3 sepals, concave, rounded, fleshy; petals 3, longer than the sepals, valvate, purple outside, yellow within. Stamens numerous; filaments shorter than the others; no trace of pistil. Female flowers with petals not much longer than sepals; stamens none; ovary large, 3-lobed, smooth, 3-celled, with a single erect ovule; stigma sessile conical. Fruit the size of an apple, depressed at the top, 3-celled, with a single seed in each cell.

The Sago Palm of Malacca and the Malay Peninsula. Syn.—Sagraerus Rumphii, Roeh., Fl. Ind., Ed. C.B.C., 669; Borassus Gomutus, Lour.; Gomutus saccharifera, Spr. Vern.—Taung-ong, toong-ong, Burm.; Ejp ( fibre), Malaya; Gumit (tree), kobong, Malacca.

Habitat.—A Malayan tree, generally cultivated in India, but said by Kurz to be wild in Burma, also mentioned by Hooker and Thomson as found wild in Orissa. One or two trees were observed growing along with Caryota urens on the mountains of North Manipur, apparently wild (especially in the Kabû valley).

Properties and Uses—Fibre.—At the base of the petiole is found a beautiful black, horsehair-like fibre, known as the Ejp or Gomuta Fibre. Within the sheaths is a yellowish layer of reticulated fibres, which is said to be in great demand in China, being applied, like oakum, in caulking the seams of ships. It is also largely used as tinder for kindling fires. The Manipuris value very much this reticulated fibre, which they use, as a substitute for the native reticulated fibres used for making mechanical filters. A bundle of these black reticulated fibres, tied firmly together, is placed in the bottom of a perforated vessel; the water, percolating through, is cleansed of mechanical impurities. The fibre has a high reputation for lasting under water. Mueller (Extra-Tropical Plants) says: “The black fibres of the leaf-stalks are adapted for cables and ropes intended to resist wet very long.” Roxburgh (Fl. Ind., Ed. C.B.C., 669) remarks: “I cannot avoid recommending to every one who possesses lands, particularly such as are low, and near the coasts of India, to extend the cultivation” of this plant “as much as possible. The palm wine itself, and the sugar it yields, the black fibres for cables and cordage, and the pith for sago, independent of many other uses, are objects of very great importance, particularly to the first maritime power in the world, which is in a great measure dependent on foreign states for hemp, the chief material of which cordage is made in Europe.” Simmonds, writing of this palm, says: “It furnishes a highly valuable black fibrous substance, Ejp fibre, superior in quality, cheapness, and durability to that obtained from the husk of the cocoanut, and renowned for its power of resisting wet.”

Food.—The sago, from the interior of the stem, although inferior in flavour to that obtained from the true sago palm, is nevertheless an important article of food. It is the source of the Java sago, and although chiefly cultivated for its sap, from which a wine, and also sugar
and vinegar, are prepared, the sago is an important article of food throughout the Malay peninsula. Alter the tree ceases to yield sap or toddy, the stem furnishes the starchy substance. It is said that a single tree will often yield 150 to 200 pounds; *Arenga* is doubtless the source of a good deal of the sago of commerce (*Bentl. & Trim.*). It is generally stated that the trees which produce female spadices yield the best sago and scarcely any sap, whereas the male spadix gives a copious flow of the sap, from which toddy, wine, sugar, and vinegar are made.

The Manipurius eat the young and blanched leaf-stalks as a pickle.

"The young kernels are made, with syrup, into preserves." (Mueller.)

**The Sap.**—The following interesting account of the process of extraction of the sap is taken from Simmonds' *Tropical Agriculture* (p. 248): "One of the spadices is, on the first appearance of fruit, beaten on three successive days with a small stick, with the view of determining the sap to the wounded part. The spadix is then cut a little way from its root (base), and the liquor which pours out is received in earthenware, in bamboos, or other vessels. The Gomuti palm is fit to yield toddy when nine or ten years old, and continues to yield it for two years, at the average rate of three quarts a day.

"When newly drawn the liquor is clear, and in taste resembles fresh *must*. In a very short time it becomes turbid, whitish, and somewhat acid, and quickly runs into the vinous fermentation, acquiring an intoxicating quality. In this state great quantities are consumed; a still larger quantity is applied to the purpose of yielding sugar. With this view the liquor is boiled to a syrup, and thrown out to cool in small vessels, the form of which it takes, and in this shape it is sold in the markets. This sugar is of a dark colour and greasy consistence, with a peculiar flavour; it is the only sugar used by the native population. The wine of this palm is also used by the Chinese residing in the Indian islands in the preparation of the celebrated Batavian arrack.

"In Malacca, the Gomuti, there termed Kabong, is principally cultivated for the juice which it yields for the manufacture of sugar. Like the coconuts, it comes into bearing after the seventh year. It produces two kinds of 'mayams,' or spadices, male and female. The female spadix yields fruit, but no juice, and the male *vice versa*. Some trees will produce five or six female spadices before they yield a single male one, and such trees are considered unprofitable by the toddy collectors, but it is said that in this case they yield sago equal in quality, though not in quantity, to the *Cycas circinnata*, though it is not always put to such a requisition by the natives; others will produce only one or two female spadices, and the rest male, from each of which the quantity of juice extracted is the same as that obtained from the coconuts. A single tree will yield in one day sufficient juice for the manufacture of five bundles of jaggery, valued at two cents each. The number of *mayams* shooting out at any one time may be averaged at two, although three is not an uncommon case. When other occupation or sickness prevents the owner from manufacturing jaggery, the juice is put into a jar, where in a few days it is converted into excellent vinegar, equal in strength to that produced by the vinous fermentation of Europe. Each *mayam* will yield toddy for at least three months, often for five, and fresh *mayams* make their appearance before the old ones are exhausted; in this way a tree is kept in a state of productivity for a number of years, the cutting at the top of the trunk, the next lower down, and so on, until at last it yields one at the bottom of the trunk, with which the tree terminates its existence.

"Dr. J. E. de Vry states that this palm contains a great proportion
**ARENGA saccharifera.**

**Arenga Sugar.**

| SAP. | of cane-sugar, although the natives in Java extract it by a very rude and entirely primitive mode. He thus describes the process, which differs little from that pursued for obtaining sap and sugar from other palms:—

> “As soon as the palm begins to blossom, they cut off the part of the stem that bears the flower; there flows from the cut a sap containing sugar, which they collect in tubes made of bamboo cane, previously exposed to smoke, in order to prevent the fermentation of the juice, which, without this precaution, would take place very quickly under the double influence of the heat of the climate and the presence of a nitrogenous matter.

> “The juice thus obtained is immediately poured into shallow iron basins, heated by fire, and is thickened by evaporation, till a drop falling on a cold surface solidifies; this degree of concentration attained, the contents of the kettle are put in forms of great prismatic lozenges. Several thousand pounds of sugar are thus obtained yearly. I have collected some of the sap in a clean glass bottle, and I found that the unaltered juice does not contain any glucose, but a nitrogenous matter which, by the heat of the climate, quickly converts a part of the cane-sugar into glucose. In order to prove, without employing any artificial means, that the juice exuding from the tree contains pure cane-sugar, I collected a sample directly in alcohol; the nitrogenous principle is thus eliminated by coagulation; a mixture of equal parts of juice and alcohol has been, after filtration, evaporated on the sand-bath to the consistence of syrup. I brought this syrup with me on returning from Java; and during the voyage it became solid, presenting very fine and well-defined crystals of cane-sugar, immediately recognised as such by all the experts.

At the Congress of Giessen, I spoke of the preparation of sugar from palms as the only rational mode of obtaining sugar in the future, being my opinion on the following grounds: Sugar, by itself, being only composed, in a state of purity, of carbon, hydrogen, and oxygen, does not take anything from the soil; but the plants now mainly cultivated for extracting sugar, *vis.*, the Beta vulgaris and the Saccharum officinarum require for their development a great amount of substances from the soil in which they grow, whence it follows that their culture exhausts the soil. But this is not the only evil; what is worse is, that the space now occupied by beet-roots in Europe, and by sugar-cane between the tropics, might and ought to serve for the culture of wheat or of forage in Europe, and for rice under the tropics; and it is my opinion that, considering the increase of population, the time is not far distant when it will be absolutely necessary to devote to the culture of wheat or rice the lands now employed for beet-roots or cane. While the cane and beet-root require a soil fit for cereals, the Arenga palm prospers on soils entirely unfit for their culture,—so unfit, indeed, that one might try in vain to grow on them rice or cereals; the Arenga palm thrives in the profound valleys of Java and in some parts of the island extends from the shores of the sea to the interior, where the tree is found in groups, and it is very possible to make rich plantations of that fine tree. There is one drawback, but not a very serious one; the tree must be eleven or twelve years old before it will yield sugar. When, however, it commences, the operation can be repeated during several years, and the preparation of the sugar becomes a continuous industry, and not an interrupted one, as it is now. According to my average, a field of thirty acres (¾ acre) planted with those trees should produce yearly 4,000 kilogrammes of sugar in a soil quite unfit for any other kind of culture.”

**Structure of the Wood.**—“The trunk of the dead palm becomes soon hollow, and furnishes very durable underground water-pipes; also good for troughs or channels for water.” (Kurs.)

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ARGANIA, Röem. et Schult.; Gen. Pl., II., 656.

A genus closely allied to Sideroxylon, containing only one species, the Argan tree of Morocco, which is found growing sparingly in forests in the Atlas Mountains; in its wild state over but a small limited area.

Properties and Uses—

Oil.—An oil, resembling olive oil, is extracted from the seeds. It has a clear, light-brown colour, and a rancid odour and flavour. It is an important domestic oil among the Moors, and to a certain extent finds its way to India.

Food and Fodder.—The fruit, of the size of a small plum, is used for feeding cattle, the skin and pulp being much relished. The leaves are also given as fodder.

There seems no reason why this exceedingly valuable tree might not have been successfully introduced into India. The attempt to do so appears, however, to have failed. In the Kew Report for 1879, page 12, an interesting account of this tree is given, from which the following has been extracted:—

"The husk of the fruit is greatly valued for cattle food, while the seed-kernel is the source from which an excellent oil is extracted.

"At different times the seed has been procured and distributed to various colonies, where, however, its slow growth has led to disappointment. In 1870 a supply was obtained through the kindness of Mr. C. F. Winsten, H. B. M. Vice-Consul, Mogador.

"Amongst other places the Botanic Garden at Saharanpore was supplied, where, however, the plant, though probably well suited for North-west India, does not appear to have survived." (See also Kew Report 1879, p. 17.)


A small American genus (six species) belonging to the Natural Order APOCYNACEAE; one species naturalized in India.

An erect, prickly annual; juice yellow. Flowers bright yellow; sepals 2-3; petals 4-6. Stamens indefinite. Ovary 1-celled; style very short; stigma 4-7-8; ovules many, on 4-7 parietal placentas. Capsule short, dehiscing at the base; valves that alternate with the stigmas and placentas. Seeds 5.

The Indian representative of this genus has now passed completely the plains of India, ascending the hills to about 2,000 feet in altitude, but for its known history, no one could hesitate in pronouncing it an indigenous. It is, however, one of the numerous introduced species which have made India their home; it has even received by adaption of names to oriental literature before the introduction of Casuarina.

The name Argemone is derived from the name of a small ulcer in which this was supposed to be a specific.

A. 1350
ARGEMONE
mexicana.

Argemone mexicana, Linn.; Fl. Br. Ind., i, 117; Papaveraceae.

THE MEXICAN OR PRICKLY POPPY.


Datturi or Datheri gida is the Kanarese name under which this plant is generally known in Mysore, Bangalore, and Bellary; but this name is liable to be confounded with that of Datura alba in several other languages, as has been pointed out by Moodeen Sheriff.

Habitat.—A spiny, herbaceous annual, introduced into India with historic times, common everywhere from Bengal to the Panjab on roadsides, and has escaped and established itself in the cold sea areas. The Bombay Gazetteer (Vol. III., 206) says that in the Panch Mahal this plant “is as common here as elsewhere, and not the least like a foreigner.”

THE SAP.

The milky sap, on drying, forms a substance resembling opium.

THE OIL.

The seeds yield a pale yellow, clear, limpid oil, used in lamps and medicinally in ulcers and eruptions. In Bengal, and more or less throughout India, the seed is collected and pressed for the oil, which is yielded as copiously so that from mustard seed. The drawn oil is allowed to stand for a few days to deposit a whitish matter, after which it remains clear and bright. (Spens’ Encycl.) According to M. Lepiné, this oil might with advantage be used in the arts (Journ. de Pharm., Juillet 1861, p. 16). Charbonnier describes it as of a light-yellow colour, limpid, transparent, retaining its fluidity at 5° C., of a nauseous odor and slightly acrid taste, which, however, is not very disagreeable. It dries on exposure to the air, but is entirely soluble in 5 or 6 measures of alcohol at 32° C. Flückiger has not found this statement to be correct, however. He says it has the specific gravity of 910 at 16°5° C., and remains clear at 5° C., but on exposure dries slowly and completely. Dr. Dymock informs me that the oil changes to a deep red colour. It may be readily separated by means of carbon disulphide. It is thought that it is likely to come into great demand as an oil for painting; if so, India could supply a practically unlimited amount, as in many parts of the country the plant is so abundant as to have become a source of anxiety to the cultivator.

MEDICINE.

The yellow juice of this plant is used as a medicine for dropsy, jaundice, and cutaneous affections. In the West Indies it is reputed to be used as a substitute for ipecacuanha. It is also diuretic, relieves blisters, and heals excoriations and indolent ulcers. The native practice of applying the juice of this plant to the eye in ophthalmia is dangerous, although interesting historically, the same practice having in all probability suggested the name Argemone (see generic description). The seeds have narcotic properties. They yield on expression a fluid, which has long been in use amongst West Indian practitioners as an aperient. It exercises a soothing influence when applied externally in headache, and also to herpetic eruptions and other forms of skin

Seeds, Oil.

A. 1356
The Mexican Poppy.

ARGEMONE
mexicana.

MEDICINE.

Infusion.
1357

The juice of the plant in infusion is diuretic, relieves strangury from blisters, and heals excoriations. The seeds are very narcotic, and said to be stronger than opium. Simmonds says: 'The seeds possess an emetic quality.' In stomach complaints, the usual dose of the oil is thirty drops on a lump of sugar, and its effect is perfectly magical, relieving the pain instantaneously, throwing the patient into a profound refreshing sleep, and relieving the bowels. This valuable but neglected plant has been strongly recommended as an aperient, anodyne, and hypnotic by Dr. Hamilton and other experienced practitioners in the West Indies. Samples of the oil were produced at the Madras Exhibition. It is cheap and procurable in the bazaars, being used chiefly for lamps. (Ainslie, Lindley, Simmonds, &c.)" (Baden Powell's Punjab Products, I., 326.)

"The seeds and seed oil have been used by European physicians in India, and there has been much difference of opinion regarding their properties, some considering them inert, and others asserting that the oil in doses of from 30 to 60 minims is a valuable aperient in dysenteric and other affections of the intestinal canal. The evidence collected in India for the preparation of the Indian Pharmacopoeia strongly supports the latter opinion; my experience is also in favour of it; and Charbonnier, who examined the oil in 1868, found it aperient in doses from 15 to 30 minims. Possibly those who have used the oil unsuccessfully, purchased it in the bazar, and were supplied with a mixed article: no bazaar-made oils can be relied upon. An extract made from the whole plant has been found to have an aperient action, and the milky juice to promote the healing of indolent ulcers. I have not noticed any bad effects from its application to the eyes. . . . Recently (1878) a case has occurred in Bombay in which a number of people suffered from vomiting and purging after using sweet oil which had been adulterated with Argemone oil. The adulteration may be detected by the rich orange-red colour developed when strong nitric acid is added to Argemone oil, or to mixtures containing it." (The Vegetable Med. Materia Medica of Western India, by W. Dymock, 40.)

"The seeds are used in Jamaica as an emetic, a stimulant being bruised with water. Barton again describes them as being more powerfully narcotic than opium.

"The Editor has subjected the seeds to numerous experiments, and has never found them to show any emetic or narcotic influence; they contain a bland oil resembling that of the poppy, and which can be used in ounce-doses without producing any purgative effect.

"The juice, which exudes on bruising or bruising this plant, is of a bright yellow colour, and is used by the natives as an application to indolent ulcers, and to remove specks on the cornea. It has by some writers been described as possessing the activity of gamboge. If this expressed juice of the plant be rendered alkaline by ammonium carbonate, a precipitate falls which is partially soluble in hot alcohol, giving a rich golden tincture; on cooling and spontaneous evaporation, silky crystals of an alkaline principle are deposited, which we propose to term argemomin.

"We have given this argemomin in considerable quantities to dogs, and did not find it induce any acrid or narcotic effects. It has not been as yet tried in hospital practice." (The Bengal Dispensatory and Pharmacopoeia by W. B. O'Shaughnessy, M.D., p. 183.)

Special Opinions.—"I have used the seeds of Argemone mexicana in many cases and found them to be laxative, emetic, nauseant, expect.
ARGEMONE
mexicana.

MEDICINE.

orant, and demulcent, and the oil obtained from them is a
purgative, nauseant, and expectorant. The seeds and oil have
beneficial control over asthma. The largest dose of the seeds I have
is two drachms and a half, and even in so large a dose as this the
thing in their action to lead to the suspicion of their being a
as is generally supposed. It is difficult to account for such a suppo-
without suspecting that some other seeds were confounded with
under immediate consideration. I shall, therefore, describe the
minutely as I can, and if due attention is paid to this description
will be no difficulty in distinguishing them from all other seeds.
seeds are small, round, hard, striated, dark brown, and about the
small mustard-seed. They are full of oil, and if one of them is
on paper with a hard substance underneath and pressed with the
the finger, it breaks with a noise and leaves an oily stain on the
the kernel is white, minute, and albuminous. Although the doses
seeds I have mentioned above are very large, yet this is no dis-
tage, because they are always used in emulsion, which is taste
be sweetened, if necessary. The emulsion is much liked
patient.

"There is also a great difference of opinion as to the action and
the oil of Argemone mexicana. Some say that thirty minims of it as
efficient cathartic, while others consider it to be quite inert and in-
of producing any purgative effect in ounce-doses. I got this oil for
three or four times in my own presence and tried it in many cases
former opinion is quite correct, and with regard to the latter, it is
sary to say that, so far from being inert in ounce-doses, it is
administered the oil in more than forty minims, and produces a
ous hypercatharsis when its dose is increased to one drachm. If it
fresh, its average dose is twenty-five minims, and if old thirty-five.
good drastic or hydroogue cathartic in such doses, and general
duces from five to ten or twelve motions. Its advantage over
rhubarb, castor oil, &c., is the smallness of its dose; and over the cor
its freeness from unpleasant, nauseous, and acrid taste. Its disad-
as a purgative are, firstly, that its action is not uniform even in an
age dose, which produces more than 15 or 16 motions at one time
only 3 or 4 at another; and secondly, that it is generally accompa-
vomiting at the commencement of its operation. Though the latter
severe, it is undesired, and an unpleasant effect in a purgative me
Hypercatharsis, however, from the use of this oil is not generally at
with great debility, nor with the other dangerous symptoms fre
observed under a similar condition from croton oil and some
purgatives." (Honorary Surgeon Mooden Sheriff, Madras.)

"Very common all over South India and the Deccan, and th
is in vogue as a native remedy." (Deputy Surgeon-General G. Bidia,
Madras.) "The yellow juice mixed with ghi is given internally in
rheum." (Surgeon-Major D. R. Thompson, M.D., Madras.) "Oils a
sedative in colic, dose 30 minims ; noticeable effect when applied ex
skin diseases," (Apothecary Thomas Ward, Madanapalle, Cuda.
"The juice of this plant is much used by the inhabitants of My
indolent and syphilitic ulcers and for itch." (Surgeon-Major John
Bangalore.) "The yellow juice is often used by natives in
conjunctivitis." (Honorary Surgeon Easton Alfred Morris, Negri

"I found the juice very useful in scabies. Ass. Gowry (Mukerji found the powdered root in drachm doses useful in tape
(Surgeon R. L. Dutt, M.D., Pabna.) "In Cuttack the seed
plant is mixed with mustard seed as an adulteration." (Surgeon
P., N. Mukerji, Cuttuck, Orissa.) "The yellow juice of the pla

A. 1358
the cold-drawn oil of the seed is useful in scabies. I have seen the insect killed (under the microscope) on the application of ether." (Surgeon K. D. Ghose, Africa.) "Oil obtained from the seed is largely used by the Santals for the purpose of burning. A valuable remedy for itch." (Brigade Surgeon S. M. Shircore, Moorshedabad.) "The juice of the plant is used as a detergent in chronic ulcers and sinuses with good effect." (Assistant Surgeon Nundo Lal Ghose, Bankipore.) "Useful in scabies." (Surgeon-Major C. F. W. Meadows, Burrisal.) "The fresh juice is used in scabies and indolent ulcers." (Brigade Surgeon J. H. Thornton, B.A., M.B., Monghyr.) "Known as Karved in Oudh. The oil is used in the West Indies on sugar for colic. Has been tried in Oudh for the same ailment with advantage in several cases." (Surgeon-Major Bonavita, Etawah.) "The seeds contain an alkaloid which gives reactions similar to morphia (Dragendorff)." (Surgeon-Major W. Dymock, Bombay.) "The juice is efficacious in scabies. I saw a case of dangerous inflammation of the eye caused by the application of the juice in ordinary conjunctivitis." (Assistant Surgeon Shih Chunder Bhattacharji, Chanda, Central Provinces.)

ARGYREA. ARGYREIA.

MEDICINE.

ARGYREA, Lour.; Gen. Pl., II., 869.

A genus of scendent shrubs, containing some 30 species, belonging to the Natural Order CONVOLVULACEAE. The species are chiefly Indian (25 species); but one occurs in Africa, and a few others in China and the Malaya.

Leaves from cordate-ovate to narrow-lanceolate, silky hirsute or pubescent.

A. 1361
ARGYREAIA
speciosa.

The Elephant Creeper.

Gynoecium sessile or pedunculate, capitate or corymboso. Flowers showy purple or rose, rarely white. Sepals from orbicular to lanceolate, sub-equal or the inner smaller, adpressed to the fruit, often somewhat enlarged.

The generic name is derived from ἀργυρός = silvery, in allusion to the silveryomentum of the under-surface of the leaves.

Argyreaia speciosa, Sweet.; Fl. Br. Ind., IV., 195; Wight, Ic., t. 851.

The Elephant Creeper.

Syn.—Lettsomia nervosa, Roxb.; Fl. Ind., Ed. C.B.C., 164; Convolvulus speciosa, Linn.

Ver.—Samandar-kē-pāti, samandar-soh, samandar-sokh, samandar-phain, HIND.; Bichērak, gugul, BENG.; Kesāk arak, SANTAL; Samudra-balaka, mriddhadāraka, SANS.; Samudra soha, or shahā, MAR.; Saman-
dar-kē-pattā, DUR.; Shamuddirap-paṭh-cho, TAM.; Samudra-pā, chandra-poda, kokhi, pāla-samudra, TEL.; Samudra-paṭh-cha, sa-
dra-yagam, samudra-pala, MAL.; Mahādevamūtra, SINGH.

M. Green Sheriff points out that the Hindustani and Deccan name of this plant are to be distinguished from Samandar-phal, the Hindustani and Deccan name of Barringtonia acutangula.

Habitat.—A twining, perennial plant, found all over India, ascending to 1,000 feet in altitude from Assam to Belgium and Mysore, frequent in Bengal; cultivated in China and the Mauritius. Extremely common in Western India. Dr. Bidie informs me that it also extends to the extreme south of the peninsula of India.

Botanic Diagnosis.—Leaves large, ovate-cordate, acute, glabrous above, persistently white tomentose beneath; peduncles long; flowers sub-capitate; bracts large, ovate-lanceolate, acute, thin, softly woolly, deciduous; corolla-tube woolly; fruit brown-yellow, stout, nearly dry; stem white, tomentose, almost woody. (Fl. Br. Ind.)

Properties and Uses—

Oil.—Reported to yield oil; but no definite information regarding this fact can be discovered.

Medicine.—The leaves are maturative and absorptive, and are used as emollient poultices for wounds, and externally in skin diseases, and by some authors they are even said to have rubefacient and vesicant properties. The root is regarded as alternative, tonic, useful in rheumatic affections and diseases of the nervous system. In synovitis the powdered root is given with milk.

“...The large leaves, which have the under-surface covered by a thick layer of silky hairs, afford a kind of natural impermeable pline, and are used as a maturant by the natives. With regard to the alleged blistering properties of the upper surface of the leaf there must be some mistake, as I find it has no effect when applied to the skin.” (The Vegetable Materia Medica of Western India by Dr. W. Dymock, 474.)

Special Opinions.—“Mixed with vinegar the sap is rubbed over the body to reduce obesity.” (Surgeon G. A. Emerson, Calcutta.) “Used externally in chronic eczema and as emollient poultices. Internally the root is given to rheumatic patients, dose 5 to 20 grains.” (Surgeon W. Barron, Bhuj, Cutch.) “Leaves are used as a poultice in guinea-worm.” (Surgeon Joseph Parker, M.D., Poona.) “Useful when applied to foul ulcers.” (Assistant Surgeon Shih Chunder Bhattacharji, Chanda, Central Provinces.) “The juice of this plant, mixed with an equal quantity of gingelly oil, and a little powdered dill seed, is used as an external application in scabies and other cutaneous diseases of children.” (Surgeon W. A. Lee, Mangalore.) “In cases of unhealthy ulcers, and ulcers, the hair surfaces of the young leaves are applied, the hairs causing irritation and promoting the secretion of healthy pus. When the sores are p-
The Arisæa.

A genus of herbaceous plants with tuberous (often edible) corms, belonging to the Natural Order ARACEÆ. There are about 50 species belonging to the genus, inhabitants of temperate and extra-tropical Asia, with a few in America and Abyssinia. In India there are some 22 species.

Leaves 1 to 5, each 3-lobed or pedate or verticillate lobed, with 5 to many segments, each broad, acute or acuminate; margin entire or crenulate; petiole sheathing at the base. Spathe deciduous, tube oblong, convolute at the base, not infrequently many-veined; mouth contracted; blade large, acuminate or caudate. Peduncle solitary. Spadix with an appendix included within the spathe or exserted. Flowers dioecious, rarely monocious, male scattered, female crowded with neuter subulate flowers above. Perianth none. Male flowers with 2-5 stamens, sub-sessile. Female flowers with the ovary ovoid-oblong or globose, 1-locular, style short or O; ovules 1-many, orthotropous, erect; panicles short, attached to a basilar placenta. Fruit an oblong berry, 1 or few-seeded.


Syn.—Arum curvatum, Roxb.; Fl. Ind., Ed. C.B.C., 628; Wight, Jc., t. 788.

Vern.—Bir-banka, Nep.; Gārin, dor, kērkikchālā, kārkal, jangkākā, Pāl.

Habitat.—This plant grows at many places in the Panjab Himalaya, from 4,000 to 6,000 feet.

Medicine.—It is stated to have poisonous qualities. In Kūlā the seeds are said to be given with salt for colic in sheep.


Syn.—Arum cuspidatum, Roxb.; Fl. Ind., Ed. C.B.C., 628; Wight, Jc., t. 784.

A. erubescens, Schult.

Syn.—Arum erubescens, Wall.; Pl. As. Rar., II., 38, t. 135.

Habitat.—The Himalaya and Western Ghātās.

A. intermedium, Blume.

Habitat.—The Western Himalaya (Simla, 2,600 feet).

A. Jacquemontii, Blume.

Habitat.—The Himalaya, 2,000 to 4,000 feet.

A. Leschenaultii, Blume; Mono. Phan., DC. II., 552.

Syn.—A. Papillosum, Saint.

Vern.—Wal-kidārān, Singh.

Habitat.—A native of the Himalaya (Nepal), Khāsia Hills, the Nilgiri Hills, and Ceylon.

Medicine.—"The roots are employed as a medicine by the Singhalese." (Thwaites, En. Plant Zeyl., 335)

A. 1377
ARISTOLOCHIACEAE. Aristolochiaceae or Birthworts.

1378 Arisæma Murrayi, Graham; Cat. Pl., Bombay.

The Snake Lily of the Konkan.

A. papillosum, Stend., see A. Leschenaultii, Blume.


Syn.—Arum speciosum, Wall.
Vern.—Samp-khi-khum, kiri-ki-kukri, kiralu, Pus.

Habitat.—Found in the Panjáb Himálaya, from 6,000 to 8,500 feet.

Medicine.—In Hazâra the root is stated to be poisonous; in Chumbá it is applied pounded to snake-bites. In Külâ, where the root is given to sheep for colic, the fruit is said to have deleterious effects on the mouth when eaten by children.

381 A. tortuosum, Schott.; Engler, DC. Mono. Phan., II., 345.

Vern.—Kiri-ki-kukri, Pus.

Habitat.—Found in Chumbá at about 7,000 feet, also eastward to Nepal.

Medicine.—The root of the plant is used to kill the worms which infest cattle in the rains.


1383 Aristida depressa, Retz.; Duthie’s List of Grasses, 26; Gramineae.

Vern.—Spin-khalāk, spin-wege, jandar lamba, lāmp, Pus.; Nalla-pālū, Tél.

Habitat.—Inhabits the plains in North India; also found in the Southern Provinces. Grows in a dry, barren, binding soil.

Fodder.—Roxburgh did not find that it was put to any use; but Stewart says it is a favourite food for cattle in North India. “Cannot be cut with a scythe, as it is too fine. Particularly relished by cattle, and is nutritious. It is too short and light to stack.” (Mr. Coldstream, Commissioner, Hissar.)

1385 A. setacea, Retz.

Vern.—Shīpur-gaddi, Tél.; Thodāpā-pālū, Tam.

Habitat.—Common in dry parts of the Panjáb and North-West Provinces; also in South India, where it grows in dry, barren, binding soil.

Fodder.—“Cattle do not eat it, yet it is very useful.” (Roxburgh.)

As to the remark that cattle do not eat this grass, Roxburgh was apparently mistaken, for Bidia says it is eaten by bullocks.

Domestic Uses.—The Telinga paper-makers construct their frames of the culms; it also serves to make brooms and tooth-picks. It is employed in preference to other grasses for making the screens called tatties; for this purpose it is spread thin in bamboo frames and tied down; these are placed on the weather side of the house during the hot land-winds, and kept constantly watered during the heat of the day, renders the temperature of the air in the house exceedingly pleasant, compared to what it is without;” It is used, in fact, like the khas-khas roots in Northern India.

ARISTOLOCHIACEÆ.

A Natural Order of herbaceous plants with creeping rhizomes and creeping or twining stems; wood, when present, scented, composed chiefly of parallel plates held loosely together by soft medullary processes; no
The Family of the Birthworts.  

ARISTOLOCHIACEÆ.

concentric zones nor liber fibres. There are in all some 200 species in the world, referred to 6 genera. They are inhabitants chiefly of tropical America, are rare in the north temperate zones, occasional in tropical Asia, and somewhat frequent in the Mediterranean region. In India there are in all some 6 or 7 indigenous species belonging to Aristolochia and Bragantia, with as many more introduced species, chiefly seen under garden cultivation.

The genera are referred to three tribes, the diagnosis of which, if taken collectively, constitute the characters of the order—an order which must be admitted as exceedingly artificial, since it includes tribes dissimilar in vital characteristics. The affinities of the family are, accordingly, very obscure.

Tribe I.—Asaraceæ.

Herbs with perennial rhizomes, having the lower leaves scab-like, the upper reniform. Flowers terminal, solitary. Calyx persistent; limb regular, 3-lobed. Stamens 12, all free, the outer and shorter whorl opposite the styles; anthers introrse or extrorse. Ovary more or less inferior, 6-celled, short and broad; a capsule, opening, when ripe, irregularly.

Asarum, Heteropœa.

For the former of the two genera in this tribe see Asarum.

Tribe II.—Bragantineæ.

Shrubs or under-shrubs. Leaves reniform, oval or oblong, lancolate, reticulate. Flowers in spikes or racemes, small (Bragantia) or large and campanulate (Thottée). Calyx deciduous, closely appressed to the top of the ovary and 3-lobed. Stamens 6-36, equal and free. Ovary completely inferior, elongated, slender, stipitate, 4-gynous, 4-celled; ovaries numerous, 2-seriate on the middle of the septa. Capsule silique, 4-valved.

Bragantia and Thottée.

For the former genus see its place in this Dictionary.

Tribe III.—Aristolochiæ.

Twining herbs (rarely scandent). Calyx deciduous, constricted above the top of the ovary, irregular, tubular, limb various. Stamens 6 (rarely 3); anthers ovate, extrorse, adnate by their whole dorsal surface to the column or style. Ovary completely inferior, elongated, slender, stipitate, 6-gynous, 6 (rarely 5) celled; ovaries numerous, inserted at the central angle of the cells and 2-seriate. Capsule oblong or globose, 6-angled, 6-valved, opening at the top or bottom.

Affinities of the Aristolochiaceæ are very obscure; the gynandrous condition of the stamens and twining habit bring Aristolochiæ near to Asclepiadææ, but the opposite leaves and superior ovary of the latter at once separates them. By some botanists, an affinity to Cucurbitaceæ is seen in the twining stem, alternate leaves, inferior ovary, and extrorse stamens; but Cucurbitaceæ differ in their didymous double-perianth, imbricated aestivation, in the number and condition of the stamens, the mode of placentation and exalbuminous seeds. It seems almost impossible to assign a natural position for this family. The Genera Plantæ places them after Nepenthææ, Cytinææ, and before Piperaceæ, Monimiææ, Laurinææ, Santalææ, Balanophorææ, &c., and this would seem their most natural position. Like the Cytinææ they have a mono-perianthed flower, inferior, often 1-celled ovary, but Cytinææ are aphyllous and parasitic. With Nepenthææ they have many affinities, and although it is only fanciful, the pitcher-like glandular development on the leaves of Nepenthææ is exceedingly like the flower of the Aristolochiæs.
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Aristolochia bracteata. Birthworts.

Properties and Uses.—Most of the Aristolochiaceae contain in their roots a volatile oil, a bitter resin, and an extractable acid, from which they derive their virtue as stimulants of the glandular organs and of the functions of the skin. The name Aristolochia is derived from ἀρτος, best, and λάκτος, child-birth, or herbs which promote child-birth, in allusion to their reputation as emmenagogues. They are also administered as anti-hysterics. As medicines they may be described as aromatic, stimulating, tonic, and useful in the latter stages of low fever. They are bitter and acrid with disagreeable odour. They are also described as purgative, and are in India chiefly taken advantage of as mild aperients for children. They are all attributed with the property of being antidotes to snake-bite, the two best known examples being the Virginian snake-root and Guaco roots. The roots of the Assarum are emetic.

Aristolochia, Linn.; Gen. Pl., III., 123.

As this is the only Indian genus belonging to the Tribe Aristolochia, it is scarcely necessary to add other characters to what have been already given. Aristolochia acuminata differs, however, from Holotylis in the pitcher-like form of the flower and more numerous stamens.

Aristolochia acuminata, Willd.

Botanic Diagnosis.—An extensive twining plant. Leaves cordate, entire, acuminate, from 4-6 inches long by 2 to 4 broad. Flowers large and pendulous.

A. bracteata, Retz.

The Bracteate Birthwort.

Vern.—Kirádmár, gandán, gandha, Hind. Duk.; Pattru bung, khatrāubung, Sans.; Paniri, Uriya; Gandhālī, hidadhā, Bom.; Angri-putari, Tam.; Gādide gada-para-ku, kadapara, Tel.; Ailék, Pálā, Mal.

Habitat.—Found on the banks of the Jumna and Ganges and in the Deccan. Seems to luxuriate on the black soils of Western India.

Botanic Diagnosis.—Leaves reniform, glaucous; flowers axillary, solitary-peduncled; peduncles furnished at the base with sessile, reniform bracts.

Properties and Uses—

Medicine. A. 1396

Medicine.—Every part of this plant is nauseously bitter, and is much used by the Hindú physicians on account of its anthelmintic and purgative properties. Two fresh leaves rubbed up in a little water, and given to an adult for a dose, once in 24 hours, are considered a cure for purging with gripes. ( Roxburgh.) The leaves are applied to the navel to move the bowels of children, and are also given internally along with castor oil as a remedy for colic. The natives squeeze the juice of this plant into wounds to kill worms. (Dr. Gibson.) It is spoken of by Dalzell as possessing "a merited reputation as an antiperiodic in intermittent fevers." Other authors affirm that it holds a high reputation as an antiperiodic in the treatment of fevers. For this purpose it is often made into a paste along with the seeds of Barringtonia australasica, Celastus paniculata, and Black Pepper, the whole body being rubbed with this paste in malarial fevers. (Dymock; Dalzell; Gibson's Flora of Bombay.) It is also supposed to be an emmenagogue. Dr. J. Newton reports that in Sind the dried root, in doses of about a drachm and a half, is administered during labour to increase uterine contractions.

A committee, consisting of Drs. Carter, Dymock, and Sakhishér Arjun, reported on this drug as follows: "The drug consists of the
whole plant in fruit; it is nauseously and persistently bitter.” “Anthelminthic, antiperiodic, and emmenagogue. Used in the bowel complaints of children, when depending on worms, in intermittent fevers, and to increase uterine contractions during labour. The juice of the leaves is applied to foul and neglected ulcers to destroy maggots. Dose—1 drachms of the dried root is given in powder or infusion in cases of labour. The juice of the fresh plant is chiefly used by native practitioners.” According to the same authorities it is found on banks of rivers and water-courses, and in the black soils of Gujarát and Deccan. The price is R3-8 per maund. (Home Department Correspondence, 1860, p. 223.) It was recommended by the Surgeon-General of Madras to be excluded from the proposed new edition of the Indian Pharmacopeia (page 240).

§ “This species, or one resembling it, is considered a powerful abortive, acting similarly in animals. The root is given mixed with round pepper.” (Surgeon W. D. Stewart, Cuttack.) “The leaves bruised and applied as a poultice remove maggots from ulcers.” (Surgeon-Major John Lancaster, M.B., Chittor.) “Antiperiodic, anthelminthic, also similar action to ergot on the uterus, produces violent contractions of the womb during labour. Dose one to two drachms.” (Surgeon W. Barren, Bhuj, Cutch.) “Antiperiodic (slight), tonic; Infusion of whole plant, dried 6 oz, boiling water 10 oz, dose 1 to 2 oz.” (Apothecary Thomas Ward, Madanapalle, Cuddapah.) “Common in Madras, regarded as anthelminthic and emmenagogue by natives.” (Deputy Surgeon-General G. Bidie, C.I.E., Madras.)

**Aristolochia hastata, Nuthal.**

**Habitat.**—A species met with on the banks of the Mississippi.

**Medicine.**—Used medicinally in America.

A. *indica*, Linn.

**Vern.**—The root: *Isharmul, ishamulu-ki-jar, Hind.; Isarmul, Beng.; Bhedi janetet, Santal; Sāpasan, Bom.; Mar.; Isharmul, ishamulu-ki-jar, Duk.; Arkhuma, rukhumula, Cutch, Guj.; Sāpas, Goa; Sunandā hari, jowari, arkhumul, SANS.; Zardevande-hindi, ARAR., Pers.; Ich-chura-mūlī, or ich-churu-mūlī-ved, Peru-marindu, peru-khāngu, TAM.; Ishanaru-vedyu, dāla-gōvila, govila, Tel.; Karalekan, harakukulpullu, karal-vedham, ishwardumī, MAL.; Ishveri-vedr, KAM.

**Habitat.**—A twining perennial, found all over India,—Bengal, Konkan, Travancore, and Coromandel.

**Botanic Diagnosis.**—Leaves cordate, wedge-shaped, three-nerved, with an undulated margin from 2-4 inches long by 1-2 broad; flowers small, erect.

**Properties and Uses**—

**Medicine.**—The root possesses emmenagogue and antiarthritic properties. It enjoys, like all members of this genus, the reputation of being a valuable antidote for snake-bite, and is said to be used to effect abortion. It is also held in much esteem by the natives as a stimulant and tonic, and is used by them in intermittent fevers and other affections. The early Portuguese settlers called it *Raia de Cobra*, owing to its supposed efficacy against the bite of the cobra, being both taken internally and a powder of the root applied externally to the injured part.

A committee in Bombay, consisting of *Drs. Carter, Dymock, and Sakhārām Arjun*, reported on this drug as follows: “The drug, as found in the shops, consists of the root and stem; the latter is by far...”
ARISTOLOCHIA
rotunda. Birthworts.

the largest portion. In many parcels the stem only is to be found. It is either in short pieces, or the whole stem may be twisted into a kind of circular bundle. The thickest portion of the stem is from \( \frac{1}{2} \) to \( \frac{3}{4} \) inch in diameter, and has a central woody column made up of about ten wedge-shaped woody portions. The bark is thick and corky, marked with longitudinal ridges and numerous small warty projections; it is of a yellowish-brown colour. The taste is bitter, camphoraceous. "A stimulant, tonic and antiperiodic. It is chiefly used in the bowel complaints of children and in intermittent fevers. The juice of the leaves is believed to be efficacious in cases of snake-bites. Emmenagogue properties have also been attributed to it. Dose—of the decoction 1 to 2 ounces. Price six annas per lb. The drug can scarcely be called an article of commerce." It is common in the jungles of West India. (Home Department Official Correspondence, 1880, 323.)

§ "Tonic and stimulant, excellent antidote for scorpion-bite, used externally and internally. Dose—one to two drachms. Produces abortion, used as a cathartic in dropsy. Dose of the expressed juice, half to two drachms." (Surgeon W. Barren, Bhuj, Cutch.)

"It is undoubtedly used to produce abortion." (Brigade Surgeon S. M. Shircore, Meershedabad.)

1400

Aristolochia longa, Linn.

LONG-ROOTED BIRTHWORT.

Vern.—The root: Zaraoande-tavil, zaraoand, Arab.; Zaraoand-deve, Pers.

Habitat.—Indigenous to South Europe; imported into India.

Medicine. 1401

The leaves are said to be useful in the cure of snake-bite, especially cobra-bites. The root is bitter, and used as an emmenagogue and in diseases of the womb and affections of the gums or ulcers; also in indigestion and bowel complaints of children. It is said to act as a tonic and febrifuge.

§ "Used by natives in apoplexy, jaundice, paralysis, gout, and chronic rheumatism." (Surgeon G. A. Emerson, Calcutta.)

"Much used by native hakims in these Provinces in cases of ulcer, &c. Suppositories prepared from this drug are supposed to produce abortion. It is also applied locally in cases of scorpion-sting." (Surgeon J. Anderson, M.B., Bijnor, N.W. P.)

1402

A. reticulata, Nuttall.

An American species used medicinally, but only as a substitute for the true Serpentina; it is a coarse species.

1403

A. rotunda, Linn.

ROUND-ROOTED BIRTHWORT.

Vern.—Zaraoand-emudakraj, Arab.; Zaraoand-gird, Pers.

Habitat.—Indigenous in South Europe; imported into Bombay.

Medicine.—Used in coughs. The root is hot and aromatic. It is used by natives in the treatment of itch, lice, and intestinal worms; also in leprosy and ulcers, and to promote secretion of urine. It is also known as an antidote for poisons. Dr. Dymock, in his Materia Medica of Western India, says it is difficult to get this drug pure, corrons of an amy being often substituted for it.

§ "It is also used in rheumatism, fever, emphysema, chronic bronchitis, caries of tooth, enlargement of spleen." (Assistant Surgeon J. N. Dypt, Fyopore.)

A. 1404
Aristolochia serpentaria, L.

The Virginian Snake-root.

Habitat.—A native of North America.

Medicine.—The root of this species is given in the Pharmacopoeia
of India as the official form of Aristolochia.

Medicinal Properties and Uses.—"As its common and specific names
of Snake-root and Serpentaria imply, Serpentary had formerly a high
reputation for the cure of the bites of venomous serpents; indeed, it was
first introduced into regular medical practice as a remedy in such cases,
but like all the so-called specifics of vegetable origin which have been
introduced for destroying the effects caused by venomous reptiles, it is
no longer regarded as of any remedial value. As a stimulant tonic,
diaphoretic, and diuretic, it is, however, a medicine of some repute,
but in too large doses it causes nausea, flatulence, griping pains in the
bowels, and tendency to diarrhoea. It has been extensively employed in
typhus and typhoid fevers; and has also been highly recommended in
intermittent fevers, but in the latter it is commonly given as an adjunct
to bark or sulphate of quinia, whose effects it is said to increase in a
marked degree. It has likewise been employed as an antidote against
the bite of a mad dog, but it has no more value in destroying the effects
in such a case than as a remedy in the bites of venomous reptiles. It is,
however, used with good results in diphtheria, chronic rheumatism, atonic
dyspepsia, and in exanthematous diseases to promote eruption.
A strong infusion is also reputed to be serviceable as a gargle in malignant
sore-throat. Garrett states that, from observations made during many
years, he is inclined to think that serpentine is a remedy of some consi-
derable power, acting in a manner not unlike Guaiacum in stimulating
the capillary circulation, and promoting recovery in chronic forms of
gouty inflammation; and as it does not disturb the bowels, it may often
be administered when Guaiacum is not easily tolerated." (Bentl. and
Trim., 246.)

The official preparations are an infusion of the root in boiling water;
dose from one to two fluid ounces three or four times daily. A tincture
of the root in proof spirit, dose from 1 to 2 fluid drachms. This is re-
garded as a good adjunct to stimulant and diaphoretic mixtures. Serpen-
taria is an ingredient in Tincture Cinhonche Composition.

Chemical Composition.—"The principal constituents of serpentine
root are, a volatile oil in the proportion of about 2 per cent. and a bitter
principle. The volatile oil has the odour of the root, and the bitter
principle (aristolochin), which was first made known by Chevalier,
is described as an amorphous substance of a yellow colour, a bitter and
slightly acrid taste, and is soluble in both water and alcohol. It requires
further investigation. The medicinal properties of serpentaria are doubt-
less essentially, if not entirely, due to these two substances. But ser-
pentary root also contains tannic acid, resin, mucilage, sugar, and some
other unimportant ingredients." (Bentl. and Trim., 246.)

§ "It is met with in the bazaars of Bombay, and is in general use by
native practitioners under the name of Kaid Qalda. It appears to be used
as a substitute for Pavonia odora in Sanskrit prescriptions." (Surgeon-
Major W. Dymock, Bombay.)

ARNEBIA, Forst.; Gen. Pl., II., 862.

Annual or perennial, hispid, spreading herbs, belonging to the Natural
Order Boragineae. Leaves alternate. Racemes terminal, elongated, bracteate;
Flowers subsessile, yellow. Corolla-tube elongated; lobes 5, distinct imbricate
in bud. Stamens 5, dimorphic, in some flowers the stamens are below the

A. 1410
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ARRACACIA

esculenta.  The Arracacha.

mouth of the corolla, and the style protruding, in others protruding and style
short. Nuts on a flat or nearly flat receptacle, scar basal, large, flat, or but
little hollowed out, shortly produced up the inner surface, without a prominent
margin.

There are in all some 12 species, of which 4 occur in India, but c
fined to the Panjab, Kashmir, and Western Tibet.

1411 Arnebia tibetana, Kurs; Fl. Br. Ind., IV., 176.

Verz.—Dimok, Bhoti (Atchison).

Habitat.—A native of North Kashmir and Western Tibet, altiti
7,000 to 12,000 feet; frequent.

Medicine.—§ “The scaly bark of the root-stock is employed as a d
and medicine for cough by the Bhotis of Ladak.” (Surgeon-Major J.
T. Atchison, Simla.)

1413 Arnebia, sp.

Dr. Dymock informs me this root is imported into Bombay from
Afghanistan, and used as a substitute for Alkanet, which see.


1414 Arnica montana, L.; DC. Prod., VI., 317; Composite.

ARNICA.

Habitat.—Native of Western and Central Europe.

Medicine.—Imported into India, being officinal in the Pharmacopoe
Used internally as a stimulant and externally as a sedative and resor
In British practice its use is limited to the application of the tincture
sprains, &c.

Chemical Note.—§ “Garrod’s experiments on the use of Tincture
Arnica for bruises indicate that the tincture has no more power
expediting the recovery of the skin to its normal condition than spirit
the same strength. The plant contains a bitter non-crystalline glucosid
arctic.” (Surgeon C. J. H. Warden, Prof. of Chemistry, Calcutta)

Arnotto, the seeds of Bixa Orellana, Linn., which see.

1417 ARRACACIA, Bamer.; Gen. Pl., I., 884 (Arracacha, DC.

Prod., IV., 243).

A genus of perennial herbs, containing some 12 species, belonging to the
Natural Order Umbelliferae. They are natives of both Andean and South-
West America, one species being cultivated in most warm temperate regions,
forming an important article of food in Mexico.

Underground part thickened, tuberous, edible. Leaves pinnate or de-
compound; segments dentate or pinnatifid. Umbels compound; involvul
bracts foliaceous, 1 or 0; bracteoles many, rarely foliaceous, entire. Flowers
white, nearly allied to those of Comium. Sepals dentate, small. Petals sub-
extreme, point inflexed, broad or ovate. Syllobods conical, undulate at the margin.
Fruit ovoid or ovoid-oblong, often pointed at the apex, compressed at right
angles to the septum, and more or less constricted at the commissure.
Pericarp transversely suberete or 5-gonal; primary ridges little or scarce
prominent, sometimes unequal. Vittae many, often irregular or unequally
confluent. Carpophore 2-partite. Seeds concave on the face, sulcate or involute.

The generic name is derived from the South American name Arracal

1418 Arracacia esculenta, DC., Prod., IV., 244.

THE ARRACACHA; PERUVIAN CARROT; APID, Sp.

Syn.—A. Xanthorrhiza, Bancroft.

Habitat.—Supposed to be a native of the elevated regions of equator
America, Pasto, and New Granada. It is now, however, met with

A. 1418
Arracacha or Peruvian Carrot.

**ARRACACIA esculenta.**

Food.—M. De Candolle, in his *L’Origin. Cult. Pl.*, gives some interesting information regarding this plant. He says that the tuber compares well with potato, and the fecula is regarded as lighter and more pleasant to the taste. The lateral suckers which it throws out are used for propagation, and they are also more esteemed as an article of food than the central stem.

In 1879 the Government of India, Revenue and Agriculture Department, obtained, through the Secretary of State, some plants of the *Arracacha*, but on reaching Calcutta only two were found alive. After a few days these were sent to Sikkim. On the way one died, and the other was retained at Mengpú (near Darjiling), but died in a few weeks.

Shortly after, the Revenue and Agriculture Department obtained seeds, which were sown in the Chajuri garden at Mussorie by Mr. Duthie, the Superintendent of the Saharanpore and Mussorie Botanical Gardens. Accounts of this trial have been given in the Annual Reports of these gardens, and been reproduced in various publications. Up to date, the introduction of *Arracacha* into India has failed. The following extracts from well-known authors may, however, prove useful to persons desirous of prosecuting experiments in India with this most useful plant:

"The root of this plant, for the sake of which it is cultivated, is a fleshy body, not unlike a parsnip in size and form, but more blunt, tender when boiled, and nutritious, with a flavour between the parsnip and a roasted chestnut. Dr. Bancroft compares it to a mixture of parsnip and potato. A fecula, analogous to arrowroot, is obtained from it, by rasping in water, as starch is from the potato. It yields a large produce; according to Boussingault, as much as sixteen tons per acre, from land that will not bring more than nine or ten tons of potatoes. It requires deep rich soil, and is renewed annually by off-setts from the crown of the roots, which the Spaniards call its sons (Hijos). Otherwise its cultivation is similar to that of the potato.

"Several attempts have been made from time to time to introduce the arracacha into field culture in Europe; but it will not yield even to garden management, and all the experiments with it in Europe have terminated unsuccessfully. This seems to arise from the peculiar climate which it requires, and to which we have nothing analogous, unless in the south-west of Ireland. The mean temperature of the arracacha country is said by Mr. Goudot, who lived there for many years, to range from 63° to 82°, there being neither frost nor cold weather, nor dry summer heats, but an even damp climate. We are, therefore, unable to fulfil the first conditions demanded for this plant in field culture; and this circumstance, together with a great difficulty in preserving the roots through a winter, opposes an apparently insuperable bar to its introduction as a rival to our other edible roots." (Morton’s *Encyclopedia of Agriculture*, 108.)

In a communication to Sir Joseph Hooker, Mr. Henry Birchall of Bogota says: "About 6,000 feet is nearly the upper level of any extensive cultivation of this plant, though it produces at points a good deal higher. It is rather difficult to obtain the seed, as from habit the peons invariably pull up the flowering plants, as they do not produce the edible root. I have several times missed getting the seed by the stupidity of the men who tended the plantations."
ARROWROOT.

The Saccaracha.

Food.

"As regards cultivating from seed, my own experience is nil; but my neighbours assure me that by repeated replanting of the young plants at last the roots are developed.

"When this is attained the plant throws out a multitude of shoots from the crown. These being broken off are prepared by slicing the base neatly and then putting them in a hole dibbled about 5 or 6 inches deep, and require no further care than ordinary weeding, for which the rows and plants should be 3 feet apart.

"In our climate the root comes to perfection in eight to ten months, and the weight of a good specimen will be 8 to 10 lbs. No doubt scientifically cultivated, and in properly loosened soil, much larger roots would be obtained. We do not even plough, but stick the seed in immediately after burning off the forest or the brushwood, as the case may be. It is cheaper to take new ground than to cultivate properly the old, as we have no command of skilled labour or good apparatus." (Kew Reports, 1879, pp. 31, 32.)

"Mr. Duthie reports from Saharanpur, 30th May 1883: 'Of this valuable South American vegetable there are a few plants still left, and they are in a fairly healthy condition. They do not, however, appear to have formed to any extent the characteristic tubers which constitute the edible portion of the plants so highly valued in its native country. M. DeOandolle, in his recently published work on the origin of cultivated plants, observes that this vegetable bears comparison with potato, and yields a starch which is lighter and more agreeable. It has been tried in England and in several parts of Europe, but without success, the climate being evidently too damp for it. I intend to give it a trial at Arnigad, where it will at any rate have a better chance of being looked after than it had at Chajuri.'"

"Mr. Morris, the Director of Public Gardens and Plantations, Jamaica, has communicated to The Planter's Gazette for October 16, 1883, an important note on the little-known cultivation of this esculent in Jamaica. He states that it was introduced into the island in 1883 by Dr. Bancroft; it flourishes best in the Blue Mountain districts at elevations between 2,500 and 5,000 feet, with mean annual temperatures of 72° and 65° Fahr. respectively, and a mean annual rainfall of 100 inches.

"Mr. Morris adds: 'I believe the Arracacha is a most valuable food plant; and for my own part, I not only like it, but find that it becomes more palatable and desirable the longer it is used. If the natives of India take to it as an article of food, I can conceive nothing more likely to flourish in the hill districts, and to afford, with little labour, the means of sustaining life under adverse circumstances.' (Kew Reports, 1884, p. 17.)"

For further information, see Botanical Magazine, t. 3092; Comptes Rendus, Nov. 24, 1845; and The Gardener's Chronicle, 1846, p. 335, and 1848, p. 491. Grisebach's Flora of British West India Islands.

Arracacia moschata, DC. Prod., IV, 244.

The Saccaracha.

Habitat.—This species is said to frequent colder regions than the preceding, ascending in America to altitudes 8,400 feet. It smells like musk, hence the specific name; apparently this has not been introduced into Europe nor into India. The tubers are edible.

Arrowroot, see Maranta arundinacea, Linn.; Scitamineae.

A. 1424
ARSENIC

ARSENIC.

Arsenic, White, or Arsenicum Album.

**VERN.**-Sanbul-khār, sofī-sunbul, sancbhyā-sunbul, sancbhyā, HIND.; Duk.; Sanka višku, dūremukh, sāmbalā khārā, SANS.; Sanka, sāmba lalākārā, somal-khār, BENG.; Somal, somal-khār, GOJ., MAR.; Velati-pāshānām, TAM.; Tella-pāshānām, zhenku-pāshānām, TEL.; Vellap-pāshānām, MAL.; Pāshānā, KAN.; Shāk, tarbūt-khārī, sam-
mulfār, ARAB.; Marge-mūs or marg-mūs, PERS.; Sudu-pāshānām, SINGH.

The word sanbul is used for white arsenic in the Deccan, but is also used for *Nardostachys Jatamansi* (Indian spikenard) in Arabic and Persian. (Mooden Sheriff.)

§ “The Arabic name is sammul-fār, or the rat-poison, by which name it is sold in Muscat. The Indian names sanbul khār and sāmbalā khārā are evidently corruptions of the Arabic name.” (Surgeon-Major C. T. Peters, M.B., South Afghanistan.)

**Dye and Tan.**—“Arseniate of potash is used for preserving hides. Crude white arsenic is used as veterinary medicine in Burma.” (Prof. Romanis, Rangoon.)

**Agricultural and Industrial Uses.**—Five pounds of arsenic and one pound of soda are to be boiled in five gallons of water, until the arsenic is dissolved. To one measure of this solution, 160 measures of water are to be added, and the liquid thus formed is recommended by an American entomologist to be sprinkled upon plants infested by worms. The *Tropical Agriculturist, Vol. I.*, p. 603, adds: “[Query.—Application of this solution for the destruction of grub. It might kill them without injuring the roots. (Ed. T. A.)]” “Largely imported here for agricultural purposes.” (Dr. Dymock, Bombay.)

**Medicine.**—It is not necessary to discuss the imported and specially prepared European arsenic compounds and drugs, since these may be found in the *Pharmacopoeia*; the following notes should be understood to refer mainly to the indigenous drug. In the *Indian Pharmacopoeia*, this substance is described as alterative, tonic, antiperiodic; in large doses powerfully poisonous. It has been used with much success inague, neuralgia, and spasmodic affections, and in chronic skin diseases, including leprosy. In chronic rheumatism, cancer, uterine congestion, menorrhagia, snake-bite, and chronic catarrhal affections, it has proved an effectual remedy. (Pharm. Ind.)

It can be obtained pure in most bazaars; is largely used at all dispensaries. Babu Rakaldas Ghose read a valuable paper before the Calcutta Medical Society, in which he stated that in obstinate cases of chronic intermittent fever which is seldom benefited by quinine, he found arsenic to do much good.” (Indian Medical Gazette, May 1881.)

§ “Useful in auge in doses of ½ grain.” (Assistant Surgeon Shib Chunder Bhattacharjji, Chanda, Central Provinces.) “It is also considered as an aphrodisiac.” (Surgeon Anund Chunder Mukerji, Noakhally.) “Much used in dispensary practice in malignant fevers and skin diseases.” (Surgeon G. Price, Shahabad.) “Antiperiodic, tonic, relieves hemicrania, when applied locally, useful in rheumatism.” (Surgeon W. Barren, Bhuj, Cutch.) “Invaluable in splenitis or auge in conjunction with quinine.” (Surgeon-Major Henry David Cook, Calicut, Malabar.) “Very good in bad cases of anemia.” (Surgeon H. D. Masani, Karachi.)

**Chinese Arsenic.**—“Sin-shih; Arsenious acid, also called Pih-sin and Hung-pê. Of the specimens which I have received, some are apparently...”  

A. I429
ARTABOTRYS

suaveolens.

The Artabotrys.

a natural mineral, constituting a translucent, crystalline mass, va
colour from pure white to a yellowish brown or grey. Other sp
have the aspect of the ordinary massive white arsenic of E
commerce.

"Tsae-hwung, yellow sulphuret of arsenic; native orpiment, Pu
It occurs in the province of Yunnan; probably also in Burma, a
been shipped in considerable quantities from Moulmein. Ainsli
that it is exported from China to India.

"Orpiment is resorted to by the Chinese in cases ofague, b
pounded in a manner so absorbed as to render the dose extremely u
or even a nonentity.

"Heung-hwung, Native Red Sulphuret of Arsenic; Realgar : 
chod, Cleyer. Med. Simp. , No. 176. It is found in the province of
in the south of China, and has been exported in small quant
London from Canton. Realgar is also sometimes imported into E
from Bombay.

"Small shallow cups, elegantly carved out of this mineral, an
highly polished, are used by the Chinese for administering 
medicines; by which means, when the inner surface of the cup
sometimes happens, in a somewhat disintegrated condition, it is
that a minute dose of arsenic may be administered." (Hanbury's
Papers, pp. 220, 221.)


A genus of sermentose or scanty shrubs, belonging to the Natural Or
Amonaceae, comprising some 15 species, 10 of which are met with in India.

Leaves shining. Flowers solitary or fascicled, usually forming wo
hooked recurved branches (peduncules). Sepala 5, valvate. Petala 6, sum
base concave, connivent; limb spreading, flat, suberete or clavate. Stam
oblong or cuneate; connective truncate or produced; anther-cells for
Torus flat or convex. Ovaries few or many; style oblong or columnar; ov
s, erect collateral. Ripe carpels berried.


Syn.—Unona odoratissima and Hammata, Roxb.; Fl. Ind., ii., 66
Vern.—Madumati, madan-mast, Duk.; Vilayati-champa, Bom.; 
ranjitam, Tam.; Phala-sampenga, sakala-phala-sampenga, m
fjolam, Tel.; Madura-kumtevar, manurangijam, Mal.; Man
jatam, Kan. (Madras).

Moosan Sheriff says (that the Vythians assign a narcotic to
the flowers of this plant, Madan-mast—ki-phul); hence the means
Dukhini names—toxicated. He adds, however, that the name is
to the rhymes of a Curcuma and also to a species of Acousha
Dymock informs us that Madan-mast is the name by which ths
of a species of Amporphallus are sold in Bombay.

Habitat.—Southern parts of the Western Peninsula and in C
cultivated throughout India.

I can find no record of the uses of this plant. The odour
strongly-scented flowers is closely allied to that of the Ilang-Ilang (O
odorata).

MEDICINE.

PERFUMERY.

A. suaveolens, Blume; Fl. Br. Ind., I., 55.

Vern.—Durie corban, Indian Archipelago.

Habitat.—A large, woody climber, met with in the forests of th
Peninsula, from Sylhet to Malacca.

A. 1434
**ARTEMISIA Absinthium.**

**MEDICINE.**
- Leaves. *I435*
- Infusion. *I436*
- Seeds. *I437*
- Oil. *I438*
- Perfumery. Flowers. *I439*

**Artemisia Absinthium, Linn.; Fl. Br. Ind., III., 328.**

**The Absinthe; Wormwood.**

**Syn.**—Absinthium vulgare, Gartn.; A. officinale, Lam.

**Vern.**—Afghanin, PERS. and ARAB.; Vidya, Hind., Duk.

**Habitat.**—An aromatic, silky, hoary herb, met with in Kashmir, altitude 5,000 to 7,000 feet; distributed to North Asia, Afghanistan, and westward to the Atlantic.

**Botanic Diagnosis.**—This belongs to the section Absinthium, or the species of Artemisia with heterogamous heads, ray flowers (female and disk-flowers hermaphrodite), and with the receptacle covered with long hairs.

A perennial species with hoary pubescence, stem erect, angular and ribbed. Leaves ovate or obvate, unequally 2-3-pinnatifidly cut into spreading linear-lanceolate obtuse segments, hoary on both surfaces, radical and lower cauline leaves narrowed into winged petioles. Heads 3-4 inch diameter, dediceded, hemispheric, in drooping semidracemes, terminating the branches; outer involucro-bracts oblong, hoary, narrowly scarious, inner orbicular broadly scarious; receptacular hairs long, straight.

**History.**—Several species of Absinthium (ψηρθον, aspithion) are referred to by Dioscorides, one of which appears to be this plant. The passage, “He hath made me drunk with wormwood” (Lamentations of Jeremiah, Chap. III., 13), doubtless refers to this plant, and it seems very probable that the extract, which is so largely consumed in France at the present day, was the preparation which produced the intoxication.

**Oil.**—Wormwood yields by distillation a dark green or yellow oil, having a strong odour of the plant and an acrid taste. It is isomeric with camphor, and has the specific gravity 0.972. According to Dr. Wright it is chiefly composed of absinthol (C₉H₅O), and, when heated with phosphorus, pentasulphide, or thiophosphate, it splits into cymene (C₉H₈) and a resinous substance. The colouring substance is the Azulene of Plessen.
### Dictionary of the Economic

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<th>ARTEMISIA maritima</th>
<th>Worm-seed</th>
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**In large doses this oil is a violent narcotic poison; in a man, 1 oz. caused insensibility, convulsions, foaming at the mouth, and a tendency to vomit.**

**Medicine.**—According to Braconnot, 100 parts of this plant yield 15 of the volatile oil, 30 of bitter extractive matter, 2 of a very bitter resin, and 5 of a green resin. The plant yields also a large quantity of ash, chiefly carbonate of potash, known from remote times as salt of wormwood. The whole herb is an aromatic tonic, and formerly enjoyed a high reputation in debility of the digestive organs. It was also regarded as an anthelminthic, but, as Christie noted, through the caprice of fashion, it is neglected at the present day. It is now chiefly used as a domestic and family medicine in Europe, but before the discovery of quinine it was largely used in intermittent fevers. It exercises a powerful influence over the nervous system, and its tendency to produce headache and other nervous disorders is well known by travellers in Kashmir and Ladakh, who suffer severely when marching through the extensive tracts of country covered with this plant.

It is chiefly used in the form of an infusion either in water or spirit; a dose of one to two ounces. A decoction is less narcotic than the infusion. The herb is sometimes prescribed in the form of a poultice or fomentation as an antispetic and discutient.

**Absinthe.**—A liqueur, largely consumed in France; consists essentially of an alcoholic solution of oil of wormwood, containing a little angelica, anise, and marjoram. If carefully prepared it is of a bright green colour.

The effects of this liqueur are peculiar, and possess features not manifested by alcoholic excess. This has been described as absinthism. By the French Act of 1872, the trade in this liqueur has been put under severe restrictions. Its use has been prohibited in the French Army and Navy. Its effects appear to be exhilarating, but the habitual use, or excessive use, brings on gradual diminution of the intellectual faculties, ending in delirium and death. These effects resemble those produced by the oil. Absurd and extravagant statements appear, however, to have been made regarding the injurious effects of absinthe, but it is an established fact that its abuse is even more dangerous than the excessive consumption of alcoholic drinks. (Bent. & Trim.; U. S. Dispens.; Smith's Dic.; Fluck. & Hamb. Pharm.; Royle’s Mat. Med., Ed. Harley, &c.)

**Artemisia Abrotanum**, a garden plant, sometimes seen in India; is the Southern-wood, or Old Man, of English writers. It is a native of the south of Europe, and is a favourite on account of its stimulating aromatic odour.


**Habitat.**—Western Thibet, altitude 14,000 to 16,000 feet; Lahore, Afganistan, West Asia, and South and Middle Russia.

**Food.**—Introduced into Europe as a cultivated pot-herb nearly 30 years ago. It is the Tarragon of English gardeners; used to flavour dishes. Although a native of India, it does not appear to be put to any economic use.

**A. indica**, Willd.; Syn. for A. vulgaris, Linn., which see.


**Worm-seed, Levant Worm-seed or Santonica, Eng.; Semen Contra, Semecine, Barbotine, Fr.; Wurm-samen, Zerstossen, Ger.**

**Syn.**—Artemisia, sp., in Pharm. Ind.

**A. 1452**
Products of India.

Santonica.

**ARTEMISIA maritima.**

**Vern.—Shīb, sariqūn, afsantūn-ul-bāhr (ašลำlūh). Arab., Pers.; Kirmanī, owa, Bom.**

**Habitat.—**Western Himalaya, from Kashmir to Kumaon, altitude 7,000 to 19,000 feet, Western Thibet; abundant in salt plains, altitude 9,000 to 14,000 feet. Commercially obtained from Russia.

**Botanic Diagnosis.—**This species belongs to the section Seriphidium, *i.e.*, with homogamous heads; flowers all fertile, receptacle naked; it is the only Indian representative of this section.

An exceedingly variable plant, with erect or sometimes drooping flower-heads. The whole plant hoary or tomentose, shrubby below; stems erect or ascending, much branched from the base. *Leaves* ovate, 2-pinnaatiate; *segments* small, spreading, linear, obtuse, upper simple linear. *Heads* 3-5-flowered, ovoid or oblong, sub-erect in spicate fascicles; involucres-bracts linear-oblong, outer herbaceous, tomentose, inner scarious acute, glabrous.

**Trade Supplies.—**In European commerce there are two forms of worm-seed—1st, Aleppo, Alexandria, or Levant Worm-seed; and 2nd, Barbary Worm-seed. The former comes from Persia, Asia Minor, or other parts of the East, and the Barbary from Palestine and Arabia.

**Fluckiger and Hanbury,** in their invaluable *Pharmacographia* say: "The drug, which consists of the minute, unopened flower-heads, is collected in large quantities, as we are informed by Bjorklund (1867), on the vast plains or steppes of the Kirghis, in the northern part of Turkestan. It was formerly gathered about Sarepta, a German colony in the Government of Saratov; but from direct information we have (1873) received, it appears to have been obtained there no longer.

"The emporium of worm-seed is the fair of Nishnei-Novgorod (July 15th to August 27th), whence the drug is conveyed to Moscow, St. Petersburg, and Western Europe." In 1864, 11,400 cwts. were imported into St. Petersburg. Dr. Dymock says it is brought from Afghanistan and Persia to Bombay in considerable quantities; value Rs.1 to Rs.3 per maund of 37½ lbs.

**Medicine.—**The flower-heads of this plant are largely used for their anthelmintic, deobstruent, and stomachic tonic properties. In the form of a poultice it is used to relieve the pain caused through the stings of insects and poisonous bites. Santonine is chiefly employed in the treatment of round and thread worms. It has the peculiar property of sometimes causing objects to appear yellow to patients under its action.

Worm-seed of the Bombay market has been examined by Hanbury, who considers that it does not materially differ from the Russian drug, but is slightly shaggy and mixed with tomentose stalks. "Arabic and Persian writers on materia medica generally describe worm-seed under the name Shīb, giving as synonyms Sariqūn and Afsantūn-ul-bāhr." "In Bombay shīb is the recognised Arabic name of the drug amongst the hakims, who prescribe it, in doses of from 2 to 3 drachms, as an anthelmintic, and as a deobstruent and stomachic tonic. In the form of a poultice they use it to relieve the pain caused by the bites of scorpions and venomous reptiles."

§ "I have constantly observed santonine to be inert if administered when the worm is young. [This was in Rangoon,]" (Honorary Surgeon P. Kinsley, Chicacone, Madras Presidency.)

"Useful in gleet." (Surgeon H. D. Maani, Karachi.) "It renders the urine of a deep yellow colour." (Brigade Surgeon G. A. Watson, Allahabad.) "I have never seen the optical effect from santonine, though I frequently use the drug; in fact, I have made special enquiry on this point." (G. E.)

A. I454
Dictionary of the Economic

**ARTEMISIA scoparia.**

**Worm-seed.**

**1455** Chemical Composition.—"The small seed-like flower-heads contain an essential oil, which has an odour resembling cajuput oil and camphor. The anthelmintic properties of the seeds are due to a glucoside santoin. According to Hesse, santoin is an hydriac of a crystallizable acid, santoinic acid, which, when heated to 12° C., is resolved into santoin and water. When heated with an alkali, santoin is not resolvable into santoin and water. (Pharmacographia.)" (Surgeon C. J. H. Warden, Calcula.)

Santanum or Santoin is a crystalline substance prepared from worm-seed, about 1/2 to 1/4 per cent. being obtained. It occurs in flattened, shining, prismatic crystals, not altered by air but readily affected by light, turning yellow. It is odourless and tasteless, becoming in the mouth ultimately bitter. It is nearly insoluble in cold water, soluble in 250 parts of boiling water or 40 parts of alcohol at 15° C., or in 3 parts of boiling alcohol. When heated it melts at 170° C., forming, if rapidly cooled, an amorphous mass. The formula given for santoin is C₁₃H₁₄O₅; the principle of its isolation consists in that while not an acid it is capable of combining with bases; i.e., santoin boiled with milk of lime. This forms santoinate of calcium, a soluble substance. On the addition of hydrochloric acid, santoinic acid C₁₃H₁₄O₅ is precipitated, and parting with H₂O santoin is thus produced. Fatal consequences have repeatedly followed the administration of large doses of this drug, the symptoms being giddiness, mental apathy, great paleness and coldness of the surface of the body, vomiting, profuse sweating, trembling, mydriasis, and finally, loss of consciousness, and convulsions. All objects appear yellow or even green, and the urine has been observed coloured after 16 minutes. The dose for an adult is from 24 grains for a child two years old 1/2 to 1 grain. (U. S. Dispens.; Fleck, and Hand, Pharm., &c.).

**1458** *Artemisia parviflora,* Roxb.; *Fl. Br. Ind.,* III., 323.

Vern.—Kanyôra, Pn.; Burmar, baza tashbang LADAK.

Habitat.—Common in the higher regions of North-West Hindustan, in Lahoul, and Laddak.

Fodder.—Browsed by goats and sheep.

**1459**

**1460** *A. persica,* Boiss.; *Fl. Br. Ind.,* III., 327.

Vern.—Sákh, sáriqán, afsantin-ul-bakr, ARAB. and Pers.; Pardini e mau, GUJ.; Dáwánd, MAR.

Habitat.—Collected by Bellew in Afghanistan; it is also found in Western Thibet, altitude 9,000 to 14,000 feet.

Botanic Diagnosis.—Receptacle puberulous.

Medicine.—Bellew states that the plant is used as a tonic, febrifuge and vermifuge.

**1461**

**1462** *A. sacrorum,* Ledeb.; *Fl. Br. Ind.,* III., 326.

Vern.—Támen, muñyá, niwrtá, jau, chémbar, shíir, bármat, Pn.; Támen, burmack, LADAK.

Habitat.—Western Thibet, Kanawar, and the Thibetan region of Kumaon; altitude 9,000 to 17,000 feet.

Medicine.— Said to be given medicinally to horses in affections of the head.

**1463**

**1464** *A. scoparia,* Waldst. & Kit.; *Fl. Br. Ind.,* III., 323.

Vern.—Jhau, lengj, piśa jau, biur, king khok durung, lenmng, lenh, marka, Pn.; Chhú soroj, danén, BAZAR NAME.

Habitat.—Found in the Upper Gangetic plain, and westward to Séd
and the Panjáb, Western Hindúkush; from Kashmir to Lahoul, altitude 5,000 to 7,000 feet; Western Tibet, altitude 7,000 to 12,000 feet.

**Medicine.**—The branches appear to be officinal in the Panjáb. The smoke is considered good for burns, and the infusion is given as a purgative.

**Fodder.**—Browsed on by cattle and sheep.


**Vern.**—Afnatín, dauna, Pers., Arab., and Bomb.

**Habitat.**—Western Hindúkush from Kashmir to Lahoul, altitude 8,000 to 10,000 feet; Western Tibet, China, and Russia.

**Medicine.**—A plant very similar to *A. Absinthium*, Linn. It is said to be cultivated, at Bandora near Bombay, by Christians, from whom the fresh herb reaches the market. The Bombay imports of the drug are from Persia. Hakims prescribe this medicine in hypochondriasis, jaundice, dropsy, gout, scurvy; being used as a tonic, deobstruent, febrifuge, and anthelmintic, also as an emmenagogue. It is applied externally as a discutient and antiseptic. (Dymock, Mat. Med., W. Ind., 361.)

**A. sternutatoria**, Roxb., see Centipeda orbicularis, Lour.; Composite.


**Indian Wormwood**; *Flea-bane*.

**Syn.**—*A. indica*, Wild.

**Vern.**—Nágáná, mújší, māstār, dona, Hind.; Nágórá, Beng.; Tátárin, pácjan, bānjír, chambra, ibázhá, tarkhá, Pr.; Būl mādārán, afzamí, Pr.; Bazar Names; Surbán, Mak.; Tilāpat, Nepál; Nágadāná, gránthāpatí, Sans.

**Dr. Mooden Sherif** supplies the following note regarding the vernacular names of this species: “In Madras the native names are referred to two sections: (a) *A. vulgaris*—Mársángh, Arab.; Mársángh, Pers.; Dóuná, Hind.; Duk.; Mar-i-kurónu, Tam.; Dóváná, Sans., Tel., Kan. (b) *A. indica*—Máś-pátri, Duk.; Máchí-pátri, Tam., Tel., Malá, and Kan.; Garántúpatí, Sans.; Afnatín-címbí, Arab. and Pers.; Walkblundu, Singh. *Máres* is not a Hindustani synonym for *Dóuná*, as is supposed in some books; it is the name for *Origanum Majorana*.

**Habitat.**—Throughout the mountain tracts of India, altitude 5,000 to 12,000 feet; on the West Hindúkush, Khási Hills, Mánipur, and the mountains of North Burma. “A gregarious shrub, coming up on old cultivations between 3,000 and 6,000 feet in the Sikkim Hills, and often covering large tracts of land, until killed down by the tree growth which succeeds it.” (Gamble.) Mount Abú, the Western Ghats from the Konkan southwards to Ceylon. Distributed to temperate Europe and Asia, Siam, Java, &c.

**Botanic Diagnosis.**—A tall, shrubby plant, with hoary pubescence or tomentose. Stems leafy, paniculately branched. Leaves large, ovate, lobed laciniate or 1-2 pinnatifid or pinnate, white tomentose beneath, rarely hoary or green on both surfaces; lobes acute, irregularly serrate or lobulate, lower petioled, upper sessile or with stipule-like petioles, uppermost linear-lanceolate, entire. Heads, ⅓ to ½ inch long, ovoid or subglobose, clustered or seriate, subsecund, in short or long subrect or horizontal panicked racemes; involucro-bracts wooly or glabrate, outer small, herbaceous, inner almost wholly scarious. Corolla glabrous. *Sir J. D. Hooker* adds to the above description that he is unable to separate, even as varieties, the following plants referred to by Indian authors: *A. indica*, *A. dubia*, *A. a.
**ARTHROCNEMUM indicum.**

**Arthrocnum.**


One or two of the forms of this species, along with A. Absinthium, constitute the official worm-wood.

**Medicine.—** It has stomachic and tonic properties, and is used as a febrifuge. Dr. Wight states that the leaves and tops are used in nervous and spasmodic affections connected with debility; also an infusion of them is given as a fomentation in ulcers. (Illus., II., 92.) It may be used as an inferior substitute for cinchona in intermittent fevers; it is also employed in dyspepsia, and as an anthelmintic, and in liver diseases.

Amongst the vernacular names of this plant has been included the Mohammedan word afsaunt, and it seems probable that this is one of the sources of the remedy known by that generic name.

The term *Moxa* is applied to a cube of inflammable tinder ignited in contact with the skin in order to produce cauterization. For this purpose, in many parts of the world, the tomentum from the leaves of wormwood is often used. The origin of the word *moxa* is obscure, but the practice of burning to produce revulsion, thereby relieving deep-seated inflammation, has been practised both by savage and civilised nations. The Mānipuris, and also the Angāmī Nagās, rub between the palms of the hands the withered leaves of this plant, as also of a species of Anaphalis, until the tissue crumbles away, leaving only the tomentum in the hand. This they preserve as a tinder, which they ignite by rubbing rapidly a round stick by means of a string, made to revolve upon a small ball of the tinder placed in a hole in the ground (or simply between the hands), until the friction of the point ignites the tinder. I could not discover that they used this tinder as *moxa*, although I made careful enquiries.

§ “It is used as a tonic, anthelmintic, antispasmodic, and expectorant, especially in diseases of children. The native women believe that its presence protects children from being eaten by witches.” (Brigade Surgeon J. H. Thornhill, Monghyr.) “Expressed juice is applied by native practitioners to the head of young children for the prevention of convulsions.” (Brigade Surgeon S. M. Shircore, Mozhbad.) “In Hindū medicine it is given in skin diseases and foul ulcers as an alternative.” (Civil Medical Officer U. C. Dutt, Serampore.) “Tonic and antiperiodic.” (Surgeon W. Barren, Bhuji, Cutch.)

**Manure.**—Its ashes when burnt are considered to give a good manure for cultivation.

**Domestic Uses.**—Wormwood is used to prevent moths and other insects from infesting clothes and furniture. It is used as a symbol of bitter calamity, and is frequently mentioned in the Bible.

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**ARTHROCNEMUM, Moq.; Gen. Pl., III., 65.**

Arthrocnum indicum, Moq. DC. Prod., XIII., 2, 151; Chenopodiaceae.

**Syn.—** Salicornia indica, Willd.; Icon., 175, non R. Br. (Pharm. Ind.).

**Vern.**—Pyu-polang, Benc.; Machale, ghuri, Bom.; Chī, Go.; Machul, Mar.; Umarī, Tam.; Kayyapippīl, Tel.

**Habitat.**—A gregarious weed, met with in the Sunderbunds and along the Coromandel Coast, also at Bombay.

**Medicine.**—Roxburgh urges that the preparation of "fossil alkali" or barilla from this plant should be encouraged on the Coromandel Coast, but he does not inform us whether it was actually prepared. Compare with remarks under Caroxylon, Salicornia, and Barilla.
ARTOCARPEÆ; Gen. Pl., III., 346.

An important tribe of Urticaceae, referred by many botanists to the Sub-order Moræe, which see. It may be said to be represented by the Banian or Fig and the Jack-fruit.


A genus of evergreen trees with milky sap, belonging to the Tribe Artocarpeæ, of the Natural Order Urticaceae. It comprises some 40 species, inhabitants of tropical Asia, Ceylon, the Malaya, China, and of the Pacific Islands.

Leaves alternate, large, coriaceous, pennivined, entire or lobed; stipules lateral, often very large. Flowers small, very numerous, monocious, male and females forming distinct axillary and solitary, pedunculate, globose or cylindrical heads. Male flowers with a perianth of 2-3-4, lobed or parted; segments obtuse, imbricate. Stamina 4, erect; anther slightly exerted; ovary rudimentary. Female flowers, perianth tubular, ovoid-oblong or linear; bases fleshy and consolidated into the infrutescence, apices free, with a minute opening, often 3-4 dentate. Ovary erect, included within the amalgamated perianths, free from each other, 1-locular, rarely 2-3 locular, with a solitary pendulous ovule; style terminal or lateral, simple or 2-3-fid; stigma various. Nuts enclosed within the persistent and consolidated perianth-tubes, forming the so-called flakes of the syncarpium. Seeds pendulous; testa membranous; albumen none; embryo erect or incurved; cotyledons equal, thick, fleshy or unequal; radicle short, superior.

The generic name is derived from ἀρτος, bread, and καρπός, fruit, in allusion to the species popularly known as the Bread-fruit tree.

Artocarpus Chaplasha, Roxb., Fl. Ind., Ed. C.B.C., 634; Urticaceæ.

Vern.—Chaplash, chapli; Beng.; Lutéen, NEPAL; Chram, GARO; Sam, Ass.; Cham, CACHAR; Pani, toponi; Mugh.; Tounnpingain, tounp-ponoi, BURM; Kaita-da, AND.

Habitat.—A lofty, deciduous tree, met with in Eastern Bengal, Burma, and the Andaman Islands.

Botanic Diagnosis.—A tall, erect, straight, growing tree. Leaves in young tree pinnatifid, when old obovate, entire or remotely dentate; stipules long, axillary, caducous. Male and female heads on long peduncles. Fruit spherical.

Nearly allied to A. Lakoocha, with which compare.

Caoutchouc.—Kurz remarks that in Burma it yields a tenacious milky caoutchouc.

Structure of the Wood.—Yellow to brown, moderately hard, evenly-grained, rough, durable, seasons well. It seems to get harder and heavier as it gets older; two specimens from the Andaman Islands, cut in 1866 and stored since then in Calcutta, give respectively 46 and 52 lbs., and Skinner gives 63 lbs., but this is probably a mistake. (Gamble.)

It is much used for canoes; in Sikkim and Assam for planking, teak-boxes, and furniture. Roxburgh says that this wood is regarded as "superior to every other sort, particularly when employed under water."


Vern.—Pha-phana, rén-phana, Mar.; Ayni, anjali or angeli, aiyane-pela, I.A.; Aini, anjali, angeli, MA.; Hebalu, hel, kalasu, hesswa, hessain, KAN.

Habitat.—A lofty, evergreen tree of the forests of the Western Ghâts, ascending to 4,000 feet.

A. 1482
ARTOCARPU S integrofolla. The Jack-fruit Tree.

Botanic Diagnosis.—Young shoots hirsute; leaves alternate; petiole ovate-obtuse, entire, somewhat hairy underneath, particularly on the veins, 6-7 by 4-5 inches; stipules hirsute on the outside, lanceolate. Male heads cylindrical, pendulous, female globular and erect, both occurring in pairs in the axils of the leaves or leaf-scars.

The Juice as a Cement.—"The concreted juice forms a waxy, tough, light-brown substance, which, when melted, is used as a cement to join broken earthenware and stoneware." (Surgeon-Major W. Dymock, Bombay.)

Food.—Produces a fruit, the size of a large orange, which contains a pulpy substance much relished by the natives.

Structure of the Wood.—Wood hard to very hard, yellowish brown, durable, seasons well. Weight about 35 lbs. per cubic foot.

Much used on the western coast for house and ship building, furniture, and other purposes. It "is a very large and handsome evergreen tree, whose massive trunk occasionally rises straight and clean-stemmed for 150 feet. It yields the Anjeli wood of commerce, and is equally valuable for ship and house building. A seasoned cubic foot weighs 40 lbs." "This is an excellent wood for making boxes, buildings and furniture generally, and, like its congeners, as ornamental as it is useful." (Tropical Agriculturist, II, p. 885.)

Artocarpus incisa, Linn.

The Bread-fruit Tree of the South Sea Islands.

Vern.—Rata-del (or the foreign del), Singh.

Habitat.—"Cultivated in South India, Ceylon, and Burma. Succeeds well in Bombay; a few good trees may be seen in the garden attached to the Albert and Victoria Museum. In Bengal the winter proves too severe for its growth." (Roxburgh.) Cultivated in the islands of the Asiatic Archipelago from Sumatra to the Marquesas Islands, when Europeans first began to visit them. It is probably a native of Java, Ambon, and the neighbouring islands. (De Candolle, L’Origin. Cult. Pl., 238).

Recently efforts have been made, and are continuing to be made, by the Agri.-Horticultural Society of Madras to establish and distribute the edible (seedless) varieties of this tree in southern India. A large tree already flourishing in the garden of the late Sheriff of Madras has afforded the basis for propagation; and a stock of good sorts has been procured from Ceylon. The tree propagates by suckers or offsets from the base of the stem rather than by cuttings. When the fruit is of good quality it rarely produces fertile seeds.

Botanic Diagnosis.—Leaves pinnatifid. Male-heads cylindrical; female terminal, round. (Roxburgh.)

Gum.—Yields gum.

A. integrofolla, Linn.

The Jack-fruit Tree. (A name said by De Candolle, in L’Origin. Cult. Pl., to be derived from a common Indian name, jaca or tisjak.)

Vern.—Karnthali, katol, kathali, chakki, panasa, panaz, Hind.; Kuthali, kuthal, Beng.; Knuthali, Ass.; Kanthar, Santal; Paros, Koz.; Panam. Univa.; Phanasi, Mar., Bom., Pila, pilPa3kaHam, Tam.; Panasa-pandu, panasa, vurtu-panasa, Tel.; Halsu, hoh-belsu, hatchina, Kan.; Teprom; Garo; Panasa, Sans.; Feingnai, pienne, Burm.; Cos, Singh.
Products of India.

The Jack-fruit Tree.

ARTOCARPUS integrifolia.

Habit.—A large tree, cultivated throughout India and Burma, except north. Supposed to be wild in the mountain forests of the Western ascending to 4,000 feet. (Beddome; Wight.) Its dome of dark with the stem burdened with monster fruits (often 2) feet in is perhaps one of the most characteristic features of the Indian surroundings.

is both cultivated and found wild in the evergreen Sahyadri. (Bombay Gazetteer, Vol. XIV., 62.) “It is also wild in the Ghats.” (Central Provinces Gazetteer, p. 503.) “Grows freely in Eastern Ghats, Rakhphali taluka.” (Central Provinces Go-
p. 503.)

Cultivation.—“A pit is dug and filled with cowdung, and in this the seed is inserted in June or July. The cost of cultivation is nil, the profits vary from 4 annas to Rs. per tree, realized by the sale fruit.” (McCann’s Dyes and Tans of Bengal.) “The value of a ee in Surat is about Rs.5 per annum.” (Bombay Gazetteer, H., 3)Gandolfo thinks that the cultivation of this tree is “probably not than the Christian era. It was introduced into Jamaica by Admi-
ley in 1782. It has also been introduced into Brazil, Mauritius, &c.” (r. Cult. Pl., 240.)

Anatomical Diagnosis.—Glabrous or the young shoots with short stiff branchlets with annular raised lines, the scars of the caducous leaves coriaceous, smooth, shining above, rough beneath, elliptic base obtuse, mid-rib prominent beneath, with 7-8 lateral nerves on either side, 4-8 inches; stipules large, with a broad apexcylindrical base, us. Fruit large, hanging on short stalks, oblong, fleshy with a thick yellow receptacle; rind muricate. Seeds reniform, oily.

n.—The bark yields a very dark-looking gum, with a resinous taste, soluble in water. (Atkinson’s Gums and Resins.) The juice is a valuable bird-lime and as a cement.

writer in the Indian Agriculturist describes certain experiments caoutchouc from this plant. He says it is elastic, leathery, water-
g, and capable of removing pencil-marks; but, as remarked by the although the order Artocarpaceae of course yields caoutchouc, it is useless, which experiment alone can decide, whether rubber of suffi-
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cost value could be obtained from this species. Each fruit about two ounces of milk, from which, according to the writer in in Agrarian, a drachm and a half of the caoutchouc-like ce can be obtained.

i.—The wood, or its sawdust, yields on boiling a decoction used as a dye, to colour the Burmese priest’s robes, and to some extent it is used as an ordinary yellow dye in Madras and other parts of India. It is fixed with alum, and often intensified by a little c. With indigo it gives a green, said to be used in Malaya. If yellow is often used in dyeing silk. “In the Madnapur district ye for home use is produced by boiling the juice of green jack-fruit Ash root and lime. With this red dye, cloth and the jute used g bombs are dyed.” “Both fruit and wood are used as dyes in.

According to Mr. Liotard’s memorandum, it would seem that is extracted in Oudh from the bark; and Balfour mentions that a dye is obtained from the roots in Sumatra.” (McCann, Dyes and "Bengal.

re.—The bark yields a fibre. § “A fibre extracted from the bark at the Paris Exhibition from Sandoway; a cordage fibre is also d from the bark in Kumaon.” (T. N. Mukarji, Revenue and Culture Department, Calcutta.)

A. 1499
ARTOCARPUS integrifolia. 

**The Jack-fruit Tree.**

**Medicine.**—The juice of the plant is applied externally to glandular swellings and abscesses to promote suppuration. The young leaves are used in skin diseases, and the boor internally in diarrhoea.

§ "This is an important article of food, both when green as well as when ripe. The seeds contain a quantity of starchy matter, which may be separated by drying and pounding them. The unripe fruit is astringent, the ripe laxative, but rather difficult to digest, although very nutritious. The juice of the plant is used to promote absorption of glandular swellings." (Surgeon D. Basu, Faridpur, Bengal.)

**Food.**—The large fruit obtained from this tree would be more correctly described as a fruitscence, since, like the pine apple, it is an aggregation of the fruits produced by an assemblage of flowers. The individual fruits are often spoken of as flakes; they each consist of a seed surrounded by a pulpy mass of luscious tissue having a strong odour. The external rough skin of the fruitscence is rejected, and the yelloniishly mass which surrounds the seeds eaten by the natives of India, and by them regarded as one of the best Indian fruits. It is seldom eaten by Europeans. The average size of the fruit is from 12 to 18 inches long by 6 to 8 inches in diameter. Each contains from 50 to 80 or more flakes, of a soft juicy and sweet substance, which, if fermented and distilled, yields an alcoholic beverage, with a strong odour and peculiar flavour.

The seed, when roasted, is eaten as an article of food, and is said to resemble chestnuts. When ground to flour it very much resembles the Kashmir Singara-nut flour. A writer in the Indian Agriculturist says: "I believe it contains only a very large percentage of starch, and as such could be utilized in a variety of forms." § If these seeds be taken to weigh a third of an ounce each, one fruit will give us 90 ounces of flour, and 20 fruits, the produce of one tree, 600 ounces = 37 lbs. of flour.

"The fruit weighs up to 60 lbs., and is much used by the people. The roasted seeds are not unlike chestnuts, and are in bad seasons often the only food of the poorest hill people." (Bombay Gazetteer, Vol. XV, Pt. I, 62.)

§ "The fruit when unripe is cut into small pieces and cooked in curry with shrimps. The seeds of the ripe fruit, when roasted in hot ashes, are very palatable and nutritious, and in taste resemble somewhat the Spanish chestnuts." (Mr. L. Liotard, Calcutta.)

"The strong unpleasant odour of the ripe jack-fruit is probably due to the presence of butyrate of ethyl." (Surgeon C. J. H. Warden, Calcutta.)

**Structure of the Wood.**—Heartwood yellow or rich yellowish-brown, darkening on exposure, compact, even-grained, moderately hard, season well, and takes a fine polish. Weight about 40 lbs. per cubic foot.

It is largely used for carpentry, boxes, and furniture, and is exported to Europe for cabinet-work, turning, and brush-backs.

"The trunk grows to a great height. The wood is yellow when cut, but gradually darkens. It becomes beautifully mottled with time, and takes as fine a polish as mahogany. A seasoned cubic foot weighs 42 lbs. It is used for building and for furniture." (Bombay Gazetteer, Vol. XV, Pt. I., 62.) Mr. Gibson says this is a useful firewood tree, found in Thia, growing in salt-marshes. The jack-trees in Bengal attain a great height, but are not very lofty. Planks 20 or 24 inches across are often seen cut off jack-tree boles. An average tree ceases to yield fruit when it has reached a circumference of 9 feet, and may at that time be sold at Rs. (Indian Agriculturist.) According to the Tropical Agriculturist, large jack-trees will sell for as much as Rs 100 each; they are used for canoes.

§ "Jack-wood is yellow, hard, takes an excellent polish, is beautifully

A. 1509
marked, and is one of the handsomest furniture woods found in the
country." (Surgeon C. J. H. Warden, Prof. of Chemistry, Calcutta.)
Sacred.—Artocarpus integrifolia is often seen on Buddhist sculptures.
In some instances it appears to have been mistaken for the custard apple.
(See remarks under Annonaceae.)

Artocarpus lakoocha, Roxb.

Vern.—Tián, tiun dhae, daheo, Pn.; Dahu, dhow, barhol, lakáh, dhóó̄, HIND.; Loei, BOM.; DUK.; Volamba, MAR.; Vonte, KAN.; Dáho, KUMAO; Dephal, dahu, dëhaha, lakukha, mādär, BENG.; Dahu, SAN-
TAK, KOR.; Dewa, emma, chambuí, ASS.; Dewa, CACHAR; BARRÉ; NEPAL; Kamba vigu, lakukhamu nákha-ránu, TEL.; Lakuka, SANS.; Mwię kró, myanlkó or mi-anb-tok, BURM.; Caunagóna, etalera, Singh.

Habitat.—A large tree met with in the outer hills of Kumaon, Sikim, Eastern Bengal, Burma, and in the evergreen forests of the Western Ghâts and Ceylon.

Botanic Diagnosis.—Branchlets and undersides of the leaves with short, soft grey tomentum, not marked by the scars of the stipules as in A. integrifolia. Leaves coriaceous, oval or ovate-obtuse or shortly acuminate entire; blade 6-10 inches. Flower-heads globose, axillary, the male subsessile, the female shortly pedunculate. Fruit acid, of an irregular roundish shape, 3-4 inches in diameter, velvety yellow when ripe.

Caoutchouc.—A caoutchouc similar to that obtained from the preceding species is derived from this plant.

Dye.—The root yields a yellow dye. Wood used in dying cloth yellow. (Burm. Gaz., I., 138.)

Fibre.—A fibre is prepared from the bark; used for cordage.

Food.—It flowers in March, and produces a fruit which is eaten by the natives. The male spadix is used in curry and also pickled. Mr. Mann says the bark is chewed in Assam as a substitute for betel-nuts.

The fruit is eaten in curries in Kanâra (Bombay). (Bombay Gazetteer, Vol. XV., Pt. I., 62.)

Structure of the Wood.—Heartwood large, white, soft, perishable. Heartwood yellow, hard. It seasons well and takes a good polish. Weight 30 to 50 lbs. per cubic foot.

Used for furniture and canoes.

A. nobilis, Thw. Enum., Ceylon Pl., 262.

Vern.—Del, auadel, Singh.

Habitat.—A large tree of Ceylon.

Food.—The seeds are roasted and eaten by the Singhalese.

Structure of the Wood.—Heartwood shining, moderately hard; pores filled with a white substance, giving the wood an elegant mottled appearance.

Used for canoes and furniture.


A genus of herbaceous plants, with tuberous corms, often edible, belonging to the Natural Order Aroidae. The genus comprises some 20 species, inhab-

A. 1520
Aroids.

**ARUM**

*speciosum.*

naked, frequently stalked and cylindrical, rarely clavate. **Inflorescence** monochous, perianth none. Female flowers below forming a cylindrical mass, separate from the male by a tuft of hair like steller flowers, which blend above into the male condition. **Stamens** 3-4; **anthers** sessile, opposite or sub-opposite, obvoid, dehiscing by a slit towards the apex, connate more or less prolonged; **pollen** vermiform. **Ovary** obovate-obtuse, 1-locular; **styles** sessile; **ovules** 6 or many, orthotropous, erect; **funiculus** short; **placenta** parietal 2-3-seriate; **micropyrs** superior. **Fruit** an obvoid many-seeded berry.

The generic name is derived directly from ἀρος, Gr., aros, aro, Latin=the Cuckoo-pint. Some authors regard the Greek word, however, as derived from the Hebrew ὄρν, fire or flame, probably referring to the burning or acrid character of the plants, or to the scarlet head of fruits.

**Arum campanulatum, Roxb.**; Syn. for **Amorphophallus campanulatus, Bl.**

A. **Colocasia, Wilie.**; Syn. for **Colocasia antiquorum, Schott.,** which see.

A. **cucullatum, Lour.**; Syn. for **Alocasia cucullata, Schott.,** which see.

A. **curvatum, Roxb.**; Syn. for **Arisaema curvatum, Kunth,** which see.

A. **cupidatum, Roxb.**; Syn. for **Arisaema cupidatum, Engl.,** which see.

A. **divaricatum, Linn.;** Syn. for **Typhonium divaricatum, Dec.,** which see.

A. **flagelliforme, Lodd.;** Syn. for **Typhonium cupidatum, Dec.,** which see.

A. **fornicatum, Roxb.;** Syn. for **Alocasia fornicata, Schott.,** which see.

A. **gracile, Roxb.;** Syn. for **Typhonium gracile, Schott.,** which see.

A. **Griffithii, Schott.; N. E. Brown, Linnean Soc. Jour., XVIII., 297.**

**Habitat.**—Afghanistan. ([Griffith; Atchison, Kurram Mon Valley]

A. **indicum, Roxb.;** Syn. for **Alocasia indica, Schott.; Engler in DC. Phaner., II., 501.**

A. **lyratum, Roxb.;** Syn. for **Amorphophallus lyratus,** which see.

A. **margaretiferum, Roxb.; Dr. Dymock’s Mat. Med., West. Ind., 684.**

Syn. for **Plessonium margaretiferum, Schott.; Engler, DC. Mon. Phaner., p. 303,** which see.

A. **montana, Roxb.;** Syn. for **Alocasia montana, Schott.,** which see.

A. **nymphaeifolium, Roxb.;** Syn. for **Colocasia Antiquorum, Schott., var. nymphaeifolia, which see.**

A. **odorum, Roxb.;** Syn. for **Alocasia odora, C. Koch, which see.**

A. **orixense, Roxb.;** Syn. for **Typhonium trilobatum, Schott., which see.**

A. **rapiforme, Roxb.;** Syn. for **Alocasia rapiformis, Schott., which see.**

A. **sessiliflorum, Roxb.; N. E. Brown, Linnean Soc. Jour., XVIII., 29; Wight, Ic., t. 809; the lot of Dr. Dymock’s Materia Medica of India, a Syn. for **Saurornatum sessiliflorum, Kunth, which see.**


A. 1521
Arum silvaticum, Roxb.; Syn. for Synanthera silvatica, Schott., which see.

A. trilobatum, Willd., in Roxb.; Syn. for Typhonium divaricatum, DC.

A. tortuosum, Wall.; Stewart’s Ph. Pl., Syn. for Arisema tortuosum, Schott.; Engler, DC. Mono. Phaner., II., 545, which see.

A. viviparum, Roxb.; Syn. for Remusatia vivipara, Schott.


(Compare with Bamboo and also the definition given under Bambusea.)

Arundinaria falcata, Nees; Duthie’s List of Grasses, 46; Gramineae.

HIMALAYAN BAMBOO.

Vern.—Nigal, nigál, ringál, nagre, narri, gerri, gero, narkat, narquil, Hind.; Spigó, gurma, spíko, píko, Kanawar; Koei, Thibét; Prong., N.-W. P.; Titinigála, Nepal; Prongmók, Lepcha.

Habitat.—Met with from the Ravi to Bhután, above 4,500 feet in altitude in the western, but descending near to the plains in the eastern, Himalaya.

Fibre.—The leaves are used for roofing and baskets.

Structure of the Stems.—Six to 10 feet high, strong, annual; used for roofing and baskets.


Syn.—Thamnocalamus falconeri, H.f.

Vern.—Ringál.

Habitat.—Deoban to Simla (Brand.); Kumaon, 7,000 to 8,500 feet, (S. and W.) Nepal (Wall.); (Duthie’s List of Grasses, 46.)

A. Griffithiana, Munro.

Habitat.—Met with in the Khásia Hills.

Botanic Diagnosis.—Stems 4 to 6 feet high; internodes woolly, sometimes prickly.

A. Hookeriana, Munro.

Vern.—Prong, prong, Lepcha; Singhani, Nepal.

Habitat.—A bamboo, with stems 12 to 15 feet in height, common about Dimsong. Frequent in Sikkim at 4,000 to 7,000 feet in altitude. (Gamble.)

Food.—The seeds are edible.

A. intermedia, Munro.

Habitat.—Sikkim, from 7,000 to 8,000 feet; stem from about 6 to 8 feet.

A. khasiana, Munro.

Vern.—Namlang, Khasia.

Habitat.—Met with in Khásia Hills; stem from 8 to 12 feet.

A. racemosa, Munro.

Vern.—Pammoon, Lepcha; Pat-hico, maling, Nepal; Mooma, Bhutia.

Habitat.—A bamboo, 2 to 4 feet high, with blueish rough internodes, occurring in Sikkim and Nepal, above 6,000 feet.

A. 1532
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**Arundinaria spathiflora, Trin.**

*Syn. — Thamnocalamus spathiflorus, Munro; Brandis, For. Pl., 48.*

*Vern. — Ringál.*

Habitat — Hattú, near Simla, 8,400 feet; Deoban range, 8,000 feet (Brand.); Garhwal, 8,500 feet; Kumaon (Falc.), Nepal. *(Duthie's List of Grasses, p. 46.)*

**A. Wightiana, Nees.**

THE NILGIRI AND WESTERN GHÁT HILL BAMBOO.

*Vern. — Cherari, Bomb.; Dala & Gigs., Bomb. Pl., 209; Brandis, f.l.*

Timber — A most useful Bamboo, yielding the walking-sticks of Mahableshwar; young stems are also eaten.

**ARUNDO, Linn.; Gen. Pl., III., 1179.**

**Arundo Donax, Linn.; Graminée.**

*Syn. — Donax arundinaceus, Beauv.; A. Bengalenesis, Retz.*

*Vern. — Sána, Hoshiarpur.*

Habitat — Plains of the Panjáb and North-Western Provinces, also the lower Himalaya. *(Duthie's List of Grasses, 35.)*

**A. Epigejos, Linn.; Syn. for Calamagrostis Epigejos, Roth., which see.**

**A. Karka, Roxb.; Syn. for Phragmites Roxburghii, Kunth, which see.**

**A. madagascariensis, Kunth.**

*Syn. — Donax Thouarii, Beauv.*

Habitat — The Panjáb Himalaya, ascending to 8,000 feet in altitude.

**A. mauritanica, Desf.**

*Syn. — A. Pliniana, Torn.; A. Plinii, Vitéon; Phragmites gigantea, Gr.*

Habitat — North-West Himalaya.

**A. Phragmites, Linn.; Syn. for Phragmites communis, Trin., which see.**

**Asafetida, see Ferula Narthex, Boiss.; Umbellifere.**

**ASAGRAEA, Lindl.; (Reduced to Schonocaulon) Gen. Pl., III., 86.**

**Asagráe officinalis, Lindl.; Liliaceae.**

**CEVADILLA OR SADBILLA.**

*Syn. — This plant has received various names — Veratrum officinale, Helminia officinale, and Schonocaulum officinale; but as it is not an Indian plant, it has been thought the more convenient course to leave it for the present under Asagráe, its best known synonym.*

Habitat — A native of Mexico; imported into India.

**Medicine.**

Veratrum. **Seeds.**

1542

Chemical Composition — The active principle of sabadilla, is usually found in commerce as an amorphous, odourless, pale-grey

A. 1543
The Asarabica or Foalfoot.

**Asarum europaeum**

powder, often containing a large percentage of resin. The taste is highly acid and bitter, and when inhaled through the nostrils causes most painful and prolonged irritation. Veratrum has been shown to be capable of existing in two isomeric modifications, the one soluble and the other insoluble in water. The alkaloid has been obtained in a crystalline form. Two other alkaloids have been isolated from the seeds, namely, *subadilline* and *subadrine*. Two volatile crystalline acids, *subadilllic* and *veratic acids*, are also contained in the seeds. (Surgeon C. F. H. Warden, Calcutta.)

**ASARUM, Linn.; Gen. Pl., III., 122.**

A small genus belonging to the Natural Order Aristolochiaceae.

Leaves reniform. Flowers solitary, drooping bell-shaped 3-fld, appearing from between two opposite leaves. Stamens 12, inserted at the base of the style; anthers attached to the middle of the filaments. Stigma 6-lobed. Capsule 6-celled.

**Asarum europaeum, Linn.**

**Common Asarabica, Asarabacca, or Foalfoot, Eng.; Cabaret or Assaret, Fr.; Häselskrant, Ger. (Balfour).**

**Vern.**—Taggar, tagar, Hind.; Upana, Sans.; Asdrun, Arab.; Mutrikhunjayov (?), Tam.; Chepututaku (?), Tel.; Togara, Bom., Cutch.

**Habitat.**—Indigenous to temperate Europe and North Asia.

**History.**—This plant has been used in medicine from very ancient times.

Ainslie, in his *Materia Medica*, states: “The appellation *Asarin*, which has been given to this article by the Arabs and the Mahometan conquerors of India, *Moomina* informs us, was first bestowed on it by the Syrians, in whose country the plant at one time plentifully grew.” All parts of the plant are acrid, but those used in medicine are the roots and the leaves, chiefly the latter.

**Description.**—In the *U. S. Dispensatory* the root is described “as thick as a goose-quill, of a greyish colour, quadrangular, knotted and twisted, and sometimes furnished with radicles at each joint. It has a smell altogether analogous to that of pepper, an acrid taste, and affords a greyish powder.” The leaves are “kidney-shaped, entire, somewhat hairy, of a shining deep green colour when fresh, nearly inodorous, with a taste slightly aromatic, bitter, acrid, and nauseous. Their powder is yellowish green.”

**Chemistry.**—It is further stated that in an analysis made by Grager, the root was found to contain “a liquid volatile oil, two concrete volatile substances, called respectively *asarum camphor* or *asarone* and *asarite*, a peculiar bitter principle called *asarin*, tannin, extractive, resin, starch, gluten, albumen, lignin, citric acid, and various salts.” In the leaves he found asarin, tannin, extractive, chlorophyll, albumen, citric acid, and lignin.

**Medicine.**—Both the root and the leaves were formerly much used in Europe as a powerful emetic and cathartic, the dose being 30 grains to a drachm, but as an emetic they have now been entirely superseded by ipecacuanha. They are now used only as an erethic. “One or two grains of the powdered root, snuffed up the nostrils, produce much irritation and a copious flow of mucus for several days until the desired effect is produced. The leaves are milder and generally preferred. They should be used in the quantity of three or four grains repeated every night until the desired effect is experienced. They have been strongly recommended in headache, chronic ophthalmia, and rheumatic and paralytic affections of the face, mouth, and throat, and are in great repute in Russia as a remedy for deranged state of health consequent on habits
of intoxication.” (U. S. Dispens. 15th Ed., p. 1578.) It is, however, not much used in India. Ainslie found that the “Tamil physicians occasionally prescribed the root as a powerful evacuant; they also employ the bruised and moistened leaves as an external application round the eyes in certain cases of ophthalmia.” Irving, in his *Med. of Puts..., says: “The dry plant, imported from Persia, is used as a stimulant. Dose 5i.” According to O’Shaughnessy, “the dried plant is sold in the Indian bazaars under the name of *Aśvārāṇ. Royle* states, however, that a hill plant, called *Tugger*, is generally substituted for it.” This is most probably *Valeriana hardwickii*, for which *Aśvārāṇ* and *Tugger* are Hindi names.

§ “Tonic and antiperiodic, applied locally to indolent ulcers.” (Surgeon W. Barren, Bhuj, Cutch.)

### Asbestus or Asbestos.

**Vern.**—§ “Shankha paḷita, Mar. (literally wick made of shells).”

A fibrous mineral, now viewed as a variety of HOROBLENDE, allied to augite, tremolite, and clinolite, in which the proportion of alumina is less than usual. It contains a considerable quantity of magnesia, and is found in connection with serpentine. There are many varieties of asbestos, one in which the fibres are so long and flexible as to admit of being woven into cloth. This form is generally known as *Amianthinus*.

**Medicine.**—§ Found in the Gokā Taluka in the Belgum district in the Southern Maratha country, where it is used as an external application in ulcers, made into a paste, after rubbing it down with water, used especially in syphilitic ulcers. (Surgeon-Major C. T. Peters, South Afghanistan.) “Is obtainable in large quantities in the country to the south and west of the Kurum river, Afghanistan; used as medicine, and made into brooms and rough ropes, and padding for saddles.” (Surgeon-Major J. E. T. Aitchison, Simla.)

### ASCLEPIADEAE.

“Herbs or shrubs, usually twining. *Leaves* opposite or oblongate, very rarely alternate, quite entire, exstipulate. *Inflorescence* various, usually an axillary umbelliform cyme; flowers regular, hermaphrodite, 5-merous. *Calyx* inferior, lobes or segments imbricate, *Corolla* lobes or *segments* valvate or overlapping to the right, very rarely to the left; tube or throat often with a ring of hairs, scales, or processes (the outer or *corollia corona*). *Stamens* at the base of the corolla, filaments free in *Perigone*, with or without interposed glands; in other tribes, connate into a generally very short fleshy column, which usually bears a simple or compound ring or series of scales or processes (inner or *staminal corona*) that are attached to the filaments or to the back of the anthers, or to both; anthers crowning the column, connate or free, adnate by the connective to the stigma, *2-celled*; tip often produced into an inflexed membrane; pollen forming one or two granular or waxy masses in each cell, the masses united in pairs or fours to a gland (*compus*) which lies on the stigma. *Ovary* of two distinct superior carpels, enclosed within the staminal column; styles 2, short, uniting in the stigma, which is 5-angled, short, and included between the anthers, or is produced beyond them into a long or short simple or 2-fid column; ovules many, rarely few, 2-seriate in each carpel. *Fruit* of 2 follicles. *Seeds* compressed, usually flat ovoid, winged and surmounted with a dense long brush of hairs (coma) (absent in *Sarcobatus*); albums copious, dense; embryo large, cotyledons flat, radicle short, inferior. *Distrib.*—Species about 1,000, chiefly tropical.

“The analysis of the plants of this order is most difficult, and in dried...
Products of India.

The Asclepiadaceae.

specimens never satisfactory, from the fleshiness and complexity of the coronal processes and anthers. I have spent many months over the Indian ones, and have kept pretty close to the generic limits adopted in the Genera Plantarum. I have, however, been obliged to abandon the tribe Stapelium, to suppress Vincetoxicum, and to propose several new genera.

SUB-ORDER I.—PERIPOCÆÆ.

Filaments usually free; anthers acuminate or with a terminal appendage; pollen-masses granular, in pairs in each cell.

TRIBE I. Periopocææ.

Characters of the Sub-order.

• Coronal scales or processes 0.
Anthers with bearded appendages . . . 1. Pentanura.

•• Coronal scales corolline, free, short, thick.
Corolla very small, rotate, lobes valvate . . . 2. Hemidesmus.
Corolla small, rotate, lobes overlapping . . . 3. Cryptolepis.

••• Coronal scales 5, free, close to or adnate to the filaments.
† Coronal scales short, broad; filaments without interposed glands.
A pubescent twining shrub; leaves opposite . . 4. Brachylepis.
An erect tree; leaves alternate . . . . 5. Utelia.

†† Coronal scales filiform or subulate.
(a) Filaments free, without interposed glands.
Cymes stout, pubescent. Corolla-lobes short, broad . . . 6. Finlaysonia.
Cymes slender, glabrous. Corolla-lobes slender, straight . . . . 7. Atherostemon.

(b) Filaments free, with interposed teeth or glands.
Cymes short, sessile. Corolla-lobes short, ovate . . . 10. Streptocaulon.
Cymes loosely panicked. Corolla-lobes lanceolate . . . . 11. Myriopteron.

††† Coronal scales short, broad; filaments connate, with interposed glands.

•••• Coronal scales connate into a lobed ring; filaments without interposed glands.
Corolla rotate, lobes overlapping . . . 13. Periopoca.

SUB-ORDER II.—EUASCLEPIADEÆ.

Filaments connate; pollen-masses waxy.

TRIBE II. Secamoneæ.

Anthers with a membranous inflexed tip; pollen-masses in pairs in each cell (20 in all), sessile in fours (2 pairs) on the corpuscle.
Corolla rotate, lobes overlapping to the right . . 14. Secamone.
ASCLEPIADEAE.  An Analysis of the

Corolla rotate, lobes overlapping to the left  15. Toxocarpus

TRIBE III. Cynancheae.

Anthers with a membranous inflexed tip; pollen-masses solitary each cell (10 in all). Sessile or pedicilled in pairs on the corolla pendulous.
   * Corona single, corolline, 5-crested
   ** Corona double, corolline and staminal
   *** Corona staminal, of 5 processes adnate to the anthers, or 0.

† Stem erect.

Corolla valvate. Coronal processes laterally compressed
Corolla valvate. Coronal processes spathulate
Corolla lobes overlapping. Coronal processes short, fleshy
†† Stem twining. Corolla-lobes overlapping.
Corolla campanulate. Coronal processes ligulate
Corolla rotate. Coronal processes laterally compressed
Corolla funnell-shaped. Coronal processes laterally compressed
Corolla campanulate. Coronal processes O
   ++++ Corona single, staminal, cupular or annular. Corolla rotate
Corona of a 10-lobed ring, and 5 horny processes behind the anthers
Corona annular. Leafe erect or twining herbs or shrubs
Corona annular. Leafless, straggling shrubs

TRIBE IV. Marsdeniaceae.

Anthers with a membranous inflexed tip (absent in Physostelma, rarely in Hyoscyamus). pollen-masses solitary in each cell (10 in sessile, or pedicilled in pairs on the corolla, erect (rarely loculicid) or pendulous in Tylophora).

   * Corolla-lobes overlapping. Corona O, or corolline.
   Stem twining. Corolla-lobes short. Corona O
   Stem pendulous. Corolla-lobes long. Stigma included
   Stem twining. Corolla-lobes short. Corona on the corolla-tube
   ** Corolla-lobes overlapping. Coronal processes on the staminal column, rarely O.

† Corolla urceolate campanulate or salver-shaped.

Corolla urceolate. Coronal processes minute or O. Stigma included
Corolla urceolate or salver-shaped. Coronal scales on the back of the anthers, simple
Corolla rotate or salver-shaped. Coronal scales on the back of the anthers, notched
Corolla salver-shaped, coriaceous. Coronal scales O (in Indian species)
Corolla-lobes long, doubled down inwards in bud

A. 1555
**Corolla rotate.**

Cymes various. Column minute. Coronal processes fleshy

| 36. Tylophora. |

Cymes umbelliform. Column large; coronal processes simple

| 37. Treutlera. |

Cymes racemiform. Column minute, fleshy; coronal processes 2-fid

| 38. Cosmostigma. |

Cymes umbelliform, pendulous. Coronal scales spreading, cuspidate

| 39. Dregea. |

*** Corolla valvate. Coronal processes adnate to the staminal column.

Corolla small, rotate. Column short, corona stellate. Follicles slender

| 40. Heterostemma. |

Corolla large, rotate. Column short, corona stellate. Follicles stout

| 41. Dittoceras. |

Corolla urceolate or disciform. Corona cupular, fleshy

| 42. Oianthus. |

Corolla minute, urceolate. Coronal scales membranous, erect

| 43. Dischidia. |

Corolla rotate. Corona very large, stellate

| 44. Hoya. |

Corolla cupular. Corona large, stellate

| 45. Physostelma. |

Corolla-tube short, lobes long subulate. Ovary sunk in the calyx-tube

| 46. Pycnorhachis. |

**Tribe V. Ceropegia.**

Anthers incumbent on the stigma, without a membranous tip; pollen-masses one in each cell (10 in all) sessile in pairs on the corpuscle, erect or horizontal. Corolla-lobes valvate in all.

Corona double; corolline lining the corolla-tube and forming minute processes in the sinus of its lobes, staminal annular.

Calyx turbinated, 5-lobed. Corolla rotate

| 47. Leptadenia. |

Calyx 5-partite. Corolla salver-shaped

| 48. Orthanthera. |

** Coronaria staminal, simple or compound, annular 5-to 10 lobed, with 5 processes from its inner face which overlap the anthers.

† Leafy herbs with terete stems and branches.

Corolla rotate, lobes very narrow. Stem very slender, erect or twining

| 49. Brachystelma. |

Corolla-tube long. Stem stout or slender, erect or twining

| 50. Ceropegia. |

Corolla rotate, stem erect and branches short, stout, fleshy

| 51. Frerea. |

† Leafless herbs, with fleshy 4-angled stems and branches.

Corolla rotate, lobes very narrow. Flowers lateral, sub-solitary

| 52. Caralluma. |

Corolla rotate, lobes very broad. Flowers terminal, umbelled

| 53. Boucerosia. |

Genus known by name only. Odonanthera, Wight in Lindl. Veg. Kingd., 626." (Flora of British India, IV., pp. 1-4.)

Distribution of the Indian Species.—There are a little over 1,000 species belonging to this order, known in the whole world, and they are mostly confined to tropical regions: 245 species are described in the Flora of British India. Of these a few are introduced and cultivated in the plains, and one or two are doubtful species. Excluding these,

A. 1556
we have 236. Dividing India into four sections, the following indicates distributions of the Indian species:—

I.—North India.—The Panjáb, Sind, and the North-West provinces, and the corresponding frontier mountainous tracts, in a species, or 76% per cent.

These may be still further classified:—

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<td>Ditto from 5,000 to 10,000 feet</td>
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Of this number, 7 are distributed into Afghánistan or Persia, not met with in Afghánistan, finds its way, however, into Spain.

II.—West India.—Bombay and the greater part of Central India, and of the Central Provinces:—

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This is about 14.83% per cent.

III.—East India.—Bengal, Assam, Burma, and Maláxá:—

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<td>Ascending to from 2,000 to 5,000 feet</td>
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<td>Ditto from 5,000 to 10,000 feet</td>
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This is about 50% per cent.

IV.—South India.—Madras, Hyderabad, Mysore, and Ceylon:—

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<td>Ascending to from 2,000 to 5,000 feet</td>
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<td>Ditto from 5,000 to 10,000 feet</td>
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This is about 17.8% per cent.

To these must be added a few species which are not referred to either of the above, but which occur in two or more of the provinces,—in other words, occur throughout India:—

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<td>Ditto from 5,000 to 10,000 feet</td>
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<td>And ascending 9,000 to 12,000 feet</td>
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This gives about 97.4% per cent.; but none of this last class find their way into the Afghán-Panjáb frontier, nor are distributed into Afghánistán.

We thus learn from the analysis of the Indian Asclépiadæ that they attain their maximum in the tropical plains of Bengal and Burma (97.4%), that Madras stands next in importance (17.8% per cent.), then come the plains (14.83% per cent.), and last of all the Panjáb (76% per cent.), the arid tracts of the Indian division of Asia which most resemble Afghánistán containing fewest species. Viewing the Asclépiadæ collectively, we have the following results: tropical, 62.7% per cent.; extra-tropical, 25.43% per cent.; and temperate, 11.9% per cent.

A. 1556
The Asparagus.

ASCLEPIAS, Linn.; Gen. Pl., II., 754.

According to some authors the Soma plant of the Sanskrit authors is a species of Asclepias (see under Sarcostemma and also in Max Müller's History of Sanskrit Literature).

Asclepias acida, Roxb.; Syn. for Sarcostemma brevistigma, Wight & Arn., which see.

A. asthmatica, Wild.; Syn. for Tylophora asthmatica, Wight & Arn., which see.

A. curassavica, Linn.; Asclepiadeæ.

CURASSAVIAN SWALLOW-WORT OR WEST INDIA IpéCAUANHA.

Vern.—Káktundī, Pn.; Kurakí, kıkutundī, BomB.

Habitat.—Indigenous in the West Indies, but quite naturalised in India. Found as a weed in Bengal and various parts of India.

Medicine.—The root of this plant possesses emetic properties, and hence the West Indian colonists gave to it the name of Bastard or Wild Ipécauana. The expressed juice of the leaves acts successfully as an anthelmintic. It also sudorific. The juice of the flowers is said to be a good styptic.

In Jamaica it is called "blood flower" owing to its efficacy in dysentery. The root is regarded as purgative, and subsequently astringent. It is also a remedy in piles and gonorrhoea. (Ainslie: Baden Powell, Panjáb Products, I., 191.)

According to the U. S. Dispensatory, the root and expressed juice are emetic and also cathartic. The juice has been strongly recommended as anthelmintic, and according to Dr. W. Hamilton, it is useful in arresting haemorrhages and in obstinate gonorrhoea. The medicine is, however, somewhat uncertain in its operation. (U. S. Dispensatory, 15th Ed., p. 1579.)

A. gigantea, Roxb.; Syn. for Calotropis gigantea, R. Br., which see.

A. laurifolia, Roxb.; Syn. for Genianthus laurifolia, Hook. f., which see.

A. pseudosarsa, Roxb.; Syn. for Hemidesmus indicus, Br., which see.

A. rosea, Roxb.; Syn. for Brystelma esculentum, Br., which see.

A. tenacissima, Roxb.; Syn. for Marsdenia tenacissima, Wight & Arn.

A. tinctoria, Roxb.; Syn. for Marsdenia tinctoria, Br., which see.

A. tingens, Buch.; Syn. for Gymnema tingens, Wight & Arn., which see.

A. tunicata, Wild.; Syn. for Cynanchum pauciflorum, Br., which see.

A. volubilis, Linn. f.; (Wild. in Roxburgh); Syn. for Dregca volubilis.

Ash, The, see Fraxinus floribunda, Wall.; Oleaceæ.


Asparagus ascendentis, Roxb.; Liliaceæ.

Syn.—A. satavara.

Vern.—Sufed-mušli or sufed-mušli, satáwar, Hind.; Khairuwa, N.-W. P.; Shaqqulé-hindú, Anb., Pers. and Duk.; Sápeta mušli, dholí mušli.

A. 1562
### Asparagus officinalis

**The Asparagus.**

- **Bomb.** Dhali musali, saphed-musali, sittimusali, Guj. Safidah musali, Mar.

This is the true Safid musli of commerce. Dr. Mooden Sheriff first drew careful attention to the fact that various species of Asparagus, especially A. sarmentosus, were known as safid musli, but that only the roots of A. ascendens should be regarded as the true article. Dr. Dymock and other more recent authors have confirmed this opinion. (See A. sarmentosus.)

**Habitat.** Found in Rohilkhand and other parts of India.

**Description.**—In South India safed musli is the torn and dried roots of A. sarmentosus. These pieces are, however, quite unlike the shirred and decorticat tubers of the true plant. The tubers are about 2 to 3\(\frac{1}{2}\) inches long by \(\frac{1}{4}\) inch in diameter. They are of an ivory-white color, often twisted, hairy, and brittle. When soaked in water they swell up and become spindle-shaped (Dymock).

**Medicine.**—The tuberous roots of this species are used as a demulcent and tonic and as a substitute for Salep; and, indeed, by some authors they are regarded as superior to Salep.

Its Safed musli has an agreeable mucilaginous taste; it contains no starch. I have used it largely as an article of diet; it is far nicer than salep, and is generally relished by Europeans. To prepare it, take 200 grains of the powder, 200 grains of sugar, pour upon them slowly a large tea-cupful of boiling milk, stirring constantly all the time. Bombay is supplied with safed musli from Rutlam in Gujarát." (Dymock, Mat. Med., West. Ind., 665.)

§ “Tonic, demulcent; substitute for salep misree.” (Surgeon W. Barren, Bhuj, Cutch.)

“Said to be useful in diarrhoea, dysentery, and general debility.” (Surgeon Joseph Parker, M.D., Poona.)

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### Asparagus filicinus, Ham.

**Vern.**—Alii pilii, saunsapour, sensar pali, satsera, Pr.

**Habitat.**—Occurs frequently in the Panjab Himalaya from 3,000 to 8,500 feet.

**Medicine.**—The root is considered tonic and astringent. In Kanwir a sprig of this is put in the hands of small-pox patients as a curative measure. (Stewart.)

### A. officinalis, Wild.

**The Asparagus.**

- **Vern.**—Nig-doun, halwán, Hind.; Hillás, Beng.; Halpën, mar-gháb, márgyák, Pers.; Halpën, khasuíli-khyak, asbá-ḡát, Arab.

§ “Halwán, Pers. The fruit is imported from Persia.” (Surgeon-Major W. Dymock, Bombay.)

**Habitat.**—There are several wild Indian species used by the hill-people of Eastern India. Indian species have climbing or trailing stems, often spinoze. The cultivated asparagus of Europe is a native of several parts of Great Britain near the sea. It is also very plentiful in the southern parts of Russia and Poland. It is frequent in Greece, and was formerly much esteemed as a vegetable by the Greeks and Romans. It appears to have been cultivated in the time of Cato the elder, 200 B.C., and Pliny mentions a form which grew in his time, of which three heads would weigh a pound. (Treasury of Botany.)

**Medicine.**—According to Dr. Honigerger, the berries are used by the hakims in debility of the stomach, also in liver, spleen, and renal disorders. They consider them to be diuretic; tonic and aphrodisiac.

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**A. 1568**
The Asparagus.

**Asparagus racemosus.**

**Properties** are also ascribed to them. Dr. Irvine, in his *Materia Medica of India* (p. 50), says that the leaves, berries, and roots are used as demulcent and diuretic in native practice.

The *U. S. Dispensatory* says: "The root, which is inodorous, and of a weak, sweetish taste, was formerly used as a diuretic agent and astringent to the blood; and it is stated to be still employed to a considerable extent in France. It is given in the form of decoction, and made in the proportion of one or two ounces of the root to a quart of water." Considerable difference of opinion prevails, however, many authors considering that in the dried state at least the roots are wholly inert. "In the berries, H. Reinsch has found a large proportion of glucose and a yellowish-red colouring matter, Spargin." "The sprouts themselves are not without effect, as the urine acquires a disagreeable odour very soon after they have been eaten. They have been accused of producing irritation with a morbid flow of mucus of the urinary passages."

**Chemical Composition.** - "Asparagus was originally discovered in the rice of *A. officinalis*, but it has since been shown to exist ready formed in the juice of a large number of plants. It is especially abundant in the stem of shoots developed in germination of leguminous seeds, and is found in all plants. (Graham.) Asparagine forms some marked crystals, which are nearly tasteless, but which possess diuretic properties, and impart a peculiar odour to the urine. (Pharmacographia, p. 93.) By the action of acids or alkalis asparagus is converted into asparagine, acid, and also by the action of hydrating agents as albuminoid substances of animal and vegetable origin. It is contained in somewhat considerable quantity in best sugar molasses. (Graham.)" (Surgeon C. J. H. Warden, *prof. of Chemistry, Calcutta.*)

**Food.** - The blanched lower stems of this species are extensively eaten as a vegetable all over the world, and to a small extent in India, though they cannot be cultivated so successfully as in Europe. Indeed, the asparagus, chiefly seen at the Indian dinner table, is imported in tons from Europe and America. One of the chief recommendations to Indian towns for asparagus is that it is in season when all other vegetables are out of season. Fleming recommends that the seed be sown in August under shelter from the weather. At the close of the rains the seedlings should be about 10 inches high; they should then be planted in holes a foot wide and two or more deep, and well watered and kept constantly moist and gradually earthed up until the end of April or the beginning of May, when they will flower. The flowers should be carefully cut off, and the foliage should not be interfered with. When the rains set in they will require no further care, and in the following March may be forced on the table. This is done by removing the earth carefully and covering the roots with manure.

**Asparagus (punjabensis, in Stewart’s Panjáb Plants).**

**Vern.** - *Sasan pál, chutí, kuchán, sannáli, Pe.*

**Habitat.** - This plant is said to be common in parts of the plains of the Panjáb, east to the Sutlej; as well as in the Salt-Range, and on the Sutlej 1,500 feet.

**Medicine.** - A sprig of this plant or of *A. ficifolius*, according to Stewart, put in the hands of small-pox patients as a curative measure. The ayes are official at Lahore.


**Vern.** - *Salamúli, Sans.; Bení; Satyawar, sháhíčí, Hind.; Satýwar, bozandán, húllán, Pe.; Shá nodeñi-e-mir, Dur.; Satývarti, Guj.*

A. 1575

**Roots.** 1569

**Sprouts.** 1570

**Food.** 1572

**Medicine.** 1574

**1575**
Asphodelus fistulosus

**Medicine.**

1576


**Habitat.**—A climber, found all over India.

**Medicine.**—The root of this plant is used medicinally as a refrigerant, demulcent, diuretic, aphrodisiac, antispasmodic, alterative, anti-dermatitic and antisynergic. It is used chiefly as a demulcent in veterinary medicine. Baden Powell says that it prevents confluence of small-pox. It is used in impotence in the form of a preserve.

According to Dr. Irvine the root is used by native physicians as a stimulant and restorative. (Mat. Med., Patna, p. 94.)

§ “Not found of any use as a refrigerant.” (Surgeon G. J. W. Meadows, Burrittall.)

1577

Asparagus sarmentosus, Willd.

**Syn.**—Asparagus sarmentosus, Kunth; Dymock, Mál. Med., W. Ind., 685.


This is erroneously called Sáféd mássi in some parts of India.

§ “This plant Zatar, Mar., does not produce sáféd mássi, but the roots fresh and candied are used medicinally under the name of sátáwári. The dry sáféd mássi of the bazaar is quite a different article, probably from Asparagus ascendens.” (Surgeon-Surgeon W. Dymock, Bombay.) “The native names of the fresh roots of A. racemosus and of A. sarmentosus are in Madras almost the same.” (Honorary Surgeon Moodten Sheriff, Khan Bahadur, Tríplicane.)

**Habitat.**—A climber, found in Upper India; common in the Korkam and the Deccan.

**Medicine.**—The root is simply mucilaginous, but is considered nourishing and aphrodisiac. Boiled with oil, it is applied to cutaneous diseases.

The roots of this plant are said to be used to adulterate or as substitutes for Aconitum heterophyllum, and in that case sold under the name of Atilis (Aconitum heterophyllum).

§ “The root juice boiled with ghee is given to children in debility and emaciation as a cooling and nourishing medicine.” (Native Surgeon Ruthnam Moodstiliar, Chingleput, Madras.)

“Direction, 15 grains per dose in gonorrhoea.” (Assistant Surgeon Nehal Sing, Saharanpore.)

A. satawar (Murray’s Drugs of Sind), see A. ascendens, Roxb.

1579

**Asphodelus fistulosus, Linn.; Gen. Pl., III., 782.**

**Asphodelus fistulosus, Linn.; Wight, It., t. 2062; Liliaceae.**

**Vern.**—Píndí, bokáti, bokáti, binghar bij (seed), Pá.

**Habitat.**—Abundant as a field weed in most parts of the plains of the Panjáb, so much so near Jhelum as to be troublesome to the cultivator. (Aitchison.)

**Medicine.**—The seed is officinal at Lahore. It is also said to be diuretic.

**Food.**—It is eaten as a vegetable in times of scarcity.

1581

A. 1581
Products of India.

The Astragalus.  ASTRAGALUS

Aspidium Filix-mas, Swz., see Nephrodium Filix-mas, Richard, Filians.

ASPLENIUM, Linn.; Hook.,” Syn. Filiz., 244.

Asplenium (Anisogonium) esculentum, Pr.

Vern.—Miwana-kola. Singh.

Habitat.—A common fern from the Himalaya to Ceylon, &c.

Food.—Dr. Trimen writes me that in Ceylon this is a well-known vegetable and curry-stuff, largely used by the natives.

Asteracantha longifolia, Nees; see Hygrophilla spinosa, T. And.; Acanthaceae.


A genus of herbs or under-shrubs belonging to the Sub-order Papilionaceae, of the Natural Order Leguminosae, and in the Tribe Galegeae. There are in the world, as estimated by Bunge, 1,200 species. They belt the world in the north temperate zone, the head-quarters being in Western and Central Asia. India possesses 70 species.

The generic name is derived from Lat. Astragalus, and Gr. ἀστράγαλος, the ball of the ankle-joint, in allusion to the knotted and knotted nature of the procumbent stems of many species. They are in English generally known as the milk vetches.


Habitat.—An annual, growing in Beluchistan, Sind, and the Panjāb.

§ “Ākhīl-ul-malik is imported into Bombay from Persia.” (Surgeon-Major W. Dymock, Bombay.)

Botanic Diagnosis.—Heads peduncled, dense; leaflets 13-25, oblong emarginate, pod long, cylindrical, glabrous, much recurved, nearly bilocular, and 16- to 18-seeded. (Fl. Br. Ind., II., 122.)

Dye.—T. N. Mukarji, in his Amsterdam Exhibition Descriptive Catalogue, says: “By dyers and calico-printers it is employed as an adjunct to dyeing substances, for producing a glaze on the coloured stuffs.”

This might be said of any member of the genus which yields gum tragacanth, but it would be interesting to have this record of actual use confirmed by specimens of the gum, and of the plant from which it was obtained. Gum tragacanth is imported into India.

Medicine.—It has emollient and demulcent properties, and is useful in the irritation of the mucous membranes. The pods are officinal, and are ground to be mixed with plasters.

§ “Is laxative and used in nervous affections; made into a paste with vinegar, it is employed externally in headaches. It is said to be lactagogue, and to be used in catarrhal affections.” (Surgeon G. A. Emerson, Calcutta.)

A. multiceps, Wall.; Fl. Br. Ind., II., 134.

Vern.—Kandīdara, kandī, kālar-banda, pīsar, sarmāl, Ps.; Tinani, dīk-dani, Afg.

Habitat.—Found in the West Himalaya, altitude 10,000 to 12,000 feet; Simla, Kumaon, and Garhwal.

A. 1588
### ASTRAGALUS

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<th>Tragacanth.</th>
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**Botanic Diagnosis.**—Main stems not produced; branchlets with densely crowded nodes, flowers 1-2 together in the leaf-axils, usually not peduncled; corolla twice as long as the calyx. *(Fr. Br. Ind.)*

**Food.**—At times browsed by cattle. The calyces, which have a sweetish, pleasant taste, are said to be eaten in the Salt-range by the natives.

### MEDICINE.

<table>
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**Astragalus, ? sp.**

**Gum.**—A gum is exported from Persia into Bombay which Dr. Dymock regards as the true Sarcocolla of the ancients, and there would seem much to favour this idea. The gum is known as *ansarati*, A. *kunfjidak, Pers.; angira, Hind.; gujar, Bomb.* Meer Mahamud Husain, in his *Makhsun-ul-Adviya*, describes the plant which yields this gum as a small thorny shrub known as *shayakah*, a native of Persia and Turkistan.

**Medicine.**—For some time Sarcocolla was supposed to be obtained from *Peneis* (Sarcocolla) *micranthes*, a native of the Cape of Good Hope. It is known to come from Persia, and it cannot therefore be obtained from a species of *Peneis* (the so-called Sarcocolla plants) which are found in the south of Africa. Mr. Baden Powell mentions *Peneis* in his *Punjab Products*, but, as pointed out by Dr. Dymock, the gum is entirely imported into India, coming from the Persian Gulf. The medicinal virtues of Sarcocolla have long been much admired by the natives of India, made either into a tincture and plaster, or into a medicated oil. It is one of the chief ingredients of the Parsi bone-setter's plaster (*lapi*). The gum is described as aperient, and a resolvent of corrupt and phlegmatic humours, acting best when combined with myrrh or Sagapenum. It is also supposed to be fattening, and is therefore eaten by the Egyptian women. This exceedingly useful gum, which is widely consumed in the East, does not seem to have attracted the attention of Europe to the extent which it deserves.

Dr. Irvine says that Sarcocolla is supposed to heal wounds rapidly.

He gives the price at Rs. 1-4 a lb.

§ "This gum, combined with bdellium, is commonly used as a local application for rheumatism and neuralgic pains." *(Surgeon J. R. R. Ahmedabad.)*

### MEDICINE.

| 1594 |

**Astragalus, sp.**

The roots of a species of Astragalus are in Thibet made into a strong paper. *(Sir J. D. Hooker's *Him. Journ.*, II., 162.)*

| 1595 |

**A. tribuloides, Deville; Fl. Br. Ind., II., 122.**

**Vern.**—Ogisi, Pun.

**Habitat.**—Grows in the western and central parts of the Punjab plains. Distributed through Afghanistan to Egypt.

**Botanic Diagnosis.**—Heads dense sessile; leaflets 13-15 oblong-lanceolate acute; pod short linear-oblong, densely pubescent, little recurved, 10-12 seeded, sub-bilocular.

**Medicine.**—The seeds are used medicinally.

### MEDICINE.

| 1596 |

**A. viris, Oliver.**

**The Tragacanth.** *(See Bassora Gum.)*

**Gum.**—Flückiger and Hanbury, in the *Pharmacographia*, describe 10 species of Astragalus as yielding the tragacanth of commerce, none of which are known in commerce. *(Surgeon J. R. R. Ahmedabad.)*

| 1597 |
which are met with in India. The above species is enumerated as one of
the 10. (For further particulars see Tragacanth.)

Medicine.—The gum is officinal, being emollient and demulcent, useful
in irritation of the mucous membranes, but especially of the pulmona-
y and genito-urinary organs. Imported into India and sold by
druggists.

§ "Tragacanth" or "Katilla" kateré is a valuable medicine in gonori-
losis. Its emollient and demulcent properties suggest its use in all cases of
irritation of mucous membranes. "During the hot season it is given to
horses for its demulcent and refrigerant qualities." (Surgeon R. L. Dutt,
M.D., Pubna.)

ATALANTIA, Correa; Gen. Pl., I, 305.

atalantia missionis, Olivi; Fl. Br. Ind., I, 513; Rutaceae.

Syn.—Limonia Missionis, Wall.

Vern.—Pambéri, Singh.

Habitat.—A small tree in the hotter parts of South India and Ceylon.

Structure of the Wood.—Wood yellowish white, sometimes variegated,
moderately hard, close-grained. Annual rings marked by a white line
and a belt of more numerous pores. Weight 48 lbs. per cubic foot.

Used for furniture and cabinet-work.


THE WILD LIME.

Vern.—Mokod-limbu, mokod-limbu, Mar.; Naruni, Uribaj; Adavi-
nimma, Tel.; Kattu-emitcham-param, katuru (?), Tam.; Kan-
nimbé, adavi-nimbé, Kan.; Atavi-jambira, Sans.; Mal-nibargá, Mal.;
Jangi-nimbù, Duk.; Medangnar, S. Konkan.

Habitat.—A large shrub or small tree of East Bengal, South India, and
Ceylon.

Medicine.—Ainslie says that the berries of this thorny plant yield a
warm oil, which is, in native medicine, considered as a valuable applica-
tion in chronic rheumatism.

Structure of the Wood.—Wood yellow, very hard and close-grained.
Weight 65 lbs. per cubic foot. Numerous white concentric lines at vary-
ing distances.

The Bombay Gazetteer (Vol. XV., Pt. I., 62) says the wood of this plant
is "close-grained and heavy, but is not generally used."

Recommended by Kurz as a substitute for box-wood.

atis, The, see Aconitum heterophyllum, Wall.; Ranunculaceae.


"A genus of Chenopodiaceae, with the foliage covered with a granular
mealliness. The Arachis are chiefly distinguished by the two bracts of small
leaves, enclosing the fruit, and enlarging after flowering; they are frequently
dotted with large coloured warts, which give them a peculiar appearance.
The genus possesses several species, which are very variable in form, according
to soil and situation." (Treasury of Botany.)

The generic name is derived from ἀραχῆ, from, and τρέψω, to nourish.
A genus of important fodder plants frequenting desert tracts near salt-
marshes and on the sea-coast.

tripllex halimoides, Lindley; Syn. for A. Lindleyi, Moq.; DC.
Prod., XIII., 2, 100.

"Over the greater part of the saline desert interior of Australia,
reaching the south and west coasts. A dwarf bush, with its frequent companion A. holocarpum, among the very best for salt-bush pasture. (Baron F. von Mueller, Select Extra-Tropical Plants, p. 39.)


GARDEN ORACHE, THE MOUNTAIN SPINACH, Eng.; AEROCH, Fr.

(FOR GARDEN SPINACH see Spinacia oleracea.)

Vern.—Korake, suraka, Pn.

Habitat.—These two species inhabit the Western Himalaya in the temperate zone, also sub-montane tracts in the Panjab, and in Afghanistan.

Food.—The former is said to be a favourite vegetable on the Peshawar valley. Is this the mallulach or "mallows" of Job, xxx, 4? "Who cut up (mallulach) mallows by the bushes and juniper roots for their meat." The garden orache is an erect-growing, hardy annual, with large hastate leaves, much cultivated in France for its large and succulent leaves, which are used as a spinach. It is, however, far inferior to the true spinach; there are several varieties, differing chiefly in the colour of the leaves and stems. The seeds are said to be unwholesome, exciting vomiting. (Lindley's Vegetable Kingdom.)

A. nummularia, Lindley; DC. Prod., XIII, P. II., 460.

Habitat.—"From Queensland through the desert tracts to Victoria and South Australia."

Fodder.—"One of the tallest and most fattening and wholesome Australian pastoral salt-bushes, also highly recommendable for artificial rearing, as the spontaneously growing plants, by close occupation of the sheep and cattle runs, have largely disappeared, and as this useful bush even in many wide tracts of Australia does not exist. Sheep and cattle depastured on salt-bush country are said to remain free of fluke and get cured of this distemper disease and of other allied ailments." (Baron F. von Mueller, Select Extra-Tropical Plants, p. 40.)

The following account of the experiments connected with the efforts which are being made to introduce this most valuable plant into India will be found interesting:—

"The small plantation which was made last season continues to thrive. The plants are now from four to six feet high. They are remarkably healthy, and nearly all of them are in flower."

"The genus Atriplex differs from that of Chenopodium in having the flowers unisexual, and in some species of Atriplex the flowers are not only unisexual but dioecious, i.e., some plants bear male flowers only and others only female ones. The salt-bush is described in the Flora of Australia, Vol. V. p. 170, as dioecious. A few of the plants in this garden, however, are distinctly monocious, clusters of the broad fruited bracts being rapidly developed beneath the terminal racemes of the withered male flowers. This is so far favourable for supplying a more bountiful supply of seed for distribution from our own plants. I have been daily expecting to receive a large supply from Australia."

"Up to date 408 plants have been distributed, and about 60 are left in stock."

"Inquiries have been made regarding the condition of plants dispatched from this garden to different places in India. Those sent to the Cawnpore Farm all died about two months after they were planted. Of the 50 plants sent to Mr. Ridley at Lucknow, only two survived; these latter, he tells me, were planted out last November, and are now healthy."

A. 1610
Deadly Nightshade.

Mr. W. Impay, G.S., Tier from Cawnpore in March last, says: 'The Atriplex nummularia of last year are thriving very well. Some of the bushes are 3 to 4 high, and I have taken many cuttings from them.' Fifty plants sent to Bara Banki. The President of the Local Committee informs us that were planted in poor soil, where other trees or cultivation hitherto failed. A few have died, and the remainder, though they have considerable growth, are not thriving on the poorer soils as the plant was represented to be likely to do. Mr. Dowie, the Settlement Officer arnold, reports favourably on the plants sent to him on 31st December.

The salt-bush, being essentially a desert plant, should not be perma-

naty transplanted until after the rainy season is over; this injunction is more particularly to those parts of North-West India where the

continue for any length of time. As soon as the plants have had suffi-
time to establish themselves, no amount of rain is likely to injure them.

seed is sown in pots during the hot season, the seedling will be

for transplanting in September or October.' (Report on Botanicals, Saharanpur and Mussoorie, 1883-84, p. 8.)

ex spongiosum, F. v. Mueller.

through a great part of Central Australia, extending to the west.

Available, like the preceding and several other native species, salt-bush culture. Unquestionably some of the shrubby extra-Austra-
apodes, particularly those of the Siberian and Californian steppes,
also be transferred advantageously to salt-bush country elsewhere.
crease its value, particularly for sheep pasture.' (Baron F. von Mu-
ller, Select Extra-Tropical Plants, p. 40.)

sicariuam, Howard.

in the interior of South-Eastern Australia, and also in Central
Asia. Perhaps the most fattening and most relished of all the dwarf-
salt-bushes of Australia, holding out in the utmost extremes of
heat, and not scorched even by sirocco-like blazes. Its vast abundance
extensive salt-bush plains of the Australian interior, to the exclusion
most every other bush except A. halimoides, indicates the facility
which this species disseminates itself.' (Baron F. von Mueller,
Extra-Tropical Plants, p. 40.)


A genus of SOLANACEAE, containing only one species, a native of the Western
hill, from Simla to Kashmir, altitude 6,000 to 12,000 feet, and distri-
cted to Europe and North Persia. A coarse, lurid, glabrous herb. Leaves entire, elliptic-lanceolate. Pedicels hairy, solitary, nodding. Flowers somewhat large, dirty purple or lurid

Calyx large, deeply 5-lobed, scarcely larger in fruit. Corolla widely

lobes 5, triangular, imbricate in bud; stamina attached the base of the corolla, filaments linear; anthers oblong, dehiscing longitudi-

ly. Ovary 2 celled; style linear, stigma obscurely 2-lobed. Berry globose.

many, compressed; embryo peripherically. (Fl. Br. Ind., IV., 241.)

he generic name ἀργον, one of the three Fates—the goddess used to determine the life of man by spinning a thread; the name given to this plant in allusion to its poisonous property. It is the
shade or Dwale of English writers.


DEADLY NIGHTSHADE.

A. 1614

A. 1614

1011

1012

1013

1014
**ATROPA**

*Belladonna.*

**Deadly Nightshade.**

"Ustrung, Arab.; Merdum zevah (?), Pers.; Yebrui, Beng.; Lucknow, lucknumee, Hind. These names are of very doubtful correctness, but are given on Ainslie's authority." (O'Learynnessy.)

§ "Giribiti.—I never heard this name, nor have I seen the drug here." (Dr. W. Dymock.)

**Habitat.**—Simla to Kashmir, 6,000 to 12,000 feet; found wild in Kanawar at 8,000 feet.

Dr. Aitchison writes me that the var. lutescens, Fag., "is a much more common plant from Kanawar to Afghanistan," having the same properties as the type form of the species.

**Botanic Diagnosis.**—The leaves of the Indian plant are a little more acuminate in the Himalayan than in the European plant. This is probably what has given origin to A. lutescens, Fag. Matthiolus calls this plant *Solanum majus*, and tells us that the Venetian ladies used water distilled from the plant as a cosmetic, hence the name *herba Belladonna*.

**Medicine.**—The official parts of this plant are its leaves and the dried root. They are powerfully sedative, anodyne, and antispasmodic. As an antispasmodic, it is a valuable medicine in the advanced stages of hooping-cough, spasmodic asthma, laryngismus stridulus, chorea, epilepsy, and spasmodic stricture of the urethra; as a sedative and anodyne, in various forms of neuralgia, rheumatism, tetanus, hydrophobia, delirium tremens, dysmenorrhcea, and other painful uterine affections, cancerous and other painful ulcerations; in cataract and other eye affections, in which it is desirable to dilate the pupil or to keep the edge of the iris free; it is invaluable in surgical practice. In rheumatic and scrofulous iritis it is a relieving agent.

The properties, preparations, and uses of this drug are too well known to require to be treated of here. The reader is referred to the following works: *Pharmacopoeia of India*, pp. 171-174; Flückiger and Hawley's *Pharmacographia*, pp. 455 to 459; U. S. Dispensatory, 15th Ed., 283 to 313; Bentley and Trimen's *Medical Plants*, 193; Roylce's *Mat. Medica*, Ed. Harley, pp. 488 to 496; &c., &c.

It is a remarkable fact that while this most useful plant is exceedingly plentiful in many parts of the Western Himalaya, its medicinal virtues seem to have escaped the detection of the natives of India completely. Absolutely worthless drugs are carefully collected and exported to the plains of India, from the very localities in which Belladonna is abundant, and yet not a single leaf or root of this most valuable drug can be purchased, of Indian origin, in the native drug-shops of the plains. No mention is made of it by Drs. Dymock, Moodoone Sheriff, nor by U. Dutt. O'Shaughnessy refers to it briefly, and gives the paragraph which will be found under the vernacular names. He says it is "known in the bazaars of Central Asia and the North of India." Ainslie, who gives the vernacular names republished by O'Shaughnessy and Birdwood, states clearly, however, that he has never seen the plant in India, and recommends its introduction.

It would therefore appear that the natives of India have been made familiar with the virtues of this plant in the form of an imported drug, while the Himalaya might supply the world with Belladonna.

**Chemical Composition.**—§"The active principle of A. Belladonna is atropia, an alkaloid which is either identical with or very closely allied to curarine. It exists in all parts of the plant apparently in combination with mastic acid. The quantity present in various parts of the herb has been determined by Gunther and others. The ripe seeds contain the largest percentage, while the root and stalk contain a very much smaller amount. Physiologically, atropine acts on the pupils, and on the system.
Gold.

AURUM.

Products of India.

1618

Gold.

Nergerally, in the same manner as daturine. A second alkaloid, Belladonna, has been discovered as existing in the plant, but according to Blyth probably a product of the decomposition of atropine. By the action of certain reagents atropine gives rise to various derivatives, tropine, pic acid, and isatropic acid. According to Blitz, asparagus contain the Belladonna plant. (Surgeon Warden, Professor of Chemistry, Cuttta.)

Special Opinion.—"Useful to diminish the secretion of milk; it checks nausea, and especially local, perspiration, as of the hands or feet, or of the face and in phthisis; it also checks salivation from mercury or other astringent. It is antagonistic to Calabar bean, aconite, and to the poisonous ciple of fungi (muscari). (Surgeon-Major E. G. Russel, Calcutta.)

"Useful in mercurial salivation." (Surgeon H. D. Masani, Karachi.)

But we have found a drop of atropine occasionally dropped into the eye to great relief in ocular neuralgia. I know of no better anodyne for local application in facial neuralgia than a combination of aconite and belladonna. I usually apply dry heat after their application to the eyelid."

(Surgeon Joseph Parker, M.D., Poona.)

of Roses, see Rosa.


A genus containing 3 species of small trees or only 3 forms of 1, belonging to the Natural Order CORNACÉ. A glabrous, branching shrub. Leaves opposite, petiolate, ovate or lanceolate, obtusely serrate, leathery, shining, turning red on drying. Flowers small, ditectonic. Male calyx small, 4-toothed. Stamens 4; disk quadangular, fleshy. Berry ellipsoid, crowned by the calyx and style, smooth, shining, orange, yellow or scarlet.

The generic name is of Japanese origin. The presence of this plant is one of the most striking temperate Japanese features of the Eastern Himalaya and Manipur as compared with the Western Himalaya.

ba himalaica, Hook., f.; Ill. Him. Pl., t. 12; Fl. Br. Ind., II., 47.

Vern.—Phul amphi, Nepal; Singna, tapather, Lepcha.

Habitat.—A small tree of the Siikim Himalaya, Bhutan, Nagá Hills Manipur, between 5,000 and 9,000 feet.

Structure of the Wood.—Wood black when fresh cut, becoming ter-coloured on exposure, hard and close-grained. Weight 55 lb. per c.e.

andia Costus, Falc., see SAussurea LAPS, C.B.C.; COMPOSITE.

AURUM.

Timber.

1620

am.

Vern.—(The metal) Sind, Hind, Duk, Beng, Guj, and Mar.; Pan, thangan Tam and Mal.; Banguru, Tel. and Kan.; Zakab, Arab.; Swaranam, Sans.; Tor, tila or tilá, Pers.; Ran, Singh; Shae, Burn.; (Gold leaf) Sonchri-Varag, sém-bá-varag, Hind.; Son-ta-totag, Duk.; Sonar-pal, umáili, Beng.; Tangá-réka, ban, rék, Tam. and Mal.; Bangará-réku, Tel. and Kan.; Soni-cha-varag, sona-ku-varag, Guj.; Swaunna-patram, Sans.; Ran-tahadu, ran-taquá, Singh.; Shauzaza, Burn.

Medicine.—Is used in the form of leaf as a nervine tonic. Combined with silver leaf, arsenic, and other metals, in the form of confection called in, or maaqán, it is extensively employed by hakims.

A. 1623

A genus of grasses belonging to the Tribe AVENÆ of the Natural Order Graminæ. There are said to be some 40 species in the whole world confined to the temperate regions. Annual or herbaceous plants. Spikelets 2-many-flowered, very rarely 1-flowered. Glumes, the inferior empty, equaling or overtopping the flowers. Lower pale large-awned, ending in 2 points, having lateral veins.
Meadow Oat Grass.

AVENA
pratensis.

Meadow Oat Grass; Narrow-leaved Oat Grass.

Syn.—A. bromoides, Kunth.

Habitat.—Reported to occur in Lahoul. In Europe this is described as denizen of moors and poor clays; its specific name being thus inappropriate, as it is seldom met with on meadows.

Botanical Description.—Panicle erect, with simple or slightly divided branches; flowers erect, 3-6, exceeding the glumes, the upper of which are 3-veined. Root fibrous; height nearly 2 feet.

AVENA
pratensis, Linn.

The Wild Oat.

Vern.—Kulijd, ganer, gandai, jee, Hind.; Gashang, ganerjii, kisamme, yippy, dpona, Pa.

According to Professor Buckman in the Treasury of Botany, this is probably the plant from which, by a continuous process of cultivation, the domesticated oat has been induced. He bases this opinion on a series of experiments from 1851 to 1860, in which he ultimately raised a plant which could hardly be distinguished from the Tartarian so-called potato oats. He also points out that seed oats gone on a field degenerate, the first indication of which being the production of hairs upon the grains, similar to those in A. fatua, a character which cereal oats never possess.

Habitat.—Inhabits the plains and hills of Northern India; common as a weed in cereal crops throughout the plains; ascends the mala up to 9,500 and 11,500 feet.

Botanic Diagnosis.—Panicle erect, spikelets drooping, each of about three flowers; flower falling short of the glume, with fulvous hairs at the base; lower pale bifid at the end. Plant about 3 feet in height; root nodal; upper glume 5-6-veined and awn much bent, the lower half sessile. The awn is also long, rigid, and sensitive to the changes of the atmosphere, as regards moisture. These peculiarities give the seed such an appearance of a fly that it has been used in trout-fishing for this purpose. On coming in contact with the water, the long awns begin to twist about and deceive the fish by their apparent struggling. This property has also given origin to their being used as a hygrometer, the seeds jumping about when breathed upon, or when the atmosphere becomes dry.

Medicin.—It is believed to produce poisonous and deleterious effects.

Fodder.—Stewart and Madden say that in all the places where it was it is pulled up or gathered for fodder, but is suspected of occasionally producing bad effects.
FODDER.

1636
AVENA
sativa.

Fodder.—Baron von Mueller says it thrives well on dry, clayey soil, producing a sweet fodder; it is recommended for arid ground, particularly such as contains some lime, being thus as valuable as Festuca ovina.

1637
Avena pubescens, L.

Downy Oat Grass.

Syn.—Trisetum pubescens, R. & S.

Habitat.—Royle found it at Simla. In Europe this is a common meadow grass in limestone pastures.

Botanic Diagnosis.—Panicles erect, nearly simple; flowers erect, or 3, scarcely exceeding the glumes. A creeping plant with the lower leaves and sheaths hairy; height 1-2 feet.

Fodder.—It is a sweet, nutritious, prolific, perennial grass, requiring dry but good soil containing lime. (Mueller.) The downy hairs which cover the surface of the leaves of this grass, when growing on poor soil, almost entirely disappear when it is cultivated on a richer soil. (Loudon; Duthie.)

1639
A. sativa, Linn.

Oats.

Ver.—जाती, wilyatjak, jāti, Hind. and Pār.

Under the subject of Oats, De Candolle (L’Orig. Cult. Pl., 209) says there is no Sanskrit name for Oats, nor any in modern Indian languages. Again (p. 300), the European vernacular names prove an existence north-west of the Alps and on the borders of Europe, towards Tartary and the Caucasus. The most widely diffused name is the Latin Avena; Ancient Slav, ovizû, ovesû, oza; Russian, ovizû; Lithuanian, auiza; Letonian, ausas; Ostias, abîz. The English word Oats comes, according to A. Pictet, from the Anglo-Saxon atsa or atø. The Basque name alba or alba argues a very ancient Iberian cultivation. The Celtic names are quite different: Irish cuircce, cuircce, corca; Armorican, kerch; Tartar, sulu; Georgian, kari; Hungarian, szob; Croat, sob; Estonian, kaer, are given by Mennich as generic names for oats.

Habitat.—Of recent introduction into Indian agriculture; it was first grown in Northern India, under English auspices, round cantonments and stud depôts, for the supply of horses. The oat is cultivated in temperate regions throughout the globe even as far north as the Arctic zone.

History.—The origin of this plant is unknown, but it is supposed by Dr. Lindley to have been originally a native of Northern Europe. This opinion is confirmed by De Candolle in the passage quoted above.

Plants gone wild from cultivation show an approach to the type of A. strigosa, Schreb, from which it is chiefly distinguished by the bristles at the end of the flowers. These might be presumed to have disappeared under cultivation. A. strigosa may, however, only prove a variety of A. fatua, in which case the origin of the domesticated oats would have to be traced to that species. See under A. fatua.

Cultivation.—The cultivation of oats has not gained much extension. It is still confined to North India, where it is restricted chiefly to districts where horse-breeding is carried on, viz., in the Meerut and Rohilkhand divisions of the North-West Provinces, and in the Hissar and Kānl districts of the Panjāb. In the Meerut District the area annually under oats is 5,000 acres, and in Rohilkhand 5,000 acres. The total area under the crop in the 30 temporarily-settled districts of the North-West Provinces and Oudh, including of course the two divisions just mentioned, is returned at 9,781 acres.

A. 1641
Oats are grown as a rule on the better-class soils near village sites. The mode of cultivation differs in no way from that pursued with Barley; fact they are often sown together. Messrs. Duthie and Fuller write:

Fith a copious supply of water it has been found that oats are an aluable green fodder crop for the cold season, yielding as many as three tings, and then making sufficient growth to bear a thin crop of grain.

The produce probably comes from the northern parts of the Panjab and the North-West Provinces.

**Trade Returns.**

The following are the Imports and Exports of Oats for the past five years ending 1883-84:

<table>
<thead>
<tr>
<th>Years</th>
<th>Imports</th>
<th>Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cwt.</td>
<td>R</td>
</tr>
<tr>
<td>10</td>
<td>48</td>
<td>247</td>
</tr>
<tr>
<td>11</td>
<td>233</td>
<td>1,196</td>
</tr>
<tr>
<td>12</td>
<td>738</td>
<td>5,130</td>
</tr>
<tr>
<td>13</td>
<td>347</td>
<td>2,999</td>
</tr>
<tr>
<td>14</td>
<td>537</td>
<td>4,174</td>
</tr>
</tbody>
</table>

The imports chiefly consist of oats brought by ships carrying horses. The following table will show the quantity and value of the imports and exports of oats made in the year 1883-84:

<table>
<thead>
<tr>
<th>Imports</th>
<th>Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cwt.</td>
<td>R</td>
</tr>
<tr>
<td>285</td>
<td>2,453</td>
</tr>
<tr>
<td>252</td>
<td>1,721</td>
</tr>
<tr>
<td>337</td>
<td>4,174</td>
</tr>
<tr>
<td>51</td>
<td>375</td>
</tr>
<tr>
<td>354</td>
<td>2,453</td>
</tr>
<tr>
<td>105</td>
<td>1,050</td>
</tr>
<tr>
<td>337</td>
<td>4,174</td>
</tr>
</tbody>
</table>

The above figures do not, of course, include the imports of oatmeal, which are included under Provisions and Oilman's stores.

"**Varieties of Oats generally Cultivated.**—The different kinds of oats distinguished from each other by a variety of characteristics, such as their, size, and form of the seeds, quality of the straw, the period of}
Oats.

Oats are a cereal crop that ripens, liability to shed their seeds in high winds, and adaptation to particular soils and climates. There are three principal groups of oats, easily distinguishable by colour, viz., white, black, and gray or dun. White oats are separable into two principal varieties, the late and early; and these again into several sub-varieties, characterized by certain peculiarities of growth.

"Early oats are best adapted for the higher class of soils, as the greater yield per acre more than compensates for the inferiority of the straw. Their earliness renders them very suitable for late districts, but the liability of some to shed their seeds in high winds, renders their cultivation in high-lying and exposed situations extremely hazardous.

"Late or common oats, as they are more generally termed in Scotland, are distinguished from the early variety by late ripening, thicker husk, and less meal; the latter being of better quality, lighter per bushel, not usually so prolific; the former, however, have a more vigorous constitution, and are better able to resist the effects of atmospheric changes, such as rains or droughts, and when ripe they are less liable to shed their seed in high winds; the straw is greatly superior as fodder; and lastly, they can be cultivated with greater success than the earlier varieties on inferior soils, and also those of a strong clayey nature."

"Black oats are of two kinds,—the one the Tartarian, having the ear only on one side of the straw; and the other the old or common black, with black seeds, but having a spreading ear, similar to the white varieties. Dun oats are to all appearance hybrids between the last mentioned variety and one or other of the white sorts, most probably the late or common white oat, as they have more of the characteristics of the last mentioned; such as hardiness, lateness, adaptation to clayey and stiff-soiled, and by the superior quality of the meal and straw."

(Morton's Cyclopædia of Agriculture, Vol. II., 482.)

Of foreign oats Great Britain imported in 1883, 15,248,467 cwt, and the annual imports show a steady increase.

The food value of oats is very great. The quantity of starch is nearest to that in barley. Oats are very rich in oil and fatty matter. The proportion of flesh-forming materials in good oats is larger than in wheat, barley, or Indian-corn. "Many people in Scotland live entirely on oatmeal, and their strong, muscular forms are undeniable proof of the superior qualities of oats in supplying the materials from which the muscles are formed." (Morton.)

Four varieties of Scotch oats, free from husk, and dried at 212°, were analysed by Professor Norton and Mr. Fromberg, with the following results:

<table>
<thead>
<tr>
<th>Component</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starch</td>
<td>65.24%</td>
<td>64.30%</td>
<td>64.79%</td>
<td>65.90%</td>
</tr>
<tr>
<td>Sugar</td>
<td>4.31%</td>
<td>4.58%</td>
<td>2.90%</td>
<td>2.90%</td>
</tr>
<tr>
<td>Gum</td>
<td>2.10%</td>
<td>2.41%</td>
<td>2.12%</td>
<td>2.12%</td>
</tr>
<tr>
<td>Oil</td>
<td>5.44%</td>
<td>6.97%</td>
<td>6.41%</td>
<td>7.38%</td>
</tr>
<tr>
<td>Casein (avenine)</td>
<td>12.76%</td>
<td>16.25%</td>
<td>17.72%</td>
<td>16.37%</td>
</tr>
<tr>
<td>Albumen</td>
<td>0.46%</td>
<td>1.33%</td>
<td>1.76%</td>
<td>2.17%</td>
</tr>
<tr>
<td>Gluten</td>
<td>2.47%</td>
<td>1.45%</td>
<td>1.33%</td>
<td>1.45%</td>
</tr>
<tr>
<td>Epidermis</td>
<td>1.18%</td>
<td>2.39%</td>
<td>2.84%</td>
<td>2.75%</td>
</tr>
<tr>
<td>Alkaline salts and loss</td>
<td>2.84%</td>
<td>1.84%</td>
<td>0.94%</td>
<td>1.75%</td>
</tr>
</tbody>
</table>

100'00 100'00 100'00 100'00

A. 1642
M. Boussingault, in his Economic Rurale, gives the following analysis of oats according to life-sustaining compounds:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogenous ingredients</td>
<td>1393</td>
</tr>
<tr>
<td>Non-nitrogenous ingredients</td>
<td>8207</td>
</tr>
<tr>
<td>Inorganic ingredients</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>100'000</td>
</tr>
</tbody>
</table>

And according to ultimate elements:

<table>
<thead>
<tr>
<th>Element</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
<td>5070</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>640</td>
</tr>
<tr>
<td>Oxygen</td>
<td>3670</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>220</td>
</tr>
<tr>
<td>Ash</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>100'000</td>
</tr>
</tbody>
</table>

For warm climates, oatmeal is not a proper article of human diet, as it heats the blood and produces eruptions on the skin; neither is it wholesome for persons engaged in sedentary occupations.

The oat constitutes the most important article of food for horses in Great Britain.

Oat-straw has been supposed to be less nutritious than other kinds of straw; but it would appear this opinion is quite erroneous as regards the oat-straw grown in Britain. (Morton’s Cyclopaedia, Article Oats, Vol. II., pp. 560-509; Atkinson, Hist. Dist., 692; Duthie and Fuller’s Field and Garden Crops, Part I., p. 14.)


A genus containing 3 species of small trees, belonging to the Natural Order Geraniaceae. Two are cultivated in most tropical countries, and the third is indigenous to the New World, whence the cultivated species were most probably introduced into India by the Portuguese.

**AVERRHOA Carambola.**

**VERN.**—Unripe, (the fruit) kelambh, Hind.; Bilimbi, Bino.; Belambh, Duk.; Bilimbh, Guj.; Bilambh, Mar.; Pulich-chakkbd, bilimbikdy, hach-chil-tamarindi, Tel.; Puliam-kaya, Bilo-bili-kayaule, Tel.; Vollambikbd, vilimbh, karichakk, Mal.; Kala-covun-si, kala-covun-sa-si, Burm.

**Habitat.**—Cultivated in gardens on the plains of India. It flowers in the beginning of summer and ripens its fruit in about two or three months after. The fruit is cylindrical, about two inches long, and pulpy, and is very sour when green, but loses some of its acidity when ripe. It has become almost naturalized in India.

**Food.**—The fruit is generally used in pickle and in curry. The flowers are made into preserves.


**VERN.**—Kuml, khamrak, kamaranga, Hind.; Kamar, kamarak, Beng.; Kardar, Ass.; Tamarak, kamarakha, Guj.; Kamarakha, Mar.; Khamaraka, karamara, Bome.; Kumrak, Duk.; Tamarit, kamaritakdy, Tel.; Karomonga, tamaritaka, Tel.; Tamarat-tuka, Mal.; A. 1646

**BILIMBI TREE.**

**VERN.**—Bilimbi, (the fruit) kelambh, Hind.; Bilimbi, bilmibi, Beng.; Belambh, Duk.; Bilimbi, Guj.; Bilimbi, Mar.; Pulich-chakkbd, bilimbikdy, hach-chil-tamarindi, Tel.; Puliam-kaya, Bilo-bili-kayaule, Tel.; Vollambikbd, vilimbh, karichakk, Mal.; Kala-covun-si, kala-covun-sa-si, Burm.
AVICENNIA officinalis.

The White Mangrove.


Habitat.—A small tree with sensitive leaflets, 15 to 20 feet in height, extensively cultivated in India for its apples, which when stewed are very palatable. It is found as far north as Lahore.

Dye.—"The unripe apples are astringent, and are used as an acid dyeing. The acid probably acts as a mordant." (Deputy Surgeon-General G. Bidie, Madras.)

Medicine.—"The leaves, the root, and the fruit are used as cordial medicine." (Amster. Cat.) "The acid dried fruit is given in fevers." (Irvine, Mat. Med., Patna, p. 55)

"Kamranga," is met with in two forms in Bengal,—the sweetish acid and the extremely sour. The former is cooling and useful in feverishness. Both varieties have antiscorbutic properties. (Surgeon R. L. Dutt, M.D., Patna.) "The fruit is an excellent antiscorbutic." Surgeon-Major J. E. T. Aitchison, Simla.) "It is highly cooling; if taken raw it brings on fever and chest complaints." (Assistant Surgeon J. N. Day, Jessore)

"The ripe fruit has a pleasant acid and sweetish taste, and is used for culinary purposes." (Surgeon Shib Chunder Bhattacharji, Central Provinces.) "Fruit used for making pickles." (Deputy Surgeon-General G. Bidie, C.I.E., Madras.) "Fruit used in curries." (Honorary Surgeon P. Kinsley, Chicoole, Ganjam, Madras.)

Food.—It blossoms in the rainy season, and the fruit, which ripens in December and January, is about three inches long, and is eaten raw to a small extent by the natives. The flesh is soft, juicy, and refreshing. It is sometimes stewed in syrup with a little cinnamon; and is then very pleasant; it is also made into an agreeable jelly.

Structure of the Wood.—Light red, hard, close-grained. Weight about 40 lbs.

Mr. Home, of the Forest Department says it is used in the Sunderbans for building purposes and for furniture.

AVICENNIA, Linn.; Gen. Pl., II., 1760.

A genus of Verbenaceae, comprising in all some 3 or 4 species of bushes or small trees, frequenting the salt-marshes on the coast and in the tidal forests of rivers of India, Burma, the Andaman Islands, Africa, Australia, New Zealand, Tasmania, America, and the West Indies.

Branchlets fleshy. Leaves opposite, in the Indian plant coriaceous, elliptic-lanceolate. Flowers yellow, sessile, in rounded heads. Calyx of 5 sepals, supported by ovate-ellate bracts. Corolla-tube short, limb of 4 nearly equal segments. Capsule compressed, ovate-mucronate, 2-valved, 1-seeded; raddle woolly; cotyledons thick, fleshy, folded. Like the true mangrove the seeds frequently germinate within the fruits while attached to the tree.

The genus is named in honour of Avicenna, an Arab physician, philosopher, mathematician, &c., who lived (at Bokhara?) between the years 980 and 1037.

Avicennia officinalis, Linn.

The White Mangrove.

Syn.—A. tomentosa, Jacq.

Vern.—Bina (bany in Gamble), Beng.; Mada, naile-mada, Tel.; Twe, Bom., Mar., Sind; Oapat, Mal.; Lame, tham, Burm.

Habitat.—A small tree or shrub of the salt marshes and the tidal forests of India and Burma, found also in Andaman Islands. Roxburgh says it is common near the mouths of rivers where the spring tides rise. It is found everywhere in the Sunderbans, often becoming a tree of considerable size; but on the Coromandel coast it is only a bush. Kurz A. 1655
The Azima.

**AZIMA tetracanth**a.

gives this species as frequent along the Burmese coast from Chittagong along with the next species.

**Botanic Diagnosis.**—"Leaves usually lanceolate and indistinctly white-tomentose beneath; flowers shortly spiked; calyx-lobes 1 line long; style very short." (Kurz.)

**Dye.**—The bark is used as a tanning agent. (Birdwood, Bombay Prod.) The ashes of the wood are used to wash cloth. (Drury). In Río Janeiro the barks of various species of *Avicennia* are used in tanning leather.

**Food.**—The kernels are bitter but edible.

**Structure of the Wood.**—Grey, with a darker heartwood, hard, heavy, consisting of numerous, narrow, well-marked, concentric layers. Weight 58 lbs. per cubic foot.

It is very brittle; used in India only for firewood. **Major Ford** says it is used for mills for husking paddy, rice-pounders, and oil-mills in the Andamans.

**Avicennia tomentosa,** Roxb.; Kurz, For. Fl. Burm., II., 276; Roxb., Fl. Ind., Ed. C.B.C., 497.

**Vern.**—Binaí, Hind.; Beng.; Timmer, chería; Sind.; Tīvar, Mar.; Nalla-māda, māda-chettu, Tel.; Uppūtī, Mal.

**Habitat.**—Common in India in low places near the mouths of rivers and in salt-marshes. In the lower parts of the Delta of the Ganges it grows to a tree of considerable magnitude. "Frequent in the tidal forests all along the coast of Burma from Chittagong down to Tenasserim." (Kurz.) It is abundant on Bombay and Malabar coasts.

**Botanic Diagnosis.**—"Leaves more or less obovate and usually indistinctly tawny-tomentose beneath; flowers in heads; calyx-lobes 2 lines long; style long and slender." (Kurz.) It seems doubtful how far this should be viewed as distinct from the preceding species, but if distinct the vernacular names and facts regarding the economic uses of the two plants would appear to have got completely mixed up together.

**Medicine.**—The roots possess aphrodisiac properties. The unripe seeds are used as poultice to hasten suppuration of boils and abscesses.

§ "Dhobies in the Madras Presidency use the ashes of the wood for washing and cleaning cotton cloths. It is also used in small-poss. The bark is used in Río Janeiro for tanning." (Surgeon Major W. Dymock, Bombay.) "Bark astringent, ashes used for washing and bleaching cloth; common in Madras." (Deputy Surgeon-General G. Bidie, Madras.)

**Azadirachta,** see Melia.

**AZIMA Lam.; Gen. Pl., II., 681.**

**Azima tetracantha,** Lam.; Fl. Br. Ind., III., 620; Salvadoraceae.

**Syn.**—Monetia barleroides, L’Herit.; Roxb., Fl. Ind., Ed. C.B.C., 496; Fagoniamontana, Még.

**Vern.**—Kántakôr-kamat, Hind.; Trikántâ-gati, Beng.; Sukkî-pot, Duk.; Sung-elly or sung-ñi, changan-chedî, multu-chengan-chedî, nalla-chengan-chedî, Tam.; Tella-uppi, uppi-aku, Tel.; Kundali, Sans.

**Habitat.**—A small, thorny shrub, growing plentifully in the Deccan and Ceylon. "On every part of the Coromandel coast it grows freely in all situations, and is in flower and fruit most part of the year." (Roxb., Fl. Ind., Ed. C.B.C., 716.) "Frequent in the dry forests and shrubberies of Ava and Prima." (Kurz, II., 161.)

A. 1665

Baccarea affinis, Müll.-Arg.; Euphorbiaceae.

B. flaccida, Müll.-Arg.
A small tree, chiefly met with in South India.

B. parviflora, Müll.-Arg.
Vern.—Kanaao, BURM. (Kura).


DYE. Mordant. 5
Green dye. 0

Food. Fruit. 7

TIMBER. 8

9


B. 10
Baccharis nitida, Wall.; Syn. for Blumea chinensis, DC.; Fl. Br. Ind., III., 268.

BALANITES, Delile; Gen. Pl., I., 314.

A small genus containing 2 or only 1 species, belonging to the Natural Order Simarubaceae. Spiny shrubs or trees. Leaves coriaceous, 2-foliolate, entire. Flowers in axillary cymes, small, green. Sepals and petals 5; disk thick, conical. Ovary entire, 5-ovuled. Seeds solitary, pendulous from the apex of each cell.

Balanites Roxburghii, Planch.; Fl. Br. Ind., I., 521; Simarubaceae.

Syn.—(?) Only a variety of B. aegyptiaca met with in Africa; Ximenia aegyptiaca, Rott.; Fl. Ind., Ed. C.B.C., 328.

Vern.—Hingan, hingga or hingen, ingua, kingol, hingota or hingot, Hind.; Hingan, Bng.; Gérald, Gond; Hingana or hingan, Mar.; Egore or igora, hingga, Goj.; Hinganbet, hingga, Duk.; Hinganhet, Cutch; Hingga, Ulwar; Hinganbet, Bomb.; Nanjunda, Tan.; Nanjuntha, Mala.; Géri, gera-panda, gera-cherva (plant), tingari, Tel.; Ingudi, Bangala, (plant), ingudi or ingudam, Sans.

Habitat.—A small, thorny tree, growing in the drier parts of India, extending from Cawnpore to Sikkim, Behar, Gujarát, Khândesh, and the Deccan. It is found in Dehrà Dun (Royle), and also in Burma.

Grows everywhere, often little more than a thorny bush in the Panch Mahâls, Gujarát. (Bomb. Gaz., III., 200.)

Properties and Uses—

Oil.—A fixed oil is expressed from the seed. The corresponding oil prepared from the African plant is known to the negroes as zachun.

The oil is used as an application for the cure of ophthalmia. It is referred to in the drama of Shakuntalâ. (Sakhârâm Arjuna Râovat, L.M., Girgaum, Bombay.)

Medicine.—The seeds, fruit, bark, and leaves are used in native medicine. The seeds are given in coughs. The bark, unripe fruit, and leaves have antihelmintic properties attributed to them and are purgative. The bark is given to cattle as an antihelmintic, especially by the people of Western India. The unripe drupes have strong cathartic properties; they are also antihelmintic.

“Seeds are expectorant, dose 2 to 30 grains. Fruit purgative, 1 to 20 grains.” (Surgeon W. Barren, Bhuj, Cutch.)

“Seeds are useful in colic, dose half a seed.” (Joseph Parker, M.D., Poona.)

Fodder.—The young twigs and the leaves are browsed by cattle. The ripe fruit is oval, of a yellowish colour, composed of a sweet but disagreeable pulp surrounding the stone. In Western India, as also in Egypt, it is eaten as a fruit, and when fermented is said to yield an intoxicating liquor used by the negroes. Ballon gives the ripe fruit the name of Desert-date, and when unripe that of Egyptian myrobalan.

Structure of the Wood.—Yellowish white, moderately hard, no heartwood, no annual rings. Weight 48 lbs. per cubic foot.

It is used for walking-sticks and for fuel, and by the Africans for house furniture.

Domestic Uses.—“The nut is employed in fireworks. A small hole is drilled in it, at which the kernel is extracted, and being filled with powder and fired, bursts with a very loud report, so exceedingly hard is the nut.” (Roxburgh.) The nuts are made into crackers in the Panch Mahâls. The pulp of the fruit is used as a detergent to clean silk in Râjputana. (Branst.) The bark yields a juice, used in the Panch Mahâls, Bombay, to poison fish. (Bomb. Gaz., III., 200.)

B. 23

A genus of leafless parasites which give their name to a small Natural Order, which may be briefly defined as parasitic herbs, fleshy, aphyllosous, mone-
cocious or dicocious, having scapes naked or scaly, and terminating in capitula of
flowers, each having 4-6 generally 3-lobed perianth, with 3-many stamens in-
serted on the perianth, the ovary being inferior and 1-celled. In India we have
only a few species belonging to this Natural Order, Balanophora itself con-
taining the most important examples. The Indian species do not appear, however,
to have been put to any economic use. In Dr. Dymock's Nat. Med., West.
India, under Gajpipal, p. 719, occurs a brief notice of what in all prob-
ability is a species of Balanophora. It is sold in Bombay under the vernacular
name of gajpipal, and is described as mucilaginous and astringent. Various
other plants are also sold by Indian druggists as gajpipal. Roxburgh gives
Pothos officinalis as the drug which bears that name, and in the Punjab it
appears that Plantago amplexicaulis is also known to the native druggists
as gajpipal.

In various parts of the world the species of Balanophoraceae are known
to possess astringent properties. The reddish juice of Eupomor-
cus coccineum (the Fungus Melitensis) was formerly prescribed as an infallible
stypic for hemorrhage and diarrhoea. In Java, wax prepared from a
species of Balanophora is made into candles.

§ "Balanophora? This is substituted in the shops of Bombay for
Scindapsus officinalis. It is a parasite. Does not seem to possess any
active properties." (Sakhārām Arjun Rāhūl, L.M., Girgaum, Bombay.)

BALATA.

Balata gum. A caoutchouc-like substance, obtained in all probability
from two or three species, chiefly Achras Sapota, Linn., and several species
of Minimus, which see.

BALIOSPERMUM, Bliim.; Gen. Pl., III., 324.

A genus of Euphorbiaceæ, comprising some four species of Indian shrubs
or bushes, belonging to the Tribe Crotonæ and the sub-tribe Geleronæ.
Leaves alternate, irregularly sinuate-dentate or sub-lobed, pennivined or
at times tri-lobate at the base. Inflorescence axillary racemes, flowers fasci-
cled, rarely elongated and lax. Flowers monoeccious, apetalous; Sepals 4-5, im-
bricate. Stamens 10-60; filaments thin, free; anthers terminal, loculi adnate.
Disk entire. Ovary 3-locular; style short, fleshy, recurved, shortly 2-3-dicerni,
oxyles solitary in the loculi. Capsule 3-celled, separating into 3 cocci.

Baliospermum montanum, Müll.-Arg.; Gamble, Man. Tim., 348;

Euphorbiaceæ.

Syn.—Croton Polyandrum, Roxb., Fl. Ind., Ed. C.B.C., 687; C. Rox-
burchii, Wall.

Vern.—Dántü, hákōm or hákın, Beng.; Dánti, Śañ; Habbañul-
Tim-sahürü, habbussalídva-barrí, Aran.; Bādānijre-katā, Fess.; Kon-
du-śan, naypamam (Dr. Kinsey), ačiro-śanamul, Tel.; Pe-
guntig, Lepchá; Šangli, Jamalgo, N.-W. Pr.; Dánti, Māk; Jamalgo,
dántimus, Bom., Guj., Cutch. "The vernacular names of B. mont-
unum, Croton Tigrimum, Habbação, Hamalulifera, and T. Curcas are con-
joined with each other in most districts of India, particularly in the Madras
Presidency." (Modern Sheriff.)

The root is sold as dántimus by native druggists.

Habitat.—One of the commonest shrubs of North and East Bengal.

It extends to South India and Burma.

Properties and Uses—

Medicine.—The seeds are used as a drastic purgative, but in over-
doses are an acro-narcotic poison; they are sometimes used as a substi-

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The Balsamodendron.

BALSAMODENDRON.

OIL. 30

MEDICINE. Root. 31

Leaves. 32

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BALLOTA, Linn.; Gen. Pl., II., 1212.

Ballota limbata, Benth.; DC. Prod., XII., 521; Labiatae.

Vern.—Bái, phādkanda, jaundí, lana, kandisāri, agahan, awāni-bāt, Pa.

Habitat.—A small prickly shrub, with yellow flowers, occurring on the Salt-range, Trans-Indus, and in the Jhelum basin, at times ascending to altitude 4,000 feet.

Medicine.—The juice of the leaves is applied to children's gums, and to ophthalmia in man and beast. (Stewart.)

Fodder.—Browsed by goats.

BALSAM.

Balsam, Canada, is obtained chiefly from Pinus balsamea, L.; see under Ábies.

Balsam, Copaiba, is obtained from several species of Copaifera, natives of South America.

Balsam, Gurjan, see Dipterocarpus.

Balsam of Peru is obtained from Myroxylon Pereira, Kots., a native of Central America.

Balsam of Tolu is obtained from Myroxylon Toluifera, H. B. K., a native of Central and South America.

BALSAMODENDRON, Kunth.; Gen. Pl., I., 323.

A genus of Burseraceae, comprising some 10 species of balsamiferous, spiny, small trees or shrubs, inhabitants of North India and Arabia, and of tropical and South Africa.

Leaves alternate, 1-3-foliolate or imparipinnate; leaflets sessile, oblique, crenate-serrate. Flowers small, few fasciculate, polygamous, on racemose panicles. Calyx tubulo-urceolate, 4-toothed, persistent. Petals valvate. Disk erect, cupular. Stamens 6-8, usually 4 long and 4 short, inserted on the margin of the disk. Ovary sessile, surrounded by the disk and 4-celled; style short, stigma obtuse, 4-lobed; ovules 2 in each cell. Drupes indehiscent, ovoid, containing a 1-3-celled and -seeded stone or 1-3 distinct stones within the pericarp.

Baildon claims that by priority the correct name for this genus should be Balsamea. Gleditsch Engler (Engler, Bot. Jahrb., l., p. 42) in his revision of the Burseraceae concurs in this view. In a work on Indian
Economic Botany it seems desirable, however, to follow the Flora of British India in all matters of synonymy.

Balsamodendron Berryi, Arnott.; Fl. Br. Ind., I., 129; BURSERACEAE.

Habitat.—A tree of the forests on the east side of the Nilgiris.

Gum.—It is very fragrant and yields a gum-resin.

B. Kataf, Kth.

African BdeUium.

Syn.—Balsamea erythrea, Engler; Amyris Kataf, Forst.; Hemp.

Vern.—Bysabol, BOMB.; Mukhakabe, CUTCH.; Mahosabol (or bhasabol), SANS.; Habak-Had (corrupted into Habahghadi), ARAB.

Gum.—This gum-resin reaches Bombay from Berbera; the purer kinds do not resemble Myrrh, with which it has been confused by many authors. Professor Oliver refers to it as B. Playfairi, thus making the gum-resin hodlatk to be obtained from the same plant as bysabol (or B. Playfairi). Bysabol is darker and more reddish than the true Myrrh; it is but sparingly soluble in bisulphide of carbon, and the solution does not assume the violet shade characteristic of Myrrh on the addition of bromine. It has a much stronger or acrid taste, and a peculiar odor quite different from that of the true Myrrh. (Kew Report, 1880, p. 39; Flück. and Herb., Pharmacog., p. 146; Bentley and Trimen, Med. Plants, p. 60; Dymock’s Materia Medica of Western India, p. 138.)

§ “Emmenagogue. Invariably given after delivery, dose 1 to 6 grains; used locally for chronic ulcers.” (Surgeon W. Barren, Bhus, Cutch.)


Gum GUGUL.

Vern.—Guggul, gugul, mukul, rauhan tēbh, Beng.; HIND., DUK., GOG., and SIND.; (Gugl, Hind.); Gugul, GUT, CUTC; Guggal, KAV, MUS; Maiśkāshti (commonly maiśkāchī); gukku, gukku, TAM.; Maiśkāchī, or maśkāt, (commonly maśkāchī), gugul, Tel.; Maqī, maqī-araq, afṣatān, ARAB.; Bid-ṣahādān, PERS.; Koushikālī, gagugula, SANS.; Gagula, jatayu or jasyu, ratadumula, SINGH.

Habitat.—A small tree, found growing in the arid zones, Sind, Kattor, Rājputana, Khāndesh.

Gum-resin.—Yields the gum-resin known as Gugul or as an Indian BdeUium. It occurs in vermicular or stalactitic pieces, is of a brown or dull green colour, and has a bitter, acid taste. It exudes from incisions on the bark made in the cold season. It swells when heated, diffusing a disagreeable odour.

Properties and Uses—

Medicine.—Indian BdeUium is used in native medicine as a demulcent, aperient, carminative, and alternative; especially useful in leprosy, rheumatism, and syphilitic disorders. It is also prescribed in nervous diseases, scrofulous affections, urinary disorders and skin diseases, and is employed in the preparation of an ointment used for bad ulcers.

It is known by the name of gugul or mukul, and is said to be moister and therefore not so brittle as myrrh, for which it is often used as a substitute, being much cheaper. The Pharm. India states that in general practice it is found useful in the form of an ointment in cleansing and stimulating indolent ulcers, and is a favourite in the treatment of Delhi sores, especially when combined with sulphur, catechu, and borax. Gugul has stimulating properties, and is sometimes given internally, especially in the treatment of horses.

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Special Opinions.—"Applied as a hot paste to incipient abscesses, as an abscessant. Is used as an expectorant. Is aphrodisiac according to St. Bolali-Saina, the ‘king of Hakims.’ Applied locally as a paste in hemorrhoids." (Surgeon G. A. Emerson, Calcutta.) “Used externally and internally in muscular rheumatism, leprosy, piles, dysentery, gleet, scurvy, fistula, hysteria, anemia, dyspepsia, and chronic diseases of the lungs. A preparation of gugal called yogaraja gugal is given internally for muscular rheumatism, and is said to be more effective in its action when administered with the decoction of rasa; given with the infusion of adulsu as an expectorant. There are 22 ingredients in the preparation called yogaraja gugal." (Surgeon W. Barren, Bhuj, Cutch.) “Bellulium is sold in the native drug-shops in Madras, and is known as Mahi-sakshi; I have personally identified it.” (Deputy Surgeon-General G. Bidie, C.I.E., Madras.) “The fumes of gugal are believed to be disinfectant.” (Surgeon R. L. Dutt, M.D., Pubna.) “It is held in the highest repute in the treatment of rheumatism. It is given internally and applied locally. Internally it is given in the form of pill, with numerous other native drugs.” (Surgeon-Major J. Robb, Ahmedabad.) “Repeatedly beaten with a hammer its efficacy is said to increase; it is extensively used here in sciatica and all rheumatic affections.” (Surgeon J. C. Penny, M.D., Amritsar.) “In combination with other medicines (black pepper and colchicum) the gum is given in the form of confection in cases of rheumatism, hemorrhoids, and flatulent dyspepsia. The dose is 1½ drachms.” (Lal Mahomed, Hospital Assistant, Hoshangabad, Central Provinces.)

Structure of the Wood.—Soft, white. Weight 20 lbs. per cubic foot. Apparently not put to any purpose.

Domestic Uses.—Mixed with mortar the gum forms an excellent cement; it is soluble in potash.

alsamodendron Myrrha, Nees.

MYRRH.

Vern.—Böl, Pers.; Hind., Duk.; Gandha-rasaha, Kirboli, bôl, Beng.; Hîrîbol, bôl, Guj., Cutch; Bôla, gandha-rasaha, rasanganbaha, Sans.; Mur., murr, Arab.; Mor, Hebrew; Velanip-palam, Tami.; Bollintra-palám, Tel.; Bôla, Kân.; Bôlam, gandara-sa, Singh.

There are two important kinds of what may be called the true Myrrh; these are the African, or Karam, and the Arabian and Siam, or Meetya.

Habitat.—A small tree of Arabia and of the African coast of the Red Sea. Often cultivated in Western India.

History.—There are several distinct substances which, in English, go by the name of Myrrh. There is the common British herbaceous plant belonging to the family of the Carrot (Umbelliferae) which, in all probability, derives its name, Myrrhis odorata, from the resemblance of the smell of its fresh green stems to that of the Eastern Myrrh gums. The Myrrh of the ancients is now pretty generally believed to have been the gum-resin known in India as Herabol or Myrrh, a proportion at least of which is the produce of Balsamodendron Myrrha, Nees. Bellulium and gum gugal are sometimes known as “False Myrrh.” Some authors think that the Myrrh of the ancients was also obtained from a species of the genus Cistus, the Rock Rose, a genus not represented in India. This idea is chiefly based upon the fact that the gum obtained from that plant is known at the present day by the name of "Ladanum," a word supposed to be the same as the Hebrew "Lát" which has been translated as Myrrh. If this be correct, two distinct gum-resins have come to bear the same name in translations from the Hebrew writers.
<table>
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<th>THE GUM-RESIN. Myrrh.</th>
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| COMMERCIAL FORMS.—Of the Myrrh of commerce there are two or three distinct varieties, and under each an assortment of stuffs of different commercial value. There is the east coast African Myrrh known in Bombay as Karam, and the South Arabian and Siam Myrrh, the Meetiya. Myrrh of good quality is also sent from Persia. The latter tars are really only substitutes, however, for Myrrh. The Karam obtained from Africa may be said to be the true commercial Myrrh, but is by no means proved that this is entirely obtained from B. Myrrha, Neem. The principal mart for Myrrh is in Bombay, the chief firms having the agents at Aden and Mukulla. These agents attend the great annual fair at Berbera, and exchange English and Indian goods for Myrrh and Beclium. The bags of these, on arrival at Bombay, are said to contain 1st, a large proportion of roundish masses of fine Myrrh; and, a considerable proportion of small semi-transparent pieces of Myrrh; and numerous pieces of dark-coloured Myrrh, mixed with refuse; 4th, a small proportion of opaque gum-resin (Guibourt’s "Opaque Beclium"). The packages are assorted, the best qualities are re-shipped for Europe, as also the darker pieces, declared as second quality, while the refuse is exported to China. The best qualities of Karam Myrrh sell for Rs 34 per maund of 37 lbs.; Meetiya, Rs 16 to 25; and the so-called refuse, Rs 8 per maund. (Dymock’s Materia Medica, W. Ind., pp. 124-125.)

Myrrh is chiefly adulterated with inferior qualities, or with the gums and resins derived from other species of Balsamodendron, such as B. Mukul, Hook.; B. pubescens, Stocks; B. Opobalsamum; and sometimes also with B. Roxburghii, Arn. Properties and Uses—

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Medicinal Properties.—Myrrh is beneficial in dyspepsia, amenorrhoea, and chlorosis, and is a useful stimulant and astringent to all ulcerations or congestions of the mucous membrane. It is a useful application to old, foul and indolent ulcers, and a valued wash for the mouth and gums, and a gargle in ulcerated sore-throat. (K. L. De, C.I.E., Rai Bahadur.) It is a stimulant expectorant, much admired as a remedy for pulmonary affections, especially the asthma of the aged. (Ind. Pharm.) Meer Mahomed Husain says it is hot and dry, and that the best quality when broken shows white marks like those at the root of the finger-nails. Internally it is regarded as tonic and antispasmodic, emmenagogue, astringent and expectorant. Hakims use it for intestinal worms. It is a "detergent, siccative, astringent, and aperient, a disperser of cold tumours, and one of the most important of medicines, as it preserves the humours from corruption." "Dissolved in women’s or ass’s milk, it is dropped into the eye in purulent ophthalmia." (Dymock.) It is said to cause abortion, and is useful in fever and epilepsy.

OFFICIAL PREPARATIONS.—It is an ingredient in Decoctum Aloes, Comp.; in Mistura Ferri, Comp.; in Pilula Aloes et Myrrheae; in Pilula Asafoetidae, Comp.; and in Pilula Rhei, Comp. It is also made into Tinctura Myrhræ, P. B.

Dose in pill, powder, or emulsion, 10 to 30 grains; of tincture 1 to 2 fl. drachm.

Special Opinions.—Mérh (Swahili=Africa) is not found in Indian bazaars, but is brought to Zanzibar from Mekula and Arabia generally. In shape it is of a small, hard, black cone. Composition unknown; rubbed down on an earthen plate in water to the consistency of thin gruel and taken as a drink in flatulence and dyspepsia. Is very commonly given to children, and used internally and externally is said to allay the severe pain of orchitis (Zanzibar).” (Surgeon-Major John Robb, Bombay.) "The gum-resin, in combination with gér, is given to increase the secretion of milk in women.” (Norain Missir, Hoshangabad, Central Pro-
Opaque Bdellium.

BALSAMODENDRON Roxburghii.

vince.) "Myrrh, as obtained in the bazars, is very impure, but is used to check bronchial secretion. Owing to its impurity, not much reliance can be placed on it." (A Surgeon.) "In combination with dilute nitric acid, I have found Myrrh a very useful application to chronic and unhealthy ulcers. Its efficiency as an ingredient in expectorant mixtures is too well known to call for remark." (Surgeon S. H. Browne, Hoshangabad, Central Provinces.)

Balsamodendron Opobalsamum, Kunth.; Brandis, For. Fl., 65.

Balsam or Balm of Gilead.


Habitat.—A small-branched tree found on both sides of the Red Sea, south of 22° north latitude. It is also recorded from several places on the Nubian coast and in Abyssinia. It is met with on the Asiatic side at Ghizandad in Arabia, at Aden, and Yemen. It is in all probability introduced into Palestine.

Properties and Uses—

Gum.—The famous Balm of Gilead or Balsam of Mecca is imported into Bombay from Arabia. It is a greenish-yellow oleo-resin of the consistence of honey, used as a perfume and in medicine.

Medicine.—The wood (Oad-i-Balasam) and the fruit (Tukm-i-Balesam) are also imported, and are chiefly used as medicines by the Yunnan Hakims of India. "The fruit is considered to be a powerful carminative and digestive; it is also praised as a stimulant, expectorant, and is usually administered in combination with tragacanth." (Dymock.)

§ "Mixed with oil of roses, balsam is used in earache. Made into a paste with lard, it is applied locally in scrofulous and cancerous sores." (Surgeon G. A. Emerson, Calcutta.)

B. Playfairii, Hook. f.

Opaque Bdellium.

Vern.—Hotai, or hodhâi, Somal., Duk., Arab.; Merna-hurma, Bom.-

Habitat.—Met with in North-East Africa.

Gum-resin.—Yields an opaque, whitish gum-resin, which is used as a soap by the Arabs and Somalis to kill lice, and in Bombay in the cure of guinea-worm. (Compare with remarks under B. Kataf.)

§ "A recent chemical examination has shown that Opaque Bdellium and Hotai are far from being identical, Dukh, the Arabic name of the gum Hotai." (Surgeon-Major W. Dymock, Bombay.)

B. pubescens, Stocks.; Fl. Br. Ind., I., 529.

Vern.—Bayisa-kugul, Mar.; Bayi, bai, Beluch.

Habitat.—A small tree of Beluchistan and the hills separating that country from Sind as far south as Karachi.

Gum-resin.—It yields a small quantity of tasteless, inodorous, brittle gum, almost entirely soluble in water.

Medicine.—Dr. J. Newton reports that the gum obtained from this tree may be used in the form of ointment for cleansing and stimulating bad ulcers. It is a favourite application in Delhi sores, combined with sulphur, catechu, and borax; it is reported to stimulate healthy action.


Vern.—Gugala, Beng.; Gugal, mhaishabola, Bom.; Gugar, Sind; Gugul, Guj.; Gkbul, Tam.

GUM.

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MEDICINE.

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GUM-RESIN.

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MEDICINE.

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BAMBUSEÆ.

Classification into Genera

Habitat.—A small tree of East Bengal and Assam.

Properties and Uses—

Gum-resin.—It yields a gum-resin of a greenish colour, moist and easily broken, having a peculiar cedar-like odour; it is largely supplied to the Bombay market from Amráoti, and is much used by masons to mix with fine plaster. (Dynock.)

Oil.—Baden Powell mentions that the plant yields a medicinal oil. This is in all probability the gum-resin, which is quite liquid and not unlike an oil when fresh.

Medicine.—Birdwood mentions this plant in his list of drugs, but gives no information as to its medicinal properties.

BAMBOO.

Probably no plants are more valuable to the inhabitants of India than the graceful, gigantic grasses, popularly and collectively known as Bamboo. They constitute the Tribe BAMBUSEÆ of the Natural Order GRAMINEÆ—the Grasses. The late General Munro, in a valuable paper upon Bambuseae published in the Transactions of the Linnean Society of London, Vol. XXVI., 1870, gives an account of over 170 species. Previous to this, the literature of the subject consisted of scattered publications describing the bamboos of certain regions, the only complete paper having been written in 1839 by Prof. Ruprecht, in the Transactions of the Academy of St. Petersburg. Subsequent to General Munro's account of these exceedingly valuable plants, the late Mr. Kurz, of the Calcutta Botanic Gardens, in the Journal of the Asiatic Society of Bengal (Vol. XXXIX., 88, and XLII., 249), described a number of new or little-known species, and gave in the Indian Forester, Vol. I., pages 198, 335, under the title "Bamboo and its Uses," much interesting information of a practical nature. The difficulty in collecting complete sets of the leaves, flowers, and fruit of the same species of bamboo renders the study of the bamboos exceedingly troublesome. It must be admitted that there remains much to be done before we can be supposed to possess even an approximately complete knowledge of these most useful plants. Bentham and Hooker, in the Genera Plantarum, refer the members of the Bambuseae to 22 genera, of which 14 have representatives in India and the Malaya. Unfortunately, however, the information of an economic nature is uniformly published under the generic name Bamboo, or is, at most, associated with but one scientific name. It is, accordingly, almost impossible to refer the properties and uses of the various bamboos described by authors to their respective botanical species. On this account it has been deemed advisable to give, in its place, a popular account of the bamboo, instead of attempting to pursue the course usually adopted in this work. The following brief analysis of the more important genera of the Indian Bambuseæ may serve, however, to direct the reader's attention to their respective alphabetical headings, where fuller and more scientific details will be found.

Tribe Bambuseæ.

Botanic Diagnosis.—Tall, bushy or arborescent grasses, with woody stems (the culms or rhizomes of authors). Leaves flat; sheath large; petiole short or absent; blade articulated and generally cadaceous, leaving the sheath embracing the stem or branch. Inflorescence spike-like, branched and spreading panicles of fertile spikelets rarely glomerulate; panicles and even spikelets sometimes bracteate. Spikelets pedicelled or subsessile, one to many-flowered. Glumes 2 or many, empty, often grading above into the palea, the lower pair of which may be empty or contain only abortive or incomplete flowers. Palea large, 2 or many, outer and inner, standing opposite each other and protecting the flower, rarely absent, arranged distichously on the rachis; outer concave or involute.
and generally keeled, those of the fertile being often quite different from the sterile flowers; inner flat or concave, 2-keeled and more delicate than the outer. (The palea afford perhaps the most important generic character.) The florets normally are composed of three whorls of organs arranged ternately: 1st, Lodicules (or squamules)—3 hypogynous scales, 2 alternating with the palea, and 1 opposite or only 2, or absent—these may be said to correspond to the corolla; 2nd, stamens—3 to 6, or many; 3rd, ovary—sessile or spirally stalked, ovate or pear-shaped, with a solitary style and stigma, 2-3-fid, rarely entire. The florets may be dichious, hermaphrodite, or polygamous or even abortive, and it is by no means unusual to find the palea giving origin not to a floret but to a spikelet, this peculiarity producing branching and spreading inflorescences with pedunculate spikelets, so frequent a condition in the Bambuseae.

Sub-tribe 1st, ARUNDINARIEÆ.

Stamens 3. Palea, 2-keeled. Pericarp thin, semi-adnate to the seed.


Cespitose shrubs with slender mostly annual stems, rarely arborescent. Spikelets many-flowered, mostly pedunculate, forming racemes or panicles, the branches occurring in the axils of small linear bracts which become large and amplexicaul in the species formerly referred to the genus Thamnochlamus; empty glumes 1-2, inferior.

Sub-tribe 2nd, EUBAMBUSEÆ.


* Filaments free.

2. Bambusa, Schreb.

Trees, rarely shrubs or more rarely scandent plants, growing in clumps; stems tall, woody. Spikelets 2 to many-flowered, generally sessile, in interrupted glomerulate panicles. Empty glumes 3-4, inferior. Palea boat-shaped, with ciliate keels or distinctly winged. Apex of the ovary hairy. Style deciduous, deeply 2-3-fid. Embryo conspicuous on the surface of the fruit. Caryopsis with a deep longitudinal furrow, often adherent to the palea.

** Filaments united into a tube.


4. Oxytenganthera, Munro.

Inflorescence and habit of Bambusa. Spikelets 1 to many-flowered, the terminal one only being fertile. Palea absent or indistinguishable from the glumes.

Sub-tribe 3rd, DENDROCALAMEÆ.

Stamens 6. Palea 2-keeled. Caryopsis often very large. Pericarp separating into an outer hard shell free from the seed.

5. Dendrocalamus, Nees.

Habit of Bambusa. Spikelets 2 to many-flowered; panicles distantly glomerulate, the flowers often only one, fertile. Lodicules none or very rarely represented by 1-2 rudimentary scales. Inner palea boat-shaped and 2-keeled. Ovary stipitate, hirsute on the apex; style long, filiform, entire or 2-3-fid at the apex, base persistent. Caryopsis terete, generally small; pericarp thick; position of the embryo generally not conspicuous.
<table>
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<tr>
<th>Classification of Bamboos, 69</th>
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<tr>
<td>6. Melocalamus, Benth.</td>
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<tr>
<td>Habit of Bambusa. <em>Spikelets</em> 2-flowered, forming elongated and sparsely glomerulate panicles. <em>Ovary</em> glabrous. <em>Caryopsis</em> large (as large as a wood-apple); pericarp thick, fleshy. (Kurz by mistake placed the species of this genus under Pseudostachyum.)</td>
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| Pseudostachyum, Munro.       |
| Sub-arborescent plants with the foliage of Bambusa. *Spikelets* few, one-flowered, in bracteate spikes, forming open panicles. Empty *glume* one, inferior; terminal *glume* also empty and globose. *Caryopsis* comparatively small, flattened globose; pericarp crustaceous. |

| Teinostachyum, Munro.       |
| Arborescent, fruticose, or sub-scandent bamboos, with the foliage of Bambusa. *Spikelets* one-flowered, sub-spicate, forming branched panicles, bracteate. Empty *glumes* 1-2, inferior, and terminal *glume* also empty and acute. *Caryopsis* large, acuminate; beaked; pericarp fleshy, and when mature separating into an outer cartilaginous coat and inner layer. |

| Cephalostachyum, Munro.   |
| Bushy or arborescent bamboos. *Spikelets* one-flowered, in numerous terminal globose or glomerulate heads, protected by bracts. Empty *glumes* 1-2, inferior. *Caryopsis* oblong, beaked; pericarp thick. |

| Sub-tribe 4th, MELOCANNAE.  |
| *Stamens* 6 to many. *Spikelets* one-flowered. *Palaea* absent or the same as the *glumes*. *Pericarp* crustaceous or fleshy, free from the seed. |

| Dinochloa, Buse.          |

| Melocanna, Trin.          |
| Arborescent bamboos with the foliage of Bambusa. *Spikelets* bracteate, arranged in unilateral compressed spikes. Empty *glumes* many, inferior, mucronato-acuminate and not keeled, becoming convolute (resembling *palaea*) above. *Lodicules* 2. *Stamens* 6, free or more or less connate. *Caryopsis* very large; pericarp thick and fleshy. |

| Ochlandra, Thu.           |
| Arborescent bamboos. *Spikelets* large, densely capitate or sub-spicate. Empty *glumes* 3 to many, inferior. *Lodicules* very irregular. *Stamens* most frequently 6 or many, filaments variously connate. *Caryopsis* large, with a thick fleshy pericarp. |

**Habit and Growth of the Bamboo.**

Under each of the Genera briefly defined in the preceding pages, one or more species of gigantic or even arborescent grasses have been described by botanists, each of which may popularly be known as "the bamboo." Most authors, however, speak of *Bambusa arundinacea* as "the bamboo," an expression which is quite incorrect, since the spiny bamboo of South and West India is by no means either the most useful or most abundant

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species in India as a whole. It is quite customary also to read of *Bambusa vulgaris* as the "common bamboo," whereas in India, at least, this cultivated Eastern species is by no means a common plant. It would be more correct to speak of *Bambusa Tulda* as the "common bamboo," and, as far as Bengal is concerned, it certainly is the most abundant species, while *B. Balcoos* is nearly as plentiful, and is much more useful, having also a wider distribution. On these grounds it would, by the majority of the natives of India, be pronounced "the bamboo." The term "male bamboo" may be said to be applied to any solid bamboo used for spear or lance staves, walking-sticks, &c.; it is more particularly applicable to *Dendrocalamus strictus*. The stamens and pistil being on the plant, it is difficult to see why the term "male" should be given to a solid and "female" to a hollow bamboo, but they are expressions in frequent use in India.

As with all other grasses, the bamboo stem consists of a more or less hollow culm, with transverse solid joints called nodes. The thickness of the woody shell and the length of the internode varies exceedingly in the different species. One peculiarity is preserved by all bamboos, namely, the rapid growth of the young shoot. Running up to its full height before the branches are produced, the shoot at the same time attains its full thickness immediately on escaping from the ground. This is a most important provision, for, otherwise, the branched culm could never penetrate through the crowded mass of its associates. Having in about a month reached its full height, the shoot commences to produce its branches and branchlets, and thus weighted, it curves into the graceful plume which is the elegant and familiar feature of the plant. At the same time, the large sheathing leaf-scales of the young shoots give place to the mature and distichously-arranged leaves. These, owing to their horizontal position and the concavity of their upper surfaces, keep rustling and trembling with every passing breeze. At a rule the bamboo is gregarious, establishing itself so thoroughly over certain portions of wild forest-clad tracts that it exterminates all other forms of vegetation. Seen from a height nothing could be more lovely; but, to the traveller, who for days together may have to clear a path for himself, the interminable monotony, and the twilight shade and death-like stillness, broken only by the sighing of the grating culms, make the bamboo jungle dreary in the extreme. However, in mixed forests, an occasional bamboo clump has a most pleasing effect. It supplies the traveller, moreover, with some of his most essential materials of equipment. Indeed, in a bamboo tract tents may be dispensed with, for, through the expert handling of the bamboo, the camp follower, armed with a large knife, can, in less than an hour, erect a most comfortable hut and furnish it with beds, tables, and chairs, all constructed from the bamboo.

Popularly, bamboos may be divided into those which grow in separate clusters or clumps, and those which grow in a more continuous manner. The former are characteristic of the tropical, and the latter of the extra-tropical or temperate forests. The clumped forms give to the soil a curious undulated appearance, each elevated mass consisting of the old stems or rhizomes and the entangled and tufted roots with the earth gathered around them. In many localities ant-hills surround the bamboos to a height of several feet, ultimately proving fatal to the plant, which, however, for a time, appears to grow from the top of the elevated mounds. Each clump consists of from 30 to 100 culms, which attain a height of from 30 to 100 or even 150 feet. In the scattered forms the culms rarely rise singly from the rhizome, but form small clumps containing only a few culms, the clumps being so closely packed together as to form impenetrable jungles. These latter are smaller in thickness and height,
and are generally solid; collectively they are known as hill bamboo. A few species are climbers, their festoons and pendulous boughs passing gracefully from tree to tree.

The home of the giant forms of bamboo may be said to be in the tropical and extra-tropical forests; on entering the temperate zones they dwindle down to mere under-shrubs, until ultimately they are scarcely distinguishable from other grasses.

**The Stem or Culm.**

For about two-thirds of its outer portion, the culm is unbranched, or possesses only very short and inconspicuous branches. As already stated, on escaping from the ground the shoot attains at once its full diameter, appearing like a great scaly cone, clad in large embracing sheaths. The shoots and leaf-scales afford the most important popular and practical characteristics for recognising the different species of bamboo. Solid-stemmed bamboos are, as a rule, much smaller than hollow ones, but bamboo culms may be said to range from the thickness of a goose’s quill to more than a foot in diameter. Until the branches have been fully developed the culm is not mature; this generally occupies a variable but considerable period, the shoot attaining its full height in from 90 days to 2 or 3 months. The branches are produced from below upwards, and with their appearance the stem gradually matures. A good deal has been written as to the rate of growth of the shoot, but up to the present date exact and definite figures, even for the important species, cannot be obtained. It is probable that an average of 3 inches per day would not overstate the growth of the young shoots of the more important bamboos. This seems also, in the majority of species, to take place chiefly at night and to continue for a month pretty uniformly, being increased, if anything, during fine clear days, and retarded apparently in damp and cloudy weather. The period of sprouting is generally about the beginning of the rains. **Captain W. H. Sleemann** says: ‘In the rains of 1866, my bamboos at Jubbulpore had not thrown out their shoots at what I considered the usual time, and I asked my gardener the cause. He replied, ‘We have had no thunder yet; as soon as the thunder comes, you will get shoots.’ I asked him what possible connection there could be between the sound of thunder and the shooting of the bamboos. ‘God only knows,’ said he, ‘but we know that till the thunder comes, the bamboos never shoot well.’ The thunder came, and certainly the gardener’s theory seemed to me to be confirmed by a very steady and abundant shooting of the bamboos.” This same belief is very generally entertained by the natives of India, and, as remarked by Mr. Kurz, the observation may be a perfectly correct one, the phenomenon depending upon the greater amount of nitrogen compounds in the atmosphere during electric discharges. “Repeated cutting of too many bamboo-shoots considerably weakens the stock, while the cutting of full-grown hales does not more injure them than mowing does the grass. Indeed, it is believed that too much cutting of shoots results in early flowering of the stock itself, and such means in most cases death to the whole plant. (Kurz, Indian Forester, I., 257.) This statement is in keeping with a very general opinion (see Bombay Gazetteer, XV., Pt. I., 63) that the year before flowering, the large bamboos cease to send up shoots. Besides, it has an important bearing upon the question of the application of the bamboo for the manufacture of paper—young and not mature culms being necessary for that purpose. (See page 378,—Bamboo as a Paper Material.)

The number of shoots produced yearly from each clump varies according to the vigour of the individual and the peculiarities of the
species. Kurz states that the larger species produce 12 to 20 and the smaller 30 to 50. "If we assume, say, only 10 per stock a year, we should get as many as 300 halms to the stock in 30 years, which is the mean age of most of the bamboo species, at which they begin to flower and die off; while 50 and fewer halms to a bamboo-stock is a very dense growth even in those primeval forests where the axe of man does not touch them."

**Peculiarities of Bamboo Stems.**

It is by no means unusual to find the greatest variation in the colour of bamboo stems. Some are dark green, as in **Bambusa Tulda**; yellow and even striped yellow and green in **B. vulgaris**; bluish with rough internodes in **Arundinaria racemosa**; and pale glaucous with blue rings at the nodes in **A. Hookeriana**. Many species when young are covered with a tomentum of closely-adpressed hairs or whitish powder, which in many cases forms a useful character: it is best seen upon the young scales. Solidified buds are developed into formidable recurved spines in **Bambusa arundinacea** and **B. spinosa**, while many of the hill bamboos produce below the sheath on the lower half of the culm a whorl of rootlets which harden into spinescent bodes. These are popularly called the spiny bamboos. This root spinescent tendency was found to be developed to a formidable extent in the hill bamboo on the Burma-Mánipur frontier, especially on the Kassome hills beyond the Kaboo valley. Most bamboos show a tendency to flattening above the nodes, especially where buds are developed. This is apparently what has been taken advantage of in the production of what is known as the cultivated square bamboo of China. Interesting information regarding this curiosity will be found in the Tropical Agriculturist (April 1884, p. 698, reproduced from N. C. Herald), from which the following passage may be extracted: "Pre-eminence is assigned to the square variety of this most useful as well as ornamental plant, which has been a favourite in imperial gardens wherever its acclimatisation has been effected in the north. The Emperor Kao Tsu once inquired of his attendants who were planting bamboos, concerning the various kinds. In reply he was informed respecting several remarkable species. Chêkiang in particular furnished one that was an extraordinary curiosity, in that it was square, and for that quality and its perfect uprightness was much esteemed by officers and scholars. They also told him that it was used for many purposes of decoration and utility, including, among others, that of being made into ink-slabs."

**Durability of the Bamboo.**

This depends, in the first instance, upon the culms being cut when mature. Specific peculiarities render some culms more durable than others, as, for example, the thickness of the woody shell, and the amount of siliaceous matter deposited within the tissue. In this latter respect bamboos vary exceedingly. Long immersion in water greatly enhances the durability, rendering the stem less liable to the attacks of insects, owing to the sap, which the insects are fond of, being thus extracted.

**Flowering of the Bamboo.**

A great deal has been written regarding this exceedingly curious and interesting peculiarity. The inflorescence exhibits many important variations, most of which have been accepted by botanists as generic characters. All the species commence to flower when in full leaf, but as the inflorescence expands the leaves as a rule fall off, until when in complete
flower the clump or certain portions of it are leafless. In some cases
special flowering culms are produced, at other times every culm flowers,
the flowering portion or the entire clump dying off after the seeds are
mature. In a few instances the plant continues to flower as a perennial,
while some bamboos are entirely annual, flowering and dying down to
the ground every year. With all the larger species the flowering stage
is reached after a prolonged period of vegetation, variously stated at from
25 to 35 years, and is almost regularly followed by the death of the
whole stock. Captain Sleeman, in the Trans. Agric.-Horti. Soc. of India,
III., 1859, dated 1856, publishes a most interesting letter containing the
main facts of all that is known even at the present day regarding this
subject. It may be well to reproduce a portion of this most valuable
letter:

"All the large bamboos, whose clusters and avenues have formed the
principal feature in the beauty of Dehra Doon, ever since the valley
became known to us, or for the last quarter of a century, have run to
seed and died this season; as well those transplanted from the original
stock last season and those transplanted 20 years ago. This is the charac-
ter of the bamboo: all the produce of the same seed will run to seed and
die in the same season, without reference to the season in which they
may have been transplanted from the original stock; and unless we have
them from different stocks we shall always be likely to lose all that we
have the same season, and to have our grounds deprived for eight or
ten years together of what may have been their principal ornaments;
for the bamboo does not in less time attain its full size and beauty. The
shoots of the first season come up small, whether they be from the
original stock or seed, or from transplants from the original stock. We
may take from the original stock bamboos six inches in diameter with
a sufficient portion of the roots, and transplant them; but the shoots of
the first season, from this stock, will still be very small, those of the
second season will be larger, those of the third larger again, and so on
till in about eight or ten years they attain their full size. It is well
known that bamboos do not increase in diameter after they come above
ground; they shoot out as thick as they are to be, and increase only in
length after they come up. What is the ordinary age of the bamboo
I know not, but the people of the hill and jungly tracts of Central
India calculate ages and events by the seedling of the hill bamboo; a
man who has seen two Katungs, or two seedlings of the bamboo, is
considered an old man—perhaps sixty years of age."

Bambusa arundinacea is the common species in the Dún, and all those
flowered in 1880; assuming that Captain Sleeman alludes to that species,
these dates would give 44 years as the period required to reach flowering.

Another correspondent, in the same volume, writes: "Field rice is
selling at 16 seers local weight per rupee, and bamboo rice at 20 seers.
This bamboo, I am told, does not bear seed every year, nor at any
fixed periods. The sign of bearing showed itself last year, after, I am
informed, a lapse of 20 years; and some very old people could not call to
their recollection when, prior to the former event, bamboo had borne
seed; perhaps encouraged by particular circumstances connected with
elemental changes, they spontaneously fecundate; for it does not appear
to me that the matured bamboo only bore seed, but young and old
together, from the lowest stem to the highest points—a circumstance
which does not admit of the belief that it follows the regular course by
which nature governs the other orders of vegetation. This, of course,
is a conclusion only from apparent causes, for I have not had time
to investigate the fundamental cause or law by which it is influenced;
and native traditions are rather incoherent and speculative to lead to

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any satisfactory conclusion. Superstition, which seizes on everything, however trivial, as a material with which to manufacture a portent, assigned to the appearance of the seed a certainty of impending famine; or, say the Brahmins, ‘When bamboo produce sustenance, we must look to heaven for food.’ But for the hundredth time, perhaps, is Brahminical prescience belied, for never was there a finer crop of rice on the fields than at present. It would not be surprising, however, if the common and intended meaning of the prophecy be hereafter denied, for bearing as it does a double meaning, like many of the responses of the Pythian oracle, the incorrect reading may be ascribed to ignorance.”

“Each bamboo bears from 4 to 20 seers, which assigns to it in my opinion a character of extreme fruitfulness, considering the close and compact order in which the bamboo grow. Soon after bearing, the bamboo seems to have fulfilled its career and dies, but the roots again send forth offshoots to perpetuate the species on the same ground; nor is it in this manner only that it is propagated; for the seed germinates, as I have tried, and have not the least doubt that a plantation may be raised from it.” (J. B. Jones in Trans. Agri.-Horti. Soc. India, Ill., 1843)

Beddome is of opinion that *Bambusa arundinacea* generally flowers at an age of about 32 years, he having ascertained that in Western India it flowered in 1804, 1836, and 1868; but Dr. Brandis adds that this species also flowered in Kanara in 1864. The most animated discussions have been published as to whether the bamboo flowers when it attains a definite age, or only at any period when mature, provided the circumstances of the season are favourable. In his *Himalayan Journal* Sir J. D. Hooker seems to favour the latter theory, but there are many facts which go to support the former. Both may be true, and this is probably the wiser solution of the difficulty—that is to say, a bamboo may not flower before it has attained a certain age, but its flowering is not fixed so arbitrarily that it cannot be retarded or accelerated by climatic influences. It is an undoubted fact that the flowering of the bamboo is decidedly influenced by the causes which bring about famine, for the providential supply of food from this source has saved the lives of thousands of persons during several of the great famines of India.

Captain Sleeman very wisely suggests that it would save the complete destruction of the bamboos of a district to introduce seedlings obtained from stock in other districts. It appears certain that it is immaterial whether cuttings are taken a few years or many years before the flowering; the parent or stock plant, as well as plants raised from cuttings, will all flower and die at the same time. Indeed, it has been shown that cuttings taken a year or so before the flowering, if unable to produce flowers, nevertheless die with the rest. This curious fact seems to indicate that the life of the plant is perfectly fixed and is renewed only by seed. The introduction of two or more batches of seedlings from remote districts into each forest would seem to be an expedient that might fairly well claim the attention of the forest authorities, but it would deprive the people, to a large extent, during times of scarcity, of the chance of obtaining a crop of bamboo grain. It would be intensely interesting to have the facts relating to bamboo flowering carefully recorded every year all over India. Do all the forests, for example, of a certain bamboo in India, exhibit a tendency to flower at once, or is there any relation between the periods of flowering of the same species in different parts of India? It seems likely that each of the recorded periods of flowering were in reality the times of flowering of different species of bamboo, and are thus relatively of little importance. The natives of some parts of India say the flowering can be averted by cutting down all the bamboo the year before the flowering is

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expected. It is difficult to see how this can affect the plant. At most it can only retard the flowering for a year or so; and it is equally difficult to understand how it can be known when flowering is taking to place.

**Propagation of Bamboos.**

This may be effected—

1st, **By Seed.**—This is the slowest but most effectual process. The ovary (surrounded by the lodicules and palea) drops from the plant and readily germinates, usually within the first week after reaching the ground. Some species germinate while the seed is still attached to the plant, the young shoot creeping from the parent when seemed fit to rise; but when it is known as to the period of vitality of the bamboo seeds, but if carefully collected and matured in the usual way, they may be sent from one part of India to the other in good condition. This of course applies only to those which fall from the plant before germinating. Propagation by seed is the most certain plan, but the plant requires 10 to 12 years to attain a growth sufficient to admit of cropping.

2nd, **By Cuttings.**—This is the process most frequently adopted in India. The lower part, say 3 feet in length, of a growing half-mature stem is placed in the ground shortly after the commencement of the rains. This is most frequently cut off so as to leave, if possible, a portion of the rhizome attached. The cutting should be made a little below one of the nodes and buried so as to include this and the next node. Sometimes the cuttings are laid lengthwise along the ground on a specially-prepared soil, and the sprouting at each node with their roots are afterwards separated and transplanted to their final positions.

**Properties and Uses of the Bamboo.**

**Fibre as a Paper Material.**

References.—**Rouldge—On Bamboo considered as a Paper-making Material:**

*Ken Reports. 1877, p. 35, and 1879, pp. 23, 34; Dr. King’s Reports of the Botanic Gardens, Calcutta, for 1877, 1878, and 1879; Spons’ Cyclopaedia; Official correspondence with Forest Department.*

“Of all the fibre-yielding plants known to botanical science, there is not one so well calculated to meet the pressing requirements of the paper-trade as ‘Bamboo,’ both as regards facility and economy of production, as well as the quality of the ‘paper-stock’ which can be manufactured therefrom; grown under favourable conditions of climate and soil, there is no plant which will give so heavy a crop of available fibre to the acre, and no plant which requires so little care for its cultivation and continuous production.” These are the opening sentences of Mr. Rouldge’s most useful and interesting little book on “Bamboo as a Paper-making Material,” published in 1875. That young bamboo shoots can be used in this way is now an established fact, and great credit is due to Mr. Rouldge for the energy and persistence with which he has advocated the claim of “Bamboo fibrous stock” to the paper manufacturers. While this is so, there are practical difficulties which seem likely to prevent bamboo from ever taking the place which the study of the prepared fibre apart from the plant would naturally suggest for it. The structural differences between monocotyledonous and dicotyledonous plants have repeatedly been pointed out, in connection with the subject of the fibres obtained respectively from certain members of these sub-kingdoms. In the former the bundles of vessels are isolated, and pursue a curiously-curved course through the stem growing at the upper extremity upwards and outwards, and at the lower downwards and outwards. This curvature gave rise
### Products of India.

#### Bamboos.

BAMBUSÆ.

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To the mistaken idea of internal growers or endogens. The vital difference between the two classes of stems is found chiefly, however, in the vessels, which in both cases take their origin at the growing point of the stem. In the monocotyledon they remain quite distinct from each other, being simply imbedded amongst loose cellular tissue. They have a pronounced tendency to elongate, but do not enlarge very much in thickness. In the dicotyledonous plants the fibro-vascular bundles, on the other hand, steadily increase in thickness, and as a consequence they coalesce together, forming zones of woody tissue. The young outer layer, including the bark, is thus the only portion of the dicotyledonous stem which can conveniently be reduced to fibre, whereas the great bulk of the monocotyledonous stem is amenable to the agencies now employed by the manufacturer for the production of fibre. It thus follows that not only have dicotyledonous stems to be subjected to an elaborate process for the purpose of separating wood from bark, and of liberating the fibres of which the bark is composed, but only a small percentage of the crop obtained from the field actually goes to fibre. These are powerful arguments, no doubt, in favour of bamboo and other monocotyledonous fibres for paper trade. The yield of flax per acre is about 5 cwt., hemp 7 cwt., jute 5 or 6 cwt., and cotton much less, while about 10 tons can, according to Routledge, be obtained from an acre of bamboo jungle. The paper manufacturer cannot afford to give the prices which can readily be commanded by any prepared fibre. Esparto, which may be directly placed in the pulping pans, might not incorrectly be taken as the type of fibre required by the paper trade. The increasing demands for this grass, which already exceed the supply, have forced upon the world the serious problem of finding a substitute, and for some time the greatest hopes were entertained that immense expanses of almost waste bamboo jungle in India would be rendered available, thus meeting the industrial wants and at the same time opening up a new source of revenue to the country.

### Objections to Bamboo as a Paper Fibre.

It is very much to be regretted that the great expectations as to the future application of the bamboo to the requirements of the paper-trade were frustrated by practical obstacles which Mr. Routledge did not apparently foresee. These may be briefly stated:

1st.—The young shoots only being serviceable for paper-making, three serious difficulties arise: (a) the bamboo shoots appear from June to July, and are in condition during August and September, but by the end of October they are too old; (b) the stock is found to suffer severely from the removal of the shoots; (c) each clump can yield only about three or four shoots a year. Experience has shown that this is about the full number which each clump can be supposed to yield. The shoots that are removed must not be cut close to the ground, otherwise the plant suffers still more severely.

2nd.—Experiments seem to have failed to induce the bamboo to produce a continuous supply of shoots throughout the year.

It was found that a large percentage of old stems required to be left on the stools, otherwise the plant was in time killed, and that the same danger existed in the complete removal of the young shoots. This would necessitate a methodical working of the jungles, and thus considerably increase the charges of collection and transport. Dr. King has demonstrated (in Reports of the Royal Botanic Gardens, Calcutta, 1877-80) that if all the shoots be removed for three successive years the plant is killed. This danger may be averted for a time by systematic working of the clumps, but does not appear to be curable.

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4th.—During the months in which the bamboo shoots appear, the climate of the most important bamboo forests is such that labour could not be obtained. In fact, bamboo forests occupy, as a rule, uninhabited districts, rendering the labour question, apart from the dangers to human life, one of the most serious difficulties.

5th.—The freight and transport charges incidental to all raw products which have to be conveyed for long distances are very considerable. In fact, owing to the scattered nature of the clumps which form bamboo jungles, human labour would be the only means of collecting the material to points from which it could be conveyed to the factory.

6th.—A most unexpected difficulty, which in itself almost renders the bamboo unsuitable for paper-making, exists also in the hard adpressed hairs which cover the scales and young stems. It has been found impossible to remove these, and they are not only dangerous to the men employed, but injure the paper seriously.

**Experiments in Cultivating Bamboo as a Paper Fibre.**

An experiment was, however, undertaken in Burma, and the terms of a concession discussed by Government some few years ago. **Mr. Routledge** found that paying Rs 15 a thousand for the shoots landed at Rangoon, he could prepare fibre at a price that could be given by the paper manufacturer. A thousand green bamboo shoots weigh about 8 tons, and losing 75 per cent. in moisture they yield 2 tons of dry fibre. He thus paid about 30s. for the materials from which two tons of fibre were prepared. To this must be added the charges connected with the separation of the fibre and the shipping and freight to Europe.

A point of great importance, and one which must not be overlooked, is, that the bamboo shoots must be reduced to fibrous stock in India. Various proposals have been made to meet this difficulty. One, that floating machinery should be conveyed up and down the rivers to convenient places near the forests, and that the crushing, or the first stage of the process of manufacture, should be conducted in this manner on board at flats. The ribbons of crushed bamboos are, however, very subject to destructive fermentation, being rapidly rendered useless. If not reduced at once to dry fibrous stock, the greatest possible care must be taken to see that the ribbons are conveyed in safety to the factory where they are to be reduced to fibre.

The idea of floating the young shoots down the rivers to some healthy situation, where a factory could be located, has also been discussed, and, if practicable from the manufacturer’s point of view, this would only have to contend against the dangers and difficulties in the forests.

Another proposal is to have machinery which could be put down in the jungles, and moved from place to place as required. The obvious objection to this is the danger to human life from the malarious nature of the forests, and the expense and danger of conveying heavy machinery through wild tracts of country where there are no roads.

**Mr. Routledge** seems to be most in favour of the idea of selecting a healthy district where a large plantation could be opened out around the factory, and an elaborate system of irrigation might be adopted to force the growth of the bamboo. This seems to completely ignore questions of a vital nature; if the land were good and favourably situated with reference to facilities for exportation, it would never pay to put it under bamboo cultivation, and if not so favoured, it might be possible to make the bamboo grow, but quite another matter to make the factory a profitable undertaking.

Besides, there are many other fibres which in all probability would be
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More profitable to cultivate in the way Mr. Routledge proposes bamboo. The Nepal paper plant, for example, would seem to be which should attract the most attention in the future. It has overlooked by Europeans, chiefly through the success of jute and other plants suited to the plains of India.

Routledge deserves every praise, however, for the manner in which he has attracted attention of late, it has not by any means been finally disposed of. Paper has been made both in India and in the bamboo; indeed, in China, it is “the principal if not the chief material for paper-making, and was there used as such when our ancestors were savages.” (Kurtz.)

Mr. J. H. Hume writes regarding the Chinese method of preparing paper bamboo: “I would suggest that the Chinese method of making paper pulp obtained from mature bamboo is more likely to pay than that employed by Mr. Routledge of using only the young succulent shoots. The method of preparation from bamboo is as follows: The leaves are stripped of its leaves and split into lengths of three or four feet, packed in bundles and placed in large water-tanks; each layer is then covered with a layer of lime; water is poured on till the layer is covered. After remaining in this condition three or four months, the bamboo becomes quite rotten, when it is pounded into pulp in a bed of sand and mixed with clean water. This liquid is poured, less sufficient for the size and thickness of the sheets required, into sieve-like moulds. These sheets (of which a skillful workman can make six in a minute) are allowed to dry, then taken from the mould and passed through a moderately-heated wall, and finally exposed to the air. The best quality is made from the shoots of the bamboo, added to the infusion; the second from the bamboo itself, higher grade of this quality is attained by the previous treatment of the green portion.”

Bamboo is repeatedly proved by European manufacturers that the bamboo can compete with other paper-yielding substances. Both in India and Europe, thousands of tons of bamboo fibre (supplied to the West Indies) have been made into excellent paper. “Efforts made in Brazil to utilise the fibre for textiles, in mixture and silk.” (Spence’s Encycl.)

Obstacles to the establishment of bamboo as an industry are not serious. The natural nature, but they are such as might be expected to give place when the necessity for more fibre. So long as this is not the case, not appear to be much chance of the trade in bamboo fibre the form of an established industry. For the convenience of the industry, the following extracts from Mr. Routledge’s papers may be republished in this place: “An essential point in the treatment of bamboo is the distance from which the fibres are to be obtained. The fibres are cut from the stems, by a guillotine knife or shears, are delivered by a

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carrier or automatic feeder direct to the boiling pans, or elsewhere, as
desired.

"As the object of my process is to produce a fibrous or tow-like stick,
retaining as far as possible the normal or natural condition of the fibre,
and not 'Half-stuff' or 'Pulp,' my system of treatment differs matri-
ally from the ordinary process of preparing fibres, more especially in
the boiling and washing processes.

"Both of these processes I conduct in a battery, or series of vessels (16, 26,
or more in number), such vessels being connected together by pipes or
channels furnished with valves or cocks, so that communication be-
tween the individual vessels may be maintained, disconnected, and regulated
as desired, in such manner that the vessels, being methodically charged
in succession with the material to be operated upon, the heated leys (com-
posed of caustic alkali) can be progressively conducted from vessel to vessel
of the series, passing over and through the material placed therein.

"The leys are thus used again and again (each successive charge
or charge of ley carrying forward the extractive matters it has dis-
solved from the fibre with which it has been in contact) until exhausted
or neutralised (when they are discharged), fresh leys being methodically
and successively supplied, until by degrees the extractive matters com-
bined with the fibre or fibrous material have been rendered sufficiently
soluble, when hot water for washing or rinsing is in the same con tin-
uous manner run successively from vessel to vessel, over and through
the material contained therein, until the extractive matters rendered soluble
by the previous alkaline baths have been carried forward and discharged,
leaving the residuary fibre sufficiently cleansed.

"By this system of boiling in continuity, until all the effective alkali
in the leys is exhausted or neutralised, I realise an economy of from 30
per cent. to 40 per cent. of soda over the usual process of boiling, and
by the subsequent washing or rinsing in the same continuous manner,
without removing the material from the vessels, the normal structure
of the fibre is in a great measure retained, waste is minimised, and this,
while being thoroughly cleansed and freed from extraneous matter, the
strength and staple of the fibre are preserved; a considerable saving of
fuel results from the heated liquors being used again and again, less steam
being required, as also less water, while at the same time economy of both
labour and power is effected over the ordinary system.

"Assuming the boiling and succeeding washing processes to be con-
cluded, and the material ('Bamboo') in one of the vessels of the series
in its regular succession to be found sufficiently treated and cleansed,
a final cooling water is run on and through the fibre, which is then drained
and the contents of the vessel (disconnected for the time being from the
series) emptied into a waggon running on a railway, by which it is conduc-
ted to a press or otherwise to abstract all the remaining moisture possible.

"The dry, or semi-dry, fibre is then submitted to the action of a
willow, or devil, by means of which it is opened or teased out, and con-
verted readily into a tow-like condition, when it is dried by a current
of heated air induced by a fan-blast, and finally baled up for storage or
transport, in a similar manner to cotton or jute.

"In this condition of 'paper-stack' it may be kept an indefinite length
of time without injury, and when received by the paper manufacturer,
requires merely soaking down and bleaching to fit it for making into paper,
either by itself, or used as a blend with other materials, as desired." (Mrs.
Routledge's "Bamboo considered as a Paper-making Material," pp. 12-14.)

Much has been written for and against the idea of practically utilizing
our vast bamboo forests as a supply for paper, but the present position
may not incorrectly be described as a controversy of opinions which have
not been put to a practical test. Experiments of sufficient magnitude have not as yet been undertaken to ascertain whether or not Mr. Routledge's proposals can be practically carried out in India. If cheap machinery could be invented suitable for the preparation of the fibrous stock, one would be inclined to hope that the smaller proprietors of bamboo jungles might take to preparing the fibre. Indeed, past experience would seem to justify the opinion that the native and not the European is the proper person to look to for the cultivation and preparation of fibres.

**MEDICINE.**

In the interior of the hollow stems of some bamboos, chiefly Bambusa arundinacea, a silicious and crystalline substance is found, known in the bazaars of India as Tabashir or Tabashir.

**BAMBOO MAMMA.**


There are two varieties of tabāshir known in the bazaars, vis., kabūdi, blue; and sāgrād, white: the former is only pale blue.

The following interesting historical account of this substance is extracted from Sir George Birdwood's Bombay Products: "Tabashier is an article of the greatest antiquarian interest, as Salmasius, Sprengel, and Fee are of opinion that it is referred to, and not sugar, by the ancients.—Dioscorides and Pliny, for example, where they mention ἀβίδακης and Saccharum. Salmasius states that the Saccharum of the ancients, as described by them, had none of the properties of sugar, and was used in ways sugar never could be; and in another place that the ἀβίδακης of the Greeks was tabashier 'beyond all controversy.' Against this dictum the line in Lucan has been cited—"Quique bibunt tenera dulces ab arundine succos," as if the bamboo could be a 'tenera arundo.' But Salmasius quotes this very line, and yet goes on to show by arguments one finds it difficult to refute, although common sense would reject the conclusion, that cane-sugar was unknown to the ancients. One would think Pliny's description left little room for doubt; yet Salmasius, by means of a comma, alters its whole meaning. The passage is as follows: "Saccharum et Arabiae fort, sed laudatius India; est autem mel in arundinisbus collectum, gummi modo candidum, dentibus fragilis, amplissimum nucis ovalae magnitudine, od medicine tantum usus." But says Salmasius, 'ita haec distinguienda, collectum gummi modo, non ut est dulgo gummi modo candidum. Haec omnia prorsum quadratur in tabascir, vel saccharum mambu,'—"It is white, brittle to the teeth, is collected in reeds, is sweet" (1) 'and useful in medicine.' Dioscorides says: 'What is called abīdakēs is a kind of concrete honey, found in reeds in India and Arabia Felix, in consistence like salt, and brittle between the teeth like salt. Takendissolved in water it is borne by the stomach,' &c. It is difficult to deny that sugar is not here meant, and very hard to allow that tabashier is. Pliny, copying from Dioscorides, as is plain, perhaps confused tabashier with sugar in his description, and thus has involved the passage in obscurity. The President of the Bombay Branch of the Royal Asiatic Society has suggested to the compiler a reading of Pliny as ingenuous as that of Salmasius, and probably more just, inasmuch as it supports the common-sense view in the 'Sugar Controversy.' Placing a full
stop where the first semicolon occurs, the Honorable Mr. Frere reads the passage as follows: 'Saccharon et Arabia fert sed laudatius India. Est autem mel in arundinibus collectum,' &c. As if Pliny, on mentioning, at once dismissed so familiar an article as 'Saccharon,' and then went on to describe in detail so rare a substance as *tabasheer* must have been.

*Fee, Sprengel, and Humboldt* simply follow *Salmasius, Humboldt* very diffidently. A passage from his *Prolegomena de distributione Geographic* *Plantarum* (quoted in his *Cosmos*), states an opinion, all, on reading the whole controversy on sugar, will probably acquiesce in, and is on other accounts worth introducing here: 'Confudisse videntur etem saccharum areum cum Tebaschiro Bambuseae, tum quia utrque in arundinis inventiunt, tum eliam quim vox sancrudana saccharara, quaehaui (ut Pers. Schucker et Hind. Schukar) pro saccharo nostro adhibetur, observa-
tio Bogrio, ex autoritate Amarasinhe, proprii nil dulce (made) significat, sed quicquid lapidosa et arenaceum est, ac vel calculating vesica. Versamile igitur voce 2000 saccharara duantaxat tebaschiram (saccor nombus) indicat, posteriorius in saccharum nostrum humilioria arundinis (iskchu, kandesha, kando) in similidinis aspectus tronsulatum esse. Vox Bambuseae ex massa derivatur, ex kando nostratium voco caudis sucherkand. In tebas-
chiro agnositer Persarum schirr, h. e. las, Sanscr. Kshiram.' The Sanscrit name for *tabascher* is *teakhschir*, bark-milk. *Herodotus* (Book XIV., ch. 104), writing of the Gyantzians, observes that in their country a 'vast deal of honey is made by bees; very much more, however, by the skill of men.' In a note *Rawlinson* states: 'Bees still abound in the country, and honey is an important article of commerce. A substitute for honey is likewise prepared from the juice of the palm.' *Sprengel* states that the sugar-cane is first mentioned by *Abulfadil*, 13th century, and sugar by *Moses Chorenensis*, A.D. 462; and notwithstanding that it must, the writer would apprehend, be mentioned in Hindû books of a far earlier date, it is not a little remarkable that a Hindû name of sugar is Cheene.'" (Birdwood's *Economic Products of the Presidency of Bombay*, pp. 55-66.)

*Tabashir* is largely used by Hindús and Mohammedans, and is considered "cooling, tonic, aphrodisiac, and pectoral. It is an ingredient in many compound medicines which are given in different lung diseases. Sanskrit writers describe it as sweet, i.e., not bitter" (Dymoke, *Mat. Mid. W.*, Ind. 697). "The most complete account of its varieties, history, formation, and properties has been published by Sir David Brewster (Philos. Trans., 1819, and Edin. Journ. of Science, Vol. VIII., p. 286), and in the same paper are embodied some earned remarks by Prof. H. H. Wilson on its nomenclature and the uses to which it is applied by the natives, drawn from Sanscrit works." "It is highly prized in native practice as a stimulant and aphrodisiac; but from its composition we are warranted in believing that as a medicinal agent it is inert." (Pharm. of India.)

The deposit called *Banslochan* (or *tabashir*) is supposed to be efficacious in paralytic complaints, flatulence, and poisoning cases. It is highly prized in native practice as a stimulant and aphrodisiac. It is supposed to be cool and to remove thirst, and therefore useful in fever, jaundice, and pulmonary affections. The Bajuras of the Central Provinces are said to be very clever at detecting bamboos in which this *banslochan* or *tabashir* is likely to be found. The substance holds a high reputation as a febrifugal, and accordingly fetches, in these Provinces, a good price. (Gazetteer.)

It seems probable that *tabashir* is an after-product from the natural sap of the bamboo, which gives to the young shoots their peculiar flavor. This has not been clearly established, however, nor indeed has the process of the excretion been looked carefully into by modern botanists, and accordingly rather conflicting statements occur in the writings of authors.
Chemical Composition of Tabāshīr.

BAMBUSÆÆ.

Bamboo Sugar. 85
Bamboo Sap. 80
Poison. 87
Decoction. 88

Chemical Composition of Tabāshīr.

The most complete analysis yet published is that of Prof. T. Thomson on (Records of Gen. Science, Feb. 1876), "who found its consti-
table—100 parts, Silica, 90-5; Potash, 1-19; Peroxide of Iron, aminia, 0-40; moisture, 4-87; loss, 2-23."

In addition to tabāshīr, other parts of the bamboo are sometimes used. Kurz says: "The still, fragile, very fugacious hairs or rather

on the sheaths of the shoots are used for poisoning. They are a meal, or more usually in the coffee, to be partaken, and are said
dead, not suddenly, but the action is very slow and the victim

is only after many months." (Kurz in Indian Forester, I., 239.)

In addition to many other important uses, "the bamboo" is supposed

as an emmenagogue, a decoction of the leaves and shoots being

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used both in India and China to assist the lochial discharge after childbirth.

In places where ordinary surgical appliances are not available, the leaf-sheaths or carefully-cleaned sections of stems may be used as splints. It is by no means an unusual thing to find a bamboo joint used as an artificial limb, the stump of the leg being simply inserted at the open end of the bamboo.

FOOD.

It has already been stated that, in times of scarcity, bamboo grain has saved the lives of thousands of human beings. This was the case in the Orissa famine of 1812. A similar event took place in Canara in 1864, when it was estimated that 50,000 persons came from Dharwar and Belgaum districts to collect the seed. In 1866 bamboo grain sold in Maldah at 13 seers to the rupee, rice being 10. Many other instances are on record of the providential flowering of the bamboo having saved the lives of starving people, but while this is so, it is impossible to follow Mr. Kurz and others who have advocated the extended cultivation of bamboo as a means of averting famine. "Here we have," says Kurz, "at once a key in dealing with the mitigation of famine in India." For this purpose he recommends the extended cultivation of *Bambusa arundinacea, B. Tulda, and B. vulgaris,* suggesting the encouragement, in these proposed famine relief plantations, of tuberous wild plants, such as *Dioscorea* (yams), *Tacca, Amorphophallus* (OIl), *Colocasia* (Kutchu), &c. He is of opinion that the extended cultivation of bamboo over wild tracts of country would increase the humidity and thus prevent the tanks and streams from being dried up. In this way a larger amount of fish might be produced. There cannot be a doubt but that cultivation in any form would greatly improve the condition of barren tracts of country, and thus lessen the tendency to famine; but there would seem to be no special claim in favour of the bamboo, the more so since the crop of grain, which occurs only after thirty years, brings with it a plague of rats which injures the country for years after. Moreover, when grain is plentiful, the bamboo seed is not much eaten. "It is a very unsafe aliment, being apt to produce diarrhoea and dysentery." (Dr. Bidie.)

The young shoots constitute a most important article of food all over India, nearly every bamboo being eaten in this stage; but the larger species are those most generally used. Freed from the sheaths and hairs, they are cut up into small pieces and eaten in curries. They are also pickled or made into preserves. The very young shoots of the smaller species, boiled in water with a little salt, resemble an inferior quality of asparagus. "They are eaten in Assam with great relish." (Mr. H. Z. Barrah, Assam.)

TIMBER.

Bamboos form "the most important portion of the minor forest produce of all forest divisions, and one that increases in value every year." (Atkinson.) It would occupy a volume even to enumerate by name all the uses to which the mature bamboo stems are put. Suffice it to say that to the inhabitants of the regions where the bamboo luxuriates, it affords all the materials required for the erection and furnishing of the ordinary dwelling-house. Certain species are more serviceable for posts, and others are more adapted for matting and basket-work, but with one or two species every requirement may be met. For the construction of the mast of which the walls of huts are made, *B. Tulda* is the species most frequently used, and a strip from the outer green layer of this stem forms at once a most convenient and useful rope to tie the parts of the house which require to be made fast. *B. Balcoa,* on the other hand, having a
thicker and more durable shell, is generally used for posts, boat-oars, and masts and all other purposes requiring greater strength and durability. *Dendrocalamus strictus* and one or two allied species of male bamboos are those resorted to for walking-sticks and spear-shafts, good solid bamboos being for these purposes in considerable demand.

**DOMESTIC USES.**

Every person in India is familiar with the simple yet clever way in which the bamboo is cut up and split into bands of every size or thickness so as to allow of its being used in the manufacture of mats of any degree of quality, from the exceedingly fine mats made at Midnapur in Bengal, to the ordinary coarse mat extensively used in house-building. Thin strips of bamboo tied with strings are made into elegant door *tatties* (or curtains). Hollow bamboos are beaten here and there and cut at the nodes, lengthwise, and thereafter opened out and flattened into slabs which may be used for the seats of chairs, tops of tables, beds, or other articles of furniture. In fact, everything necessary for the erection and furnishing of a comfortable house can be obtained from the bamboo. The large Karen houses, each of which constitutes a village by itself, and which is large enough to contain as many as 200 to 300 persons, are entirely constructed of bamboo. Fishermen frequently build bamboo houses over the rivers. The greater part of the people in Eastern India and the Malay live entirely in bamboo houses. Bamboo bridges are frequent all over India. A complicated mass of uprights, in all directions, supports a pathway consisting of bamboo mats covered with a sprinkling of earth, and resting upon a few horizontal bamboos attached to the uprights. To the new comer, bridges of this nature seem most insecure, but if in good condition they may be ridden over with perfect safety.

The larger hollow species are well suited for aqueducts, water-pails, pots, cups, and other vessels. Pieces of thick bamboos from three to six feet in length, with the partitions perforated, so as to form long pails, are carried by hill watermen, suspended over the back by a bamboo string passing across the forehead, instead of the water-skin used by the *bhatsi* of the plains. From these long tubes the water escapes with a gurgling noise, but it may be carried for days without either getting warm or being in any way spoiled. A single joint of a green bamboo is frequently used as a cooking-pot, the rice and water being placed inside and the mouth covered up; this primitive pot is placed on the fire until the rice is cooked. Spoons and knives are meanwhile being cut by the cook from the nearest bamboo clump. A simple ladle is made by cutting down to a handle the upper portion of a joint, leaving about 2 or 3 inches of the bottom as a large spoon or ladle. By the aid of this ladle the food when cooked is divided, and by means of the knife made of the hard outer portion of the stem, fish or other animal food may be cut up. In fact, every domestic appliance may be made of bamboo, including the pail used in milking the cows and the churn with which the butter is prepared. In the Nagá country a section of a bamboo is used for stamping out circular rice-biscuits required in certain religious observances. All sorts of agricultural implements are also made of the bamboo, and the appliances for spinning cotton and wool, and also for reeling silk, are often constructed entirely of the same material.

The fisherman makes his oars, masts, fishing appliances, baskets, and even his hooks, of bamboo. One of the most curious hooks perhaps in the world is the one in common use in Bengal and Assam. This consists of a short piece of well-seasoned bamboo, say 3 inches in length and 1/4 of an inch in thickness. The string is attached to the middle of the twig, which is then bent into the shape of the letter U. The bait
**BAMBUSÆ.**

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| 103      | Generally used is the common green grasshopper, the head of which is plucked off and rejected. The two points of the bent bamboo twig are now inserted into the open end of the body and the baited hook dropped into the water. The upper end of the string is attached to a small piece of bamboo, about a foot in length, and left floating in the water with the baited hook suspended. The fisherman, from his dug-out, drops these lines in likely positions and rows himself about from one to the other. When the fish cuts the bait the hook jumps open in its mouth, the extremities getting amongst its gills. Large fish are often caught in this way, the pain and inconvenience of the hook apparently preventing the fish from offering the resistance which would at once set it at liberty. The common and characteristic harpoon of Bengal consists of a piece of *Dendrocalamus strictus* about 6 feet long, cut into 8 or 10 long pieces about as thick as the little finger. These are smoothed and rounded up within a foot of the top, where the bamboo is firmly bound with string or wire to prevent its splitting further. The point of each of these portions is armed with a metal-pointed cap. The fisherman, rattling this instrument against the side of the dug-out, alarms the large fish from their hiding-places amongst the weeds; and no sooner is a fish visible than with great adroitness the harpoon is thrown, and the prongs spreading out as it enters the water, so large a space is covered as to leave the fish but a poor chance of escape if once the fisherman has been allowed to come sufficiently near. All sorts of ingenious contrivances are made for catching fish, and in the majority of cases they are constructed from the bamboo. Perhaps none are more beautiful than the small and delicate basket traps which are placed here and there in pools of aquatic plants built artificially across portions of tanks. Excellent fishing-rods are also made of the solid bamboo; these are in universal use all over India. Jointed rods of European manufacture have not as yet found their way to India, except in the hands of a few European anglers. Although the bamboo is not suited for the construction of boats or canoes, it is by no means unusual to find a raft, composed of one or two large bamboos lashed together, used by the fishermen on lakes. Timber is also largely floated down the rivers upon bamboo rafts. Bamboo is extensively used for making spear-shafts, bows and arrows, poles for carrying loads, &c. The spiny bamboos were formerly planted in ditches around forts as a protection. The Nagás and other hill tribes use the hardened outer woody portion as knives and spears. The jungle and forests around villages are often covered for miles with these formidable weapons. Short sharp bamboo knives called *pangis* are buried amongst the leaves along the foot-path in such a position as to go right through the foot of the unfortunate traveller. Often three of these are arranged, two sloping forward and the other facing the traveller on his approaching the village. The foot is by accident placed between these, and being cut by the one in front, is rapidly withdrawn, only to have the other two violently driven in from behind. Sometimes thousands of these *pangis*, both visible and invisible, cover the entire surface of the ground—so much so that the village is unapproachable to any person but the inhabitants, who are familiar with every turning that has to be taken to escape this formidable bamboo defence. Pits are also dug, the bottom of which is full of these knives, pointing in every possible direction. The mouth of the pit is cleverly covered with leaves, and the animal or man who places his foot upon this trap falls to a fearful and certain death. Crude scabbards are also made of the bamboo, and handles for swords, knives, and axes. All sorts of curious musical instruments are made of the bamboo—from the fife to the crude violin with its two or three strings. The string |}

**Fishing-rods.**

<table>
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**Walking-sticks.**

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**Musical Instruments:**

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are prepared from the green outer layer of the stem carefully cut, and when tightened give out a dull musical tone. In Manipur and the Nagā country the hill tribes prepare an exceedingly curious jew’s-harp from the bamboo. This consists of a thin piece of bamboo not unlike the common musical pitchfork in size and shape, only that it has three instead of two arms, and is not more than \( \frac{1}{4} \) of an inch in thickness. This is placed in the mouth just as with the jew’s-harp, and a monotonous music is produced. (Mr. McCabe, Deputy Commissioner, Nagā Hills.) Perhaps the most amusing musical contrivance is the bamboo /Eolian/ harp made in the Malay Peninsula. The bamboos in a village clump or far away in the jungles are perforated here and there in such a way as to keep whistling in all tones at once as the wind blows through the culms. The sound produced in this way has been described as at times soft and liquid like the notes of a flute, and again deep and full like that of the organ. “A kind of very curious whistle is used by the Chinese for driving away evil spirits, &c. Several holes are pierced in a piece of bamboo, two of the natural knots being left, one of which offers an opening out in a slope; to each extremity are fastened two long strips of paper from 15 to 18 feet in length and 6 to 8 inches wide. A string is attached to a groove made in the bamboo, and when there is a little wind, this curious kite is sent aloft, remaining in the air as long as the wind is strong enough to keep it up. In this position a monotonous whistling is produced, resembling at times the noise of a jet of steam, or the sighing of the wind in trees.”

“The auklong of the Malays is a very agreeable instrument. It consists of a number of hollow bamboo-joints, of various but selected length and thickness, which are cut out below and hang down from a bamboo frame. These give various swinging tones and strength, according to their size, on being beaten with a bamboo staff. On the occasion of festivities, such as a marriage, circumcision, &c., Malays greatly use the green halms of bamboo (especially the larger sorts), and have them put in specially-prepared fires. The air enclosed in the joints gets heated, and the joints burst with a heavy report, which varies in strength from that of a pistol to that of a small gun, according to the sort of bamboo used, smaller halms being usually added which keep up a continuous rattling and crackling noise.” (The Indian Forester, Vol. I., pp. 234-35.)

**BAMBUS*

*A genus of large bamboos growing in clumps or clusters, comprising some 24 species. Erect arboreous, rarely scandent plants. Leaves shortly petiolate, but with a large articulate sheath. Flowers in a few species occurring on leaf-bearing stems, generally on leafless short stems, a few of which appear and die every year, or the entire clump reaches maturity at once and after flowering dies. It often happens that the bamboos of an entire district flower and die at once, followed by a dense mass of seedlings; this is especially true of B. arundinacea. Spikelets 2-many-flowered, generally sessile, interrupted. Inferior glumes 2-4, empty. Palea 2-keeled, distinctly ciliate or winged. Stamens 6, free. Style deciduous, deeply 2-3-fid. Caryopsis small, wheat-like, with a membranous pericarp closely adnate to the seed.

The generic name Bambusa is a Latinised form of the Maharatta name Bambu.

**Bambusa affinis**, Munro, 93; Gramineae.

*Vern.*—Thaeech, thaiwma, Burm.

*Habitat.*—Found in Martaban, and said by Munro to be scandent; by Kurz to be a small tufted species, attaining a height of from 15 to 20 feet.
Dictionary of the Economic

Bambusa arundinacea, Retz.

The Spiny Bamboo of Central, South, and West India.

Syn.—B. orientalis, Nees; Arundo Bambus, Linna.; Bambos arundinacea, Pers.

Vern.—Bâns, kattang, magar bâns, naâ bâns, Hind.; Bâns, behâr bâw, Beng.; Bûch, Ass.; Katsanga, Kol.; Mat, Santali; Waâ-hau; Garo; Bariala, Chittagong; Magar, naâ, Pu.; Wâns, Guz.; Kôdu, padâi, Konkan (Thara); Vas, Panch Mahals; Mundgoy, BOMB.; Bhûns, chûmdâ (it small), barabô (it large), DUK.; Káti waâls, Gôra; Vâvù, kichak, Sânâ; Qasab, Arâb.; Nai, Pêrs.; Mêngal, Tâm.; Mûkâs, kanks (Upper Godaveri District), bônga, odûrû, bônga-odûrû, petû-odûrû (Madrâs), TEL.; Bîndûngû, Kân.; Waâ-nâh, Madî; Bûn, Buria, Burma.; Kattâ-târa, Bûna, Singî.

In towns all kinds of Bamboos are called kalâkk in Marathi. (Dr. Dymock.)

Habitat.—A common bamboo in Central and South India and Burma. Cultivated in many places in North-West India and in Bengal.

Botanic Diagnosis.—Stems tall, green, spinescent, growing in clumps of 30 to 100 each, attaining a height of from 30 to 60 feet; walls of the calms thick, cavity small; lower branches spreading; spines strong, sharp, curved either in pairs at the base of a branch or in threes, the middle one the largest. Leaves small, thin, lanceolate, 4-8 inches long and ½ to ¾ broad, generally glabrous, but sometimes with scattered hairs underneath; nerves 5 to 6 on either side of the midrib; spikelets mostly sessile, in dense half-whorled clusters. Flowering glume thickened and mucronate at the apex, glabrous, not ciliate at the edges. Ovary glabrous, style deeply 2- or 3-fid. Flowering appears to take place after long intervals, probably at the age of 30 years (Brandis). On this subject Mr. Duthie writes: “The simultaneous flowering and subsequent dying of almost every individual plant of this species in certain districts and at certain stated times has been an interesting subject for observation. There seems to be no particular age at which the flowering takes place; the event is probably to a great extent influenced by the nature of the season.” (For further information regarding the flowering of this and other species, see under Bamboo.)

By the older writers on Indian economic products the properties of the bamboo are as a whole seem to have been referred to this species, and it is accordingly difficult to separate some of the popular botanical and vernacular synonyms. The following remarks under the heading of Medicine may be understood to belong to more than one species, and might not incorrectly be referred to the peculiar species met with in each district in India:

Properties and Uses—

Medicine.—“In addition to the many important uses to which the Bamboo is applied in tropical life, it forms by no means an insignificant article of the Indian Materia Medica. Its supposed virtues are set forth at length in the Taleef Shereef (Art. Bâns, p. 28, No. 114). A belief in the emmenagogue properties of the leavess is common alike in India and China; but neither in this nor in any other character does it appear worthy of attention as a medicine. In positions where ordinary surgical appliances are not at hand, it is well to bear in mind that, with very little manipulation, splints of any required length or size can be obtained with little delay from the stems of the bamboo. For this purpose the older drier stems are to be preferred, the younger yielding somewhat on pressure.” (Pharmacopoeia of India, pp. 256-7.) It is by no means unusual to find joints of the bamboo being used in India as an artificial limb, the stump being simply inserted into the open end of the bamboo.

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Female Bamboo.

"The tender leaves of this plant are used with black pepper and common salt to check diarrhoea in cattle." (Brigade Surgeon J. H. Thornton, B.A., M.B., Monghyr.) "The most efficacious application for dislodgement of worms in ulcers is a poultice made by pounding the young shoots of the bamboo. The juice is first poured on the vermin, and the ligneous mass is applied and secured by a bandage." (Honorary Surgeon P. Kinsley, Chicaco, Ganjam District, Madras Presidency.) "The leaf-bud is used in the shape of a decoction to encourage the free discharge of the menses or lochia when this is scanty." (Native Surgeon Ruhnam Moodiari, Chingleput, Madras Presidency.) "Is used in leprosy, fevers, and hemoptysis." (Surgeon-Major D. R. Thompson, M.D., Madras.)

A silicious concretion known most frequently under the Persian name Tabashir is obtained chiefly from the interior of the stems of this species. It is much used by the natives as a drug. (See under Bamboo.)

Food.—The seed resembles unhusked rice, and is eaten by the poorer classes like that cereal. As it appears at the very season when drought occurs, and other crops have generally failed, it is of some advantage to the poor. The young shoots are cut when tender, and eaten like asparagus. This remark applies to nearly every species of bamboo, the young shoots being known as basi-ka-kulli.

Fodder.—The leaves and twigs form an important fodder, this species being largely consumed by elephants.

Timber.—This bamboo is of good quality and strong, and is used for all purposes.

Domestic and Sacred Uses.—This and other species of bamboo are frequently represented upon Buddhist sculptures. The stems are used very extensively for domestic purposes. (See under Bamboo.)

Bambusa baccifera, Roxb.; Fl. Ind., Ed. C.B.C., 305; Syn. for Melocanna bambusoides, which see.

Bambusa Bambusoides, Roxb.; Fl. Ind., Ed. C.B.C., 305.

Sometimes called the Female Bamboo.

Vern.—Balkh, Beng.; Betwa, Cachar; Bhalukia, Ass. and Cachar; Biling, Lepta.

References.—Munro, Linn. Soc. Trans., XXXVI., 100; Brandis, For. Fl., 567; Voigt's Hort. Suburb. Calc., 718; Gamble, Man. Timb., 488.

Habitat.—A native of the plains of the eastern side of India, extending from Bengal into Assam and Cachar. This is the large and characteristic bamboo of the villages of Bengal. Dr. Brandis thinks that the bamboo below Simla, ascending to 5,500 feet, may belong to this species.

Botanic Diagnosis.—Differs chiefly from B. Tulda in its larger leaves, not pubescent, and possessed of distinct transverse veins. Scales ovate or obovate, with distinct longitudinal nerves. The spikelets are also only ½ to ¾ inch long, and the joints of the rachis short and glabrous.

Timber.—A bamboo, with stems often 50 to 70 feet in height, stouter and taller than in B. Tulda. This is the best Bengal species for building, scaffolding, and other works which require both size and strength. Long immersion in water tends to make it firmer and proof against the attacks of Bostrichi. (Roxb.)

Bambusa Brandisii, Munro, 109.

Syn.—Dendrocalamus Brandisii, Kuntz, II., 560.

Vern.—Ora, Beng.; Turgu-nilh, Magh.; Keylima, noho, Burm.

Habitat.—A gigantic species, met with in Chittagong and Burma, up to 4,000 feet.

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**BAMBUSA polymorpha.**

**Indian Bamboos.**

| Botanic Diagnosis. | — Young shoots with adpressed tawny hairs; auricles waved, decurrent, fringed inside; ligule narrow. Angle of the inner pala minutely ciliate. *Kurz.* |
| — Timber. | — Stems often become 126 feet high and 30 inches in circumference. |

**Bambusa Falconeri, Munro, 95; Brandis, For. Fl., 568.**

**Vern.** — Cuye, hag.

| Timber. | 131 |
| — Habitat. | — Found in the North-West Himalaya. |
| — Botanic Diagnosis. | — The final identification of the large bamboo at the foot of the North-West Himalaya is a subject still very obscure. (See note under B. Balcon.) The present species was described from a flowering specimen collected by the late Dr. Falconer in Dehra Dún. Spikelets lanceolate, wholly glabrous, nearly 1 inch long and about 10-flowered. Flowering glumes micronate, with numerous broad, prominent nerves, somewhat like those of B. Tulda. *Brandis.* |

**B. khasiana, Munro; Munro, 97.**

**Vern.** — Tunar, Khasia.

| Timber. | 132 |
| — Habitat. | — Met with in the Khasia Hills. |
| — Vern. | — Pilampinamna, Burm. |
| — Habitat. | — Kurz says of this species that it is rarely cultivated in and around Rangoon. |

| Timber. | 133 |
| — Botanic Diagnosis. | — Young shoots with the sheaths not or only obscurely auricled at the mouth. A small bamboo with small leaves, whitish beneath. |
| — B. nutans, Wall.; Munro, 92; Brandis, For. Fl., 567. | |
| — Vern. | — Nal-bón, Beng.; Mahilans, Nepal; Mahlu, Lepcha; Pithning, Bhutia; Bidlal, mukial, Ass.; Pichle, Sylhet. |
| — Habitat. | — A most beautiful species, largely planted near villages in Nepal, Sikkim, Khasia Hills, Assam, Sylhet, and Bhután, ascending in from 5,000 to 7,000 feet. |
| — Botanic Diagnosis. | — Closely allied to B. Tulda, the leaves being of medium size and with soft pubescence beneath. Spicules long, with elongated, articulated, and clavate joints to the rachis. |
| — Timber. | — It is a small species with almost solid stems. (Munro.) “The culm is of large diameter, with a broad, hollow part, but the wood is hard.” (Gamble, Trees and Shrubs of Darjiling.) |

**B. orientalis, Nees; Beddome, Flor. Sylv., t. acxxti.**

| Timber. | 134 |
| — Habitat. | — A bamboo met with in South India. |

**B. pallida, Munro.**

| Timber. | 135 |
| — Vern. | — Burwall, bakhal, Cachar; Usken, Khasia. |
| — Habitat. | — A bamboo with stems about 30 feet long; met with in Eastern Bengal and Assam. |

**B. polymorpha, Munro; Kurz, ii, 553.**

| Timber. | 136 |
| — Vern. | — Kyathangwa or kyathangwa, Burm. |
| — Habitat. | — Common in the upper mixed forests of the Pegu Yona and Martaban. |

**B. 138**
**Products of India.**

<table>
<thead>
<tr>
<th>The Common Bamboo of Bengal.</th>
<th>BAMBUSA Tulda.</th>
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**Botanic Diagnosis.**—An unarmed bamboo with large strongly-fringed auricles, with the sheaths of the young shoots green and yellow, adpressed bristles white. Anthers purple. Stigma white. Inner palea with the angles quite smooth. (*Kurz.*)

**Bambusa spinosa**, Roxb.; *Fl. Ind.*, Ed. C.B.C., 305.

**The Spiny Bamboo of Eastern India.**

**Syn.**—Dr. Brandis and also Dr. Kurz regard this merely as a form of *B. arundinacea*, peculiar to the eastern side of India; they can find no character to separate these spiny bamboos. Dr. Roxburgh treats them as quite distinct species. In this opinion he is supported by General Munro, who distinguishes the two plants, giving the characters which will be found below for *B. spinosa*.

**Vern.**—Bur, behar bâns, HIND. (*Duthie*); Behor, BENG.; Koto, Ass.; Khokoi, CACHAR; Yelewto, BURM.

**Habitat.**—A native of Bengal, Assam, and Burma; also of the north-eastern division of the Madras Presidency. Cultivated in the North-West Provinces and other parts of India.

**Botanic Diagnosis.**—"A paler coloured and more striated panicle, smaller and more coriaceous spicula, with fewer flowers, generally smaller leaves which are often hairy on the under-side, and with the petiole sometimes remarkably swollen at the base." (*Munro in Trans. Linn. Soc., XXVI., 105.)

**Timber.**—"This beautiful, middling-sized, very elegant species, I have only found in the vicinity of Calcutta, where now and then some of the oldest are found to blossom, about the beginning of the rains, in June." "Like the other species, this is employed for various useful purposes; and as it grows to a pretty large size and with a smaller cavity than any of the others, it is strong and well adapted for a variety of uses." (*Roxb., Fl. Ind.*, Ed. C.B.C., 306.)

**B. teres, Ham.**

A native of Bengal and Assam.

**B. Thousarsi, Kih.**; Syn. for *B. vulgaris*, Woud.; which see.

**B. Tulda, Roxb.; Fl. Ind.*, Ed. C.B.C., 304.

**The Common Bamboo of Bengal.**

**Vern.**—Peka, HIND.; Tulda, jowar, milendo, matela, dwoa bâns, BENG.; Mâ, SANTAL.; Poppösina, KOL.; Makor, MAL. (S. P.); Wâkhî, GARO; Madowmsah, MAG. ; Thowma, thowma, or thalakow, BURM.


**Habitat.**—This is the common Bamboo of Bengal, where it grows in great abundance everywhere, flowering in May. "Not uncommon in the deciduous forests of Pegu, generally occupying lower and moister stretches of ground in company with *sinwa* (*Cephalostachyum erigracile*, *Munro*), the dry hills surrounding being covered with *Dendrocalamus strictus.*" (*Brandis.*)

**Botanic Diagnosis.**—Leaves middle-sized, pale and soft, pubescent beneath, transverse veins none. Spikelets terete, 1-2 inches long, joints of rachis elongated, thickened into a hairy disc, under the flowering glume; scales cuneate, thickened at the base, but without prominent nerves.

**Fibre.**—Largely used for mats, baskets, fans, and window-blinds. This is in fact one of the most useful plants in Bengal.

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**FIBRE.**

Mats, &c. 143
Dictionary of the Economic

BARILLA.

Reh Efflorescence

Food.—The young shoots are pickled when only about 2 feet high; they are tender. (Roxb.)

Structure of the Wood.—"The wood is strong, and the halms are used for roofing, scaffolding, mats, and other purposes." (Gamble.)

Found more durable if soaked in water previous to being used. This is regarded in Bengal as one of the best quality of bamboos. Both Roxburgh and Voigt mention several varieties. The following extract will be found to give the more important forms: "Jowa bans (jwabunsh?) of the Bengalis, is only a large variety of this species, and used chiefly for scaffolding and building the larger and better sorts of houses of the natives. It differs from Tulda proper in the greater length and thickness of the joints. Basini bans of the Bengalis is another variety of Tulda. It has a larger cavity, and is used chiefly to make baskets. Behoor bans is of a small size, very solid and strong, much bent to one side, and armed with numerous strong thorns, which renders it very fit for hedges. A staff of this species must be placed in the hand of every young Brahmin when invested with the sacerdotal cord, otherwise they say the ceremony cannot be performed." (Roxb., Fl. Ind., Ed. C. B. G., 395.)

Bambusa vulgaris, Wendl.
The Yellow and Green Striped Bamboo.

Syn.—B. Thouarsii, Kunth.; B. vulgaris, Schrad.; B. arundinacea, Aiton.

Vern.—Kalpak, vanav kalaka, Bom.; Basini bans, Beng.; Una, Singh.

References.—Brandis, For. Pl., 598; Thwaites, En. Ceylon Pl., 51; Dale and Gibbs, Bom. Fl., 299; Munro, 126; Beddome, Fl. Sin., CCXXXII.; Gamble, Man. Timb., 428; Lisbon, Bom. Pl., 127.

Habitat.—Cultivated throughout India; said to be a native of southern and central parts of Ceylon. It is also supposed to be a native of Sylhet and Chittagong, is naturalised in the West Indies, and cultivated in South America.

Botanic Diagnosis.—Leaves with distinct transverse veins. Spikelets laterally compressed, flowers distichous. Empty glumes 2; flowering-glumes ovate-lanceolate, narrowed at the base; longitudinal veins prominent near the apex, indistinct below, mucronate, and ciliate at the apex, fimbriate; keels of palea conspicuous near the top of the flowering glume. Anthers penicillate at the apex, with short hairs; style slender, filiform, 2-3-fid at the end.

Timber.—Stems 20 to 50 feet, yellow, or striped yellow and green. Joints 4 inches in diameter and more, with thin walls.

"Much used by Cinghalese for temporary buildings and other purposes. The flowers, which are very rarely produced, very much resemble those of the next species (B. arundinacea); but their outer palae are somewhat longer, and terminate in subulate points." (Thwaites, En. Ceylon Pl., 598.)

Banana, or Plantain, see Musa.
Barberry, see Berberis vulgaris, Linn.; Berberideae.

BARILLA.

Barilla (a crude carbonate of soda) is in India obtained from two sources: (a) as an efflorescence on the soil, and (b) from the ashes of certain sail-worts or plants containing sodium.

The former is scarcely known in Europe and should receive the name sajjī-mūtī, while the carbonate of soda obtained from plants is, strictly speaking, the barilla of commerce or the khār-saļī of Indian bazaars.

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of Sodium Carbonate.

CARBONATE OF SODA OBTAINED AS AN EFFLORESCENCE.

(a) Sajji and Sajji-máti.—The efflorescence known as reh is exceedingly abundant in India, occurring over many large tracts of country, often rendering the soil quite sterile. This has within recent years received the most careful attention both of the Agricultural Departments and of the Geological Survey. Under “Reh” this subject will be dealt with at greater detail, and it is necessary here to refer to it only in so far as it is connected with the subject of sajjí or barilla. The decomposition of rocks through the action of the atmospheric oxygen and carbonic acid gives origin ultimately to soluble sulphates, carbonates, and chlorides. These are carried away by the rivers. In the fresh-water alluvial plains of India such salts have accumulated during the lapse of centuries, to an extent sufficient to give origin, by chemical changes in the soil, to the so-called reh efflorescence, the heat of the sun drawing the ultimate salts to the surface. In an interesting report on this subject, published by Dr. W. C. Center, Panjáb Chemical Examiner, the process of capillary attraction, or the drawing of the salts to the surface in the form of an efflorescence, is carefully gone into. “These salts, however, are not deposited, as they exist in solution, as new laws come into play. The chief of these is that during evaporation the least soluble salt that can be formed is first deposited; but this is modified by two other laws,—the tendency of certain compounds to form double salts, and the tendency of substances with the same crystalline form to crystallize out together. The efflorescences thus produced consist of three groups: 1st, the neutral, which contain no carbonate of soda (these consist chiefly of sodium chloride and sulphate, and frequently magnesium sulphate); 2nd, the alkaline, which contain carbonate of soda, and alkaline chlorides and sulphates, but no lime or magnesian salts; 3rd, the nitrous efflorescences. These generally contain no alkaline carbonate, but consist chiefly of nitrate of lime and alkaline chlorides. Others contain alkaline nitrate, chloride and sulphate. They are developed where the soil has become loaded with organic nitrogenous matter.”

“Reh is thus not a special salt or mixture of salts, but a very variable compound. It is really the most easily soluble salt in the earth-water, remaining in solution after the deposition of carbonate of lime, &c., on evaporation. The ingredients and their relative proportions are found to vary in different places, exactly as the well-waters at different spots differ in saline contents, and in the same area there is a close relation between the two.”

Mr. Medlicott, Superintendent of the Geological Survey (Records of the Survey, Vol. XIII., 273), has also contributed greatly to our knowledge of usar (sterile) and kalar (saline) lands, and has thrown much light on the explanation of reh efflorescences. He has shown that the relative proportion of common salt to sodium sulphate varies from 4 to 24 per cent. In one district one salt predominates, in another a second is more abundant. Common soda (carbonate of soda—sajji) is sometimes present, and such earths are locally used by the washermen in place of soap. This is, however, a much less frequent reh efflorescence than sodium sulphate; but it seems likely that the so-called sajji-máti of our Indian bazars is a specially selected reh, containing as its principal ingredient carbonate of soda. Sajji strictly speaking, means pure carbonate of soda.

Occurrence of Sajji-máti.—In Bengal sajji-máti is said to be found in Behar north of the Ganges at Patna. O'Shaughnessy mentions that it exists in great abundance in the neighbourhood of Monghyr. In a recent correspondence conducted by the Government of India, Revenue and Agricultural Department, and at the instance of Sir J. D. Hooker, the
Commissioner of Salt Revenue, Madras, reports: "As soils containing a large percentage (from 30 to 50 per cent.) of carbonate of soda, abound all over the country and are habitually collected by the people for use as dhobies' earth, and in dyeing, and for the manufacture of soap and of glass bangles, I see no advantage in undertaking the manufacture of barilla from alkaline plants." This efflorescence referred to is common in Mysore and Travancore, and a small internal trade exists in conveying it to the town of Madras. It is purified by a simple process of liquation. This same practice prevails in some parts of the North-West Provinces where sajjī-māṭī occurs; it is said to be prepared at Ghazipur. In the correspondence referred to it is stated that the Lucknow Paper-mills have, at the suggestion of the Agricultural Department, commenced to manufacture their own caustic soda from the reh earth. By this improvement they have effected an annual saving of ₹11,000; they have at the same time abandoned the importation of European caustic soda. In the Punjab sajjī-māṭī is said (Official Correspondence) to be prepared at Mulan, Gugaria, Jhang, and Shapur (sajji-khār?). In Bombay sajjī-māṭī or carbonate of soda efflorescences is met with. The Collector of Ahmedabad reports that barilla is not manufactured from plants in his district, but that the efflorescence known as oos or khar is used in washing clothes and also in the manufacture of soap and glass; it is worth about an anna per basket.

In the Northern Division of Bombay this oos efflorescence is said to cover a large area of land; it is used extensively for soap and glass making. Both the Paper-mills and the Soap-manufacturing Company of Bombay import, however, their caustic soda from England, having found the locally-prepared article more expensive.

Chemistry of Sajji-māṭī.—Speaking of sodium efflorescences, Mr. Medlicott (Official Correspondence) says: "The direct derivation of soda from the reh salts would no doubt be an easy process (for a chemical manufacture); sometimes soda forms a principal constituent of the reh, and it is then freely utilised by the dhobies; but the commonest constituent of the reh is sodic sulphate, which is the first result in the process of 'soda' manufacture, by the treatment of common salt with sulphuric acid. Thus the most expensive part of the process would be saved, and the further conversion of sodic sulphate into sodic carbonate ('soda') by the action of lime and fuel is simple." Mr. Pedler, Professor of Chemistry, Calcutta, says that the samples of sajjī-māṭī which he has examined have consisted mainly of carbonate of soda. He adds: "As a commercial article, I believe sajjī-māṭī is usually more valuable than the barilla obtained from Spain, for while barilla rarely contains more than 25 or 30 per cent. of carbonate of soda, sajjī-māṭī is known sometimes to contain as much as 50 per cent. of that substance." (Official Correspondence, December 12th, 1863, No. 3816.)

Carbonate of Soda Obtained from the Ash of Certain Plants—Barilla.

(8) Khār-sajji, or Sajji-khār, or Barilla.—This is carbonate of soda obtained from the ashes (khār) of certain salt-worts. This must not be confused with pearl-ash or the form of potassium carbonate obtained from most other plants. In the correspondence to which reference has already been made this mistake occurs, lists of pearl-ash plants having been enumerated as those from which barilla is obtained. The manufacture of barilla first assumed commercial importance in Spain, and was an article of considerable value until Le Blanc discovered his method of preparing soda from common sea-salt. Since then it has considerably declined. Before this important discovery the demand for barilla caused attention to be directed to India as a country to which the trade might possibly be
Barilla or Sajji-khär.

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extended. Roxburgh at the beginning of the century recommended the cultivation of one or two plants on the coast of Madras, but there is no evidence of this having been acted upon.

**Mr. Baden Powell** (in his *Panjāb Products*, Vol. I., 86) has given a most instructive account of barilla manufacture as practised in the Panjāb. The process by which this substance is prepared is carried on during the month of October and the three following months. The plant after being cut down is allowed to dry. The next step is to dig a pit of a hemispherical shape, about 6 feet in circumference and 3 feet deep. One or more vessels with holes perforated are inverted and placed in the bottom of the pit, the holes being kept closed when the operation begins. The dry plants are gradually burned, and during the process a liquid substance is found to run down into the inverted vessels. After this has taken place, the residue is stirred up by means of a flat piece of wood and kept covered over for three or four days till it cools. Care must be taken not to allow water to get to the molten liquid, otherwise the whole mass would blow up. In the inverted vessels will be found a pure form of khär-sajjī, and in the bottom of the pit an impure form containing a mixture of ashes. This process differs only very slightly from that followed in Spain. In the latter country the plants are burned on iron bars placed across the mouth of the pit, and vessels to separate the substance into pure and impure barilla are not placed in the bottom.

In the correspondence to which repeated reference has already been made, the Panjāb Government has supplied some interesting information regarding the present condition of the manufacture of barilla. The industry exists only to a limited extent in Montgomery and Jhang, and not at all in Jhelum, Rawal Pindi, Gujarāt, and Mozafergarh. "In Shahpur and Multan, however, the manufacture of sajjī is considerable. The Deputy Commissioner of Shahpur reports that the outturn is from eight to ten thousand maunds a year, and the revenue derived by Government by the lease of sajjī-producing lands amounts at present to over Rs 9,500 per annum. The price, too, from various causes has risen from Rs 1-2 to about Rs 1-10 per maund since 1865."

The income derived in the Multan district is also increasing, and though not so high as it was ten years ago, is higher this year than in any year since 1880." The Deputy Commissioner of Multan says that in his district the plants are cut in the months of January and February, and not in October and November as stated in Baden Powell's *Panjāb Products*. He adds: "I can find no evidence that the introduction of soda salts manufactured by purely chemical processes has injuriously affected the trade in barilla." He adds that the land on which barilla-yielding plants grow was leased for 1883-84, and realised Rs 7,007, which is higher than that realised in any of the past ten years, except 1875-76, 1877-78, 1878-79, and 1879-80."

The Settlement Report of Shahpur district contains an interesting account of sajjī manufacture. The Deputy Commissioner says in reference to Colonel Davis' report: "The account of sajjī manufacture given by Colonel Davis in 1865 seems to contain all the information required, and this industry is now in about precisely the same condition as it was then. As far as I have been able to ascertain, the introduction of soda salts manufactured by purely chemical processes has not affected it at all injuriously. On the contrary, the price of sajjī has lately risen to Rs 1-8 and Rs 1-12 per maund, but this is said to be chiefly due to the fact that owing to recent droughts the growth of the plants has been less flourishing than formerly. The sums realised from farming the monopoly of manufacturing this alkali amount still to upwards of Rs 8,000. The income under the head sajjī last year was a little over Rs 9,500. The quantity of sajjī
 manufactured in this district is said to be about 10,000 maunds, but the plant itself is also highly esteemed as a fodder for camels, and the famers of sajj do not allow camel-owners to take the plant for fodder gratis."

The following extracts from the Settlement Reports of Jhang and Montgomery might also be here given: "Caroxylon Graftii is the khdr. There is a considerable disagreement as to what plant or plants sajj is made from. In the Jhang district sajj is made from khdr only. I have made repeated enquiries and have always received the same answer, that sajj is made from khdr, but that sometimes, as sugar is sanded, and as a variety of jams are partly made from turnips and decayed figs, so is the bulk of the sajj increased by burning lana with the khdr. I have been constantly in camp at the time the khdr is cut, but I have never seen a single bundle of cut lana, and such adulteration is very uncommon. All four plants are excellent grazing for camels."

In Montgomery "a good deal of misapprehension seems to exist about the lana plant. There are three kinds of lana: 'Khangan khdr' (Caroxylon Graftii); 'Gora lana'; and 'Methar lana' (Salolax). There is also a plant called 'Phekan lana' (Suaeda nudifora). Sajji (barilla), an impure carbonate of soda, is made from the first two. No sajj is made from the others. The best sajj, called 'Lota sutji', is made from 'Khangan khdr'; an inferior quality, known as 'Bhutni sajj', from 'Gora lana'. All four plants can be seen in the Montgomery civil station."

In the same correspondence the Commissioner of Sind reports that there are no soda salts manufactured by purely chemical processes in Sind, but that there is a substance called khdr manufactured from a plant called "lani," which grows wild all over the province and springs up spontaneously after a copious fall of rain. The khdr or salt obtained from this plant is commonly used in Sind for dyeing, washing, and soap-making purposes, and in the manufacture of common glass. The Commissioner gives the following account of the process adopted in manufacturing this salt from the "lani" plant, which, it will be observed, is very similar to that pursued in Spain: "The 'lani' plant is cut and gathered together in heaps. A circular pit varying from one and a half to two or three feet in depth and diameter, according to the convenience of the individual manufacturer and the quantity to be manufactured, is then dug in a clean level piece of ground. A fire is kindled near the pit and the freshly-cut plant thrown on it. The action of the fire causes the juice of the plant to exude and run into the pit. Fresh quantities of the plant are thrown on the fire from time to time, until the pit is almost filled with the liquid exudation. The mass is then stirred with a pole for two to three hours, after which the pit is covered over, and on the third day, when the liquid has cooled down and solidified, it is dug out and broken into pieces for use."

Mr. Erskine adds that the manufacture flourishes most near Kutche in Khelat, about 5,500 maunds of khdr being annually imported into Jacobabad; that the quantity manufactured in Shikarpur, and in Tharparkar, is roughly estimated at 5,500 maunds and 3,000 maunds respectively every year; that the demand for the article has not been affected by the manufacture of soda salts by chemical processes, and that its price varies between Rs 1 and annas 8 a maund."

In another part of the same correspondence: "The Political Resident at Aden reports that Salsola (Suaeda nudifora), vulgarly called 'Aden Balsam,' grows freely in the plain in the neighbourhood of Aden, and that before the purchase of Shah Ottoman large quantities of the bush were wastefully burnt to produce salt, but that the shrub is now preserved within British limits. He observes that the bush seems to possess great vitality and fecundity; that it

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is called by the Arabs ‘asl,’ and the barilla made therefrom is named ‘hotmi;’ that the Indians style it indifferently khār, khār-sajf, and sajī-khār; that the method of manufacture is primitive and resembles that described in the correspondence accompanying the letter from the Government of India, except that iron rods are not placed over the holes wherein the plant is consumed, and that advantage will be taken of the Spanish method in working the industry, which it is proposed to do shortly under Government supervision.” Major Hunter adds: “Soda salts manufactured by purely chemical processes are only imported into Aden to the extent of ten or twelve hundredweights per annum, and do not affect the local manufacture in any way. In Aden barilla is produced in circular cakes having a diameter of about eighteen inches and a maximum thickness of eight inches. The value may be roughly quoted at from five to eight annas per 28 lbs. It is anticipated that a certain amount of profit will be gained by the Municipality, to whom the bushes belong, either by the manufacture of barilla under supervision, or by the sale of the right to produce it.”

The following are the Indian plants reported to yield Barilla:—
1. Anthrocoenum indicum, Moq.; Coromandel Coast.
2. Caroxyylon fritidum, Moq.; Sind and Panjāb.
3. Griffithii, Moq.; Regarded as one of the best plants in the Panjāb.
4. Salicornia brachiata, Rosb.; Sudder Buns and Coromandel.
5. Salsola brachiata, Pall.; Afghanistan.
7. Sueda fruticosa, Forsk.; Sind and Panjāb.
8. indicia, Moq.; Sudder Buns and Coromandel.
9. nudiflora, Moq.; Aden; Pondicherry.

For further particulars regarding the above plants, consult their positions in this work.

It seems highly desirable that the distinction into sajī-mālī and sajīkhr urged in the above remarks should be clearly observed in all future enquiries into this subject. Care should also be taken not to confuse with these Pearl-ash, the khār or khdhra, so extensively prepared all over India (see Alkaline Earths). The former are crude salts of sodium, the latter of potassium. Information regarding iodine-yielding plants will be found under Kelp.


A genus of under-shrubs or herbs (generally spiny), belonging to the Natural Order Acanthaceae, comprising some 60 species, chiefly natives of the old world—26 occurring in India.

Leaves opposite, entire. Flowers showy, purple, blue, yellow or white; sessile, solitary or in dense or sub-lax spikes. Sepals 4, in opposite pairs, outer pair very much the larger, anterior often emarginate bilid or deeply 2-lobed. Corolla-tube elongated, sometimes very long, funnel-shaped upwards; lobes 5, sub-equal, ovate or elliptic, in-criptate in bud. Staminas 5, 2, having oblong 2-celled anthers and 2 small, rudimentary or rarely with a few grains of pollen, an abortive 5th sometimes present. Disc large. Ovary 4-ovulare; style long, shortly bilid or sub-entire. Capsule ovoid or oblong, 2 or 4-seeded below the middle.

The generic name is in honour of a Dominican traveller, the Rev. J. Barrelier, M.D.


Syn.—B. Dichotomy, Rosb.; Fl. Ind., Ed. C.B.G., q11; B. Cristata, Willd. in Rosb., Fl. Ind.; Wight, Icon., t. 455.
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**BARLERIA prionitis.**

**The Barleria.**

**Vern.**—Thînî and sada-satî, Beng.; Thînî, Ass.; Tadhrela (Bu bonâ, siyah), Pâ.; Gorg-fîbha, kâlo-bhâsa, N.-W. P.; Kolka, Thînî, Sâns.

**Habitat.**—A small elegant shrub, often met with in gardens, and wild on the sub-tropical Himalaya, Sikkim, Khâsia Hills, the mts. of Burma, of Central India, and of Madras, at an altitude of 4,000 feet. Distributed to the Malay Peninsula and China.

**Medicines.**—The seeds are supposed to be an antidote for snake bite, and the roots and leaves are used to reduce swellings, and an infusion is given in coughs. (Madden; Stewart; Atkinson; &c.)


**Syn.**—B. LONGIFLORA, Willd., in Roth., Fl. Ind., Ed. C.B.C., 471; in Wall., Fl. As. Rar., III., 92; and in DC. Prod., XI., 215. B. SPINOSA, T. Anders. Should not be confused with BARLERIA LONGIFLORA, *Linn., Amoen. Acad., IV., 326,* or with RUBELLIA LONGIFOLIA, *Linn., Ed. C.B.C., 475,* which is HYGROPHILA SPINOSA, T. Anders. A mistake has been made by Murray in *Plants and Drugs of Sikkim,* and is repeated by other authors.

**Habitat.**—A small unarmed shrub, met with in the South Peninsula.

**B. montana,** *Nees;* Fl. Br. Ind., IV., 487.

**Vern.**—Kolisté, ikhari, Bomb.

**Habitat.**—A herbaceous species, met with in the Deccan, frequently seen, and extends from Jubbulpore to Travancore.

**B. prionitis,** *Linn.;* Fl. Br. Ind., IV., 482.

**Syn.**—B. PRIONITIS, Willd., in Roth., Fl. Ind., Ed. C.B.C., 470; Icon. t., 35; Dales & Gilb., Bombay Fl., 188.

**Vern.**—Kâthârayâ, Hind.; Kântâjâtâ, Beng.; Dasakaranâ, Urdu; sunda, or kula sunda, korrháti, pajra dantî, Bomb.; Pajra-dars, Mar.; Kântâshak, Gaj.; Pimala koranta or korata, Mar.; kâ-kâ-lâ-kâ-bâtâ, Dur.; Pajra-dani, Cutt.; Shennul, varan Tam.; Mudugoranta, Tel.; Karantaka, pajradanî, Sâns; kuranda, Sîrh.

**Habitat.**—A small, spiny bush, with plentiful buff-coloured flowers, met with in tropical India, abundant in Bombay, Madras, Assam, and Ceylon. Sometimes planted as a hedge.

**Properties and Uses.**

**Gum.**—Referred to by Mr. Baden Powell (Panj. Prod., I.), one of the beautiful dark red-brown or black gums, apparently common by Madras to the Panjâb Exhibition of 1864. § “The gum alluded to above by Mr. Baden Powell is probably a preparation from the juice. When fresh it is yellow, but when dried turns black.” (Surgeon-Major W. Dymock, Bombay.) “I think it is not known to yield any gum.” (Assistant Surgeon Sakhdâr, Râebât, Bombay.)

**Medicines.**—Scarce any new information has come to light. Dr. Ainslie wrote—“The juice of this leaf, which is slightly bitter and rather pleasant to the taste, is a favourite medicine of the Hindoos, in Lower India, in the catarhal affections of children which are complicated with fever and much phlegm. It is generally administered with a little honey or sugar and water, in the quantity of two tablespoonfuls twice daily.” Dr. Dymock adds—“The natives apply the juice to their feet in the rainy season to harden them, and thus prevent the laceration and cracking of the sole which would otherwise...
The Indian Oak.

**BARRINGTONIA-acutangula.**

**Leaves.**

1/4

**arleria strigosa,** Willd.; Fl. Br. Ind., IV., 489.

**Syn.**—B. carules, Roxb.; Fl. Ind., Ed. C.B.C., 41.

**Vern.**—Dasi, Beng.; Kaila baha, Santal; Wadzi, Bom.

**Habitat.**—Much cultivated in India, but wild in the lower hills of Bengal up to an altitude of 4,000 feet; in Orissa and Chutia Nagpur, extending to the Western Ghats (var. terminalis), also in Sikkim and Assam.

**Medicine.**—The Rev. A. Campbell, of Pachumbé, Chutia Nagpur, sends me a specimen of a Barleria which appears to be this species along with the following note: "This plant is called *Kaila baha* by the Santals, and a preparation from the root is by them given in severe spasmodic coughs."

Barley, see Hordeum vulgare.

**BAROSMA,** Willd.; Gen. Pl., I., 290.

**Barosma betulina,** Bart. et Wendl.; Rutaceæ.

**The Buchu.**

**Habitat.**—A native of South Africa; the dried leaves are imported into India and sold by all chemists. In addition to the above species the drug is obtained also from B. crenulata, Hook.; B. serratifolius, Willd.

**Medicine.**—It is aromatic, stimulant, and tonic, chiefly used in disorders of the genito-urinary organs.

**BARRINGTONIA,** Forst.; Gen. Pl., I., 720.

A genus of trees belonging to the Natural Order MYRTACEÆ; it contains some 20 species, inhabitants of tropical Asia, Africa, Australia, and Polynesia, frequent near the sea.

Leaves alternate, often crowded near the extremities of the branches. Flowers in terminal or lateral racemes, or occasionally interrupted spikes. Calyx-tube scarcely produced above the ovary; lobes 2-4-valvate or 3-5-imbriicate. Petals 4, rarely 5, much imbricate, somewhat adnate to the base of the staminal tube. Stamens many, in several series, connate into a tube at the base. Ovary inferior, 2-3-celled, crowded with an annular disc; style long, simple, stigma small; ovules 2-8 in each cell, pendulous. Fruit fibrous or somewhat burred.

The generic name is in honour of the English Antiquary, the Hon. Daines Barrington, F.R.S.; it is the typical genus of the Barringtonaceæ, sometimes called the Anchovy Pear Family.

**Barringtonia acutangula,** Gardn.; Fl. Br. Ind., II., 508; Myrtaceæ.

Sometimes called Indian Oak.

**Vern.**—Ijú, samundar-phal, samunji, ingen, Hind., Duk.; ijú, Mon.; Rijú, samundar, Beng.; Níchul, hiñjula, Sans.; Rijú, Santal; Suprau; Kol.; Kinjola, hinjura, Urvä; Hendol, Ass.; Kanpa or kanapa-chettu, bati, khutá, kadaum, Tel.; Höl kawwá, Ká.; Ingen, iñjú, samundar-phal, tündor or tondar, kanapachethi (the fruit is known as samudra phala or samand ar-phal), Bom.; Pimer.

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BARRINGTONIA racemosa, The Anchoy Pear Family.

The root is bitter and supposed to be similar to Cinchona in its properties. It is also held to be cooling and aperient. The seeds are warm and dry, used as an aromatic in colic and in parturition; also in ophthalmia. (Babes Powell.) "Samundar-phal is faintly aromatic and very bitter, and is considered by the natives to be warm, stimulating, and emetic; in Bombay it is often prescribed alone or in combination with other medicines as an external application in colds. A few grains are often given as an emetic to children suffering from catarrh, and seldom fail to induce vomiting." (Dymoch, Mat. Med., W. Ind., 206.) "The fruit rubbed in water is administered as an emetic." (Lisboa, Useful Pl., Bomb.) The kernels powdered and prepared with sago and butter are said to be used in diarrhoea.

Chemical Composition.—The seeds, according to Dr. Dymoch, are about the size of a nutmeg. They are easily softened by immersion in water. "The bulk of the seed consists of starch."

Special Opinions.—"A few grains of the seed, with the juice of fresh ginger, are given to children as an expectorant and emetic. It appears to be a very efficient remedy." (Surgeon-Major W. Dymoch, Bombay.) "The juice of the leaves is given in diarrhoea. The powdered seeds are used as snuff in headache." (Civil Medical Officer U. C. Dutt, Serampore.) "The powdered fruit is an ingredient along with māł kauṭa (Celastrus) in a cosmetic; it is rubbed on the skin in cases of fever attended with nervous symptoms. Mixed with dry ginger it is also rubbed on the skin to check profuse sweating." (Assistant Surgeon Sukhārām Arjun Rāvāt, L.M., Girgaum, Bomb.)

Poison.—The bark is used to stupefy fish in most parts of India. (Bomb. Gaz., XV, Pt. I., 61.)

Structure of the Wood.—White, shining, warps in seasoning, moderately hard, even-grained, said to be durable. The radial section is beautifully mottled with the medullary rays, which appear as irregular planes. Weight 46 lbs. per cubic foot. (Gamble.) "The wood is reddish, and, though tough and strong, is not in general use. A seasoned cubic foot weighs 36 lbs." (Bomb. Gaz., XV, Pt. I., 63.)

Barringtonia pterocarpa, Kurz; Fl. Br. Ind., II., 509.

Vern.—Kyatha, Burm.

Habitat.—A small evergreen tree of Pegu and Tenasserim.

B. racemosa, Blume; Fl. Br. Ind., II., 507.

Syn.—B. Racemosa, Rafiz.; Fl. Ind., Ed. C.B.C., 445; Wight, I., 1. 183.

Vern.—Samudra, cudāpāh, Tam.; Samudra phal, Beng.; lijū, Hind.; Nīvar, Konkān; Kyāi, kyāi-lyang, Burm.; Deya-mīlī, Singh.

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Indian Spinach.

**Habitat.**—A moderate-sized, evergreen tree, with spikes of pink flowers, common on the Eastern and Western Coasts, from the Konkan to the Sunderbuns, Burma, Andaman Islands, Ceylon, and Malacca.

**Properties and Uses.**—

**Medicine.**—The root of the plant resembles Cinchona in medicinal virtues. It has decocting and cooling properties. The fruit is efficacious in coughs, asthma, and diarrhoea. The seeds are used in colic and ophthalmia.

The pulverised fruit is used as snuff, and combined with other remedies is applied externally in diseases of the skin. (Treasury of Botany.)

§ "The powder of fruit is used in skin diseases." (Deputy Surgeon-General G. Bidie, C.I.E., Madras.)

**Structure of the Wood.**—Wood white, very soft, porous. Weight 27 lbs. per cubic foot. Skinner gives 53 lbs. and says it is used for house and cart building, and that it has been tried for railway sleepers.

**arringtonia speciosa,** Forst. ; Fl. Br. Ind., II., 507 ; Wight, Icon., i. 547.

**Vern.**—Ky, Kyaiyet, BURM.; Dod-dâ, ANDAMANS.

**Habitat.**—A small, glabrous tree, with entire leaves; a native of the Andaman Islands, Singapore, and Ceylon; occurs also on the Southern Deccan Peninsula, but not wild.

**Properties and Uses.**—

**Oil.**—In the Moluccas a lamp-oil is said to be expressed from the seeds of this plant. (Treasury of Botany.)

**Medicine.**—Several brief notices have appeared regarding the properties of this plant. (See Indian Forerster, X. 75 ; and the Report of the Chemical Examiner, British Burmah, August 1885.) The active principle of the bark appears to be a volatile oil combined with a resin. The drug is simply narcotic; it stupefies fish without killing them.

**Domestic Uses.**—When dry the fruits are sometimes used as fishing-floats. (Smith’s Econ. Dict.)

**BASELLA, Linn.; Gen. Pl., III., 76.**

A genus of Chenopodiaceæ containing only one species, which, however, in cultivation assumes 2 or 3 distinct forms bearing specific names. A herbaceous, succulent, glabrous climber, freely branched. Leaves ovate, oblong or cordate, alternate, submersile or petiolate, acute or obtuse, entire. Flowers in short axillary spikes, or simple elongated spikes, or branched, white or red. Flowers hermaphrodite, sessile; perianth 3-6, compressed to about the middle, cut into 3-6 erect obtuse teeth. Stamens 5, inserted in the mouth of the tube. Ovary globose; styles 3, connate at the base; seed solitary; albumen very small, embryo coiled up.

The generic name is said to be the Malabar name of the plant; it is sometimes spoken of as the Malabar Nightshade. For convenience of reference to the economic facts, the names B. alba and B. rubra have been retained.

**basella alba,** L.; Wight, Icon., i. 896; Chenopodiaceæ.

**INDIAN SPINACH.**

**Vern.**—Pâi (cultivated), bom-pâi (wild), myah-bhâjî, sufûl-bachâl, HIND.; Sufûl-bachâl-bhâjî, DUK.; Pâi, COTCH, SIND; Vasia-kirse, TAM.; Alu-bachâl, karu-bachâl, pokam-bachâl, pedda-bachâl (a variety). Tel.; Basella- kirra, MAL.

**Habitat.**—Cultivated in almost every part of India, especially in lower Bengal and Assam.

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Properties and Uses—

Dye.—It yields a very rich purple dye, which is, however, difficult to fix (Druny). This is said to be obtained chiefly from the form which received the name of B. cordifolia.

Medicine.—Murray mentions this plant amongst his drugs, but says nothing about its medicinal properties.

§ “The leaves are made into a pulp used to hasten suppuration” (Surgeon C. J. W. Meadows, Burrisal). “Cooling properties.” (Surgeon W. Barren, Bhuj, Catch, Bombay.)

Food.—The succulent leaves and stems are used as a pot-herb (made into curry) by natives of all classes. Indeed, this forms a most important article of food; scarcely a village exists, in Bengal at least, where a hedge-row covered with this favourite pot-herb may not be seen.

§ “It is a very wholesome vegetable and makes a good spinach. It is much better than the ordinary (edge) greens of the country.” (Surgeon K. D. Ghose, M.D., Khulna.) “Both this and the next form have similar properties, and are much used as vegetables.” (Surgeon-Major W. Dymock, Bombay.) “Contains a good deal of mucilage and is used as a substitute for spinach.” (Surgeon-Major P. N. Mukerji, Cuttack, Orissa.)

Basella rubra, Linn.


Habitat.—Met with in Bengal, and indeed throughout India, under cultivation.

Properties and Uses—

Medicine.—The juice of the leaves is used in native practice in cutural affections of children.


Food.—As with the preceding form, this is cultivated as a pot-herb.

Basket-work & Wicker-work, List of the more important plants used for—

In this class the fibres have not been specially prepared, or spun and woven, but either entire or after having been treated in a required manner, they are worked into baskets or mats by hand.

Alnus nitida (baskets).
Andropogon muricatus (mats).
Arundinaria falcata (baskets).
A. racemosa (mats).
Bambusa arundinacea (baskets).
B. Tulda (mats).
Borassus flabeliformis (mats, baskets).
Calamus Rotang (baskets).
Caryota urens (baskets).
Cocos nucifera (mats).
Corokia unbracteifera (mats).
Cyperus Pongarie (mats).
C. tegetum (floor-mats).
Dendrocalamus strictus (baskets).
Hibiscus tiliacens (mats).
Indigofera atropurpurea (baskets).
I. heterantha (baskets).
Juncus effusus (mats).
Macrochloa (Stipa) tenacissima (mats, baskets).
Maranta dichotoma (Shihalpa) mats.
Melinocanna bambusaoides (mats).
Moringa pterygosperma (mats).
Nannorrhops Ritchieana (mats, baskets, leaves used for).
Pandanus odoratissimus (mats).
Parrotia Jacquemontiana (baskets).
Phoenix farinifera (mats).
P. sylvestria (mats, baskets).
Phragmites Roxburghii (forms mats).
Pseudestachyum polymorphum (baskets, mats).
Rhizoma Cottinum (basket-making).
### The Butter Tree.

| Saccharum Sara (mats, leaves used for) | Salix daphnoides (baskets) |
| S. Munja (mats) | S. tetrasperma (baskets) |
| Saccharum spontaneum (mats, grass used for) | S. Wallichiana (baskets) |
| Salix babylonica (baskets). | Tamarix dioica (baskets). |
|  | Typha angustifolia (mats). |
|  | T. elephantina (mats). |

**BASSIA, Linn.; Gen. Pl., II., 658.**

A genus of trees belonging to the Natural Order SAPOTACEAE, comprising some 30 species, inhabitants of India and the Malay.

*Leaves* petiolated, coriaceous, silky or tomentose beneath when young; *stipules* small, *prolepsis* axillary, *fascicles* among the sub-terminal tufts of leaves or in the axils of fallen leaves. *Calyx-segments* 4, *2-seriate*, 2 outer valvate, enclosing the inner (except in B. butyracea). *Corolla-tube* campylaceous; lobes 6-12. *Stamens* at least twice as many as the petals; *anther* lanceolate-acute, connective, often mucronate or excurrent. *Ovary* villous, 4-12-celled. *Berry* globose. *Seeds* ellipsoid, hilum long, sometimes large; *albumen* none; *radicle* very small.

The genus is named in honour of Fernando Bassi, a former Curator of the Botanic Gardens at Bologna.

**Bassia butyracea, Roxb.; Fl. Br. Ind., III., 546; Sapotaceae.**

**The Indian Butter Tree.**

*Vern.—Chitrā or chyrā or chāra, chatrā, bhulē, KUMAO; Cheuali, QUDH; Phulmora or phulodra, HIND; Chiri, NEPAL; Yel, yel pote, LEPCHA.*

The butter from the fruits is called *chitrā-ke-pina* (Almora), and *phulē, phulē, phulodra, phulā* (in the plains).

*Habitat.—A deciduous tree of the Sub-Himalayan tract, from Kumaon to Bhutān, between 1,000 and 5,000 feet.*

In Mr. Atkinson’s manuscript this tree is stated to be very abundant at Pithoragurth, where the bees feed on its fragrant flowers; hence the honey is highly esteemed. It is also common in the valley of the Kāllī.

**Botanic Diagnosis.—Leaves obovate or obovate-oblong; calyx-lobes 5, much imbricate but not 2-seriate; corolla-tube not fleshy, lobes spreading; stamens 30-40, filaments glabrous, as long as the anthers.**

**Properties and Uses—**

Oil.—The seeds on expression yield a concrete oil known as *phulma*. This is extracted by beating the seeds to a consistency of cream, and placing the mass thus obtained in a cloth bag, upon which a weight is laid until all the oil or fat is expressed. This becomes of the consistence of hog’s lard, is inodorous, and of a delicate white color; it contains 34 parts of fluid oil and 6 parts of vegetable matter. (Mr. E. Solly.) It dissolves readily in warm alcohol, leaving the vegetable impurities undissolved. At 95° it retains its consistence, but melts completely at 120°. (Roxburgh in Asiatic Researches, VIII., 447.) This vegetable butter, being cheaper than ghee, is sometimes used as an adulterant. It is burned in lamps, and as it burns with a bright light without smoke or smell, it may be utilised in the manufacture of candles. It makes excellent soap. Its oil has many properties which should commend it to the attention of the candle and soap makers, and it is surprising that it has not taken a better position during the past half century. (Don, Prod. Nepal, 146; Royle’s Illust., p. 15; Trail in Proceed. Corres. Commerce and Agriculture, Royal Asiat. Soc., p. 115; also a complete and interesting account by the Editor, Four. Agri-Hort. Soc. of India, Vol. I., 19.)

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The Mahuā

**Medicine.**—The butter is highly valued on account of its efficacy in rheumatism, especially in contraction of the limbs and other painful affections. It seems deserving of fuller notice. As a hair-dress it is largely used with *attar* of roses and other sweet-scented oils. It is an excellent emollient for chapped hands. (Pharm. of India; Roxburgh; Voigt; Bidon Powell, *Pb., Pr., I., 423; Atkinson, Hist. Dist., 715; Pur-Book of Pharm., 1878, 258.)

**Food.**—The pulp of the fruit is eaten, and also the cake left after the expression of the oil. The flowers are not eaten, but from them a sweet syrup is prepared which is boiled down into sugar. The sugar thus prepared resembles in appearance that prepared from the date-palm.

"The grain is very small, and, as *gur,* would fetch considerably less than the finer specimens of cane-sugar. It was, however, equal, if not superior, to ordinary date-sugar, of which such abundant supplies reach Calcutta." (Jour., Agri-Hort. Soc. of India, I., 22.) As already stated, the oil is both eaten and used as an adulterant for *ghī.*

**Structure of the wood.**—Wood light brown, hard; annual rings marked by a dark line. Weight 52 lbs. per cubic foot.

**Bassia latifolia,** Roxb.; *Fl. Br. Ind., III., 544.*

**The Butter or Mahuā Tree.**

**Vern.**—Mahuā, mahuā, mahulā, maul, jaglī-mohā, jaglīnāh, mohā, HIND., OUDH; Mahuā, banmahua, mahula, maul, BENG.; Mahuā, Unia, BURM.; Mandakun, KOL.; Mahuā, BURMJ.; and MAC. (S. P.); Matkum, SANTAL; Mākhuā, BHI. (SURAT); Māhu., BAGA; Irī, irīp, irī, irī, GOND; Māhu., KURKI; Mhōme, C. P.; Moi, mahu, mohā, BOMB.; Jaglī- mohā, mohā, DUK.; Mahuā or mahura, GHI; Monā, ānda-āndhā-khāndhā, āndā-khāndhā-khāndhā, mohā, mohā, mohā, MAR.; Illūp, illūp, kat illī, kāthi-ilāppāi, kāttu-ilppāi, kāttu-ilppāi, TAM.; Ipī, ipī, yeppa, adavu-illppā-cherru, TEL.; Ilī, Ilī, Ilī, kādā-illppā-cherru, KAM.; Poomam, kāttirippā bhanum, MALL.; Madukuk, adavai madukua vriksha, SANS.; Darabbage-gulchakow-sām, PERS.; Kansa, BURMJ.; Quintard (the oil).

**Habitat.**—A large, deciduous tree, indigenous in the forests of the Central Provinces; it may in fact be said to extend from Kanga, Kumaon, and Oudh, through the Central Provinces and Chota Nagpur to the Western Ghāts, and distributed in the south-east to Ava. It is plentiful in many parts of the Bombay Presidency, especially in Gujarāt. It forms gregarious forests, generally associated with the Sāl; abundant where met with, it may be described as forming scattered and isolated forests over the region indicated. It gradually disappears towards Calcutta, and is only sparingly met with in the Madras Presidency, its place being taken by *B. *longifolia. Dr. Stewart does not regard the plant as indigenous to the Panjab.

**Botanic Diagnosis.**—Leaves elliptic or oblong-elliptic, shortly acuminate; calyx-lobes 4, the 2 outer sub-valvate including the others, rustily tomentose; corolla-tube fleshy, lobes erect; anthers 20-30, 3-seriate, sub sessile. It attains a height of 40 to 60 feet.

The Mahuā thrives on dry, stony ground. It is protected by the natives, but not artificially planted. It sheds its leaves from February to April. The cream-coloured flowers, clustering near the ends of the branches, appear in March and April, and are soon followed by the new leaf-buds. The fruits are green when unripe, and reddish yellow or orange when ripe, fleshy, one to two inches in length, with one to four seeds, which ripen about three months after the flowers have fallen. The tree is valued for its flowers, its fruit, its seed, and its timber; and is of

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considerable economic importance to a large proportion of the poorer classes of the natives of India. (Liotard.)

Properties and Uses—

Gum.—It yields a white milky gum from incisions and from cracks in the bark. The discharge of gum is facilitated by a process of ringing the trees, practised in Chutia Nagpur during the fruiting season. The gum does not seem to be of any economic value.

Dye.—The bark is often used as an adjunct in dyeing where dark colours or black are desired; along with the leaves it is also sometimes employed as a tan.

The Oil.

Oil.—A greenish-yellow oil eaten by the Gonds and other Central Indian tribes is extracted from the kernel of the fruit; it is used to adulterate ghî. This is sometimes called Doli oil, especially in Western India, the same name being applied to the seeds. It is called Mahuika Sêra in Sanskrit, and is recommended as a medicine. It is often sold in the form of cakes, which keep fresh for a few months in cold climates, but in the plains of India they soon become rancid, separating into a clear oil and a brown fatty substance. The cakes are sold as Illipi Butter.

To extract the oil the kernels are taken out from the smooth, chestnut-coloured pericarp, by being bruised, rubbed, and subjected to a moderate pressure. They are then ground and the oil obtained by cold expression. In the Central Provinces, the kernels are pounded and boiled, and then wrapped in two or three folds of cloth and the oil thereafter expressed. In the western tracts of Bengal and in the Central Provinces, besides being used for lighting, this oil forms a very inexpensive substitute for ghî. It is a useful oil for soap, and is largely used by the poorer classes as a lamp oil.

Candle and Soap Trade.—The following interesting passage is extracted from Drury's Useful Plants of India: "In 1848 a quantity of Mahuwa oil was forwarded to the Secretary of the East India and China Association, with the view of ascertaining its market value and applicability for the manufacture of candles and soap. The managing director of Price's Patent-Candle Company stated in reply: 'I beg to inform you that the Mohwa oil, of which you furnished us samples, is worth in this country, for the manufacture of candles, £8 per ton less than Petersburg tallow. We have tried a great many experiments upon it, and found it to be of the same value as coconut oil, and its being harder makes up for the colour being inferior. Large quantities could be used in this country at about £35 per ton.'"

In Gujarât, "Soap is manufactured by Musalmans. This is made by mixing alkali soda and lime in water, and allowing them to soak for some hours. The water is then drawn off and a quantity of mahuwa oil, doliu, is added, and the whole boiled in large brick caldrons. When ready the mixture is run off into shallow brick troughs and left to cool. It is then gathered into a large heap, pounded with heavy wooden mallets, and cut into round cakes. According to the amount of mahuwa oil it contains, soap varies in price from 13d. to 3d. (1-2 annas) the cake." (Bombay Gazetteer, III., 76.) In Ahmedabad, soap is made from the oil of this tree, called doliu oil. The oil is largely burned by the Bhils and other hill tribes. In the Deccan the oil is used for making country soap.

The Gazetteer of the Central Provinces remarks that for the purpose of preparing the "oil the exports of the seed might be largely increased." "The seed of the mahua (which succeeds the flower from which the spirit is made) is extensively used for the manufacture of oil for burning; and the failure of the mahua crop is usually followed by a high price of oil.
The Bassia

Bassia latifolia

MEDICINE.

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Throughout the year in which the failure occurs.” (Oudh Gazetteer, III, 71.)

MEDICINAL PROPERTIES.

Medicine.—The flowers are used in coughs in the form of a decoction.

The medicinal properties attributed to this plant are stimulant, demulcent, and emollient, heating, astringent, tonic, and nutritive. The seeds yield, on expression, a thick concrete oil, which is recommended to be applied to the head in cephalalgia. The oil is much valued by hill tribes in the treatment of skin diseases. The residuum or cake, left after the expression of the oil, is employed as an emetic and also as a detergent.

According to the Pharmacopoeia of India, “the spirit distilled from the flowers has a strong smoky odour, somewhat resembling Irish whisky, and rather a pungent testid flavour, which, however, disappears with age. The freshly-distilled spirit proves very deleterious, exciting gastric irritation and other unpleasant effects.” Dr. U. Q. Dutt says this spirit is described by Susruta as heating, astringent, tonic, and appetising. The Pharmacopoeia adds that Dr. Dutt reports “having used the weaker (diluted?) spirit extensively; and in his opinion it is less injurious to the digestive system than rum, more resembling beer in its effects on the constitution and nutrition of the body. This view is coincident with that of Dr. W. Wright. It is evidently a powerful stimulating, and when matured by age may be used as such, when brandy and other agents of the same class are not available.” (Pharm. Ind., 131.) The leaves are boiled in water, and given as a cure for several diseases; they make a good emboecration. “The milk of the green fruit, and of the tender bark, is given as a medicine.” (Voigt.)

Dr. Irvine (Mat. Med., Patna) says that the bark is used in decoction as an astringent and tonic. “The bark is sometimes used as a remedy for rheumatic affections.” (Mysore Catalogue, Calcutta Exhibition.) Voigt says it is rubbed on the body as a cure for itch.

The residue cake, after the extraction of the oil, is said to be used to poison fish. This seems doubtful, but the statement is made by several writers. The smoke produced in burning the cake is reputed to kill insects and rats.

Special Opinions.—§ “Used as a detergent in the southern districts of Madras.” (Hon. Surgeon E. A. Morris, Negapatam.) “The expressed oil is applied to the arms of children to allay the extreme itching sometimes caused by the presence of intestinal worms.” (A Surgeon, Alighar.) “The flowers mixed with milk are used in impotence due to general debility; they are given in doses of about one and a half ounces with eight ounces of fresh milk, and are often an efficient remedy. The dried flowers are used as a fomentation in cases of orchitis for their sedative effect.” (Hospital Assistant Lal Mohamed, Hoshangabad, Central Provinces.) “The flowers of the mowa appear to impart their peculiar odour to the secretions of the body when eaten. This is notably the case in cattle, the milk being flavoured when they are allowed to feed on mowa.” (Surgeon S. H. Browne, M.D., Hoshangabad, Central Provinces.) “The flowers are sometimes boiled and eaten by the lower classes. I know a case of dangerous vomiting with brain symptoms caused by eating an excess quantity of flowers. The spirit, if carefully prepared and redistilled, is not deleterious.” (Surgeon Shib Chunder Bhattacharji, Chanda, Central Provinces.)

FOOD.

Food.—The fruit is sometimes eaten, but the principal edible structure is the succulently-developed flowers (i.e., corollas); these are yellow.

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Products of India.

or Illipi Butter Tree.

**BASSIA latifolia.**

<table>
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<tr>
<th>Fruits.</th>
<th>244</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugar.</td>
<td>245</td>
</tr>
<tr>
<td>Cakes.</td>
<td>246</td>
</tr>
<tr>
<td>Seeds.</td>
<td>247</td>
</tr>
<tr>
<td>Spirit.</td>
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</tr>
</tbody>
</table>

eaten raw or cooked, or in the form of sweetmeats. Sugar may also be prepared from the flowers. In many parts of the country they are baked into cakes. The seeds also may be eaten, but it is chiefly valuable for the oil which it yields on expression, the cake being utilised as an article of food both for men and animals. The flowers afford both food and drink to a large number of persons during a great part of the year, *via,* from March to September. After having been steeped in water, and allowed to ferment, a spirit is distilled from them which is largely consumed by the inhabitants of the mountainous tracts of the central table-land of India. In a note by Mr. Liotard, published by the Revenue and Agricultural Department, an interesting abstract of information regarding *mahuā* will be found, from which the following passage may be republished here: "When the buds appear, the people clear the jungle from below the trees; and when the flowers fall, women and children, and sometimes men, may be seen busily occupied in the early mornings gathering large quantities. It is reckoned that each tree during the season gives from 6 to 8 mounds of flowers, the quantity varying according to the size of the tree and the nature of the season. This is used in two ways: (1) as an article of food, and (2) as a material for the manufacture of aspirits.

"As an article of food it possesses, when fresh, a peculiar luscious taste, with an odour somewhat suggestive of mice. When dried the flavour has some resemblance to that of inferior kinds of figs, and forms an important addition to the food-supply of the poorer classes of parts of the country in which the tree grows in abundance. Under the Mahratta rule it is said to have been a common practice to cut down the *mahuā* trees in the Bhil country so as to afflict the lawless hill tribes and reduce them to straits. This shows how much the people depend on the produce of these trees for food. The flowers are used either freshly gathered or after being sun-dried. They are eaten cooked or uncooked, often with parched grain or with the seeds of the *adi* tree, or with leaves of other plants. Jackals, bears, wild pigs, and deer are very fond of *mahuā.*

"For the manufacture of spirits, the flowers when dried are sold by the hill people, at various rates, either to the village distillers or to the *bantians,* by whom they are exported. The dried flowers are immersed in water for four days; they are then fermented, and thereafter distilled. The liquor produced from a single distillation is extremely weak, ranging from 60° to 90° under proof. But a second distillation is sometimes resorted to, especially where still-head duty is levied irrespective of strength, and in this case a spirit averaging 25° proof is obtained. The distillation is practised in the Panjāb to a small extent; in Rājputana every village apparently has its spirit-shop for the sale of the distilled liquor; in the North-West Provinces and Oudh the liquor is made in the eastern and southern districts, and is of common use among certain classes; in the western districts of Bengal it is abundantly distilled; so also in the Central Provinces, and in parts of the Bombay Presidency, especially in the northern and southern divisions."

**ABSTRACT OF PROVINCIAL REPORTS REGARDING THE VALUE OF MAHUĀ.**

An indefinite series of extracts from published works might be given to illustrate how exceedingly important the *mahuā* tree is to the hill tribes of India. In the *Bombay Gazeteer* (XII, 26) will be found the following passage: "Its chief value lies in the pulpy bell-shaped flower, which, when dried, is eaten by the natives, and is distilled into the common spirit of the country. Almost every animal, wild or domestic, eats the fresh flowers. It is an important article of trade, and during the hot months is the chief means of subsistence to the Bhils and other hill tribes. The wood is hard and lasting, but the tree is too valuable to be cut

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for timber. The seed, when allowed to form, is enclosed in a thick walnut-like pod. It yields an excellent oil good for food and burning, and also for skin diseases. The leaves and bark make useful embrocations. Altogether, the moha is one of the most valuable of Khândesh trees, but as it grows in the wildest forests, most of the produce is lost or supports wild animals only. In the open country a few good moha trees are a small fortune."

"The mahudá, with its strongly-veined leaves and its heavy sickly-smelling flowers, is in every respect a noble tree and of great value to the district. For months in the year its flowers and fruits are meat and drink to many of the poorer classes, and its timber is of excellent quality."

(Bombay Gazetteer, III., 198.) "In Gujarát and Rájputana, every village has its spirit-shop for the sale of the distilled liquor from the flowers. In the Island of Chára, opposite to Bombay, the Government duty on the spirits distilled (chiefly from this flower) amounts to at least £60,000 per annum; I rather think that £80,000 is more generally the sum. The Parsís are the great distillers and sellers of it in all the country between Surat and Bombay, and they usually push their distilleries and shops into the heart of the forest, which lines the eastern border and hills of those countries. The spirit produced from Bāsāla is, when carefully distilled, much like good Irish whiskey, having a strong, smoky, and rather ftetid flavour; this latter disappears with age." (Dr. Gibson, in Hooker's Journ. Bot., 1853, p. 90.)

In the Central Provinces the poor people draw half their sustenance from the fleshy flowers at certain seasons of the year. "The spirit most used in the Central Provinces is the dárí distilled from mahudá."

(C. P. Gąz., Intro., p. cxiv.) Mr. J. G. Nicholls, Commissioner of Excise, on inquiries instituted with regard to the mahudá of the Central Provinces, obtained valuable information. Summarising the reports which he received, it would be within the mark to say that in the Central Provinces alone over 1,400,000 persons use the mahudá as a regular article of food. The following extract from Mr. Nicholls' paper on the value of mahudá (or mahudá) (taken from the Indian Forester, V. 472) will be found highly instructive: "From my enquiries, I am led to believe that one maund for the annual consumption of each individual is a moderate and quite safe estimate. But one maund of mahudá sets free more than an equal weight of grain, probably one and a half maunds."

Mr. Fernández, Assistant Conservator of Forests, has given this matter his special attention. He calculates that a frugal family will use 30 per cent. of grain on the average annual consumption of cereals by the partial and seasonable substitution of mahudá flower and oil.

"I will first estimate the saving to be only 1½ maunds of grain for each person, 5 maunds being the annual average consumption of each individual of the population. This represents 17,50,000 maunds of grain saved; or we may calculate in another way: that this supplementary source of food-supply sets free so much of our arable land as would be required to produce an extra 17,50,000 maunds of cereals, to be more profitably employed in the cultivation of cotton, linenseed, and the more valuable agricultural products, resulting in a still larger balance of trade in favour of these Provinces.

But so as to be sure of avoiding an over-estimate, suppose the saving to be only 12,50,000 maunds a year; this sets free so many maunds of the highest priced grain mostly for export out of the provinces. Calculating at 20 seers to the rupee, this would represent one quarter of a million of pounds sterling as the value of the mahudá crop to these Provinces in ordinary years, exclusive of what is used for distillation. The latter want
The Mahud.

will always, in ordinary years, be first provided for, because good prices would be forthcoming.

"The mahud used for distillation yields a revenue of close on ten lakhs of rupees a year, raised, in a way, by self-imposed taxation on classes who could not otherwise (save by the salt tax) be made to pay their quota towards the expenses of the State.

"At the lowest valuation, in ordinary years, the mahud produce is worth to the country at large not less than 35 lakhs of rupees.

"In times of scarcity it becomes as well as its monetary value rises with the intensity of the distress: it often becomes of vital importance. It must be remembered that failure of agricultural crops in these Provinces is more frequently the result of excessive rainfall than of drought. The mahud crop would be unaffected by an excessive rainfall in the period of the monsoon. It suffers from drought to some extent, more so from frost. Where, but for this supplementary source of food-supply, we should experience famine, with it we should only have distress. Without it, I think we should always have chronic scarcity in the wildest parts of the Provinces.

"We are now called on to part with a portion of our crop for export to Bombay. It is understood that, besides the demand in that direction for the purpose of distillation and for consumption as food, it is also required for use in the manufactures in connection with ship-painting and caulking. I have no reliable information on this point. I mention what I have been told for what it may be worth. But at any time demands may arise at the bidding of the chemist and the manufacturer in quarters where the purchasing power would be so great as to draw off much of our crop. It is not unlikely that the distillers of the North-Western Provinces will soon begin to indent for mahud on our northern districts.

"Taking the lowest valuation of the crop, i.e., 35 lakhs of rupees, and capitalising this at 15 years' purchase, we get the present value of the bearing trees, as flower and oil-producing sources, represented by £4 millions sterling.

"But to replace the present existing trees in full bearing, would require much more than fifteen years. Considering this and the cost of artificially-stimulated reproduction, together with the incidental disturbances of the normal conditions of life, double this amount would scarcely compensate the Provinces for their sudden destruction.

"This godly endowment from the hands of bountiful Nature, this inheritance may not with impunity be wrecked or impaired. It should be held as a great trust, to be left, at the least, intact, by the present generation, for the support and enjoyment of generations yet unborn."

In Oudh it is principally found in the western half of Pertabgarh. The flower withers in April, and drops from the tree during the night. There are calculated to be 434,570 trees in the district. Assuming each tree to yield 20 seers, this, at the average price, would give a value of Rs.44,856. As a rule the mahud crop is good only once in every three years. (Oudh Gaz., III., 71-72.)

The following extract from the "Statistical Account of Bengal" gives the substance of Mr. Forbes' Settlement Report of Palamau with regard to mahud: "The most important of all the indigenous jungle products is the flower of the mahud tree, as the abundance or deficiency of this crop affects the market price of all other foods throughout the year. The total number of mahud trees in Palamau, from which fruit was regularly gathered, was estimated by Mr. Forbes in 1869 at 113,885, of which 18,492 belonged to Government farms and were specially dealt with at the time of the settlement. All were of indigenous growth, and it appears not to be the practice to rear trees artificially."
The Mahuā.

“Mahuā blossoms are rarely eaten fresh, but are dried on a smooth floor of cow-dung and mud, until they shrivel to a quarter of their original size, and take a light-brown colour, so as to resemble raisins. They are usually prepared by boiling. This takes all the flavour out of the flower, and it is therefore eaten with the seeds of the sal tree called sarđāyi, or some acid leaves or herbs, to give it a relish. Those who can afford to do so eat mahuā fried in ghi or butter. The yield of a mahuā tree varies very much in different seasons. A large tree will bear in a good season from 4 maunds 2 seers to 4 maunds 29 seers of ripe blossoms; but the average yield is about 2 maunds 28 seers, which when dry does not weigh more than 1 maund 14 seers. Of late years the price of mahuā blossom has risen. It used to sell at 3 maunds for the rupee, but at the present market value, about a rupee and a half is paid for 2 maunds. During the distress of 1869, the price rose to 14 and 11 seers per rupee. The fruit of the mahuā tree begins to form immediately after the fall of the blossoms, and ripens in June. The weight of the fruit generally equals that of the crop of blossom. Natives never gather the fruit, or even shake the tree to make it fall, the belief being that if this were done the tree would not bear in the following year. When ripe, the mahuā fruit is about as big as a peach, and is made up of three separate envelopes, with a white nut or kernel inside. The two outer skins are either eaten raw or cooked as vegetable, and the inner coating is dried and ground up into a kind of meal. Of the kernel itself an oil is made; four seers of kernels making one seer of oil, which is largely used both for cooking and for adulterating ghi. Before, however, it can be used for the latter purpose, it must be clarified with butter-milk, to prevent its offensive smell from being detected in the ghi. The oil sells at 9 seers for the rupee. The amount annually made is small, and it can rarely be purchased two months after the manufacturing season is over.” (Dr. W. W. Hunter’s Statistical Account of Bengal, Vol. XVII., pp. 343-444.)

In Mr. V. Ball’s account of mahuā in the Journal of the Asiatic Society, No. II., of 1867, incorporated in Hunter’s Statistical Account of Bengal, will be found the following interesting account of the mahuā tree in the Hazaribagh District: “The duty of collecting the fallen blossoms is chiefly performed by women and children; at dawn they may be seen leaving their villages with empty baskets and a supply of water for the day’s use. Before the crop has commenced to fall, they take the precaution to burn away the grass and leaves at the foot of the tree, so that none of the blossoms may be hidden when they fall. The gleaners generally remain under the trees all day, alternately sleeping and collecting the crop; the male members of the family, visiting the trees once or twice during the day, bear off the produce in baghs. It often happens that the people who collect come from a considerable distance, in which case they erect with the branches of sal a temporary encampment of huts, in which they live until the crop is all gathered into. In front of each of these huts a piece of ground is made quite smooth and hard, for the purpose of spreading out the flower to dry. When perfectly dry, the blossoms have a reddish-brown cast, having lost three fourths of their original dimensions, and about half their original weight. It is the custom with some of the natives, before spreading them out to dry, to pull off the little ring of foliaceous lobes which crowns the fleshy corolla. It is very difficult to collect trustworthy statistics regarding the amount of yield of the mahuā trees. I have been told, and it has been repeated to me several times, that a first-class tree will yield two maunds a day, and that this will continue for fifteen days. This estimate, I believe, is more than double the real facts. The rent of the trees varies much according to their abundance in the district, the quality
of the previous rice crop, and various other circumstances affecting
the demand and supply. In parts of Hāzārībāgh I have known ten small
trees to be let for a rupee, while a single fine larger one would sometimes
bring the same amount. In Mānbhūm, I have been pointed out trees for which
a sum of from two to three rupees was charged, but I have also heard of
the trees being hired in the same district for four annas.” “Two maunds
of mahūd are stated by some to furnish a month’s food to a family consisting
of a father, mother, and three children. It is, however, seldom eaten
alone, being much more frequently mixed with the seeds of sāl or with
some of the leaves of the plants which are collectively called sāg. The
cooking is performed as follows: The sāl seeds, having been previously
well dried in the sun, are roasted and then boiled alone; the mahūd
flowers are then also boiled, and the water is thrown away. So far
having been cooked separately, they are then mixed and re-heated;
sometimes a small quantity of rice is added. It is the custom to cook
but once a day, and each member of the family helps himself whenever
he feels hungry.” (Dr. W. W. Hunter’s Statistical Account of Bengal,
Vol. XVI., pp. 48-49.)

Mr. Lockwood (formerly Magistrate and Collector of Monghyr) published
in the Linnean Society’s Journal (Vol. XVII., 89) a most instructive
account of Mahūd, the facts of which may be said to be applicable to every
district in which the plant occurs. The following extract may therefore be
republished here: “During the season of scarcity which prevailed at
Behar in the year 1873-74, the mahūd crop, which was unusually abundant,
kept thousands of poor people from starving; and all famine officers will
recall its peculiar odour as they passed through the villages where it had
been collected. The residue of the mahūd which is not eaten is taken to
the distilleries, and there, with the aid of rude pot-stills, is converted into
a strong-smelling spirit, which bears considerable resemblance to whiskey.
The Government holds a monopoly of spirit manufacture; and when
I first went to Monghyr in 1873, the custom was to charge a duty of eight
shillings for every cwt. of the raw material as it entered the distillery, on
the supposition that so much mahūd would only yield three gallons of
proof spirit. Subsequently, in consequence of experiments made by the
officers under me, this duty was somewhat raised; but in England I find
that over six gallons of proof spirit can be produced from a cwt. of mahūd.
The Government of India should be made aware of this fact; and it
would probably be advantageous to introduce patent stills in the place of
the rude machines now in use.

“The amount of mahūd, which nominally paid Government duty
yearly in Monghyr, was 1,750 tons; but with patent stills under Govern-
ment control, the mahūd would probably yield a much larger revenue to
the State. An Italian gentleman, who was living at Monghyr when I
was there, took out a patent for removing, by a very simple process, the
essential oil, or whatever it is, which gives the mahūd spirit its peculiar
smell; and for some time I thought he would make a rapid fortune; orders
poured in on him from Calcutta, and the demand promised to be
immense. But just as the inventor had taken up a whole side of the
Government distillery and got all his preparations complete, the rum-
distillers in Calcutta petitioned the Board of Revenue, and a prohibitive
duty was imposed, which completely put an end to the manufacture of
scentless mahūd spirit. A sample was sent to the Chemical Examiner
at Calcutta; and he reported that the spirit was pure and wholesome,
and came very near good foreign brandy.

“But not only are the mahūd flowers good for distilling spirit; they are
still more useful for feeding cattle. My father, the Rector of Kingham,
has been feeding his pigs on the mahūd which I brought home, and

<table>
<thead>
<tr>
<th>BASSIA latifolia.</th>
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</thead>
<tbody>
<tr>
<td>BENGAL.</td>
</tr>
<tr>
<td>Monghyr,</td>
</tr>
<tr>
<td>250</td>
</tr>
<tr>
<td>Proof Spirit</td>
</tr>
<tr>
<td>(6 gallons from 1 cwt. of Mahūd).</td>
</tr>
<tr>
<td>257</td>
</tr>
<tr>
<td>Scentless spirit from Mahūd.</td>
</tr>
<tr>
<td>258</td>
</tr>
<tr>
<td>For feeding Cattle.</td>
</tr>
<tr>
<td>259</td>
</tr>
</tbody>
</table>
Dictionary of the Economic

The Mahua.

Mahua Pork is beginning to be celebrated in his neighbourhood. Indeed, so favourably has it been received, that I have been requested to procure considerable quantities, both for distilling spirit and for feeding cattle. The Bassia family is the only family I know which yields a flower is sufficient quantities for feeding cattle and distilling spirit on a large scale. Potatoes, maize, and barley, which are principally used, are costly in production and uncertain in their yield, but the Mahua crop never dies. The oldest inhabitant in Monghyr had never heard of a season when the Mahua crop was not abundant; for, whether the fruit subsequently forms or not, the corolla is certain to be there, and certain to fall in great profusion. The extraordinary keeping qualities of Mahua form also a further recommendation to its introduction into England. Before leaving India, I had a ton shovelled into sacks and put on board a vessel at Calcutta. They were gathered in April 1876, and, after being kept for nearly two years, are as good as when first dried. No weevil, apparently, attacks these flowers as they attack grain.

"India would benefit greatly if Mahua flowers met with a demand in England. The vast forests of Mahua trees, which now yield little profit to their owners, would soon become a source of wealth; and the collection of the corollas would give work to thousands of poor people who at present inhabit the rocky country where the Mahua grows.

"To sum up the merits of the Mahua flowers for distilling purposes and feeding cattle, they are: 1, cheapness; 2, unlimited supply; 3, certain yield; 4, nourishing qualities; 5, good keeping qualities."

TRADE IN MAHUA.

EXTERNAL.

An effort has latterly been made to establish a European trade in Mahua, mainly as a source of spirits of wine and for the purpose of feeding cattle. The following quotations furnished by the Department of Finance and Commerce give all that can be published, however, of a definite nature regarding this new trade:

Export of Mahua or Mowra flowers from British India.

<table>
<thead>
<tr>
<th>Year</th>
<th>Quantity</th>
<th>Country to which exported</th>
<th>Value</th>
<th>Quantity</th>
<th>Country to which exported</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1883–84.</td>
<td></td>
<td></td>
<td></td>
<td>1884–85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bengal</td>
<td>6,215</td>
<td>90,785</td>
<td></td>
<td>Bengal</td>
<td>449</td>
<td>64,681</td>
</tr>
<tr>
<td>Bombay</td>
<td>5,70,879</td>
<td>5,70,879</td>
<td></td>
<td>Bombay</td>
<td>60,017</td>
<td>60,017</td>
</tr>
<tr>
<td>Total</td>
<td>5,93,025</td>
<td>5,93,025</td>
<td></td>
<td>Total</td>
<td>60,017</td>
<td>60,017</td>
</tr>
</tbody>
</table>

With the view to regulating the trade in Mahua spirit, the Bombay Government have passed certain legislative measures which have had the effect of making a State monopoly of the purchase of the flowers. Meanwhile the export trade has received an unforeseen check in the attitude taken by the French Government in prohibiting the importation into France of Mahua flowers. It was found that Mahua spirit was being used as an

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The Mahua Tree of South India.

adulterant for brandy,—a new trade which would have materially influenced French interests. This difficulty is much to be regretted, since it may have the effect of retarding the development of the more legitimate trade in this valuable product. Without in any way disturbing the present relations of the mahua crop as a source of food to the hill tribes, a large and profitable export trade might easily enough be established in mahua flowers and seeds.

INTERNAL TRADE.

Mahua is one of the most important articles of export from Kaira. Definite information regarding the internal trade as a whole cannot be obtained, but in the preceding pages enough has been given to show that the mahua is an exceedingly valuable plant, and a large local trade is done in both the flowers and the seeds.

§ "The flowers are very largely exported to France for the manufacture of inferior brandy." (Surgeon K. D. Ghose, Bankura.) "The spirit is much drunk in Jeypur (Vizagapatam district)." (Surgeon-Major J. Byers Thomas, Waltair, Vizagapatam.) "Fruits and flowers are eaten by the poor in the Konkan, and in Gujarat a spirit is distilled." (Surgeon W. Barren, Bittij, Cutch.)

Structure of the Wood.—Sapwood large; heartwood reddish brown, from hard to very hard. Annual rings indistinct. A cubic foot of seasoned wood weighs 61 to 68 lbs.

It is not much used, owing to the flowers being too valuable to allow of the tree being cut for timber; it has been tried for railway sleepers in the Central Provinces, and Beddome says it is used for the naves of wheels, for door and window frames and panels, for furniture and country vessels.

Mr. C. F. Manson describes the mahua as the most generally useful tree of the Santal Pergunnahs. Cleghorn says it is "a strong wood, but never felled by the natives."

Domestic Uses.—In many parts of India the broad leaves are used as plates.


The Mowa or Mahua Tree of South India.

Vern.—Mohâ, mohud, Hindi; Mohu, Beng.; Mohâ, Duk.; Madhâka, Sânk.; Darakkhe-gulchakar Pers.; Makus, mohi, Birm.; Mahuda, Cutch.; Môhâchâ-fûdâ, ëppîchâ-ôdâ, Mar.; Mahâdu, mowâ-nu-ôdâ, Guj.; Illûpî, ellûpa, illûpî, illûpî, Tam.; Íppi, ëppî, ëppî-ôkêzû, ëppi-ôpô or simply ëppi, ëppô (flower), Tel.; Hippa, ëppîpodî, Kan.; Ellûpa, ëppîpa, MAL.; Mr, Singh.; Kan jumû, bânsî, Birm.

Habitat.—A large evergreen tree of South India and Ceylon. Common in Kanâra. Mr. Baden Powell (quoting Mr. Barnes's settlement report) must have mistaken this plant for the preceding, as he describes it (Pâk. Prod., I., 424) as common in Kangra district, Panjâb. It is entirely a South Indian plant, being common in Mysore, Malabar, the Anamalays, and the Circars.

Botanic Diagnosis.—Leaves lanceolate, narrowed at both ends, glabrous, distinctly nerved; anthers 16, 2-seriate, subsessile, tips 3-toothed; young fruit globose, densely hisrute.

This should be carefully distinguished from the next species, the character of the fruits readily separating them.

Properties and Uses—

Gum.—Yields an inferior gum known as Elopé. Ainslie informs us that this is used in Madras as a remedy in rheumatic affections. Roxburgh remarks that there is frequently to be found a drop of whitish, soft, tasteless resin on the spines of the flowers before they open.

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BASSORA.

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Cake a
Detergent. 268

MEDICINE.
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Bassora Gum.

Oil.—An oil is expressed from the seeds. It is yellow and semi-solid; used for burning, for soap, and to adulterate ghee. It is said to be well adapted for the soap trade; it retains its solid form under 95° F. It is seldom sold in the bazaar, but is used for private consumption. It is suitable for the manufacture of candles. In Kanara, candles and soap are made from the oil of this species. (Bomb. Gaz., XV., 67.) The crushed seeds of this and of the preceding species, after separation of the oil, are baked into cakes and sold as a detergent; these cakes are largely used for washing the hair.

Medicine.—The plant has astringent and emollient properties assigned to it. The leaves, the bark, and the juice of the bark and of the young fruited are used medicinally. As with B. latifolia, this species yields two important products—a fixed, concrete oil and a spirit, the former obtained by expression of the seeds, the latter by distillation of the flowers. The oil is said to be good for skin diseases; owing to the rapidity with which becomes rancid it is not of much pharmaceutical value in the plains of India. The flowers are said to act as a mild laxative. (Mysore Catalogue.)

Food.—The economic uses of this tree in the South are similar to those of B. latifolia in the central table-land of India.

Structure of the Wood.—Heartwood red, moderately hard, close-grained. Weight 61 lbs. per cubic foot.

Beddome says it is very flexible and durable; is valued for ships' keels, for trenails, and for planking below the water line; and that it is used for carts, furniture, and bridges. Cieghorn says the wood is good for trenails; it is comparatively free from the attacks of the Teredo navalis; it is procurable among the logs brought down the Godavari. It is valued for all purposes, in situations where it is not exposed to air, as planking of ships below the water line, frames on which well-walls are built, etc.


Habitat.—A middle-sized tree, native of South Kanara, Malabar, and the Anamalais; up to 4,000 feet, abundant. (Beddome.)

Botanic Diagnosis.—Branchlets glabrous, leaves lanceolate or oblong-obustose, or scarcely acute, glabrescent, distinctly nerv'd; stamens 16, in 2 series, sub sessile, connective, excurrent, lanceolate linear; young int. oblong-lanceolate, glabrous.

A very nearly allied species to the Ceylon B. nerifolia, Moon.


A tree met with in Malacca and Borneo, known as Kotian, and said to yield a copious milky juice, which hardens into a kind of Gutta-percha, which see.

B. Parkii, Don.

A tropical West African tree; yields a fat known in commerce as the Galam or Shea Butter. This substance was first described by Muir Park.

BASSORA.

Bassora Gum.—A group of high-coloured gums resembling tragacanth, but very inferior, the colour being most objectionable. These are collectively known in commerce as Bassora gum, because the gum of this class which first attracted attention is supposed to have been exported from Bassora; they are also sometimes called Hog-tragacanth or Hog gums. In India they are collectively known under the generic name kattira.

A gum exported from Calcutta to America, and which in America

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The name of "Gum-Hogg," has recently attracted considerable attention, as it has been found very useful in marbling paper and the edges of books. It seems to be the gum of Cochlospermum Gossypium. An article of this name has appeared in several publications. It is not soluble in water, but instead swells into a soft, transparent mass. The filtrate of this mass gives a faint precipitate with solutions of sublimate, but no reaction with oxalate of ammonia. It is neutral to litmus, and neither taste nor smell. Alcohol and ether have no solvent action on the insoluble transparent mass, but this is removed by the action of dilute sulphuric acid, the resulting solution showing no tinge of iodine, nor with Trommer's test for sugar. Yet, if a weak solution of an alkali or alkaline carbonate, it is found to be slowly converted into a uniform thick mucilage of a pinkish colour. This solution being neutralised with an acid, it is found to be soluble, while it has lost its objectionable colour.

The main characteristics of the so-called Bassora gums which distinguish them from the Tragacanth series by the following characters are: Bassora bassorina is only slightly soluble in water, but, owing to its waxy nature for water, it will absorb as much as fifty times its weight, to a thick mucilage. The filtrate obtained on separating this is found to yield "an abundant precipitate with acetate of magnesium to mix clearly with a concentrated solution of ferric chloride x, in these respects differing from solutions of gum arabic. On the other hand, it agrees with the latter, in that it is thrown down as a jelly by alcohol, and rendered turbid by oxalate of ammonium. If Tragacanth is readily soluble in alkaline liquids even in ammonia, and at the same time it assumes a yellow colour." (Pluck and Bower.) The mucilaginous mass is tinged blue on addition of the test solution of iodine. This constitutes a convenient reagent for distinguishing Tragacanth from Bassorina, the latter remaining insoluble in the iodine. Chemically, Tragacanthin and Bassorina are nearly identical, being represented by the formula \( C_{12} H_{28} O_{10} \). The reaction appears to be due to the presence of a small proportion of citrate of potash, which makes up the Tragacanthin. In the case of the mucilage, and the immediate turbidity of the filtrate of ammonium, these are the most characteristic tests for tragacanth. They are the presence of a pectic principle, as the most characteristic feature of tragacanth.

India Bassora gums or Hog-gums are as follow:

1. Cochlospermum Gossypium.—This is the khamb or ghâhâ of Hindu lore. The tree is very abundant in the forests of the North-West, extending across the central table-land of India to the west of the Promen in Burma. This seems to be the Gum-Hogg referred to by Calcutta to America, in which a future trade seems likely to develop.

2. Cochlospermum urens.—This is the ghâhâ or pâlur and kúrs of Hind., and sam. A common tree in the sub-Himalayan tracts from the eastward. This is certainly one of the best of Indian Bassora gums. Various reports have come to me from London, one broker stating that it was worth £20 per cwt. Samples were also sent from Haidarabad at 30s. to 45s. a cwt.

3. Forster's Species of Sterculia yield gums identical with the above.

4. Sterculia montesorum.—said to yield a clear gum tragacanth.

5. B. 286
Bassora Gum.

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1. Moringa pterygosperma.—This is the Horse-radish tree of Bengal, or soja. It yields an abundance of dark-coloured Bassora gum which rapidly decays into a black powder. This is one of the gums often called mochd-rás, and also false tragacanth or gum-hog of European writers.

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2. Bombax malabaricum.—This is the sīmul or red-silk cotton-tree. It yields mochd-rás, a gum which is often declared as gum-hog. It is superior to the last mentioned, but of little or no commercial value.

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3. Allanthus excelsa.—This is the maharshik of Hind., and Mar. This much resembles moringa gum, but occurs in deep, dark red, large, rounded tears, instead of masses.

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4. Stereospermum suaveolens.—The páral or párd. A tree of the Sub-Himalayan tracts. It yields a dark-coloured massive gum of the Bassora series, of which very little is known, as it rarely occurs in the bazaars.

To this list may be added the gum of Odina Wodier, for although this appears to be a soluble and not a bassora gum, it is perhaps one of the gums most abundantly pressed on the market, either as an adulterant for gum arabic, or as a substitute for bassora and tragacanth. Perhaps no other tree yields, in Bengal at least, a larger supply of gum than this; and although it is not so plentiful as Moringa pterygosperma, the gum is more frequently met with in bazaars than almost any other gums. But for the fact that it is mixed with whitewash for walls, it may be said to be worthless as far as has yet been discovered, and it is mentioned in this place mainly as a caution, since there seems little doubt but that it is one of the principal substances used to adulterate more valuable gums.

European Gums generally known as Gum-hog.—The gum which chiefly goes by this name is obtained from Symphonia globulifera, a member of the Gamboge family and a native of the West Indies and of America; this is said to have received its name from the hogs being in Jamaica observed to rub themselves on the gum as it issues from the tree. By many writers the gum from the almond tree is also spoken of as gum-hog, and there are reports of a considerable trade between Persia and Bombay in a gum presumed to be obtained from that tree. Much confusion prevails, however, regarding the gums derived from the genus Prunus. One feels disposed to assume that the character of the gums of all the species of that genus would be more or less alike, and yet the greatest confusion exists in the literature of this subject. The Persian gum-hog, Dr. Dynock says, is a cheap substitute for more soluble gums. From this remark one would be almost justified in assuming that it was a soluble and not an insoluble gum, and had therefore been incorrectly called gum-hog. Stewart and Baden Powell say that apricot gum is soluble, and while Dr. Cook does not allude to cherry and almond gum, he places all the other gums obtained from the genus Prunus among his true gums, and not in the tragacanth series. Cherry gum has, however, been carefully examined, and pronounced to be much more nearly related to tragacanth and bassora than to the true gums. John detected in it a principle very similar to bassarin, but Berzelius places this as a mucilage nearer the mucilages from flax seed and quince seed than the gelatinous mass obtained by saturating tragacanth or bassora gum in water. Giraud has carefully examined this mucilage, and states that it differs from tragacanth in the absence of a pectic principle; and he further adds that it contains as much as 20 per cent. of cellulose. In most countries there are three or four trees which yield gums of the Bassora series. Those met with in India have already been discussed, and in Europe commerce the gum of Symphonia globulifera and the gum of the almond tree are those generally met with.

This comparative account of the bassora or gum-hog substances with the tragacanth gums may be concluded by recapitulating briefly (what will
Products of India.

The Snake Climber.

be found gone into at greater detail under Acacia Senegal) the accepted theory of the chemical nature of the true gums and of the bassora and tragacanth gums. The former are now viewed as compounds formed by an organic acid with union with an alkali obtained on the organic acid percolating through the cell-wall. The latter, on the other hand, are much more nearly related to cellulose. In fact, according to Von Mohl, confirmed by Wigaud, they are metamorphoses of cellular tissue; hence their chemical relation to cellulose.

Gum Tragacanth is imported into India and may be had in every bazaar. It is obtained from one or two species of Astragalus, a genus of Leguminosae, of which we have many representatives on the temperate Himālaya, none of which appear to yield tragacanth. For further information see Tragacanth.

**Bassorine**, see Orchis mascula, L.; Orchidæ.


A group of Convolvulaceæ now reduced to Ipomoea.

**Batatas edulis**, Chois., see Ipomoea Batatas, Lam. ; and

**B. paniculata**, Chois., see Ipomoea digitata, Linn.; Convolvulaceæ.


A genus of arborecent or scandent plants, belonging to the Leguminosæ, in the Sub-Order Casalpinææ, and comprising some 150 species, diffused throughout the tropics.

Unarmed plants with simple, usually deeply-cleft leaves, rarely entire or bijugate. Flowers showy, in copious simple or panicked often corymbose racemes. Calyx-tube with the disk produced to the top, sometimes long and cylindrical, sometimes short and tubular; limb entire and spathaceous or cleft into 2 or 3 teeth. Petals 5, sub-equal, usually with a distinct claw. Stamens 10 or reduced to 5 or 3; if fewer than 10, with sterile filaments absent or present; filaments free, filiform; anthers versatile, dehiscing longitudinally. Ovary stalked, many-ovuled; style long or short, stigma small or large and peltate, subterminal or oblique. Pod linear or rarely oblong, flat, continuous within, dehiscent or indehiscent. Seeds albuminous.

The generic name was given in honour of the botanists John and Caspar Bauhin, the brothers being commemorated by the two-lobed nature of the leaves.

**Bauhinia acuminata**, Linn.; Fl. Br. Ind., II., 276.

**Vern.**—Kúchchan, Beng.; Kachmor, kachmöli, Hind., Duk.; Kanchana, kánchana (variety), Tel.; Mahahlega byu, Bûrûm.

**Habitat.**—An erect shrub, with elegant white flowers, met with in the North-West Provinces, Bengal, Burma, South India, and Ceylon.

**Botanic Diagnosis.**—Flowers in close axillary racemes, petals as long as the calyx-limb, which is cleft into 5 subulate teeth at the tip, pod with a rib on each side of the upper structure.

This species, and also B. tomentosa, belongs to the section Pauletia. Erect shrubs or small trees, with large showy flowers and conuate leaflets. Stamens 10, all fertile. Calyx with a very short tube and spathaceous limb. Pod narrow, dehiscent.

**Oil.**— Mentioned as an oil-yielding plant in Spons' Encyclopædia.


**THE SNAKE CLIMBER.**

**Vern.**—Nag-pât, Sylhet; Nâtrûli, Nepal; Suhatângrugrih, L.

B. 297
Habitat.—A climber of North and East Bengal, Sikkim, Chittagong, Martaban, Burma, and South India. It also occurs on the Western Peninsula and is distributed to the Malay.

Botanic Diagnosis.—Fertile stamens 3. Calyx-tube scarcely asy. Flowers minute, in copiously-panicled racemes. A climbing shrub with copious circuminate tendrils, having the stem bent upon itself in a remarkable manner alternately concave.

Properties and Uses—
Fibre.—Its bark is used in rope-making.
Structure of the Wood.—Soft and porous. The stems are bent generally in alternate folds and with a straight thick margin.
Domestic Uses.—"The most regularly serpentine pieces of the stems and large branches are carried about by our numerous mendicants to keep off serpents." (Roxb., Fl. Ind., Ed., C.B.C., 347.)


Syn.—B. scandens, Roxb., Fl. Ind., Ed. C.B.C., 246; Wight, Ic., t. 84, non Linn.

Vern.—Gunda-gulla, Beng.

Habitat.—An extensive climber, found in the forests of Sylhet and Assam.

Botanic Diagnosis.—A cirrhose plant. Leaves 9-nerved, pubescent thin grey; pedicels moderately long; calyx-tube turbinate, very oblique; sepals deltoid; petals much exerted.

This belongs to the section Plantera or erect or scandent species with usually 3 or sometimes 4-5 stamens. Calyx-tube mostly produced; limb usually 5-cleft, sometimes spathaceous. The following species belong amongst others to this section: B. ornata, Kurz.; B. purpurea, Linn.; B. retusa, Ham.; B. Vahl., W. & A.; and B. variegata, Linn.

Properties and Uses—
Fibre.—The bark yields a strong fibre. "The line made from the fibre sent by Major Jenkins sustained, for forty-five minutes, 160 lbs., having stretched six inches only in three feet, and therefore is about the same strength with our best sium hemp. But, whether from the mode of preparation or the nature of the material, it is so harsh and stubborn, and the fibres stick so close together, that the heckles tear it to pieces and injure its strength." (Royle's Fibrous Plants of India, p. 307.)

At the Panjab Exhibition "there was a sample from the foot of the Kangra Hills, where it is described as used to make ropes for bedding, and the bark, which burns or smoulders slowly, is used for a slow-match." (Boden Powell, Panjab Products, I, 510.)

B. malabarica, Roxb.; Fl. Br. Ind., II., 277; Brandis, 159.

Vern.—Amli, amliya, Hind.; Karmai, Beng.; Gourubati, Urit.; Lab.; Kol.; Amli taki, Nepal; Kattu, Ass.; Cheppura, basuvana pala. Kan.; Korala, Mar.; Kundapula, dhondel, kanpati, Gond; Ambola, choupa, Kurku; Palla dandur, pali shinta, pulhara, Tel.; Choja, Kan.; Apia, Berar; Bangygan, butchkin, Burma. (Amli is also the Hind. and Duk. name for Tamarindus indica.)

Habitat.—A moderate-sized, bushy, deciduous tree, met with in the Sub-Himalayan tract (Kumaon, 1,000 feet in altitude, and ascending to 4,000 feet in Behar) from the Ganges to Assam, in Bengal, Burma, and South India.

Botanic Diagnosis.—Leaves 7-19-nerved, slightly cordate, deeply bifid; flowers in short, mostly simple corymbs; bracts minute, lower pedicels 14-2 times the calyx; calyx-limb 5-cleft, style produced.

B. 304
This, as also *B. racemosa*, belongs to the section *Pilostigma*. Erect shrubs or climbers with small flowers and connate leaflets. Fertile stamens 10, calyx with a short tube and spathaceous or 5-cleft limb. Pod narrow, indeliscent.

**Properties and Uses—**

**Food.**—The leaves are very acid, but are eaten by people in Burma, *Brandis.*

"The young shoots which appear just before the rains are used as a vegetable in the Konkan; when cooked they are slightly bitter but very palatable." *(Dymock).*

§ "Koralu, MAR.—The tender leaves are eaten as a vegetable. They are not believed to be acid in the tender state. The name Amlí is in Bombay applied to *Tamarindus indica* and not to *Bauhinia malabarica.*" *(Assistant Surgeon Sabhádrí Amjú Dóvát, Bombay.)*

**Structure of the Wood.**—Light-reddish brown, with irregular masses of black or purplish wood near the centre; moderately hard. Numerous narrow, wavy, white, concentric bands of softer tissue, alternate with bands of harder and red-coloured wood of equal width, in which the numerous fine, uniform, and equi-distant medullary rays are distinctly visible. Weight about 48 lbs. per cubic foot.

It is rarely used.

**auhinia ornata, Kura; Fl. Br. Ind., II., 281.**

**Vern.**—Myaukhelega, Burm.

**Habitat.**—Pegu.

**Botanic Diagnosis.**—An elegant species, clothed with deciduous, bright, ferruginous, silky pubescence. Leaves 9-11-nerved, pedicels long; flowers small; calyx-tube short, turbinate; sepals 5, rather exceeding the tube; petals slightly exserted.

**auhinia purpurea, Linn.; Fl. Br. Ind., II., 284; Brandis, For. Fl., 160.**

**Vern.**—Koīral, kośir, karalli, gray, Pr.; Kaliār, kālīr, kāndān, khārīwāl, kuillar, koīlā, sāna, Hīnd.; Khwārālo, Nepal; Kachik, Lechā; Devā kumkhan, rakta kumkhan, kośir, Beng.; Burjū, Kol.; Kānān, Lawārdugā; Sīkārā, Sāntāl; Kāndrōm, Mal. (S. F.); Kòdāwārī, Gōnd; Koliār, Kūrku; Rakta chandān, aīnāti, ragīk kānkhan, devā kumkhan, MAR.; Pēnāyā āre, mandareh, TAM.; Kānkhan, pedē-āre, bīdāinta-chètè; Tel.; Sārēl, swālī, kaṅkhiwālā, Kan.; Kūnkhan, Sans.: Mountā kānī, mahākālaṇī, Burm.

**Habitat.**—A moderate-sized, deciduous tree of the Sub-Himalayan tract, from the Indus eastward, Central and South India, and Burma.

**Botanic Diagnosis.**—Leaves 9-11-nerved, pubescent grey, pedicels short; sepals not fully distinct, exceeding the turbinate tube; petals oblanceolate, glabrous, exserted.

**Properties and Uses—**

**Gum.**—Yields a gum called *Sem-ki-gond*.

**Dye.**—The bark is used for dyeing and tanning.

**Fibre.**—A fibre may be prepared from the bark.

**Medicine.**—The bark of this plant is astringent, the root carminative, and the flowers laxative.

§ "A decoction of the astringent bark is recommended as a useful wash in ulcers." *(Civil Medical Officer U. C. Dut, Serampore.*) "Bark acts as an astringent in diarrhoea, the flowers are laxative, the roots tonic." *(Surgeon W. Barren, Bhuj, Cutch.)*

**Food.**—Dr. Stewart says that the flowers are used as a pot-herb in curries, and that they are also made into pickles; the leaves are given to cattle as fodder.

B. 316
**BAUHINIA racemosa.**

**Structure of the Wood.**—Pinkish white, turning dark brown on exposure, moderately hard. Weight 40 to 50 lbs. per cubic foot. Used for agricultural implements and in construction.

**Bauhinia racemosa, Lam.; Fl. Br. Ind., II., 276; Gamble, M. Timb., 139.**

**Syn.**—B. parviflora, Vahl.; Roxb., Fl. Ind., II, 323.

**Vern.**—Kachhāl, gurālī, thaur, abta, makhāna, masula, dhārāra, maril, gōla, HInd.; Barwaj, barwaja, Beng.; Kaimu, Kol.; Gatura, Dehra; Katmāli, Kharwar and Lohardugga; Berij, Santal; āmri, Mal. (S. P.); Ambāket, Uriyā; Khot, Makhāna, Oudh; Mahān, Barī; Nālī, Dharūra, C. P.; Koāndra, iass, Pā.; Bhānde, dhūndera, astra, bāno, Gond; Hāhīna, Ajmer; Amba bāno, Bhi.; Bāoss, Kuru.; Arem-kātāl, Duk.; Aṭi (?), arī, erfa, aro, man; Tam.; Arai, āre, aḍalī, Tel.; Apto, āpato, kawāla, sevāra, Mal.; Gōla; Thāna; Asindro, asindri, aṣotri, Panch Mahāls; Aṣūru, Kā; Swetavakhan, Sans.; Hpalan, palan, Burm.

**Habitat.**—A small, crooked, deciduous tree, with in the Sub-Himalayan tract from the Ravi eastwards, ascending to 5,000 feet; in Oudh, Bengal, Burmah, and Central and South India. Distributed to China, the Malay isles, and Timor.

**Botanic Diagnosis.**—Leaves small, deeply cleft, 7-9-nerved; flowers in lax, simple racemes; calyx-limb entire, stigma sessile.

**Properties and Uses.**

**Gum.**—It yields a gum of which little is at present known.

**Fibre.**—A strong fibre is made from the inner bark; used for cordage, but is not durable in water. It yields a good bast.

Specimens were shown at the late Calcutta International Exhibition from various parts of India, notably from Salem District, Madras. May this not be the undetermined bast fibre described by Royale under the name of Astra pātu, sent from Birbhum to the Exhibition of 1851?

§ "Used here for making country ropes; leaves used for making cigarettes." (Surgeon-Major W. Dymock, Bombay.)

**Medicine.**—The gum of this plant is used medicinally in South India.

(T. L. Stewart.)

§ "A decoction of the leaves is used to relieve headache in malarious fevers." (Surgeon-Major W. Dymock, Bombay.)

**Food.**—The seeds are eaten by the people in some parts of the country. In parts of Northern India the leaves are eaten by buffaloes.

§ "The leaves are pickled by the Burmese." (J. C. Harding, Eng., Rangoon.)

**Structure of the Wood.**—Light brown, hard, with irregularly-shaped masses of darker-coloured and harder wood near the centre. Weight 40 to 56 lbs. per cubic foot. "The wood is strong and close-grained."

(Bomb. Gaz., XVII., 63.)

Good, but not used, owing to the plant never growing big enough.

It is sometimes burned as firewood.

**Domestic uses.**—The leaves are made into cigarette covers in the Panch Mahāls, Gujarāt. These are in Thāna called bidīs. In Thāna along the right to pluck the leaves, used as bidīs fetches an annual rent of Rs.1,500. The leaves of Diospyros melanoxylon are also used for the same purpose. The trade in bidīs in Khāndesh is small. Match-lockmen make their matches of the bark of this tree; it burns long and slowly, without the help of saltpetre or any other combustible. To prepare the bark it is boiled, dried, and beaten.

(Roxb., Fl. Ind., Ed. C.B.C., p. 245)

"A sacred plant of the Hindūs; worshipped on the Dasera festival." (Bomb. Gaz., X., 401.)

**B. 329**

**Syn.**—B. emarginata, Wall.; *Phanera retusa*, Benth.

**Ver.**—Kuril, Ph.; Kanilla, kanilla, kwaryal, gwaryal, kanla, semla, Hind.; Luba, Kol.; Tuar, Orango; Kalman, Khwaraz, Thaur, Gond; Kaimu, Lohardugga; Tevar, Palamu; Nipa, Tel.

**Habitat.**—A moderate-sized, deciduous tree of the North-West Himalaya, from the Beas eastward, ascending to 4,500 feet; Simla, Garhwal, Kumaon, and Central India.

**Botanic Diagnosis.**—Leaves rigidly coriaceous, rather broader than long, 9-10 inches long, 9-nerved, glabrous beneath, usually deeply cordate; calyx-tube turbinate, very short.

**Properties and Uses**—

**Gum.**—It yields a clear gum called *Semla gond*, almost exactly resembling gum arabic. It is eaten by the poorer classes, and is used to waterproof terraced roofs. Roxburgh says: "From wounds made in the bark a brownish mild gum is protruded." It is used as a medicine either alone or in combination with other medicines. The annual export from Dehra Dún is about 2,500 maunds.

§ "a used as an external application to sores. It is considered as an emenagogue and diuretic by some native practitioners." (Surgeon G. J. Emerson, Calcutta.)

**Medicine.**—Reddish white, with irregularly-shaped darker masses near the centre, hard. Weight 58 lbs. per cubic foot.

**Not used.**

B. scandens, *Roxb.*, syn. for *B. macrostachya*, Wall.


**Ver.**—Achnadr, Hind.; Asundro, Guj.; Chámul, Konkan; Pívaláán, chen, aptyá, Mar.; Káncíni, Tam.; Tel.; Usamadunga, Madras; Maha-loow-bou, Birm.; Kaha-pektang, Singh. The vernacular names kacnu, kacña, and kóncan or kóncini are applied to more than one species (Bauhinia). (Mooreen Sheriff.)

**Habitat.**—North-West Provinces and throughout India to Ceylon and Penang. Distributed to China and tropical Africa.

**Botanic Diagnosis.**—An erect shrub with downy branches. Flowers usually in axillary pairs, petals much longer than the entire calyx-limb, pod stalked, not fiddyed, near the upper suture.

**Properties and Uses**—

**Fibre.**—From barks a fibre is prepared.

**Oil.**—Balfour simply mentions this plant among his oils, without describing it.

**Medicine.**—As a medicine, the plant is antisyphilitic, antinephritic, and useful in liver complaints. Ainslie says that the dried buds and young flowers are prescribed in dysenteric affections. According to Rheede the decoction of the root-bark is useful in inflammation of the liver. (Dymock, *Mat. Med.*, 1. Ind. 224.)

§ "Applied locally: aphthas. The fruit is diuretic; an infusion of the bark is used as an antiseptic gargle. The seeds made into a paste with vinegar are said the efficacious as a local application to wounds inflicted by poisonous animals." (Surgeon G. A. Emerson, Calcutta.)

"Hakeems administer this dried leaves and young flowers in dysenteric affections. A decoction of the bark of the root is used in cases of liver, also as a vermifuge." (Surgeon H. W. Hill, Mánbhám.)

**Structure of the Wood**—Tough, close-grained, with a black heartwood; when full-grown it is very soft.

**Timber.**

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B. 341


 Vern.—Malghéu, maijan, malé, maurain, jallou or jallar, Hind.; Chehar, Beng.; Séhar, mahulan, male, C. P.; Borla, NEPAL; Sungé ré, LEPECHA; Yem, SANTAL; Lama, rong, KOL.; Shík, UTT.; Maulan, KHRWAR; Taar, Pr.; Chamboli, DUK.; Chambéru, chamíli, chão, MAR.; Paur, bela, GOND.; Adda, Tel.

Habitat.—This is one of the most extensive, as it is the most abundant and most useful, of Indian climbing Bauhinias. It is found all along the lower Himalaya (ascending in Kumaon and on Paresnath in Behr to 2,500 feet) from the Chenab eastward, North and Central India, and Tenasserim.

Botanic Diagnosis.—Tendrils strong, woody; pubescence dense grey or ferruginous; leaf-lobes obtuse, pedicels long; calyx-tube cylindrical; petals much exerted, densely pilose.

Properties and Uses—

Gum.—Yields a copious gum which seems to be of little use.

Fibre.—The uses of this climber are, perhaps, more numerous than those of any other forest plant; the strong cordage prepared from its bark is an important article with the hill tribes. Specimens of this fibre were exhibited at the London Exhibition of 1851 under the name of Patna or mussul. A large collection of strong red ropes made from it were also displayed at the late Calcutta International Exhibition. In the Kew Report for 1879 it is stated that a sample of this fibre was submitted by Sir J. D. Hooker to Mr. Routledge of the Ford Paper Works, Sunderland, who reports as follows: "Excellent strong fibre; hemp character and tough. Green yield 60 per cent., bleached 54.7 per cent. Capt. Hud- dleston in his Report on Hemp in Garwhal, 1850, gives the following facts: "The 'mello' is a large creeper, forty or fifty yarsm length, and of considerable thickness, from the bark of which a very strong rope is made. The natives chiefly use it for tying up their cattle, and sewing their straw mats with the fresh bark; it also makes cattal matches for guns, and muzzles for oxen and calves." It is "cut generally in July and August, though it may be cut all seasons, and the outer bark being stripped off is thrown away, the inner coating being used for ropes, as wanted, by being previously soaked in water and twisted when wet. A large creeper will produce a mound of fibre, called 'seloo.' The bark before being used is boiled and beaten with mallets, which renders it soft and pliable for being made into ropes and string (charpoys). Though this fibre makes very strong ropes, it is not over-duckable, and rots if kept constantly in water; it will last about 18 months, it requires occasional soaking, and I am informed that when coated with tar it does not last much longer. The fibre is not collected for sale, it only for the natives' own use as they may require it; but any quantity, I imagine, might be obtained, and at cheap rates."

Royle, in his Himalaya Botany and also his Flora of India, gives an account of this fibre, quoting the above extract. No additional information has since appeared, and the fibre is still unknown to the European industries.

Medicine.—The seeds are said to possess aphrodisiac properties. The leaves are regarded as astringent and mucilaginous remedies.

Food.—The seeds are eaten raw; when ro, they taste like cashew-nuts. (Roxb., Fl. Ind., Ed. C.B.C., p. 346.) They are also eaten fried. The young pods are cooked and eaten by the hill tribes. "The seeds taken from the huge pods of B. racemosa are eaten in the hills, but..."
Bauhinia.

look like pieces of thick undressed leather, about a foot long and one or two broad; they are placed over the ashes of a fire till rosted and split open; the flat soft seeds are taken out and eaten; the savour is pleasant, but the seed is not wholesome."

(Baden Powell's "Db Products, Vol. I., p. 265.)

Structure of the Wood.—Porous, in broad, irregularly-broken conic layers, alternating with red, juicy, bark-like tissue; the pith is heart-shaped. The foliage is very dense and the stems do great damage to the trees they climb over; it is very prevalent in all forests, and in provinces being systematically exterminated.

Domestic Uses.—In the "Kew Report for 1881," it is stated that the leaves of this plant and those of Cochlospermum Gossypium are those in the construction of the crude leaf-bellows in Sikkim. They are together and used as plates, cups, rough table-cloths, umbrellas, and mats and caps. The leaves, which are heart-shaped, and above in breadth and the same in length, are sewed together with twigs into baskets for holding tea, turmeric, and ginger, and are brought to Sreennugur for sale, being used by the poor instead of dishes to eat off; the "bunneahs" wrap up their goods with them. A load of the leaves is about 2 annas." (Capt. Haldenstow's Report on Hemp in Ceylon, 1840.) In Chutia Nagpur the Santals cut off the dry loops of tendrils which have failed to catch any object, and make with these rings worn as a charm against dropsy. (Rev. A. Campbell.)

Bauhinia variegata, Linn.; Fl. Br. Ind., II, 284.

Syn.—Kachnar, kolar, curul, padriam, bhosawal, guri, guli, baril, karner, kondan, khwaradi, hinh.; Rakta kanchan, Beng.; Kurnang, Mechu; Singya, Kol.; Kundal, Bhumi; Tingya, Santal; Tali, Nepal; Ri, Lech; Kachner, C. P.; Kanchan, raghukan, Mar.; Kanchan, Konkan; Kovilcar, Bomb.; Segapu-muthari, Tam.; Kungchamideos, Kan.; Borara, Uriva; Buaychung, Buichin, Bum.

Habitat.—A moderate-sized, deciduous tree, found in the Sub-Himalayas from the Indus eastward, and throughout the forests of India and Burma. Common everywhere, ascending to 4,000 feet in altitude, and in the lower hills of India, but largely cultivated as an ornamental throughout the plains. Often completely covered with large purple white flowers which appear in the beginning of the hot season.

Medicinal Uses.—Leaves 9-11-nerved, pubescent grey, pedicels; calyx-limb entire, spathaceous, equaling the cylindrical tube; petals ob-ovate, clawed, much exerted.

Properties and Uses.—This tree, like most other members of the genus, yields the gum known as Sem or Semia gond. It is a brown-coloured gum. Sem-Kini, in fact, a sort of generic name for the gum obtained from the seeds of Bauhinia. It swells in water like cherry-tree gum, a very small portion only being soluble.

The bark is used in dyeing and tanning. (Bomb. Gas., XV., I., 64.)

"The bark is used by dyers in Madras." (Deputy Surgeon-General Bé, C.I.E., Madras.)

The seeds are said to yield an oil.

Medicine.—The root in decoction is given in dyspepsia and flatulency; the flowers with sugar as a gentle laxative; and the bark, flowers, and trituration in rice-water, as a cataplasm to promote suppuration.

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Timber.

350

Domestic.

Leaf-bellows.

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Plates.

352

Caps.

353

Umbrellas.

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Rain-hats.

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Gum.

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Dye & Tann.

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Oil.

359

Medicinal.

Flowers.

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Roots.

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Catalasm.

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BEADS.

<table>
<thead>
<tr>
<th>Natural Objects used as</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bark. 363.</td>
</tr>
<tr>
<td>Fruits. 364.</td>
</tr>
<tr>
<td>Seeds. 365.</td>
</tr>
<tr>
<td>Buds. 366.</td>
</tr>
<tr>
<td>TIMBER. 367.</td>
</tr>
</tbody>
</table>

| SACRED. 368. |

| BDELLIUM. |

Bdellium, a myrrh-like resin, of which there are three kinds:

1st.—Indian, the produce of Balsamodendron Mukul, Hook., met with in Sind, Rajputana, Khandesh, Berar, Beluchistan, and Arabia. This substance is also obtained from B. Roxburghii, and, in Beluchistan, from B. pubescens. Mukul or Gugul (Indian Bdellium) from Coromandel is the produce of Boswellia glabra, and that from the Western Himalaya is the produce of Boswellia serrata.

2nd.—African Bdellium. This is now believed to be the produce of Hemiprichia erythrea, Ehrenb. (a synonym for Balsamodendron Kataf, Kauth.). This substance to a certain extent resembles Myrrh, but is of a darker colour. It is twice the price of the Indian Bdellium. Both this and the preceding are given to buffaloes to increase their milk.

3rd.—The Opaque Bdellium. This is the produce of Balsamodendron Playfairii, Hook., which see.

BEADS.

Beads.—Articles of personal ornament (and chiefly natural objects used for this purpose) may be enumerated under the above heading. They are Beads, Rosaries, Garlands, Necklaces, Earrings, &c., and may be classed as:

1st. Those which belong to the Mineral Kingdom, such as glass and stone beads used by the mass of the people (i.e., not including those which would be pronounced as jewels), alabaster, metal ornaments, &c.

2nd. Animal Kingdom.—Coral, pearls of the cheaper kind, ivory, shells, fish and other bones, feathers, skins, &c.

3rd. Vegetable Kingdom.—Flowers, fruits, seeds, specially-prepared pieces of wood or other natural botanical structures.

A complete list of the objects used for the above purposes would be highly interesting and instructive. But such a list may be viewed as having an ethnological rather than an economic interest, and would, therefore, be somewhat out of place in the present publication. The subject is, however, replete with interest, and as a considerable trade is done in certain articles which must be enumerated here, it has been thought desirable to give the leading facts which can be collected together in a limited space. It is hoped that at least one object may be served by the publication of even an incomplete list of this nature,—namely, the creation of an
interest in a subject which the advances of civilization are certain to obscure more and more every day. The first attempts made by savage races at clothing and adornment were most probably decoration by means of natural objects. A careful study of the shells, bones, seeds, fruits, and flowers, used for this purpose by aboriginal tribes at the present day, would throw a flood of light upon many obscure anthropological subjects destined to be obliterated with the advances of foreign trade in glass beads and cheap European ornaments.

I.—BEADS AND OTHER ORNAMENTS WHICH BELONG TO THE MINERAL KINGDOM.

GLASS BEADS AND FALSE PEARLS.

An enquiry was instituted into this subject on the suggestion of the Government of India in the Department of Revenue and Agriculture. Mr. W. J. Wilson published a report in February 1883 of considerable interest. He divided glass beads into two primary sections: (a) those imported into India and China, and (b) those manufactured in India. Of the former he established seven sections.

(a) Foreign Beads.

1st. Pound Beads.—These are made chiefly in Venice. The glass is drawn into tubes, cut into small pieces, and by means of sand the edges are rounded off and polished. There are said to be 20 standard sizes of pound beads, of all colours. Black is the favourite colour, but in Rajputana light blue is in great demand. Red, blue, amber, pink, and white are also used: the smaller sizes are in the greatest demand.

They are used for a variety of purposes. The larger ones are made into necklaces, wristlets, and rosaries, while the smaller are employed in the decoration of shoes, hookah stems, toys, lac-bangles, carpets, &c.

2nd. Seed Beads.—These are smaller than the preceding.

3rd. Broken Beads.—These are like pound beads, only longer and the ends not rounded off.

4th. Pigeon-egg Beads.—These are about one inch in length and five eighths of an inch in diameter. They are chiefly used to decorate horses and cattle.

5th. Cut-glass Beads.—These are met with chiefly in Central India and Sind.

6th. Spotted Beads.—Are in demand in the Central Provinces.

7th. Round Beads.—Are not much used.

The following are the imports of beads for the past five years, and also an analysis of those for the year 1883-84, showing the countries from which the imports are obtained and the provinces to which imported:

Imports of Beads (Glass) and False Pearls.

<table>
<thead>
<tr>
<th>YEARS</th>
<th>Quantity in Cwt.</th>
<th>Value in Rupees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1879-80</td>
<td>13,751</td>
<td>8,791,995</td>
</tr>
<tr>
<td>1880-81</td>
<td>15,453</td>
<td>11,658,960</td>
</tr>
<tr>
<td>1881-82</td>
<td>16,724</td>
<td>11,34,148</td>
</tr>
<tr>
<td>1882-83</td>
<td>19,897</td>
<td>12,79,803</td>
</tr>
<tr>
<td>1883-84</td>
<td>23,243</td>
<td>16,18,728</td>
</tr>
</tbody>
</table>

B. 374
### Analysis of the Imports for 1883-84.

<table>
<thead>
<tr>
<th>Presidency or Province into which imported</th>
<th>Quantity in Cwt.</th>
<th>Value in Rupees.</th>
<th>Countries whence imported</th>
<th>Quantity in Cwt.</th>
<th>Value in Rupees.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bengal</td>
<td>19,029</td>
<td>5,05,368</td>
<td>United Kingdom</td>
<td>637</td>
<td>4,72,007</td>
</tr>
<tr>
<td>Bombay</td>
<td>12,572</td>
<td>10,68,231</td>
<td>Austria</td>
<td>1,757</td>
<td>2,61,600</td>
</tr>
<tr>
<td>Sind</td>
<td>19</td>
<td>2,200</td>
<td>Belgium</td>
<td>169</td>
<td>1,371</td>
</tr>
<tr>
<td>Madras</td>
<td>87</td>
<td>15,562</td>
<td>France</td>
<td>339</td>
<td>75,010</td>
</tr>
<tr>
<td>British Burma</td>
<td>236</td>
<td>87,167</td>
<td>Italy</td>
<td>17,059</td>
<td>7,30,318</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Egypt</td>
<td>18</td>
<td>43,638</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ceylon</td>
<td>306</td>
<td>23,777</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>China—Hongkong</td>
<td>1,792</td>
<td>6,498</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Straits Settlements</td>
<td>40</td>
<td>5,100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Other countries</td>
<td>20</td>
<td>3,100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>23,243</strong></td>
<td><strong>16,18,728</strong></td>
<td></td>
<td><strong>23,243</strong></td>
<td><strong>16,18,728</strong></td>
</tr>
</tbody>
</table>

The above analysis of the imports shows that Italy is the country which meets the major portion of the Indian demand for glass beads. The imports for the past five years indicate a steady increase, those for 1883-84 being very nearly twice as much as for 1879-80.

The beads which come from China to India are chiefly round, and vary from a quarter to half an inch in diameter. They are ruby or green coloured, and are commonly met with in the Central Provinces and in Rajputana.

(8) Manufactured in India.

Indian glass beads are said to be manufactured in Kaira and Surat in Bombay, Jaipur and Bundi in Rajputana, Saugor in the Central Provinces, Jaunpur in the North-West Provinces, and Delhi and Multan in the Punjab. They are described as of seven kinds:

1. Imitations of imported beads.
2. The Saugor beads—round, flat, about a quarter inch in diameter and one eighth to three sixteenths of an inch in length.
3. Pigeon-egg beads made in Kaira.
4. Large flat beads made in Kaira.
5. Spherical beads made in Surat.
6. Small ring beads made at Delhi and Multan.
7. Flat beads made at Lucknow.

No information can be given as to the extent of this Indian industry, but it seems probable that old glass is largely used in the manufacture of beads. When made from indigenous materials the beads are always very coarse and badly coloured. The Kutch or country glass made from red soil is either green or black. Dr. Owen, in his Catalogue of the Jeypore articles shown at the Calcutta International Exhibition, says: “Glass beads, as imitations of emeralds, rubies, sapphires, and tourquoises, are very well made, which are then cut in facets by lapidaries. These latter were once largely exported from Jeypore and engaged several families, but have fallen into the background for some years, as the competition with European-made beads was found too strong.”

A certain amount of lac beads are regularly made, and in lower Bengal a very large trade exists in glass and lac bangles (see Glass); the former are generally green or black, and the latter are often ornamented by European beads, attached while the lac is still soft.
Personal Ornaments.

(c) Stones, Alabaster, &c.

A very large trade is done in the cheaper kind of stones. These are collected on the mountains of India and Burma, and are also brought across the frontier from the northern Himalaya. A considerable trade is done at Simal in beads, necklaces, &c. The principal stones are turquoise, rubies, onyxes, cornelians, emeralds, jade stone (false), serpentine, agates, jaspers, marbles, &c., &c.

(d) Metal Beads.

Small beads made of various metals are commonly met with, the more elegant being gold beads used along with precious stones or coral.

II.—OBJECTS OF ORNAMENT BELONGING TO THE ANIMAL KINGDOM.

The most important objects belonging to this section are of course pearls and coral. As these will be found discussed in their alphabetical positions, it is not necessary to do more than mention them by name in this place. Shells are largely used for this purpose, none perhaps more extensively than the common Cowrie.

These are imported into Bombay chiefly from the Laccadive and Maldives Islands, and from Zanzibar. From time immemorial they have been used as coins by the Hindus; the currency being—

4 Cowries = 1 Ganda.
20 Gundas = 1 Pan.
16 Pans = 1 Kahan.

The present rate is 24 gandas or 96 cowries to a pice and 4 pice to an anna and 16 annas to the rupee; hence 96 × 64 = 6,144 cowries to the rupee.

They are extensively used as articles of adornment for cattle and horses, and amongst the hill tribes are also used for personal ornament. In the Nagá Hills they are cut lengthwise, the back being removed and rejected. Cut in this way they are sewn over garments, chiefly in rows, upon a piece of black cloth worn by the men, and forming a sort of kilt. Formerly the number of rows of white cowries denoted the deeds of daring committed by the wearer. He was permitted to wear one row for his first murder, another for the second, and another for the third. After that he might wear as many rows as he chose, but most preferred the triple line. By modern usage, however, all full-grown males wear a black kilt with three rows of cowries. (For further information see Cowrie.)

The Conch or Chank-sheils.

These are fished up from deep water by divers in the Gulf of Manaar, on the coast opposite Jaffnapatam in Ceylon, and also from Travancore, Tuticorin, &c., &c.

A curious trade exists in Dacca in cutting these into rings, armlets, &c. In the Nagá Hills they are cut up into beads. One half the shells are suspended from the back of the neck, the point being directed downwards, and the remainder are cut up into long pieces or beads forming the front part of the chain. The conch is of course extensively used for the horns blown at temples. (For further information see Conch.)

A number of small bivalve shells are used as ornaments by the Andaman Islanders, as also bones of various animals, including human bones. The reader is referred to an interesting paper regarding these by Professor Allen Thomson, F.R.S., in the Journ. Anthrop. Inst., XI., 295.
FEATHERS, SKINS, &c.

Feathers of various birds are used as personal ornaments, and also pieces of skins, furs, &c. The available information is, however, too imperfect to admit of these being gone into in detail. The large black and white feathers of the horn-bill are much prized by the Angâmí Nagás, and the tail feathers of the wild cock by the Gáros. The blue and green feathers of a woodpecker are used as ear ornaments by the Angâmís. The beak of the horn-bill is attached to the helmet of the Mishmi chief or head-man, and bands of bear's-skin are used in the construction of the heims worn by many of the Assam tribes. Goats' and human hair, black and dyed red by madder, are extensively used by Assam tribes for decorative purposes. The boar tusk, curving downwards and terminated above by a tuft of red hair, is the most fashionable earring amongst certain Nagás, just as a bunch of cotton-wool 2 or 3 inches in diameter inserted into a greatly dilated ear-perforation, is admired by others, especially the tribes in North Mánipur.

III.—BEADS AND OTHER ORNAMENTS WHICH BELONG TO THE VEGETABLE KINGDOM.

Certain parts of the following plants are used as beads, rosaries, garlands, &c. Fuller information will be found in their respective alphabetical positions in this work, but the abstract given below may be found useful to persons desirous of studying such objects collectively and from an ethnological point of view.

1. Abrus precatorius, The Crab's-eyes or rati seeds.—The fact of this red shining seed with its black eye-spot being used for rosaries, suggested the specific name precatorius. They are strung together along with wheat and black seeds in necklaces, and are also largely used in the decoration of boxes, baskets, &c.

2. Adenanthera pavonina, The Red-wood or rakha-banchna.—The brilliant scarlet seeds of this tree are larger than the preceding, flattened and devoid of the black eye spot, otherwise they are very much alike. They are strung and worn by the women in many parts of India.

3. Adhatoda Vasica, The Baxas of Bengal.—The wood of this plant is made into small beads resembling those made from Aëgle Marmelos, Cajams judicus, and Flacourtia Ramontchi.

4. Aegiceras majus.—The pretty white flowers of this shrub are made into garlands on the western coast.

5. Aëgle Marmelos, The Bel.—Beads are made from the rind as well as from the wood. Strung with the fibre of Agave americans, they are worn by the Sudras to denote that they are not Mohammedans.

6. Aeschynomone aspera, The Sola.—Prepared pieces of pith are sometimes worn by the aboriginal tribes as ear-ornaments. Garlands of beads of the pith or sola, coloured and tinselled, are used to decorate idols and worn by brides and bridegrooms.

7. Allium sativum, The Garlic.—A necklace of the cloves or young bulbs is worn by children as a charm against whooping-cough.

8. Aquilaria Agallocha, Eagle-wood.—Beads made of this odorous wood are occasionally seen.

9. Areca Catechu, Betel-nut palm.—Polished beads are made from the betel-nut: they are rarely worn entire, but are turned into fancy shapes.

10. Bamboo.—A ring of specially-prepared bamboo is placed in the ear-perforation by the Tankú Nagás of Mánipur.

11. Borassus flabelliformis.—The leaves are cut up into neat bracelets and worn by Santal girls.

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Personal Ornaments.

12. Bashinia Vahlili.—The dried tendrils are worn as finger-rings by the Santals, as a charm in droopy.

13. Butea frondosa, The Palak.—The beautiful bright orange flowers of this tree are sometimes, and were formerly extensively, worn in the ears by the Hindí women.

14. Cajanus indicus, The Urhar.—The wood is made into small beads (see Adhatoda Vasica).

15. Cesalpinia Bondacella.—“Necklaces of the seeds strung upon red silk are worn by pregnant women as a charm to prevent abortion.” (Dymock.)

16. Calotropis gigantea, The Akanda or Madar.—The purple-coloured corona of the flowers of this plant are, in Bengal, separated from the rest of the flower and strung into garlands. A garland of the flowers is also used in the worship of Máruti, the monkey-god.

17. Canna indica, The Indian Shot, or Kivóra, or Lál-narbonejóy.—The black seeds of this plant are sometimes strung as beads along with the red crab’s-eye seeds.

18. Carissa difusa.—Flowers strung into garlands and worn in the hair by women on the western coast.

19. Caryota urens.—The dark-coloured oval seeds of this palm are used as buttons, and by the Mohammedans are sometimes strung as beads.

20. Coix lachryma, Job’s-tears.—There are two principal forms of this grain, one almost round and either white or black. This form is sometimes, though less frequently, used for ornamental purposes than the next, but it constitutes an important article of food amongst the hill tribes on the eastern frontier of India. The second form is tubular, about $\frac{1}{4}$ an inch long. This is extensively used for decorative purposes, the dresses worn by the Karen women being often completely covered by pretty designs of this grain. It is also used by the Nagá and other Assam tribes in the construction of earrings and other simple and elegant articles of personal adornment.

21. Corypha umbraculifera, The Basarbatá-nuts imported into Bombay; also exported from N. Kanara by Arabs from the Persian Gulf who trade along the western coast. Price R20 to R25 a cándy of 616 lbs. These are worn as beads by the Hindú devotees.

22. Cotton-wood, in large bundles often 2-3 inches in diameter.—Cotton-wood is worn in ear-perforations by the northern Mánipur Nagás, and also certain classes of the Nagás proper. Similar tufts are also used in decorating the hair. As a modern degeneration it is by no means an unusual thing to find two or three empty cartridge cases placed in the ear instead of the cotton decorations—the brass ends being turned forward.

23. Dalbergia Sissoco.—The green seeds are worn by Santal girls as pendants from the ear.

24. Daphne papyracea.—Garlands of the flowers are used in religious ceremonies in the Pânjáb Himálaya, at Chumbá, &c.

25. Diospyros, sp.—Gamble says that the Burmese use the wood for earrings.

26. Eiomicarpus Ganitrus or Rudraksha.—The five-grooved and elegantly-tubercled nuts are worn as a necklace by the followers of Síva in order to obtain Śivalocaka (the heaven wherein the god Śíva resides), and in order to gain his graces. They are also supposed to preserve the health. Considerable importance is attached to the number of facets on the nuts. (Pb. Notes and Queries, March 1885, p. 65.) Imitations of these nuts are made in Eagle-wood.

27. Eiomicarpus lanccolatus, The Ustrasum Beads.—These are said to be imported from Java.

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### Natural Objects used as Personal Ornaments.

<table>
<thead>
<tr>
<th>BEADS.</th>
<th>28. Elaeocarpus tuberculatus.—As with the two preceding, the nuts of this tree are used as beads.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetable-</td>
<td>29. <em>Entada scandens.</em>—The large seeds of this climber are worn as charms and made into small ornaments, snuff-boxes, &amp;c. They are also largely used by Indian washermen to crimp linen, hence are often called the <em>Dhobi</em>’-nut.</td>
</tr>
<tr>
<td>beads.</td>
<td>30. Euonymus grandiflorus, The <em>Sivi</em> Nut.—These are strung as necklaces.</td>
</tr>
<tr>
<td></td>
<td>31. <em>Euonymus fimbriatus.</em>—The red seeds are strung into ornaments for the head.</td>
</tr>
<tr>
<td></td>
<td>32. <em>Ficocurta Ramontchi,</em> The <em>Bunj</em> or <em>boin</em>ch (see <em>Adhatoda Vasica</em>).</td>
</tr>
<tr>
<td></td>
<td>33. <em>Ficus giomerata.</em>—The fruits are strung and put round a pregnant woman’s neck on a particular day in the eighth month. <em>(Lisboa, Useful Plants, Bombay.)</em></td>
</tr>
<tr>
<td></td>
<td>34. <em>Gyrocarpus Jacquinii, Zaitun.</em>—The seeds are made into roaries and necklaces.</td>
</tr>
<tr>
<td></td>
<td>35. <em>Hibiscus rosa-sinensis,</em> The Shoe-flower.—The flowers are strung into garlands, and, combined with the yellow Indian Marigold (<em>genda</em>), we used in Bengal, being specially in demand as an offering to the goddess <em>Kali.</em></td>
</tr>
<tr>
<td></td>
<td>36. <em>Ipomoea bilobata,</em> The <em>Dopati-laté.</em>—In Bombay it is said garlands of this creeper are hung around the huts occupied by women on the sixth day after confinement to protect the new-born babe. <em>(Lisboa, Useful Plants, Bombay.)</em></td>
</tr>
<tr>
<td></td>
<td>37. <em>Jasminum grandiflorum,</em> The <em>Jati,</em> or Spanish Jasmine.—The flowers are generally used to make durbar and wedding garlands. <em>(Veget)</em></td>
</tr>
<tr>
<td></td>
<td>38. <em>Jasminum Sambac,</em> <em>chamba.</em>—The fragrant flowers much used as a hair ornament by women in the Bombay Presidency.</td>
</tr>
<tr>
<td></td>
<td>39. <em>Linum usitatissimum,</em> The common <em>Flax.</em>—Some necklaces said to be composed of sections of the stems of this plant were sent to me from Calcutta (Bazar) along with others which I sent to Kew. <em>(Mr. J. F. Duthie.)</em></td>
</tr>
<tr>
<td></td>
<td>40. <em>Mangifera indica,</em> The mango tree.—The leaves are strung into garlands which hang about Hindú temples. No marriage or burial ceremony of the Hindús in Western India is complete without these garlands.</td>
</tr>
<tr>
<td></td>
<td>41. <em>Melia Azedarach,</em> The <em>Nim</em> or <em>Bead Tree.</em>—The stone from this succulent fruit is used all over India as a bead. These beads are perforated and strung into necklaces and rosaries. During the prevalence of epidemics of small-pox, &amp;c., they are suspended as a charm over doors and verandahs to keep off infection.</td>
</tr>
<tr>
<td></td>
<td>42. <em>Mimusops Elengi,</em> The <em>Bakul.</em>—The flowers are strung into garlands. The tree is sacred to <em>Siva.</em></td>
</tr>
<tr>
<td></td>
<td>43. <em>Nerium odorum,</em> The Sweet-scented Oleander (<em>kanér, karabhi,</em> &amp;c.)—There are two varieties of this plant, one red and the other white flowered. The flowers are used in garlands.</td>
</tr>
<tr>
<td></td>
<td>44. <em>Nelumbo nucifera,</em> The Sacred Lotus or <em>Pudma.</em>—Designs of this flower are frequent in Hindú and Buddhistic sculptures, an inverted lotus forming the dome of all Buddhist and Jain temples. It is sacred to <em>Lakshmi.</em> The dry nuts are strung as beads and the flowers in garlands.</td>
</tr>
<tr>
<td></td>
<td>45. <em>Nyctanthes Arbor-tristis,</em> The <em>Singhar</em> or <em>harsinghar.</em>—The natives collect the flowers and string them as necklaces or wear them in the hair. <em>(Druvy.</em></td>
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<td>46. <em>Ocimum sanctum,</em> The <em>Tulsi</em> or Sacred Basil.—The root or woody stem is cut and made into beads worn by the Vaishna-vas, the rosary consisting of 108 beads. The plant is sacred to <em>Vishnu.</em></td>
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Products of India.

The Beaumontia.

BEAUMONTIA grandiflora.

1. Ocimum Basilicum, The Sweet-scented Basil.—The wood is used like preceding.
2. Oroxyllum indicum (Calosanthes indica). The Sena or ulla.—The flat-winged seeds of this plant are strung as ornaments to temples.
3. Pandanus odoratissimae.—The sweet-smelling spathes which enclose male flowers and also the male flowers of this tree are perhaps the finest hair ornament of the western coast Hindu women.
4. Putranjiva Roxburghii, The Joti.—The black nuts of this plant made into necklaces and rosaries and are worn by Brahmins and round the necks of children to ward off disease caused by evil spirits; the name putra-jivi = life of a child.
5. Reeds.—Pieces of reeds are worn in the ears by some of the Assam tribes.
6. Samadera indica.—The seeds are strung together and tied round men’s necks as a preventive to asthma and affections of the chest.
7. Symlocos spicata, The Bārī of Sylhet. —Roxburgh says the seeds of this plant are very hard, about the size of a pea, and resemble a minute nut; when perforated they are strung like beads and by the natives put round the necks of their children to prevent evil.
8. Tabernamontana coronaria, The Tagor of Bengal, or Chandra of the Assam tribes of India.—The flowers are strung as garlands, and they are also offered as offerings to the gods.
9. Tamarix articulata, The Fardz.—The wood is made into small ornaments.
10. Tagetes erecta, The Indian Yellow Marigold or Genda.—Garlands of the yellow flowers are largely given by the presiding Brahmins to worshippers, and are extensively used in the decoration of houses; also along with the red flowers of Euphorbia pulcherrima, this constitutes the Christmas decorations in Calcutta. The evergreens used on such occasions consist of Myristica longifolia, the deb às, also mango leaves, plantain stems, and other twigs.
11. Vanda Roxburghii.—The leaves are split and woven by Santal tribes as anklets; hence the Santal name dārī bankī. (Rev. A. Campbell.)
12. Vateria indica, The Indian Copal Tree.—The resin is made into gourds, which very much resemble the true amber. (Roxb.)

BEAUMONTIA. Used medicinally as an emollient in rheumatism.


A genus of evergreen climbing trees or shrubs belonging to the Natural Order Apocynaceae, and containing only 4 species, inhabitants of India and Malaya.

Leaves opposite, nerves distant, arching. Flowers very large, white in terminal cymes; bracts leafy. Calyx 5-partite, glandular or not within. Corolla very short, throat large, bell- or funnel-shaped, naked; lobes broad, overhanging to right. Stamens at the top of the tube, included in the throat; filaments thickened at the top; anthers horny, sagittate, conning over and adnate to the stigma; cells spurred at the base. Disc deeply 5-lobed. Ovary 3-celled, cells many-ovuled; style filiform, top clavate, stigma fusiiform. Fruit thick, woody, at length dividing into 3 horizontally spreading follicles. Seeds compressed, oval or oblong, top contracted, crowned with a pencil of 3 cotyledons thick or thin, radicle short, superior.

Beaumontia grandiflora, Wall.; Fl. Br. Ind., III., 660; Apocynaceae.

Syn.—Echites grandiflora, Roxb., Fl. Ind., Ed. C.B.C., 261.

Vern.—Barbati, Nepal.
Habitat.—An extensive climber of East and North Bengal, with large showy lemon-white flowers. It is found from Nepal eastward to Sikkim, Sylhet, and Chittagong; ascending to 4,000 feet.

Fibre.—A fibre is prepared from the young twigs.

BEES.

Bees of India.—"Bees of the genus Apis (the hive or honey bee) abound all over India, Burma, and Ceylon, and they are found on the higher regions along the northern boundary of Bhutan and the frontier of Thibet. They are but imperfectly known to European entomologists. A few important varieties have been discovered by the writer, while others only the worker is known. The habits of the known kinds have not been systematically studied under cultivation. There is also much confusion in the nomenclature, but the enquiries of Dr. A. Gerstacker have done much to clear this up. Gerstacker considers the thirteen species described by Fabricius, Latreille, Klug, Guerin, and Smith, mostly mere colour varieties, comprising only three species which form two distinct groups—the type of one group being A. dorsata, and of the other A. mellifica. The larger Indian varieties of the second group, which the writer is presently examining, were unknown to Gerstacker.

"Group 1. Apis dorsata.—The insects of this group are A. dorsata, Fab., (A. nigripennis, Lat.) A. zonata, Guér. (A. zonata, Smith), and A. bicolor, Klug.

"Description.—The bees of this group differ from A. mellifica in being larger, in building 3/4 cells to the inch, in the shape of the abdomen, in having 15 rows of bristles forming the pollen basket, in the relative positions of the eyes and ocelli, and in a very slightly different arrangement of nerves of the anterior wings. It would seem that this bee does not build larger cells for drones than for workers, and that the drone is similar in shape and size to the worker, differing principally in the head, which resembles the head of the drone of A. mellifica. It builds one large comb 3 to 5 feet long, 2 feet or more deep; the brood comb is 14 inch thick, and the store comb much thicker. Although both A. dorsata and A. florea are normally single-comb bees; under exceptionally favourable circumstances they build a second comb and their single combs are built much larger than otherwise usual,—e.g., A. dorsata, building in rock cavities; and a comb of A. florea built in a dwelling house was found to be about 5 feet in area in addition to being in some places double, the comb of this bee being usually single and perhaps less than one foot in area. Probably in all these very large nests there are several queens, and they are not comparable to single stocks of A. mellifica. The arrangement of the stores and brood is the same as in other species, A. dorsata as found in India, is exceedingly constant in size and colour; it is found in forests, but frequently builds in towns. It is reputed to be very vicious, but unless disturbed it does not attack, and could be handled by some of the measures usually employed by bee-keepers.

Habitat.—A. dorsata is found all over India, but not at great heights above sea-level; it is said to be found at 2,000 feet or more in Bhutan, but may justly be termed a tropical insect indigenous to the plains.

"Economic information.—The large size of the comb and bee has excited hopes of this insect proving, under cultivation, of great economic value, and European bee-keepers have endeavoured to obtain stocks of it. Mr. Benton, a dealer in foreign bees, went to Ceylon for the purpose, but he was unfortunate in his efforts, for the queens died. He states that...
Indian Bees.

BEES.

Honey.

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Group II.

Forms of.

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A. FLORSA.

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does not consider them so vicious as reputed when once hived, but he
gave up the attempt to cultivate the species. Several years previous
the writer undertook to obtain stocks, if likely to prove useful in Europe,
but did not hive any, as it was considered better to first investigate
the economic value of other Indian species. The reasons against
any attempt to cultivate *A. dorsata* in a hive are—(1) The bee builds
naturally in the open. (2) It builds normally only one comb, so that the
honey cannot be removed without removing the brood also. (3) Although
it builds a very large comb, this comb is not so great in cubic ca-
city, normally, as the combs built by a stock of *A. mellifica*, which is readily
cultivated and well understood already. (4) It is only found in a tropical
climate, and in this respect differs from *A. mellifica* and *A. indica*, the
most productive varieties of which are apparently indigenous to localities
having more or less severe winters. *A. dorsata* probably might be
cultivated in a semi-wild state in the forests, and the produce largely in-
creased by this means. The present practice of indiscriminately robbing
every stock found of all its comb stores and brood might be replaced by
a more rational mode of procedure; for, although not hived, many of the
processes applied in the economic management of *A. mellifica* might be
applied to the semi-wild *A. dorsata*. The bees might be fed to stimulate
breeding or prevent starvation. Excessive swarming might be interfered
with. Certain stocks might be selected to breed from, as in the old system
of bee-keeping. It might be found practicable to remove only portions of
the comb, and the bees might be induced to build on or in artificial
structures more accessible than the branches of trees.

"Large quantities of both wax and honey are taken in the forests from
*A. dorsata*; this wax appears to be bought up by dealers, and some is
exported. The honey is sold and mostly consumed locally, but is com-
monly of very inferior quality, being contaminated by pollen, the juices
of larvae, &c. It is also commonly thin and liable to fermentation. The
use of a simple extractor, care being taken to ripen when necessary, and
to grade it instead of mixing good and bad together,—these and other
simple improvements would greatly increase the value of the honey. It
appears highly probable that most of the honey produced by bees build-
ing in the open air is thin and requires ripening by evaporation to remove
its liability to fermentation. Of 60 to 70 specimens sent to the Calcutta
Exhibition, very few were free from fermentation.

"Group 2. *Apis indica*, *Apis florea.*—The bees of this group agree with
*A. mellifica* in having nine rows of bristles to the pollen baskets, and in
the division of the anterior wings, relative position of eyes, in building
drone comb, in the drones being widely different from the workers in
shape, &c. In fact, as described by entomologists, they differ from *A.
mellifica* mainly in size and colour. This group includes *A. indica*, *Fab.
(A. socialis, Lat.); A. socialis and dorsata, Lepelletier. (A. delessertii,
Guerin); A. peronii, Lat.; A. perrottetii, Guér.; A. nigrocincta, Smith; and
*A. florea*, *Fab. (A. indica, Lat. A. lobata, Smith).* Dr. Gerstacker regards
the last as a distinct species, and the others as being colour varieties of
another species, the *A. indica* of Fabricius.

"Description.—*A. florea* is very constant in colour, size, and shape
all over India.

"It is the smallest known specimen of the genus *Apis*. Its worker cells
are 9 to the inch, and its drone cells about 6; the drone is relatively to
the worker much larger than in *A. mellifica*, and has a thumb-like pro-
jection on the metatarsi of the posterior legs. This drone also differs in
some other structural respects from that of *A. mellifica*.

"Like *A. dorsata*, this species builds in the open, a single comb, and
is only found in the plains.
**Indian Bees.**

**Habitat.**—Its comb is usually built attached to a branch and commonly in bushes, but sometimes under the cornices of houses and inside buildings. Its comb is often only as large as a man's hand; at other times it may, as already stated above under *A. dorsata*, be greatly extended and in part duplicated.

**Economic information.**—The honey is small in quantity, and that of the small combs built in the open air is commonly very thin, but that found in large sheltered combs is similar to the honey produced by *A. mellifera*. The honey and wax of this species is not of commercial importance; they are often collected, but seldom offered for sale.

**Description.**—*A. indica* is described as much smaller than *A. mellifera*, but it is very imperfectly known; the writer has found that some varieties are larger than many of the European forms, and that *A. indica* hitherto known to entomologists includes only some varieties, and these the smallest and least valuable. *A. indica* differs very widely in size and colour with locality, those from the most elevated northern regions being much darker and larger than from the plains.

The smaller forms of *A. indica* build 6 cells to an inch, producing but little surplus honey, and swarming early and frequently, so that in the plains stocks are light and of little economic value. The Bhután variety is much larger, building 58 cells to the inch, and forming heavier stocks. The varieties found in the Hazará District, Panjáb, and north of Síla, on the Thibét frontier, are as large or even larger than *A. ligustica*, and appear from the reports received to be at least as productive as *A. mellifera*. The varieties of *A. indica* found in the plains generally and at Landour, Chumb, Mussoorie, in Burma, Ceylon, Assam, the Khía Hills, Bengal proper, Orissa, Kurnool, and other parts of the Madras Presidency, Central India, the Muree Hills, etc., are small. The varieties met with in the plains are lighter coloured than those of the higher regions; the latter have darker bodies than the former, and also dark wings. All build worker cells 6 to the inch. This species is cultivated or rather encouraged in most parts of India for the sake of its honey. It is the variety of the small bee which is cultivated at the hill stations, several Europeans having been very successful. The varieties found in the plains are in some cases more prone to sting than those of the higher regions. The Bhután variety builds more comb than the smaller varieties; it is exceedingly easy to handle, but is not so courageous as *A. mellifera* and *A. indica* of the plains; the sentinels at the hive-door run in as soon as alarmed, instead of coming out and defending the hive. All the above varieties so far as known are inferior to *A. ligustica* under cultivation, as they permit the presence of insect vermin in their hives, and are therefore very liable to the ravages of moth. They appear much more prone to swarm than *A. mellifera*. The large variety of the Hazará District, Panjáb, and the cultivated variety of Bashahr, are probably as productive as *A. mellifera*. An attempt is being made to obtain stocks for observation as to productiveness, temper, and resistance to moth and other vermin, so as to bring this economically valuable variety under cultivation. The productiveness of *A. indica* appears least in the plains, being there very little, and greatest in the higher regions; the greatest yield reported from a cultivated stock is 30 lbs. of honey.

**Economic information.**—Large quantities of honey are obtained from *A. indica* in the higher regions; the honey differs in appearance with the season's pasturage, that obtained in the autumn being usually light coloured. Much of the honey is inferior in quality from its liability to fermentation, the mode of extracting it, and the fact that it is not graded. It varies in price from 2 annas a seer at some hill stations, where it is plentiful, to 8 annas a lb. In the bazaars of the towns comb honey of the
Characters of the Begoniaceae.

**BEGONIACEAE**

Best kind produced in very small quantities by the European methods of cultivation fetches Rs.1 a lb. No doubt wax from *A. indica* is sold, but probably the greater portion of the wax taken in the forests and that exported is from *A. dorsata*. The production of wax and honey in India, although it attains considerable value in the aggregate, admits of enormous expansion by the introduction of improved modes of cultivation; and as there is great demand for good honey, bee culture would be exceedingly profitable.

"Successful Rearing of *A. mellifera*.—The culture of the smaller varieties of *A. indica* will, no doubt, be replaced by that of the best varieties of *A. mellifera*, or the large varieties of *A. indica*. The prevalence of moth during the rainy season, and the absence of the long winter rest of Europe, will render it preferable to cultivate a species which, like *A. ligustica*, is specially able to protect itself against moth. The introduction of European species, although previous attempts have failed, has at last been accomplished, and the production of honey and wax will be developed by cultivation of European or sufficiently productive Indian species,—the principal points requiring special attention being more frequent superseding of queens, where there is little or no winter rest, and care to stimulate breeding at such times so as to profit by the early pasturage. *A. ligustica* has been successfully introduced into India, a queen imported into Calcutta in November 1882 died at the end of March 1885; and she was laying abundantly almost the whole of this time." (J. G. Douglas, Esq., Telegraph Department, Calcutta.)


A genus of Bamboos reduced by the *Genera Plantarum* to Ochlandra, Thun., which see, and also under Bambuseae. The following are the species formerly referred to this genus.

**eessa Rheedii**, Kunth.; Munro, 144; Beddome, 3444; Gramineae.

Vern.—Blub-bam, Beng.; Pagu-tulla, Say, Saysha, Chittagong; Bisha, Mal.

Habitat.—A bamboo met with in Malabar and Cochin; stems 16 feet high.

2. *stridula*, Munro.

Vern.—Batta, Singh.

Habitat.—Met with in Bombay and Ceylon; stems 6 to 18 feet high.


Vern.—Irul, Travancore.

Habitat.—Met with in the Hills of Tinnevelly and Travancore, 3,000 to 5,000 feet; stems 6 to 8 feet high; A densely-gregarious species.

**Beet and Beet root**, see *Beta vulgaris*, Mog.; Chenopodiaceae.

**BEGONIACEAE**

A natural order of herbaceous plants, referred to two genera,—Begonia having 398 species, and Hillebrandia 1 species.

In India there are over 64 species of the former genus. They inhabit all moist tropical countries except Australia. The affinities of the Natural Order are very obscure; they are most nearly related to Cucurbitaceae and Datiscae. The discovery of the genus Hillebrandia (in the Sandwich Islands) has suggested a close affinity to Saxifragaceae. They are

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highly ornamental plants and great favourites of the modern foliage cultivator, but they are of no economic value. The following extract from the *Flora of British India* gives the diagnostic characters of the species:

"Succulent herbs or undershrubs; stem often reduced to a rhizome or tuber. *Leaves* alternate (sometimes falsely whorled in *B. verticillata*), more or less unequal-sided, entire, toothed or lobed; stipules 2, free, frequently deciduous. *Peduncle* axillary, divided into dichotomous cymes, the branches and bracts at their division generally opposite. *Flowers* white, rose or yellow, showy, sometimes small and numerous. **Male:** *Perianth* (of the only Indian genus) of 2 outer valvate opposite sepals, and 2-3 inner smaller segments; stamens indefinite often very many, free or monadelphous anthers narrowly oblong. **Female:** *Perianth* (of the only Indian genus) of 5-9 segments. **Ovary** inferior (as *Hellebrenna*, half-superior 3-4-celled; placenta vertical, axile (as the time of fertilisation), divided or simple; style 2-4, combined at the base of the stigma, branched or tortuous; ovules very many. **Fruit** capsular, more rarely succulent, often winged, variously dehiscing or irregularly breaking up. **Seeds** very many, minute globose or narrow cylindrical, testa reticulate; albumen very scanty or o. (Flora of British India, Vol. II., 635.)"


**Begonia Rex**, *Putez.*., and other species; *Pl. Br. Ind.*, II., 635; *Begoniatas.*

Food.—Many species of this herbaceous genus having succulent stems are used as pot-herbs, and when fresh have a pleasant acid taste. Speaking of his companion while ascending the Kakliang Pass, Sikkim, Sir J. D. Hooker says: "The great yellow-flowered *Begonia* was abundant, and he cut its juicy stalks to make sauce (as we do apple-sauce) for some pork which he expected to get at Bhonsong; the taste is acid and very pleasant." (Hooker's *Himalayan Journal*, Vol. I., pp. 292-93.) The natives of Chittagong, where the plant is plentiful, use the leaves as a pot-herb. (*Roxb., Pl. Ind.*, Ed. C.B.C., p. 676.) It is used by some of the tea-planters of Assam as a substitute for Rhubarb.

Medicine.—Several species, such as *B. silhetensis*, C. B. Clarke; *B. picta*, Sm.; *B. rubro-renia*, Hook.; *B. laciniata*, Roxb.; *B. Rex*, *Putez.*

The juice is poisonous to leeches, and may therefore be used to kill them when found in the nostrils of animals. See *Anagallis arvensis*, Linn., ed Leeches.

§ "When clarified with soda bicarb., the juice makes an excellent application for the hair." (Mr. G. F. Poynde, Koorkee.)

**BEILSCHMIEIDIA, Nees; Gen. Pl.*, III., 152.

A genus of trees belonging to the *Laureaceae*, comprising some 20 species, inhabitants of tropical Africa, Asia, Australia, New Zealand, and America. *Leaves* sub-opposite or alternate, *Flowers* bisexual in short axillary racemes. *Perianth* deeply 6-cleft, deciduous. Outer circle of 6 perfect stamens, opposite to the perianth segments and generally alternating with small glands; anthers lanceolate, the inner circle of 3 perfect stamens, with lateral, shorter stamens alternating with 3 short staminodia; anthers 2-celled, valves opening upwards. **Ovary** incompletely 2-celled, with 3 ovules; style filiform, stigma discoid. Fruit a dry oblong-seeded berry, base incompletely 2-celled. (Brandis, 374.)

**Beilschmiedia Roxburghiana, Nees; Lauraceae.**


Vern.—*Koholik*, *Oudh*; *Tarsing*, Nepal; *Kany*, Lepcha; *Tepali*, *Garo*; *Serai-gali*, Ass.; *Shaitsereng*, Burm.

Habitat.—An evergreen tree found in Eastern Himalaya up to 8,000 feet in Eastern Bengal, Burma, and the Andaman Islands.

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The White Gourd Melon.

**BENINCASA cerifera.**

**Structure of the Wood.**—White, moderately hard, even-grained; heartwood with red and green streaks. Annual rings marked by sharp lines. Weight about 37 lbs. per cubic foot. It is used in Assam for boats; in Darjeeling for building, tea-boxes, and other purposes.

**Beleric myrobalan,** see *Terminalia belerica*, *Roxb.*; *Combretaceae.*

**Belladona,** see *Atropa belladona*, *Linn.*; *Solanaceae.*


A genus containing only one species—an extensive climber, belonging to the *Cucurbitaceae*, most probably a native of tropical Asia, Africa, and America, but cultivated in all tropical countries.

Softly hairy; tendril 2-4fd. Leaves cordate, reniform-orbicular, more or less 5-lobed; petiole without glands. **Flowers** large, yellow, monocious, all solitary, without bracts. **Male:** calyx-tube campanulate, lobes 5, leaf-like serraete; petals 5, nearly separate; stamens 3, inserted near the mouth of the tube; anthers exerted, free, one 1-celled, two 2-celled, cells sigmoid. **Female:** calyx and corolla as in the male; ovary oblong, densely hairy; style thick, with 3 flexuose stigmas; ovules numerous, horizontal; placenta 3. Fruit large, fleshy, oblong, pubescent, indehiscent; seeds many, oblong, compressed-mar- gined. The genus is named after an Italian nobleman, Count Benincasa.


**The White Gourd Melon.**

**Syn.**—*Cucurbita pepo*, *Roeb.* includes this plant as well as *C. pepo*, *DC.*


**Habitat.**—Cultivated in India; according to *De Candolle* it is a native of Japan and Java.

**Botanic Diagnosis.**—This plant is so like the Pumpkin that the earlier botanists took it for one. To distinguish it, however, from *Cucurbita pepo*, *DC.*, the following characters may be given: Softly hairy. **Male:** flowers large, solitary; petals 5, nearly free; stamens 3, inserted near the mouth of the tube; anthers free, exerted. **Fruit** 1 to 1½ feet, cylindric, without ribs, hairy when young, and bright green, ultimately becoming smooth and covered with a bluish-white waxy bloom; flesh white.

**Cultivation.—Duthie and Fuller** say that this plant is restricted as a rule to little highly-manured patches in the vicinity of villages. In Bengal it is frequently seen creeping over huts,—in fact, the oval fruits with the white mealiness constitute a striking feature of the Bengal village.

**Properties and Uses,**—

Oil.—The fruit of this plant excretes upon its surface a waxy substance which resembles the bloom found on plums and cucumbers. This is said to be produced in sufficient quantity to be collected and made into candles.

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BENINCASA

The White Gourd Melon.

Oil from seed.

The seeds also yield a mild, bland, pale-coloured oil. As this plant has been very much confused by botanists with Cucurbita Pepo, DC, it is probable that some of the native names given above are incorrectly applied to this species. It would be very important to have specimens of the plants, from which oils have been prepared, supplied along with these oils so as to admit of final determination. The greatest possible ambiguity exists in the literature of this subject.

MEDICINE.

Fruit, Juice.

It is considered tonic, nutritive, and diuretic, and a specific for hemoptysis and other hemorrhages from internal organs. For this purpose the first juice from the fruit is administered, while a slice of the fruit is at the same time applied to the temples. According to the Sanskrit author, it is useful in insanity, epilepsy, and other nervous diseases; the fresh juice is given either with sugar or as an adjunct to other medicines for these diseases.

"It would appear that the older Sanskrit writers were not acquainted with its peculiar action on the circulatory system by which it rapidly puts a check to hemorrhage from the lungs. The Raja Nirghantu, the oldest work on therapeutics, gives a long account of its virtues, but does not allude to its uses in phthisis or hemoptysis. Neither does Susruta mention it in his chapters on the treatment of hemoptysis and phthisis, though the plant is alluded to by him elsewhere. The more recent compilations, such as Chakradda, Sangrah, Sarangadhar, &c., give numerous preparations of the article and detail its uses." "In preparing this medicine" in the form of a confection "old ripe gourds are selected. Those not at least a year old are not approved. They are longitudinally divided into two halves and the pulp scraped out in thin flakes by an iron comb or scraper. The watery juice that oozes out abundantly during this process is preserved, the seeds being rejected. The pulp is boiled in the above-mentioned juice, till soft. It is then tied up tightly in a cloth and the fluid portion allowed to strain through it. The softened and drained pulp is dried in the sun and the watery portion preserved for future use. Fifty tolas of the prepared pulp are fried in sixteen tolas of clarified butter, and again boiled in the juice of the fruit, till reduced to the consistency of honey. To this are added fifty tolas of refined sugar, and the whole is heated over a gentle fire, till the mass assumes such a consistence as to adhere to the ladle." The pot is then removed from the fire, and a number of flavouring demulcents added, such as pepper, ginger, cumin, cardamom, cinnamon, &c., the mixture being stirred until cold. Dose from one to two tolas, according to the age and strength of patient. (U. C. Dutt.) "The seeds possess anthelmintic properties, and are useful in cases of tenia. The expressed oil of the seeds, in doses of half an ounce, repeated once or twice at an interval of two hours, and followed by an aperient, is said to be equally efficacious." May be used as a substitute for male fern. (Official Correspondence from Bombay Committee regarding the revision of the Pharmacopoeia of India.)

Special Opinions.—§ "The fresh juice is often used as a vehicle to administer pearl shell for the cure of phthisis in the first stage." (Assistant Surgeon Sakhdarim Arya, Rohat, Girgaum, Bombay.) "It is considered a specific in pulmonary consumption. A native preparation made from the ripe fruit called Kushandakhanda is considered very efficacious in phthisis pulmonalis, and I have seen people benefited by it." (Surgeon K. D. Ghose, Bankura.) "This is so universally believed to be useful in pulmonary consumption that some trials should be made in order to discover whether it has any effect on the bacillus of phthisis discovered by Dr. Koch. I have seen it produce a decided effect in arresting pulmonary tuberculosis."
Products of India.

The Barberry Family.  BERBERIDEÆ.

(Surgeon K. D. Ghose, M.D., Khulna.) "Preserve is given in piles and in dyspepsia as an antilobulous food." (Surgeon-Major W. Moir, Meerut.) "This forms one of the chief ingredients of the vapour bath used in syphilitic eruptions." (Assistant Surgeon Anund Chunder Mukerji, Noolkhally.) "The expressed juice of the mature fruit possesses purgative and alterative properties. It is used in cases where the system has been affected by mercury." (Brigade Surgeon F. H. Thornton, B.A., M.B., Monypyr.) "The preserve of the white melon is an easily digestible and highly nutritious food in wasting diseases, as consumption." (Surgeon-Major R. L. Dutta, Patna.) "Much used in diabetes with successful results, the juice of the cortical part of (4 oz.), combined with 100 grains of each of powdered saffron and bran of red rice, given morning and evening, with strict diet." (Surgeon E. W. Savinge, Rajamundry, Godavari District.) "The most common way in which the juice is used is in the shape of a confection with sugar, &c., as a cooling and fattening medicine." (Native Surgeon Routham T. Moolamillir, Chingleput, Madras Presidency.) "Useful in pills given with surum. Antidote for mercurial poisoning administered in the form of pak." (Surgeon W. Barren, Bhuj, Cutch.)

Food.—The white gourd melon is used in the following ways: (a) as a vegetable, (b) as a curry, and (c) as a sweetmeat called beshim. "This species is used principally in making a sweetmeat, which consists of pieces of this gourd coated with sugar; it is said to have cooling properties." (Barden Powell's Panjāb Products, p. 265.)

Ben oil, the oil obtained from the seeds of Moringa olvoera, Garten., which see.

Benzoin or Benjamin, see Styrax Benzoin, Dryand.; Styraceæ.

BERBERIDEÆ.

A natural order of herbs, bushes, or climbers, comprising about 100 species, referred to 19 genera,—inhabitants of the temperate regions. In India there are only 17 species referred to 6 genera. The following descriptive account and analysis of the order, extracted from the Flora of British India, may be found useful:

"Usually shrubby, sometimes climbing, glabrous plants. Leaves simple or compound, with articulate segments; buds scaly; stipules very rare (Berberis). Flowers often globose, regular, solitary or in simple or simple compound racemes, usually yellow or white, Sepals and petals free, hypogynous, very caducous, 2-many-seriate, in 3 rarely 4-6-nary whorls, imbricate, or the sepals rarely valvate. Stamen 4-6 (rarely 8) opposite the petals, free or connate; anthers adnate, erect, dehiscing by lateral or dorsal slits, or by 2 revolute or ascending lids or valves. Carpels 1-3, rarely more, oblong; style short or o, stigma dilated or conic or oblong; ovules usually indefinite on the ventral suture or covering the walls of the ovary, anatropous, rarely orthotropous. Ripe carps dry or fleshy, dehiscent or not. Seeds with a crustaceous fleshy or bony testa; albumen copious, dense; embryo minute or long, straight or curved, radicle next the hilum."


An erect shrub, leaves pinnate
Climbing shrubs, leaves digitate.
Stamens monadelphous
Stamens free

1. Decaisneæ.
2. Parvatia.
3. Holboëlia.

B. 439a
Tribe II.—Berberis. Stem O or erect. Flowers hermaphrodite. 

carpe l. Seeds usually small.

- Ovules erect basal. Shrubs.
- Fruit berried
- Ovules superposed along the ventral suture.
- Leaves compound. Ovules few.
- Leaves simple, palmate. Ovules many.


5. Epimedium.

6. Podophyllum.

BERBERIS, Linn.; Gen. Pl., I., 43.

A genus of shrubs containing some 50 species, the characteristic members of Berberisidae.

Wood yellow. Leaves pinnate or simple and then fascicled in the axis of 3-5 partite spines. Flowers yellow, hermaphrodite, fascicled, racemose or solitary. Sepals 5, with 2-3 appressed bracts, imbricate in 2 series. Petals 5, imbricate in 2 series, usually with two basal glands inside. Stamens 6, free; anther-cells opening by recurved valves. Ovary simple; stigma peltate sessile or on a short style; ovules few, basal, erect. Berry few-seeded.

Berberis angulosa, Wall.; Fl. Br. Ind., I., III.

Vern.—Chitra, Nepal.

Habitat.—A large, erect shrub of the inner ranges of East Kumaun, Nepal and Sikkim, above 11,000 feet.

Structure of the Wood.—Dark grey or yellowish brown, hard. Weight about 50 lbs. per cubic foot.


The Barberry.

Vern.—Chitra, chotra, dār-hald, ravoat, kashmal, Hind.; Sāmil, Sīm, kashm, chitra, P.B.; Chitra, Nepal; Tsema, Bhutia; Chitra, serik, Pers.

Moodeen Sheriff gives the following vernacular names arranged under three heads:—

(a) Berries.—Zariškā, Hind., Pers.; Zarīsk, Duk.; Anbar-bārīs, ambarbūrs, Arab.

(b) Extract.—Ravoat, Hind.; Fīl-sahrah, fil-sahrah, Pers.; Husainkānī, fil-sahraw, Arab.

(c) Wood or Root.—Dār-hald, dār-chōb, Pers., Hind.; Dār-hald, Arab.

Berberis aristata, B. asiatica, B. Lycium, and B. vulgaris are with difficulty distinguished from each other, and in consequence they have been mistaken for each other all over India. The same vernacular names are probably applied to each of these plants and the same properties attributed to all. Considerable ambiguity therefore exists in the published statements regarding these Barberries.

Habitat.—B. aristata is an inhabitant of the temperate Himalaya between 6,000 and 10,000 feet in altitude, extending from Bhutan to Kangwar, the Nilgiri Hills, Ceylon, &c.

Botanic Diagnosis.—An erect, much-branched bush; leaves evergreen or nearly so, obovate or oblong entire, or with few distant spinous teeth; flowers in compound, often corymbose, racemes; berries tapering into a short style; stigma small, subglobose.

There are two varieties in addition to the type from B. aristata: 1st, floribunda; 2nd, micrantha.

Properties and Uses—

Dye.—A yellow dye, obtained from the root and stem, is used in tanning and colouring leather. The wood is generally known as dār-
The Barberry.  

BERBERIS aristata.

The extract as rasota, rusot, rasavanti, or ruwul (see also under B. Lycum); the fruit as amburar oris (see Dymock’s Mat. Med., Western India). Professor Solly, in Agri-Horticultural Society of India, IV., pages 272-279, writes that the colour exists chiefly in the bark and in the young wood immediately below the bark, and that in old wood the proportion is small, but much superior in quality. In India it appears the root only is used; this doubtless contains colouring matter, but, according to the Professor, not of so good a quality. Barberry is perhaps one of the best tanning dyes in India. The supply is quite inexhaustible; some five or six species occur everywhere in great abundance along the entire Himalaya; they are temperate bushes, growing on exposed hill-sides between 6,000 and 10,000 feet in altitude, and often constitute thickets of many miles in length. They are equally plentiful on the Nilgiris and in Ceylon.

Oil.—The seed yields an oil.

Medicine.—The fruit or berry is given as a cooling laxative to children. The stems are said to be diaphoretic and laxative in rheumatism. The dried extract of the root is extensively used as a purgative for children, and especially as an application in ophthalmia. It is also an excellent application for sun-blindness. The root-bark abounds in the characteristic bitter principle; it acts as a tonic and antiperiodic. It is a valuable medicine in intermittent and remittent fevers, and in general debility consequent on fevers. It is also used internally in native practice as a stomachic and in diarrhoea, &c. The berries are useful as an antiscorbutic.

Special Opinions.—§ “Instead of the root-bark of B. aristata, in my practice I have used the root itself and found it to be quite equal, if not superior, to the former. Its advantages are that it is about fifty times cheaper and more abundant. The root is one of the few really good medicines in India, and deserves the special attention of the profession. As an antiperiodic and antipyretic it is at least quite equal to quinine and Warburg’s tincture, respectively; and as a diaphoretic, decidedly superior to James’s powder. It is of the greatest service in relieving pyrexia and in converting the continued and remittent fevers into the intermittent, and also in preventing the return of the paroxysms of the latter. In addition to its cheapness, its advantages over Warburg’s tincture and quinine are, that however repeatedly it may be used it neither produces a great depression of the system nor has any bad effects on the stomach, bowels, brain, or the organs of hearing. Unlike the alkaloids of cinchona, it can be employed beneficially during an attack of fever. A very good preparation of the root is the decoction, twelve ounces of which is equal to one bottle of Warburg’s tincture. If administered during a paroxysm, in two doses (§ vi each) at the interval of two or three hours, it relieves the fever by producing a copious perspiration; six drachms of the tincture of the root is equal to one bottle of Warburg’s tincture. If used in two doses with water during a paroxysm, this produces precisely the same effect as the decoction. There is very little difference between the actions of the tincture and decoction of the root, but the former is preferable to the latter for two reasons,—viz., the smallness of its dose, and the fact that the tincture can be prepared in a large quantity and kept ready for use. To ensure the full antiperiodic effect, the drug should not only be employed during the paroxysm, but also in the same dose every fourth or fifth hour in the intermission; the cure is completed by the continued use of the drug in smaller doses for four or five days more after the fever ceases to return. Used in the manner explained above, the tincture and decoction have proved successful in many cases of malarious and jungle fevers, in a few of which quinine and also arsenic had previously failed. The watery extract and simple powder of the root are very inferior preparations, and generally

B. 450
very indifferently in their actions. The great and continuous heat which is required to prepare the extract seems to a large extent to destroy its efficacy. The wood of *B. aristata*, particularly that of the stem, is also possessed of the same medicinal properties as the root, but much inferior to the latter. The species of Berberis owe their actions to an active principle called Berberine.

"Preparations from the root.—Decoction, tincture, and watery extract. *Decoction* : Take of the root, in shavings or coarse powder, six ounces, water two pints and a half; boil on a slow fire till the liquid is reduced to one pint. *Tincture* : Take of the root, in shavings or coarse powder, six ounces, proof spirit one pint; macerate for seven days with occasional agitation, strain and add more proof spirit to make one pint. *Extract* : Take the shavings or coarse powder of the root in any quantity, boil with water till the liquor thickens, strain and evaporate on a sand-bath to the consistence of an extract. *Doses* of the decoction, from two to six fluid ounces; of the tincture, from two to six fluid drachms; and of the extract, from one to two drachms." (Honourable Surgeon Moodeen Shereff, Khan Bahadur, Madras.)

"The extract (Rosmat) mixed with opium and lime-juice is a most useful external application in painful eye affections." (Surgeon J. Anderson, M.B., Bijnor.) "I invariably use this drug in the treatment of indolent ulcers, and have never had occasion to change it for any other local application." (Surgeon Joseph Parker, M.D., Poona.) "The tincture of the root-bark, official in the Indian Pharmacopoeia, is found useful in enlargement of the liver or of the spleen in 30-drop doses 3 times daily." (Assistant Surgeon Nitinlal Banerji, Etawah.) "A good febrifuge and antiperiodic, not required during remission." (Surgeon W. Forsyth, Singapore.) "It is known here as Daru Huldu; the extract as Rosmat." (Surgeon-Major J. Robb, Ahmedabad.)

Food.—The oblong fruits are dried in the sun like raisins; are purplish or pinkish and wrinkled; they are eaten and are regarded as palatable.

Structure of the Wood.—Yellow, hard. Weight 52 lbs. per cubic foot. Used for fuel.

BERBERIS

**coriacea.**

**Rusot Extract.**

**FOOD.**

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**TIMBER.**

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**Berberis asiatica,** Roxb.; *Fl. Br. Ind., I., 110.*

Vern.—*Kirmora, Kumaon; Māte-kisni, chitra, Nepal.*

Habitat.—Dry valleys of the Himalayas, altitude 3,000 to 7,500 feet; from Bhotān to Garhwal, Behar (on Parasnatha hill), altitude 3,500 feet.

Botanic Diagnosis.—Bark pale, spines 5-fid, small, leaves orbicular or broad obovate, sub-entire or coarsely spinous lacunose, white beneath; racemes short corymbose, berries with a distinct style; stigma capitata.

Properties and Uses—

Medicine.—The medicinal properties of this species are similar to those of the preceding.

Food.—The fruit is used in the same way as that of *B. aristata*, DC, and *B. Lycium*, Royle.

**MEDICINE.**

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**FOOD.**

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Vern.—*Kashmir, Simla.*

Habitat.—A large, erect, thorny shrub of the North-West Himalayas, above 8,000 feet; often forming alone or with other shrubs large extents of scrubby jungle,—e.g., in the valley south of Nāgāland near Simla.

**Timber.**

457

Structure of the Wood.—Yellow, moderately hard. Weight about 54 lbs. per cubic foot.

B. 457
Berberis Lycium, Royle; Fl. Br. Ind., L., 110.

**Vern.**—Kashmúl, chirá, Hind.; Kashmúl, N.-W. P.; Kasmal, Simla; Darhalád (the wood), Bomb.; Kasmal-rasout, Cutch; Zirikh (the fruit), Pers.; and ambarkhâr, Arab.; Kaswãnts or rasout (the extract).

The Sanskrit name Darwi is, in South India, given to Coscinium fenestratum, Calembrooks, but in Northern India it is applied to a species of Berberis. The name rasout is generally given to the extract from the wood or root of this and of B. asiatica and B. aristata. Dr. Royle, in a paper to the Linnean Society of London, proved that this Rasout was the Lycium of the ancients. Lycium (λυκέων) is mentioned by Dioscorides, Pliny, Celsus, Galen, and Scribonius Largus, and by many of the later Greek and Arab physicians. It was held in high esteem as a drug, and was used in the treatment of chronic ophthalmia.

**Habitat.**—An inhabitant of the Western Himalaya in dry hot places, altitude 3,000 to 9,000 feet, from Garhwal to Hazará.

**Botanic Diagnosis.**—Bark white; leaves sub-sessile, sub-persistent, lanceolate or narrow obovate-oblong, usually quite entire, pale, not lacunose glaucose beneath; raceme elongate, berries ovoid, style conspicuous, stigma capitate.

**Properties and Uses.**

**Oil.**—The seed yields an oil.

**Medicine.**—The medicinal extract from the root, known under the name of Rasout, is highly esteemed as a febrifuge and as a local application in eye diseases. In chronic ophthalmia it has been used with success, when combined with opium and alum. Dr. O'Shaughnessy expresses his opinion on the medicinal uses of this drug in the following terms: "Rasout is best given as a febrifuge in half-drachm doses, diffused through water, and repeated thrice daily or even more frequently. It occasions a feeling of agreeable warmth at the epigastrium, increases appetite, promotes digestion, and acts as a very gentle but certain aperient. The skin is invariably moist during its operation."

Some difference of opinion prevails as to whether rasout should be regarded as a special preparation from the root of this species only, or from B. asiatica, B. aristata, as well as B. Lycium. The extract has been used by a few European practitioners and found useful in the treatment of chronic ophthalmia. It was employed for this purpose by Mr. Walker, of Edinburgh, who found it very efficient. The preparation used by him consisted of equal quantities of Lycium and burnt alum, with half the quantity of opium. It was applied, mixed with lemon-juice, to the consistence of cream, over the eyelids and eyebrows. (U. S. Dispens., 15th Ed.) It has also been frequently used and favourably reported on by European doctors in India. A tincture of the root-bark is often recommended in the treatment of fevers.

**Special Opinions.**—"In haemorrhoids Rasout is a very popular remedy in doses of from 10 to 30 grains." (Assistant Surgeon Mohund Lall, Agra.) "The watery extract is a bitter tonic and febrifuge in doses of half a drachm. In combination with equal parts of alum and opium, it is used as a ūpā to the eyelids in ophthalmia, often acting like a charm, subduing swelling and allaying irritability. Previously to its application the eyelids should be fomented with tukhni-páti or nám-páti." (Surgeon C. M. Russell, Sarsun, Bengal.) "Similar in action to the sulphate of Berberis; useful in eye diseases," (Surgeon W. Barren, Bhuj, Cutch, Bombay.)

"Is taken internally in 5 to 15 grain doses with butter in bleeding piles. Its solution, 1 drachm to 4 oz. of water, is used as a wash for piles. Its ointment, made with camphor and butter, is applied to pimples and..."
**BERBERIS vulgaris.**

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<th>The Barberry.</th>
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<td>boils, being supposed to suppress them.” (Surgeon J. C. Penny, M.D., Amritsur.) “Is an excellent tonic and febrifuge, especially in the low fevers of aged people; the tincture in 4-drachm doses.” (Surgeon B. Picachy, Puram.) “The Nilgiri barberry has been used in the treatment of ague with good results.” (Surgeon-General W. R. Cornish, Madras.)</td>
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**Structure of the Wood.** —Yellow, moderately hard. Weight 52 lbs. per cubic foot.

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**Berberis nepalensis, Spreng., Fl. Br. Ind., I., 109.**

**Syn.** —B. Pinnata, Roxb., Fl. Ind., Ed. C.B.C.; Mahonia nepalensis, DC.

**Vern.** —Amdanda, chiror, Pn.; Chatari, milktise, jamnemunda, Nepal.

**Habitat.** —A shrub or small tree with large pinnate leaves, common to the outer Himalaya, from the Ravi eastward to the Khalsa and Nogi Hills, Tenasserim and the Nilgiris, at altitudes above 5,000 feet.

**Botanic Diagnosis.** —Leaves pinnate; leaflets opposite, oblong oval or lanceolate, spinous-toothed, palmately 3-5-nerved; racemes dense-flowered.

**Properties and Uses.**

**Dye.** —Used, to a small extent, by the Bhutias and Nagás as a yellow dye.

**Structure of the Wood.** —Bright yellow, hard. Weight 49 lbs. per cubic foot.

Has a handsome colour and might be useful for inlaying.

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**B. vulgaris, Linn.; Fl. Br. Ind., I., 109.**

**The True Barberry, Eng.; Epine-vinette, Vinettier, Ecorce de racine de Berberides, Fr.; Faueach, Gemyene, Sauerde, Berberriteze, Berberitzzen (Saurgh), Turzelrinde, Germ.; Berberko, Jr., Sp.**

**Vern.** —Zirikh, kaschmal, chachar or chochar, Pn.; Bedana, cutch, Pers.; Ambar-basir, Arab.

**Habitat.** —A deciduous thorny shrub on the Himalaya from Nepal westward, in shady forests, above 8,000 feet; Afghanistan and Beluchistan to Europe.

**Properties and Uses.**

**Dye.** —A yellow dye is extracted from the roots; along with alkaline lye is used in Poland for colouring leather.

**Medicine.** —The Barberry is regarded as officinal in the Panjáb, being given as diuretic, and for the relief of heat, thirst, and nausea. It is astringent, refrigerant, and antimonial. In small doses it is tonic, in larger cathartic. It was formerly given in jaundice, probably on the principle of signature, the yellow colour suggesting its supposed efficacy.

§ "Cooling laxative medicine. In the form of decoction it is useful in scarlet fever and brain affections." (Surgeon W. Barren, Bhuj, Cutch.) “Dried like raisins or currants, the berries greatly resemble the latter.” (Surgeon-Major J. E. T. Atchison, Simla.) “Diuretic, demulcent in dysentery.” (Assistant Surgeon Nehal Sing, Saharumpore.)

**Chemical Composition.** —"Dr. Gräger found in the ripe fruit 15.3 per cent. of integuments and seeds, 17.20 of soluble solid constituents, and 67.22 of water. The constituents of the juice in 100 parts of fresh berries were 54.02 parts of malic acid, 4.67 of sugar, 6.61 of gum, 67.16 of water and 0.06 salts of potassa and lime. (A. J. P., Jan. 1, 1873, p. 14). The root and inner bark have been used for dyeing yellow. The bark of the root is greyish on the outside, yellow within, very bitter, and stains the
saliva when chewed. Brandis found in 100 parts of the root 66/3 of bitter, yellow extractive (impure berberine), 155 of brown colouring matter, 0.35 of gum, 0.20 of starch, 0.70 of cerin, 0.07 of stearin, 0.05 of chlorophyll, 0.25 of a sub-resin, 55.40 of lignin, and 35.00 of water."

"To a second alkaloid found in barberry bark, the names of vinetine, oxyacanthine, and herbine have been applied. To procure it the mother-liquor of berberine is precipitated by carbonate of sodium, the precipitate treated with dilute hydrochloric acid, and the liquid filtered and precipitated by ammonia. The impure alkaloid thus obtained may be purified by washing with water, drying, exhausting with ether, evaporating, dissolving the residue in dilute hydrochloric acid, and finally precipitating by ammonia. Vinetine is a white amorphous powder, crystallizable from its alcoholic and ethereal solutions, purely bitter, fusible unchanged at 139.50° C. (283° F.), insoluble or but slightly soluble in water, sparingly dissolved by cold but freely by hot alcohol and ether, and freely soluble in alcohol. It forms soluble salts with the acids, and its chloride is white." (U. S. Dispens., 15th Ed., 1886.)

Food.—The dried fruits, under the name of stirish-tursh variskhe-trush (sour currants), are imported from Cabul, Herat, and Kandadar into the Panjab. They form a pleasant acid preserve; the unripe ones are pickled as a substitute for capers.

Structure of the Wood.—Lemon-yellow, moderately hard and even-grained. Weight 55 lbs. per cubic foot.

A good firewood.

**BERCHEMIA, Neck. ; Gen. Pl., I., 377.**

erchemia floribunda, Wall. ; Fl. Br. Ind., I., 637 ; Rhamnææ.

Vern.—Kalatag, Kumaon ; Chiaduk, Nepal ; Rungyeong rik, Lepcha.

Habitat.—A large, erect or climbing shrub or small tree, found in the Himalaya from the Helum to Bhutan, and on the Khalsa Hills.

Structure of the Wood.—Yellow, turning grey on exposure, porous.

**ergamott, see Mentha citrata ; Labiatae.**

**ergamotte, or Lime, see Citrus Limetta ; and**

**ergera Koenigii, Linn., see Murraya Koenigii, Spreng. ; Rutaceæ.**

**BERRYA, Roxb. ; Gen. Pl., I., 232.**

A genus of Triæææ, containing only one species, a large tree. Leaves alternate, ovate, acuminate, glabrous, base cordate, 5-7-nerved. Panicles large, many-flowered, terminal and axillary. Calyx campanulate, irregularly 3-5-lobed. Petals 5, spathulate. Stamens many, inserted on a short torus ; anthers didymous, lobes divergent, opening lengthwise. Staminodes 0. Ovary 3-5-lobed, cells 4-ovoled ; style consolidated, stigma lobed ; ovoid horizontal. Fruit loculicidally 3-4-valved, each valve 2-winged. Seeds pilose, albumen fleshy ; cotyledons flat, leafy, radicle superior next the hilum.

The generic name is in honour of the late Dr. Andrew Berry, a Madras botanist.

**errya Ammonilla, Roxb. ; Fl. Br. Ind., I., 383.**

**THE TRINCÓMOLI WOOD.**

Vern.—Sarala-dévararu, Tel. ; Hpet-woon, petwan, Burm. ; Halmil-tila or halmila, Singh.

Habitat.—A large tree found in South India, Burma, and Ceylon.
Dictionary of the Econoie

The Beet-root.

Properties and Uses—

Flame.—In the Amsterdam Catalogue a fibre from this tree is mentioned as having been sent from Burma.

Structure of the Wood.—Heartwood dark red, very hard, close-grained, but apt to split; it has, even when old, a smooth, rather damp feel. The wood is very durable. Mr. Gamble reports that a specimen, which had been 90 years in Calcutta, was found to be perfectly sound and good on being cut into. Weight 48 to 65 lbs. per cubic foot.

It is used for carts, agricultural implements, and spear-handles, and in Madras for masula boats, and is much esteemed for toughness and flexibility. In Ceylon “the wood of this fine tree is very valuable for building and other purposes.” (Thwaites, Enum., Ceyl. Pl., 32.)

Beryya Ammonilla, Roxb., var. mollis.

Vern.—Hardwood, BURM.

“Is found on elevated ground; the wood, which is red, is much prized for axles, the poles of carts and of ploughs and spear-handles; it is also sawn up for building purposes.” (Br. Burm. Cat., I., 127.)

Berthelotia lanceolata, see Pluchea lanceolata, Olin.; COMPOSITE.


A genus of herbaceous plants belonging to the CHENOPODIACE, comprising some 12 or 13 species.

Glabrous herbs with fleshy radicle leaves. Flowers small-terinate, or glomerulate, rarely solitary, glomerules axillary or on simple or paniculate terminal spikes. Flowers hermaphrodite. Perianth 5-partite, persistent, and adherent to the base of the ovary. Stamens 3, perigynous, filaments subulate; anthers oblong. Ovary semi-inferior and surrounded by the staminal and perianth fleshy ring; stigma 2-3, rarely more, short subulate, connate at the base, papillate on the inner surface. Seed horizontal, attached laterally; testa membraneous.

The generic name is the classical Roman name for the cultivated species. The ancient Greeks, who used the leaves and roots, called the plant Testulon, also Serekles or Sefekelis, a word which very much resembles the Arab Selg, Silg. The latter word has apparently been adopted by the Portuguese, who call it Selga. The Celtic word Bet = red may be the source from which the word Beta was derived. (DeCandolle.)

Beta maritima, L.

The Beet-root.

Syn.—B. vulgaris, Moq.

Vern.—Pālak, Hind.; Pālāk, bīl pālāng or pālāng sāg, Beng.; Pālāk, Sans. (according to U.C. Dutt).

Habitat.—Two or three distinct forms are very extensively cultivated over the greater part of India as a cold-season crop. The principal are the Red Beet (B. vulgaris) and White Beet (B. cicla). These are chiefly grown by Europeans, the root being extensively used as a vegetable. The so-called Indian Beet (B. bengalensis, Roxb.) is an erect-branched species, cultivated by the natives on account of the leaves, which are eaten as a vegetable in stews, curries, &c.

Food.—The manufacture of sugar from the beet-root has, within recent years, become one of the most important industries of Europe. The white root is chiefly used for this purpose. In 1830 the extraction of beet sugar commenced in Germany and France, but it has now spread all over the Continent, and to Canada, the United States, and New
Beet Sugar.

Zealand. In fact, it is cultivated in most countries where the mean temperature is about 62° to 65° F. A moist hot atmosphere is unfavourable, hence of course India is precluded from ever becoming a beet-sugar-producing country. The plant grows freely enough in the cold season, but as a garden crop only. Mr. Duthie, in his annual report of the Saharanpur botanic gardens for 1884, says: "By constant selection of the darkest-coloured roots for seed-stock, it has improved so that the roots are now hardly distinguishable from those raised from the best imported seed." Few plants are more easily modified than beet by careful cultivation, but while, as Mr. Duthie says, it is possible to produce an acclimatized stock which will yield seed as good as that imported from Europe, the plant is not likely, however, to be cultivated in India as a field crop, either to feed cattle or as a source of sugar. The interest in beet-sugar, as far as India is concerned, consists entirely in the fact that it affects materially our cane-sugar industry, and must necessarily continue to do so. France, Austria, and Germany, in order to foster and develop the beet-sugar trade, instituted a protective system of giving bounties to home refiners, and at the same time heavy importation duties were levied upon all foreign sugars. This system naturally led to a vast extension of beet cultivation and of refining operations. Over-production soon caused ruinous reduction in prices of sugar, cane-sugar falling in the exact ratio with beet. This naturally resulted in the bankruptcy of numbers of beet-growers, and of some of the largest refiners, a financial crisis having occurred in Vienna in consequence of these failures. The area under beet may now undergo some contraction, and probably will do so, prices improving in consequence; but unless this actually takes place, a prolonged low price like what now prevails must prove disastrous to the cane-sugar industries of the East and West Indies. Already the beet-sugar trade has materially affected the cane-sugar of India, and the extension of cane-sugar cultivation in Fiji, Queensland, and other places is not calculated to lessen the danger.

In Mr. Giffen's report to the Board of Trade (London, 1884) will be found much interesting and valuable information which cannot be too carefully studied by our cane-sugar producers: "The total sugar crop of the world at the present time may be put, in round figures, at 6,000,000 tons. The known increase in 30 years has been very nearly half that amount." Mr. Giffen further writes: "As bearing on recent controversies, it may also be of interest to point out that, since the date of giving my evidence, British cane-sugar appears to have increased quite as much in proportion as beet-root sugar. In 1877-79, the production of British cane-sugar was 407,000 tons per annum, and its proportion to the total 12 per cent.; in the following three years the production was 410,000 tons per annum, and its proportion to the total was still 12 per cent. Possibly later figures may show a different result, but if there has been any change it must have been quite recent. For about 15 years it will be seen the proportion of British cane-sugar in the total production has been the same as it is now, viz., 12 per cent. The remarkable growth of beet-root sugar, in recent years, would thus seem to have been mainly in competition with foreign cane-sugar. Though the production of that sugar in amount has steadily increased, its proportion to the whole has fallen from 60 per cent. 20 years ago, to 40 per cent. at the present time; British cane-sugar, on the contrary, has not only increased in amount, but has increased so rapidly, for 15 years at least, as to maintain its former proportion to the total production." "The production of beet sugar being about 2,000,000 tons, the proportion of beet to cane in the sugar production of the world is thus about one third." (Report, Board of Trade, London, 1884.)
Properties and Uses—The interesting résumé of the present
Fibres. In the Amsterdam Consul, March 1882 the import duty was
475 
82 on the representative in the Leip-
grained, but apt to split; it has a smooth feel. The wood is very durable, a feature which had been 50 years in the making of sugar.
476 
It is used for cart, wagon and horse boxes, and more flourishing existence than it has ever had, as well as for other purposes. In Ceylon "the more it is cut into the better is the wood," must be attributed to other and whil

BERRYA Ammonilla, Linn.; Lamiaceae; (a) fermitating the expressed juice; (b) by steeping in hot heat; (c) by direct distillation of the roots. It is found on the mountains, where it is used for axles, the poles and beams of buildings. It was found to contain (p. 212) an interesting account of how it was used for distilling, and generally membranous. Fruit usually ellipsoid, thick-walled, dark brown. Fruit naked, indehiscent, red, ellipsoid, much

BERHELIA Hinn. 

Berthelotia lan 
The seeds have cooling and diaphoretic properties. Belchew

A Generally, leaves are applied to burns and bruises.


Black Birch, Linn.; PIPERACEAE.

Three leaves of the Barren Cockscomb, or the beech; the middle one bearing the sterile, the outer, fertile florets. Female flowers. 3 in the axil of each bract; bracts sessile, and generally membranous. Fruit red-capped, each with a small, thin, firm top. Fruit naked, indehiscent, red, ellipsoid, much


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The European or White Birch.

Properties and Uses—This tree is one of the most useful trees of Northern Europe. A piece of wood is quite soft, but it is valued for cartwrights, upholsterers, and turners. It is much used for firewood, and its charcoal is in high demand. The bark is impermeable to water, and very durable, being used only where the soil is kept below the soil, hence it is put to a variety of purposes, such as utensils, shoes, cards, boxes, snuff-boxes, and for preserving meat. A variety or distinct species, B. papyracea, is used

Properties and Uses—The interesting résumé of the present
Fibres. In the Amsterdam Consul, March 1882 the import duty was
475 
82 on the representative in the Leip-
grained, but apt to split; it has a smooth feel. The wood is very durable, a feature which had been 50 years in the making of sugar.
476 
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Hill Tribes eat the Birch Bark. 

BETULA acuminata.

The portable birch canoes of Canada; these are formed by binding together the root fibres of the white fir.

Birch bark contains an astringent principle used in tanning leather, and in the preparation of Russia leather. The cellular part of the bark contains starch, and thus forms a valuable source of food to the Kamchatkan. This sap is sugary before the leaves, and is considered an excellent antiscorbutic in winter, and both vinegar and beer are prepared from it. (Linn. and Deside's System of Botany.)

Birch bark is made to a small extent in Russia, where it is called Betula alba, L. It contains an abundance of tannic acid, and is esteemed on account of its peculiar odour, well known in the Russian leather. A purified oil of birch bark is sold by the Leipzig distillers. (Flück. and Hamb. Pharmacop., 623.)

The extraction of birch-bark oil is an industry of some importance in North Europe and Siberia, and is conducted in the following manner: An iron pot is filled up with bark, and covered with a close-fitting lid, through which is inserted an iron pipe. On this is inverted a smaller pot, and the rims are carefully fitted together and well luted with clay. The two are then turned upside down, so that the pot with the bark in it is uppermost. The apparatus is half sunk in the ground, well banked with a mixture of sand and clay, and a wood fire is kindled around it. When this distillation has continued long enough, the luting is removed, and the pots are separated, when the lower one is found to contain a thin oil floating on pyroglycerin acid, or, when the bark has been impure, on pitch. The yield of pure birch bark oil is about one third by weight of the white bark used. (Spence's Encyclop.) This property is apparently unknown to the natives of India.

Medicine.—In Europe and America, birch oil has been found useful as a local application in chronic eczema. "The young shoots and leaves secrete a resinous substance, having acid properties, which, combined with soda, is said to produce the effects of a tonic laxative. The inner bark, which is bitterish and astrigent, has been employed in intermittent fevers. "The leaves, which have a peculiar, aromatic, agreeable odour, and a bitter taste, have been employed, in the form of infusion, in gout, rheumatism, dropsy, and cutaneous diseases." (U. S. Dispens., 15th Ed., 1857.)


Habitat.—A large tree, met with in the Himâlaya, from 6,000 to 8,000 feet, in the Khâisa Hills, the mountains of Mánípur, and the Nagá Hills to Martaban.

Properties and Uses—

Fibre.—The bark when mature peels off in larger slabs than in any of the other species, and is therefore not so serviceable for the purposes to which the others are put.

Food.—On the mountain tracts of North-East Mánípur, bordering on the Nagá Hills, the Lahúpas cut off the bark in large slabs just before the leaves appear. The inner layer of these slabs is carefully separated from the liber and sun-dried. This is either eaten like biscuits, or it is reduced to flour and cooked as an article of food. The tree is much prized by these naked savages, and in early spring yields a considerable

Starch. 490
Sugar. 490
Tar. 491
Oil. 492
Resin. 493
Bark. 494
Leaves. 495

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portion of their diet. This remarkable fact does not appear to have been observed by any traveller, previous to my exploration in 1880 of the hill tracts of Mānipur, and apparently the nutritious properties of the bark have not been discovered by other Indian hill tribes. (See remarks under B. alba.)

Structure of the Wood.—White, moderately hard, close-grained. Weight 41 lbs. per cubic foot.

It is very little used, but Wallis says it is hard and esteemed in Nepal for all purposes where strength and durability are required. "The wood is close-grained and takes a fine satin polish. It is particularly good for door panels, and the examples in the Government House at Naini Tāl show that it is a valuable acquisition for ornamental work." (Atkinson's Hist. Dist. (X., N.-W. P. Gaz.), 81st.)


**The Indian Birch Tree; Indian Paper Birch.**

**Syn.**—B. jacquemontii, Spach.

**Vern.**—Bhājpattra or bhūjpatar, Hind.; Bārij, buraal, bhāj, phara, Pa.; Shāk or shāg, Pāl, phulāk, takā, Lādak, La houl, Pāl, Kāmanā; Tākā, Bhutia; Phuṣpat, Nepal, Tuz, Bhote; Bārijpatra, bhājpatra, Bomb.; Bārij patra, Cutch; Bhōjpatra, Gujar.; Bhārij pūla, Sans.; Bhājpatra cheta, Tel.

**Habitat.**—A moderate-sized, deciduous tree, found in the higher ranges of the Himālaya, forming the upper edge of arborescent vegetation, and ascending to 14,000 feet.

**Properties and Uses—**

Fibre.—The bark is used as a substitute for paper by some of the hill tribes, and supposed by them to be more durable than paper. It is brought down to the plains and largely used in the manufacture of hookah tubes. The young branches are plaited into twig bridges. "The bark is well known as the material upon which the ancient Sanskrit manuscripts of Northern India are written. Dr. Buhler, in his account of a tour in Kasmīr in search of Sanskrit manuscripts, says: 'The Bhūrij MSS. are written on specially prepared thin sheets of the inner bark of the Himālayan birch, and invariably in Sārdā characters. The lines run always parallel to the narrow side of the leaf, and the MSS. present therefore the appearance of European books, not Indian MSS., which owe their form to an imitation of the Talapattras. The Himālaya seems to contain an inexhaustible supply of birch-bark, which in Kasmīr and other hill countries is used both instead of paper by the shopkeepers in the bazaars, and for lining the roofs of houses, in order to make them watertight. It is also exported to India, where, in many places, it is likewise used for wrapping up parcels, and plays an important part in the manufacture of the flexible pipe-stems used by hookah-smokers. To give an idea of the quantities which are brought into Srinagar, I may mention that on one single day I counted fourteen large barges with birch-bark on the river, and that I have never moved about without seeing some boats laden with it. None of the boats carried, I should say, less than three or four tons weight."

"The use of the birch-bark for literary purposes is attested by the earliest classical Sanskrit writers. Kalidāsa mentions it in his dramas and epics; Sūsruta, Varahamihira (circa 500-550 A.D.), know it likewise. Akbar introduced the manufacture of paper, and thus created an industry for which Kashmir is now famous in India. From that time the use of birch-bark for the purpose of writing was discontinued, and
**Products of India.**

The Abor Vite.

The method of preparing it has been lost. The preparation of the ink which was used for Bhurja MSS. is known. It was made by converting almonds into charcoal and boiling the coal thus obtained with gomátra (Urina bonth); this ink is not affected by damp or water. (Journal, (Bombay Branch), Royal Asiatic Society, Vol. XII., No. XXXIV.A.)

(Des. Dymock, Mat. Med., W. Ind., 602.)

"The bark peels off in large sheets, and is used for umbrellas, for writing upon, and for the flexible tubes of hookahs. Every consignment of the ornamental paper-mâché ware of Kashmir reaches the Panjâb packed in wrappers of birch-bark. The houses of Kashmir are often wrapped with it." (Baden Powell, Panjâb Products, I., p. 569.) "The bark is used for chatta or rude umbrellas, and for covering tubes of hookah, or native smoking-pipes, and being of a sacred character it is burnt on the funeral pile. Hindi pilgrims visiting the shrine of Amarnath in Kashmir divest themselves of their ordinary clothes before entering the shrine, covering their bodies with the bhojpatra. It is now brought to the plains for lining the tubes of hookahs, and the leaves or bark are used to cover the baskets of Ganges water sold by itinerant pilgrims." (Balfour's Cyclop.)

**Medicine.—**The bark of the black birch is valuable for its aromatic and antiseptic properties. (Murray.)

**Special Opinions.**—"The decoction of the bark is used as a wash in otorrhoea and poisoned wounds." (U. C. Dutt, Civil Medical Officer, Sersampore.) "The infusion of the bark is used as a carminative; it is prescribed also in hysteria." (Surgeon W. Barren, Bhuj, Cutch.) "Much used to write medicinal charms upon." (Surgeon-Major W. Dymock, Bombay.)

**Fodder.**—The leaves are lopped off for cattle fodder.

**Structure of the Wood.**—White with a pinkish tinge, tough, even-grained, moderately hard. Weight about 44 lbs. per cubic foot. It is extensively used in the inner arid Himalaya for building; it is elastic, seasons well, and does not warp.

"Wood good: used for cups, common turnery, and for fuel by travellers in the higher ranges." (Baden Powell, Panjâb Products, p. 569.)

**Betula cylindrostachys,** Wall.

**Vern.**—Shaunl, Kumaon; Sauer, Nepal; Sungll, Lepcha.

**Habitat.**—A tall, deciduous tree, met with in Kumaon, Nepal, Darjiling Hills, from the Terai, up to 6,000 feet.

**Structure of the Wood.**—Red, hard, heavy, strong, and seasons well. Weight 52 lbs. per cubic foot.

Seldom used except for firewood and charcoal, for which purposes it is very good. Experiments made by Mr. Whitty with several kinds of wood fuel for the Darjiling-Himalayan Railway showed that this was the best for locomotive purposes.

**Bhang,** see Cannabis sativa, Linn.; Urticaceae.

**Bile of certain animals,** see Fel.

**BIOTA, Endl.; Gen. Pl., III., 427.**

This genus has, by the Genera Plantarum, been reduced to Thuya, Linn., which sec.

**Biota orientalis, Endl.; Coniferae.**

**The Abor Vite.**

**Syn.—Thuya orientalis, Linn.**

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### Bixa Orellana

**Birch, Indian**, see Betula Bhojpattra, Wall.

**Birch oil**, see Betula alba, L.

#### BISCHOFIA

A genus of Euphorbiaceae, containing only one species, a large, glabrous tree with trifoliate leaves and caducous stipules. Flowers discraceous or monocious, in axillary panicles. **Calyx** of 5-valvate segments, those of the male flowers concave, enclosing the stamens at first, afterwards reflexed; **those of the female flowers lanceolate, petals none. Stamens 5, opposite the segments, and inserted round a raised circular central body (the rudimentary ovary), filaments very short. **Ovary 3-celled, 2 ovules in each cell; style linear, entire. Fruit a globose drupe, enclosing 3 indehiscent, 1-seeded cocci.** *(Brandis, For. Fl., 445.)*

The genus is named after Dr. A. Bischof.

#### Bischofia javanica, Bl.; Brandis, For. Fl., 446.

**Syn.**—Andraschne trifoliate, Roth, Fl. Ind., Ed. C.B.C., 1793.


**Bokh, Bomb.; Thonki, Tam.; Gavarnello, Hassan; Mada-verri, Tinnevelly; Vagin (?), Burm.**

**Habitat.**—A deciduous tree met with in Kumaoon, Garwhal, Oudh Gorakhpuras, Bengal, South India, and Burma.

**Timber.**

**Structure of the Wood.**—Red, rough, moderately hard, with a uniseriate, darker-coloured heartwood. Weight 474 lbs. per cubic foot.

In Assam it is esteemed one of the best timbers and used for bridge and other works of construction. Beddome says it is used by planters the Nilgiris for building, and is sometimes called *Red Cedar.*

**Bitch or Bish**, see Aconitum ferox and A. Napelius, Wall.; Rantham Lace.

**Bitter-sweet**, see Solanum ducanum, Linn.; Solanaceae.

#### Bixa, Linn.; Gen. Fl., III., 125.

A genus of Bixineae, containing one or at most only two species, larger spreading bushes.

**Leaves simple; stipules minute. Flowers in terminal panicles, 2-sexual. Sepals 5, imbricate, deciduous. Petals 5, contorted in bud, Antlers opening by 2 terminal pores. **Ovary 1-celled; style slender, curved, stigma notched; ovules many, on 2 parietal placentas. **Capsule loculicidally 2-valved, placentas on the valves. Seeds many, funicle thick, testa pulpy; albumen foamy; embryo large, cotyledons flat.**

The generic name is supposed to be derived from the vernacular name given to the plant by the Indians of the Isthmus of Darien.

#### Bixa Orellana, Linn.; Fl. Br. Ind., I., 190.

**The Arnatto or Annatto Dye; Rocco (derived from Urucum, the Brazilian name), Fr.**

**Vern.**—Lathan, latkhan, matkana, Hind., Beng.; Kung kuwmbi, Sartu, Taran, jaladhar, Ass.; Gubhas, Uriya; Pomas, Chittagong.


**Habitat.**—A graceful shrub, with handsome white or pinkish flow.
The Arnatto Dye.

and echinate red capsules; originally a native of America, now largely cultivated in India for the red or orange dye obtained from the pulp which surrounds the seed. Found in Pegu and Tenasserim. "Cultivated and escaped." (Br. Burm. Gaz., I, 176.) Extensively cultivated by the better class of ryots in Raipur, Central Provinces.

Botanic Diagnosis.—Two forms of this plant are equally plentiful in India, the one with white flowers and greenish capsules, and the other with pink flowers and red capsules. These cannot be regarded botanically as varieties, but they are recognisable, and, curiously enough, the natives of India regard the former as indigenous, while they readily admit that the latter is an introduction. Roxburgh even seems to have regarded the white-flowered form as indigenous, but modern botanists do not support this view. Dr. Buchanan Hamilton, a contemporary of Roxburgh's, published, in 1833, the following interesting account, from which it would appear Dr. Buchanan regarded the Arnatto as a recent introduction: "The Bixa, an American plant, is now rapidly spreading over Bengal, the inhabitants having found it a useful yellow dye, which they employ to give their cloths a temporary colour in the Dolyatra or festival of Krishna. With this also they colour the water, which, on the same occasion, they throw at each other with squirts. For these purposes it is well qualified, as the colour easily washes out, and the infusion has a pleasant smell. (Compare with facts given under Abir.) By them it is called Lohan, and they say that before it grew commonly in the country, the dry fruit was brought from Patna. Probably some other fruit was then brought, and its use has been superseded by that of the Bixa, to which the natives have given the old name, as there can be no doubt of its being an American plant, and its fruit could scarcely have been brought here from the West Indies. In many parts it is called European Turmeric." (Buchanan's Statistics of Dinaipur, p. 155.)

There seems no doubt whatever that both forms of the plant were originally introduced from America, the white-flowered form having in all probability been longer in India. While plentiful everywhere around gardens and villages, it has nowhere gone wild, and is thus scarcely naturalised in India. It was used as a source of war paint in the West India Islands and Brazil before the discovery of America.

Properties and Uses—

Dye.—The pulp gives a beautiful flesh colour, largely used in dyeing silks. It is altered by certain combinations into orange, deep orange, or red, the brighter orange and red colours being obtained in combination with red powder of Mollusus philippensis. The dye is exported to Europe mainly from the West Indies, and is used chiefly to colour cheese and other edible articles, such as chocolate, &c. Mr. Lisboa says that milkmen sometimes use it to colour buffalo's milk so as to pass it off as cow's milk. (Useful Plants of Bombay.)

Preparation of the Dye.—It may be extracted from the seeds direct, or the pulpy matter may by boiling be separated from the seeds and made into cakes like those of lac or indigo. In this form it is generally sold in Europe. "The mode in which it is obtained is by pouring hot water over the pulp and seeds, and leaving them to macerate and then separating them by pounding with a wooden pestle. The seeds are removed by straining the mass through a sieve, and the pulp being allowed to settle, the water is gently poured off, and the pulp put into shallow vessels, in which it is gradually dried in the shade. After acquiring a proper consistence it is made into cylindrical rolls or balls, and placed in an airy place to dry, after which it is sent to market. It used to be most common in this form of small rolls, each 2 or 3 ozs. in weight, hard, dry, and compact; brownish without and red within. The other process..."
Dictionary of the Economic

Bixa Orellana.

The Arnatto Dye.

of manufacture is that pursued in Cayenne. The pulp and seeds together
are bruised in wooden vessels, and hot water poured over them; they are
then left to soak for several days, and afterwards passed through a close
sieve to separate the seeds. The matter is then left to ferment for about a
week, when the water is gently poured off, and the solid part left to dry
in the shade. When it has acquired the consistency of solid paste, it is
formed into cakes of 3 or 4 lbs. weight, which are wrapped in the leaves
of the banana and known in commerce as flag Arnatto. This variety is
of a bright yellow colour, rather soft to the touch, and of considerable
solidity."

"Labat informs us that the Indians prepare an Arnatto greatly superior
to that which is brought to us, of a bright shining red colour, almost
equal to carmine. For this purpose, instead of steeping and fermenting
the seeds in water, they rub them with the hands, previously dipped in oil,
till the pulp comes off and is reduced to a clear paste, which is scraped
off from the hands with a knife, and laid on a clean leaf in the shade to
dry. Mixed with lemon-juice and gum, it makes the crimson paint with
which Indians adorn their bodies." (Tropical Agriculture by Simonds,
p. 586-89.)

European Processes.—Regarding the extraction of the dye, Ure
writes: "Leblond proposed simply to wash the seeds of the Bixa till
they are entirely deprived of their colour, which lies wholly on their surface;
to precipitate the colour by means of vinegar or lemon-juice, and to boil
it up in the ordinary manner, or to drain it in bags as is practised with
indigo. The experiments which Vanquelin made on the seeds of the
Bixa, imported by Leblond, confirmed the efficacy of the process which he
proposed; and the dyers ascertained that the Arnatto obtained in this
manner was worth at least four times more than that of commerce; that,
moreover, it was more easily employed; that it required less solvent; that
it gives less trouble in the copper, and furnishes a purer colour.

"Arnatto dissolves better and more readily in alcohol than in water
when it is introduced into the yellow varnishes for communicating an
orange tint."

Chemical Reactions.—"The decoction of Arnatto in water has a
strong peculiar odour and a disagreeable taste. Its colour is yellowish
red, and it remains a little turbid. An alkaline solution renders it orange-
yellow clearer and more agreeable, while a small quantity of a which
substance is separated from it, which remains suspended in the liquid.
If Arnatto be boiled in water along with an alkali, it dissolves much better
than when alone, and the liquid has an orange hue." "The acids form
with this liquor an orange-coloured precipitate, soluble in alkalis, which
communicate to it a deep orange colour. The supernatant liquor retains
only a pale-yellow hue." (Ure's Dictionary.)

Special Opinion.—§ "The pulpary part of the seed forms the arnatto
of commerce. It is imported into England from Mexico, Brazil, &c., in two
forms—in masses of 5 to 20 lbs., and as a homogeneous paste in casks of
4 to 5 cwt. The paste has the consistence of butter, and the odour of
urine, which, it is stated, is added to keep it moist and improve the colour.
At Cayenne, where the dye is largely manufactured, the ripe fruit is
crushed and allowed to remain in water for several weeks. The maturer
is then strained through coarse cloth; on the liquor standing, the colour-
ing matter gradually settles. This is then collected and evaporated until
it is of a pasty consistence. Improvements have been introduced in the
manufacture, and the seeds, instead of being crushed, are washed with
water and fermentation stopped by some re-agent. The colouring matter
yielded by this method is in a fine state of division, and is known as
Bixin. It is made into tablets. The colouring matter of arnatto is

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### The Blumea

1 to consist of two colouring principles, *orellin*, which is yellow, le in water, and which gives a yellow colour to cloth when mordanted *bixin*, which when pure forms a cinnabar-red powder, insoluble ter, but easily dissolved by alkaline solutions. Arnatto is employed to a limited extent in dye-works, but it is often used to colour var-, cheese, butter, &c."

**ORDANTS AND AUXILIARIES:** The mordant used with arnatto is frequently crude pearl-ash; the alkali facilitates its solution, but quantity of alkali used must be regulated according to the depth lour required. The colour is, however, fleeting; it is chiefly used lk, and seldom or never for woolen fabrics. After dyeing the silk arnatto the colour may be deepened or reddened by means of vine-, lemon-juice. The Manipuris are said to use the fruit of *Blumea pedunculata* for this purpose, a fruit which it is reported has at same time the power of fixing the colour. This statement requires matiion, since the dye is generally regarded as fleeting. The s of *Symplacos grandiflora* are used in Assam as a mordant with this *G. Mann, Esq.*). The yellow tendency of the colour, produced through is may be reduced on the addition of acids, the more natural red ; produced, and restored again by further treatment with alkalis. tto is entirely insoluble in acids, the colouring matter being precipit- ; hence the necessity of using an alkali as the solvent as a first stage p process of dyeing. **Dr. McCann** says: "The bark of this plant d in Kuch Behar as a mordant in dyeing with Morinda."

**ibre.**—Bark yields a good cordage. *(Dymock.)* This is said to be in the West Indies.

**Medicine.**—Astringent and slightly purgative, also a good remedy ysentery and kidney diseases. The pulp (a well-known colouri- cr) surrounding the seeds is astringent. *(Roxburgh.)* The seeds are al, astringent, and febrifuge. *(Lindl.)*

**Tructure of the Wood.**—Wood pinkish-white, soft, even-grained. he friction of two pieces of this wood is said to readily produce for this purpose it is used by the West Indians.

**wood, Indian, or Jarul,** see Lagerstræmia Flos-Reginae, Rel. ; ETRACEAE.

### BLUMEA, DC. Gen. Pl. II. 289.

A genus of annual or perennial, woody or subshrub herbs, belonging to COMPOSITE. This may be regarded as the Groundels of India; they are separable from Laggera by the tailed anther-cells. **Leaves** alternate, usually toothed or lobed. **Heads** corymbose panicked or cleft, rarely racemose, heterogamous, disciform, purple-rose or yellow, r flowers many-seriate, female fertile, filiform, 2-3 toothed; disk flowers naphrodite, few fertile, tubular and slender, limb 5-toothed. **Involucres** ovoid ampullate; bracts many-seriate, narrow, acute, soft or herbaceous, outer fleshy; receptacle flat, naked. **Anther bases** sagittate, tails small, slender. **Arms of hermaphrodite flowers** flattened or almost filiform, rarely conuate the adjoining anthers. **Achenes** small, suberect or angled, ribbed or pappus i-seriate, slender, often caducous.

This genus contains about 60 species, natives of tropical and sub-tropical Asia, Africa, and Australia. It is named in honour of the dis-, Dr. Blume, who, in 1828, published a Flora *sava*. **Dr. Dymock** says that in Bombay the vernacular name *uburda* is applied to all Blumeas,

**aurita, DC.,** see Laggera aurita, *Schulte-Bip.*; COMPOSITE.
Blumea balsamifera, DC.; Fl. Br. Ind., Ill., 270.

Syn.—Conya balsamifera, Linn.

Vern.—Kakorond, Hind.; Kalahid, Guj.; Bhamaruda, Mar.; Penma their, Burm.

Habitat.—A sub-bushy plant, met with on the tropical Himalaya, from Nepal to Sikkim, altitude 1,000 to 4,000 feet, extending to Assam, Khúsia Hills, Chittagong, Burma, and the Straits.

Botanic Diagnosis.—A tomentose or villous woolly plant, stem tall, corymbosely branched above, leaves 4-8 inches, coriaceous elliptic or oblanceolate, usually silky above, serrate, sometimes pinnatifid, narrowed into a usually auricled short petiole; heads ½-1 inch, sessile or pedunculated in rounded clusters on the stout branches of a large spreading or pyramidal panicle; involucre bracts tomentose, receptacle glabrous; achenes 10-ribbed, silky; pappus red.

This belongs to the fifth section of the genus which is characterized by having numerous heads, large or small, forming narrow or broad terminal branched corymbs or panicles. Shrubs or small trees with large leaves.

Medicine.—The whole plant smells strongly of camphor, which may, indeed, be prepared from it. A warm infusion acts as a pleasant sudorific, and it is a useful expectorant in decoction.

B. densiflora, DC.; Fl. Br. Ind., Ill., 269.

The Ngai Camphor.

Syn.—B. grandis, DC.

Vern.—Pung-ma-theing, phém-masin, Burm.

Habitat.—Found in the tropical Himalaya, from Sikkim to Assam, Mishmi, the Nagá Hills, and the Khásia Mountains; also met with in the Tenasserim province of Burma.

Botanic Diagnosis.—Stem stout, panicle and leaves beneath densely tomentose or clothed with thick white felted wool, leaves 8-15 inches, broadly elliptic or elliptic-lanceolate, narrowed into a long-winged, sometimes appendaged petiole, puberulous above, serrate-toothed or pinnatifid, heads ½ inch diameter. Sessile, in rounded clusters on a large branched panicle; involucre-bracts narrow, rather rigid, receptacle narrow glabrous; corolla-lobes of hermaphrodite flowers hairy; achenes 10-ribbed, pubescent; pappus red.

This belongs to the same section as the preceding species.

Properties and Uses—

Camphor.—A few years ago Mr. E. O’Riley prepared Camphor from this plant, which was pronounced identical with that imported from China. For further particulars see Camphor.

B. eriantha, DC.; Fl. Br. Ind., Ill., 266.

Botanic Diagnosis.—Pubescent or tomentose or clothed with scattered long hairs, rarely silky-villous, stems 1 foot, slender, dichotomyously branched from the base; leaves 1-3 inches, acutely and irregularly toothed, lower petioled obvate obtuse, upper sessile, obvate or oblong acute, head small, ½-1 inch, mostly on the long slender peduncles of dichotomous cymes, rarely fascicled; peduncles and involucre clothed with long silky hairs, receptacle glabrous; achenes very minute, angles obtuse, sparingly silky.

This belongs to the fourth section of the genus or Blumeas with few heads, rarely many, ½-1 inch, usually pedunculated and forming loose axillary and terminal corymbs often clustered. Pappus white.

Properties and Uses—

Medicine.—A specimen of what appears to be an extreme form of this species (or a new and undescribed species) was forwarded to me for

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identification by Dr. Dymock of Bombay. It is an erect plant with curious tufts of woolly hairs at the bottom of the stem. It appears that in Bombay the plant is used as a febrifuge or insect powder (see B. laceræ).

**Blumea laceræ, DC. ; Fl. Br. Ind., III., 263.**

**Ver.**—Kakrondà, kukurbandó, jangli-máli, Hind.; Kukurswág, bur- 
saúng, Beng.; Nimárdâ, Bomb.; Jangli-kán, jangli-máli, divari-
mull, Durr.; Narah-karandâi, kati-mullángí, Tám.; Kàru-pgyāk, 
adví-mulangi, Tel.; Kukuradru, Sáns.; Kamúftás, Arab.; Mai-
yagó, Búrm. Kakrondâ and other vernacular names are applied to more 
than one allied species of *Blumea* and *Laggeà* without much regard to 
the colour of their flowers. (Modern Sheriff.)

**Habitat.**—A common weed throughout the plains of India, from the 
North-West (ascending to 2,000 feet in the Himalaya) to Travancore, 
Singapore, and Ceylon.

**Botanic Diagnosis.**—This species is placed by the *Flora of British 
India* in the second section or species with many villous heads, ⅔ in. in 
diameter, the heads being more or less clustered and forming dense oblong 
spikes or contracted panicles at the top of the stem, only exceptionally 
arranged in loose open corymbs. It smells strongly of turpentine, a 
character which, when taken along with the glabrous receptacle and 
yellow flowers, readily separates it from its nearest allies.

Stem erect, simple or branched, very leafy; leaves petioled, obovate-
toothed or serrate, rarely lobulate; heads ⅓ in., in short axillary 
cymes and collected into terminal spiciform panicles, rarely corymbose; involucres 
bracts narrow, acuminate, hairy; receptacle glabrous; corolla yellow; 
lobes of the hermaphrodite flowers nearly glabrous; achenes sub-4-gonous, 
not ribbed, glabrate.

The above diagnostic characters have been reproduced from the 
*Flora of British India*, in the hope that they may enable economic botanists 
to remove the ambiguity which still rests on the species of *Blumea* 
used for medicinal purposes. The yellow flowers of this species should at 
one remove it from *Laggeà aurita*, with which it has been confused. 
Dymock says of the Bombay drug: "I am inclined to identify kakrondà 
with *B. lacerà*." This opinion is supported by the fact that the author of the 
*Makhan* describes the flowers of kakrondà as yellow. **Moodeen 
Sheriff** refers kakrondà to *Blumea* (Laggeà) aurita, a plant with pink 
flowers. Through the kindness of Dr. Dymock, however, I had the 
pleasure of examining a specimen of the plant which he viewed as 
*B. lacerà*, and regarding which he contributed a note to the *Pharma-
ceuatical Journal*, June 7th, 1884. Along with my friend Mr. C. B. Clarke 
I have carefully examined this Bombay plant, and it appears to be a 
new species of Blumea not yet described, or an extreme form of *B. eriantha, 
DC.* It is certainly not *B. lacerà*, DC., and accordingly the vernacular 
names and economic information, as far as Bombay is concerned, should 
be removed from this position. It does not follow, however, that the kak-
rondà of Madras or of other parts of India is the same as in Bombay, 
and accordingly it has been deemed advisable to retain, for the present, 
the economic information in this position.

**Medicine.**—Kakrondà is used as a febrifuge, and also to stop bleeding, 
being regarded as deobstruent and stimulant. Mixed with black pepper 
it is given in cholera. An astringent eye-wash is made from the leaves.

*B. lacerà* is a perennial plant, with obovate, deeply serrated leaves 
and yellow groundsel-like flowers, the whole plant being thickly clothed 
with long silky hairs. The natives of the Konkan, near Bombay, call it 
Nimárdâ, and make use of it to drive away fleas and other insects.

150 lbs. of the fresh herb in flower was submitted to distillation in the 
usual manner with water, and yielded about 2 ounces of a light-yellow
essential oil, having a specific gravity of 0'9144 at 80° F., and an extraordinary rotating power, 100 mm. turning the ray 66° to the left. Mr. D. S. Kemp, who made the observation, checked it by examining a 10 per cent. solution in alcohol, which gave 66°.

"This Blumea is of interest as the possible source of an insect powder. I am forwarding a supply of the plant and a specimen of the oil to Mr. Holmes for experiment and also for identification, as the genus is a difficult one." (Dymock in Pharm. Jour., June 7th, 1884.)

Special Opinions.—§ "The expressed juice of the leaves is a useful anthelmintic, especially in cases of thread-worm, either taken internally or used locally." (Surgeon F. Anderson, M.B., Bijnor.) "Used by many Hospital Assistants and highly thought of by them as a febrifuge and astringent." "Is an invaluable remedy in Tinea tarsi. The juice of the fresh leaves is used as Kajole after removing the scales from the roots of the eyelashes. (Asst. Surgeon Bolly Chaud Srin, Campbell Medical School, Sealdah, Calcutta.)" "The fresh root held in the mouth is said to relieve dryness." (U. C. Dutt, Civil Medical Officer, Scaramure.)

**BOAT- AND SHIP-BUILDING**—Woods used for. A further list of woods of this nature, see Canors.

- Acacia arabica.
- Albizia Lebbek (in South India for boats).
- Alseodaphne, sp.
- Amoora Rohitaka and spectabilis.
- Anacardium occidentale.
- Anogeissus latifolia (ships).
- Artocarpus hirsuta (ships).
- Barringtonia acutangula.
- Bassia latifolia (country vessels)
- B. longifolia (ships' keels).
- Bellschmieda Roxburghii (boats).
- Berria Ammonilla (used in Madras for masula boats).
- Calophyllum inophyllum (masts, spars).
- C. polyanthum (masts, spars, boats).
- C. spectabile (masts, spars).
- Capparis aphylla (knees of boats).
- Carapa macrocarpa (native boats).
- Cassia siamea.
- Celtis australis (oars).
- Ceriops Candolleana (knees of boats).
- Cinnaomonum glanduliferum (boat-building).
- Cordia Myxa (boat-building).
- Dalbergia Sissoo (boats).
- Dillenia indica.
- D. pentaphyga (ships).
- Dolichandrone stipulata (oars and paddles).
- Drimycarpus racemosus (boats).
- Dyssochymum Hamiltoni (boats).
- Eriolana Candollei (paddles).
- Eucalyptus Globulus (ships).
- Fagraea fragrans (boats, anchors).
- Fraxinus floribunda (oars).
- Gmelina arborea (boats).
- Grewia oppositifolia (oar shafts).
- G. tiliifolia (masts, oars).
- Heritiera littoralis (boats).
- Hibiscus tiliaceus (light boats).
- Hopea, sp. (boat hulls).
- Kydia calycina (oars).
- Lagerstroemia Flos-Reginae (shipbuilding, boats).
- L. microcarpa (ships).
- Melanorrhoea ustata (anchor stocks).
- Melia Azadirachta (ships).
- Milicia velutina (oars).
- Morus cuspidata (boat oars).
- Nectandra Rodiae (ships).
- Pentace burmanica (boats).
- Pinus longifolia (bottoms of boats).
- P. Merkusii (mast pieces).
- Podocarpus bracteata (oars, masts).
- P. latifolia.
- Polyalthia cerasoides (boats).
- Populus euphratica (boats).
- Pterocarpus Marsupium (boats).
- Salvadora oleoides (knee timbers of boats).
- Sandoricum indicum (boats).
- Shorea robusta.
- S. stellata (boats).
- Swietenia Mahagony (ships).
- Swintonia Schwengkii (boats).
- Tectona grandis (ships).
- Terminalia tomentosa (boats).
- Thespesia populnea (boats).
- Vateria indica (masts of native vessels).
- Xylica delabriformis (boats).
The Urticaceae.

BÆHMERIEÆ.

An important tribe of fibre-yielding plants belonging to the Natural Order Urticaceæ, in the sub-order Urticææ. To enable the reader to understand the position of the Bæhmerieæ, in the following pages will be found a brief account of the properties and uses of the Urticææ as a whole and an analysis of the genera, followed by a more detailed account of the Bæhmerieæ and of the genus Bæhmera itself.

Affinities of the Urticaceæ.

These may be popularly defined as the Nettle family. They have of course their closest affinities to the other sub-orders of the Urticææ, but, as pointed out by Weddell, they may also be viewed as having many affinities to the Tiliaceæ, just as Euphorbiaceæ may be regarded as approaching the structural peculiarities of Malvacææ. To the general observer the coarsely serrate, hairy and opposite leaves of Urticææ suggest a strong external resemblance to many Labiatae. The affinity to Tiliaceæ is, however, more than in mere external appearance, since Urticaceæ and Tiliaceæ may be viewed as affording the great majority of our bast or fibre fibres such as Flax, Rhea, Jute, &c. This indicates a structural agreement which is fully illustrated by many other characters, such as the form, veination, and corrugation of the leaves, the stipules, definite inflorescence, valvate aestivation, 2-lobed anthers, and smooth pollen. Of the Urticaceæ the sub-order Urticææ bear out this resemblance in the most marked degree.

Habitat of the Urticaceæ.

The Urticaceæ are chiefly tropical as far as the distribution of genera is concerned. Europe is poorest in species, and so in India are the temperate altitudes of the Himalaya. But what is lost in the number of genera is compensated for by the great prevalence of individuals. Urticææ and Paritaria follow closely the haunts of man in the temperate regions, and in these situations cover relatively as much space as do the more numerous forms which inhabit the tropical and extra-tropical regions.

Economic uses of the Urticaceæ.

But for the valuable fibres obtained from Urticææ the properties of the whole sub-order might be described as unimportant. The stinging hairs have been used as counter-irritants. There is little to justify the belief in the virtues of the calcareous salts contained in many nettles or of the nitrate of potash in the pellitories. The young twigs of certain species of Urtica, Pouzolzia, Debregasia, and Elatostema are eaten as pot-herbs to a small extent, as are also the tubers of Pouzolzia tuberosa. From an industrial point of view, however, the liber fibres are exceedingly valuable. The various species of Bæhmeria, but more particularly B. nivæa, yield the rhea fibre of commerce—a fibre which we are accustomed to hear requires only the aid of some contrivance by which it can be conveniently and cheaply separated from the bark and deprived of its gummy substance, to become one of the most valuable textile fibres in the world. Next in importance may be mentioned the fibres from the species of Vildebruna, the Bon rhea of Assam; after these Maouta, the Fossa fibre; the fibres derived from the species of Girardinia or Nilgiri Nettles, and those from Urtica, the true Nettles. All these and probably many others are deserving of an extended investigation, for there seems every likelihood that sooner or later one or more of them will meet the demand for new textile fibres. For cordage there are several deserving of the most careful examination such as the fibres of Debregasia, Elatostema, B. nivæa.
The classification of the members of the Urticaceae depends upon variations in the following characters:

The **Stem** may be herbaceous, erect or creeping, or it may be subfruticose or woody and even arborescent.

The **Leaves** may be opposite or alternate, symmetrical or unsymmetrical at the base, equal or unequal, one being either very much smaller or even abortive, producing, in originally opposite leaves, an apparently alternate condition. They may be pinninerved, 3-costate (i.e., 3-nerved from the base), 3-plicostate (i.e., two lateral nerves springing from the midrib so as to make the leaf appear 3-costate), or they may be 5-costate. The **margin** may be entire or variously toothed or incised. The **surface** may be glabrous or hairy, and the hairs may be stinging or not; it may be smooth, pubescent (i.e., corrugated or crumpled), or rough from the presence of variously shaped crystals. The **leaves** are stipulate (except in some Parastariae, where the stipules are rudimentary or abortive); the stipules may be free, one on either side of the petiole or interpetiolar (united into one between the petioles of opposite leaves) or intrapetiolar (i.e., axillary), free or united into an entire or more or less bifid ligulate body; the stipules may also be caducous or persistent.

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The **Inflorescence** may be described as definite axillary cymes, solitary or grouped in the axils, simple or ramified, composed of simple or compound racemes or spikes or compressed into capitula, symmetrical or unilateral. The axis or receptacle may accordingly be elongated, filiform or flattened, or concave, resembling the receptacle of the fig.

The **Flowers** are declinous (i.e., unisexual, and therefore either monocious (on one plant) or dioecious (male flowers on one individual and female on another)), or they may be polygamous (i.e., declinose and hermaphrodite flowers on the same individual plant). The flowers may be sessile and grouped together, forming glomeruli or pedunculate, the peduncle or pedicel having often one or two joints, especially in the male flowers. The inflorescence may be naked or bracteate, the bracts being either small or large and foliaceous, free or connate, often forming an involucre in the capitulate forms. The sepals are generally regular in the male flowers, 5-4-3- or even 2- or 1-merous, free or more or less connate, valvate or imbricate. In the female flowers they are less regular and generally fewer in number and more frequently connate, even when they are free in the male flowers.

The **Stamens** are generally of the same number as the sepals of the male flowers, opposite and often unclosing elastically: in the female flowers they are occasionally represented by hypogynous staminodes or abortive stamens. When the perianth is adnate to the ovary a sort of perigynous condition is produced, but the ovary is not, strictly speaking, inferior, since the union of the perianth tube to it is only partial and easily separable.

The **Pistil** is rudimentary in the male flowers, but the shape and form or hairiness of this rudiment is often of importance. In the females it varies considerably: it is flat, smooth, glabrous, or granulated; it is free from the perianth or united to it, the persistent perianth tube often becoming succulent and causing the achene to appear like a drupe. The style may arise from the apex or not; it may be short or long, elongated or filiform or capitate, and papillose or hairy.

**ANALYSIS OF THE INDIAN GENERA OF URTICEÆ.**

**Tribe I. Ureæse.**—Herbs, under-shrubs, rarely trees, with stinging hairs, and opposite, decussate, or alternate spiral leaves. Flowers in cymes; male perianth 4-5-merous, rarely 2-3-merous; ovary rudimentary; female perianth 2-5-lobed or parite, free from the ovary.

* **Achene erect; leaves opposite, stipules lateral, free or united and interpetiolar.**

1. **Urtica.**—Male perianth 4-merous, exterior segments small, Stigma papillose-capitate.

2. **achene oblique; leaves alternate; stipules intrapetiolar (axillary), very frequently united.**

2. **Fleurya.**—Annual herbs. Flowers glomerulate, forming racemose spikes or panicles. Female perianth of 4 segments, equal or unequal, one large, hooded, and furnished with a stinging hair. Stigma ovate or linear.

3. **Laportea.**—Under-shrubs or trees or perennial herbs. Flowers glomerulate panicked, rarely racemes. Female perianth 4-lobed, equal or unequal, persisting, almost unchanged around the fruit, reflexed. **Stigma** filiform.

4. **Girardinia.**—Erect herbs or almost under-shrubs. Flowers in glomerulate spikes or sub-paniculate spikes; when fruiting coveredwith

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BOEMERIEÆ. The Urticeæ.

long stinging hairs. Female perianth ovoid-tubular, bifid, the upper lip 2-3 dentate, the lower almost abortive. Stigma subulate.

** Tribe II. Procrideæ. **— Herbs, rarely woody below, unarmed (or, hairs not stinging); leaves opposite or by abortion alternate and often distichous. Flowers forming capitate cymes or arranged upon a discoid receptacle; male perianth 4-5-merous, rarely 2-3-merous; ovary rudimentary; female perianth 3-5-partite, free from the ovary. Staminodes sometimes present.

* Leaves opposite, one unequal or imperfect.

5. Filea.—Under-shrubs or herbs, erect or prostrate. Flowers forming cymose-capitula or lax racemes. Female perianth 2-partite, one large, hooded, glandular or scaly, staminodes often at the base of the sepals; achene included with the succulent calyx or exerted. Stigma short, penicillate.

** Leaves alternate distichous, unsymmetrical, a large leaf usually alternating with a small bract-like or abortive one.

6. Elatostema.—Under-shrubs or perennial or annual herbs. Flowers collected on a regular or irregular discoid receptacle. Female perianth small, abortive or absent. Stigma sessile—a brush of caducous hairs.

7. Procris.—Sub-succulent and often epiphytic under-shrubs, erect, usually glabrous. Flowers, males forming glemorules, arranged in lax cymes, rarely capitula; females capitulate, collected upon a globose fleshy receptacle. Female perianth small or 3-4-partite, becoming fleshy and enclosing the ovary.

** Tribe III. Boemerieæ. **— Under-shrubs or trees, rarely herbs, unarmed, with opposite or alternate leaves. Flowers collected into glemorules or scattered ex-involucrate or with small scarious bracts, forming axillary solitary or ramified spikes or cymes; male perianth 4-5-merous, rarely 2-3-merous; ovary rudimentary; female perianth most frequently tubular, mouth contracted, 2-4-toothed, including and sometimes adherent to the ovary or very short or even absent.

* Fruiting perianth membranaceous or moist, achene included, free.

8. Boemeris.—Under-shrubs; leaves opposite or alternate. Flowers monoeccious or dioecious, male and female in separate inflorescences consisting sessile glemorules in the axils, or forming second spikes, or arranged in branched panicles. Stigma filiform, persistent.


10. Pouszia.—Herbs sometimes woody at the base; leaves alternate, rarely opposite. Flowers occasionally dioecious, arranged in axillary glemorules or spikes, in the monoeccious forms male and female flowers are often on the same inflorescence; male perianth 4-5-merous, rarely 3-merous. Stigma filiform, deciduous.

11. Distemon.—Herbs with alternate leaves. Flowers glemorulate, arranged in simple spikes; male perianth 2-merous, rarely 3-merous. Stigma linear, deciduous.

** Fruiting perianth very often fleshy, free or adnate to the achene.

12. Sarcochlamys.—A shrub with alternate leaves, rough above, white tomentose below. Flowers glemorulate, forming axillary solitary or paired spikes, males lax, females dense flowered; male perianth 5-partite, abortive. Ovary lanate. Fruiting perianth oblique, accrescent, gibbous, mouth contracted, lateral and dentate. Stigma short, penicillate.

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or Nettle Family.

BOEHMERIA.

13. Villobrunea.—Under-shrubs or trees, with alternate leaves. Flowers dioecious, forming capitulate glomeruli, sessile in the axils of the leaves or fascicled, lax, dichotomous cymes; fruiting perianth thin, fleshy. Stigma sub-pellate, sessile, penicillate, ciliate.

14. Debregeasia.—Shrubs with alternate leaves. Flowers axillary, sessile glomeruli, or numerous cymes. Female perianth minutely toothed at the contracted mouth, in fruit becoming succulent. Stigma penicillate.


Tribe IV. Parietariae.—Herbs or under-shrubs, rarely shrubs, unarmed. Leaves alternate, entire. Flowers dillinous or polygamous, 1–3, rarely numerous, included within an involucre of free or connate bracts; bracts sometimes only 2. Female perianth tubular, free.

17. Parietaria.—Herbs often diffuse; stipules small or absent. Cyme axillary, 5–8-flowered, androgynous or polygamous; bracts free, herbaceous, involucrate. Style elongated, crowned with a papillose stigma.

Tribe V. Forskohliace.—Herbs with non-stinging hairs; leaves alternate or opposite. Flowers dillinous, grouped in the axils of the leaves, generally involucrate. Male flowers irregular; female perianth free from the achenes, which it completely encloses, or absent.

18. Forskohliace.—Under-shrubs or tough herbs, covered with hooked hairs; leaves alternate, more rarely opposite, crenate or dentate; stipules lateral, free. Flowers contained within a campanulate or tubular involucre; perianth of both males and females tubular below, obtusely 3-dentate, densely lanate within.

19. Droegucia.—Differ from Forskohliace in the flowers being generally solitary or arranged in terminal spikes. Male perianth campanulate, shortly toothed.

Note.—For further information regarding the above genera, consult their respective alphabetical positions.


A genus of Urticaceae, comprising about 45 species of small trees or shrubs, inhabiting the sub-tropical and tropical regions of Asia and America. There are some 18 species met with in India, the most prevalent of which may be said to extend from Nepal through Sikkim to Assam, the Khasia Hills, Cachar, Hindostan, and Ceylon. Only three species can be said to be more generally distributed, reaching the outer North-West Himalaya as far west as Garhwal and extending to the plains and lower hills of Western India, while none occur in plains and hills of the Punjab proper.

Leaves opposite or alternate, sprinkled with inconspicuous punctiform cystoliths equal or unequal, dentate (very rarely 2-lobed), 3-nerved petiole; stipules axillary, free or less frequently connate, deciduous. Flowers minute, unisexual, aggregated into elongated axillary solitary heads or clusters (glomeruli), sparsely bracteate or tomentose axillary spikes or branching racemes or cymose panicles. Flowers monoeccious or dioecious; male perianth 4-partite or 4-lobed (very rarely 3- or 5-parted); lobes leafy, ovate, subacute or mucronate, valvate in bud. Stamens 4, opposite the perianth lobes and inserted below the calyx or sub-globose rudiment of the gynoecium, glabrous or shortly lanate at the base. Female perianth gamophyllous, tubular or saccate, compressed or ventricose, 2–4-dentate at the con-
BEOHNERIA
comosa.
The Stingless Nettles,

tracted mouth. Ovary sessile or stalked, enclosed by the perianth tube and sometimes even adnate to it, tapering into the elongated filiform persistent style; stigma papilllose on one side of the style; ovula orthotropous, solitary, sub-erect or ascending. Achene enclosed in the mucronate perianth and often cohering to it; pericarp crustaceous and thin or not like; albumen more or less copious; cotyledons of the fleshy embryo elliptical, usually a little longer than the conical radicle.

Affinities of Boehmeria.—This genus belongs to the Tribe Urticeae and to the Sub-tribe Boehmerieae; the Boehmerieae may be referred to four series of allied genera. All the species of Boehmeria receive popularly the name of the Rhea or Grass-cloth fibre plants, and, indeed, the bushy or herbaceous members of two or three other allied genera equally fall within that designation, since they all yield delicate, white, silvery and exceedingly strong fibres. It seems likely, however, that the true rhea fibre is the produce alone of B. silvestris.

B. aquamigera has been formed into the genus Chamalalnija, on account of the stigma being capitate instead of linear—a distinction which seems scarcely worthy of such importance; the leaves are also opposite. In Pouzolsia the style is filiform, articulated and caducous, and the fruit enclosed by the winged or costate calyx. In Distansum the leaves are alternate, the male flowers 2-merous, rarely 3-merous, and the stigma linear deciduous. The members of these three genera, with Boehmeria itself, may be regarded as the series of true Rhea-fibre plants—the Endoehmeria of botanists, characterised by having the tubular female perianth free or adherent to the ovary, dry or membranous in fruit, and with 2 or 4 apical teeth.

In the second series, Sarcochlamys, the female calyx is free, with a lobed or dentate mouth, fleshy and succulent around the fruit. In India we have only one species belonging to this series, viz., Sarcochlamys pulcherrima, Gaud.; this is met with in Assam, the Khalsa Hills, Syhel, Chittagong, and Sumatra.

In the third series, Villebruniaceae, the following genera are represented in India: Villebruniaceae, 3 species; Debregeassia, 3 species. These are recognised by having the female calyx adnate to the ovary, with a short dentate or sub-entire limb.

The fourth series, Maoutieae, is characterised by the calyx being rudimentary or absent. There is only one Indian species of any importance belonging to this series, viz., Maoutia Puya, Wedd., the Po fibre of Assam.

Note.—The above remarks regarding the various genera of Indian rhea-fibre plants have been given in this place in the hope that they may prove useful to persons desirous of discovering the correct botanical sources of the fibres which in the different provinces of India go by the name of rhea. For fuller details consult the genera mentioned in their respective alphabetical positions in this work, and compare with brief botanic diagnosis of these genera already given in the preceding pages.

Boehmeria caudata, Poir. (non Swartz.).

Syn.—A form of B. platypylla?, Don, and not a distinct species, probably var. macrostachya.

Habitat.—A large shrub frequent in Chittagong and Ava (Kars).

Botanic Diagnosis.—Leaves opposite, sharply crenate-serrate; stipules lanceolate, acuminate. Female perianth elliptical, obovate or roundish.

FIBRE.

B. comosa, Wedd.; DC. Prod., XVI, i., 205.


B. 566
Habitat.—A leaf-shedding small shrub, about 2-4 feet high, frequent in the mixed open forests all over Burma, ascending to 3,000 feet in altitude, and extending west to the Khäsia Hills, Sikkim, and Nepal.

Botanic Diagnosis.—Leaves 2-6 inches long, ovate lanceolate, long acuminate, crenate-serrate; stipules linear lanceolate, deciduous. Glomerules axillary spicate. Female perianth compressed lanceolate to obovate, 2-4-toothed; stigmas twice as long as the tube.

Boehmeria cuspidata, Bl. (non Wedd.).

Habitat.—Nepal.
A species apparently of no importance and very little known.

B. Didymogyne, Wedd.; DC. Prod., XVI, I., 204; Kuss, II., 423.

Syn.—Didymogyne boehmerioides, Wedd.

Habitat.—A herbaceous, glabrous bush, said to be found in Moulein.

Botanic Diagnosis.—Leaves alternate, 2-4 inches long, crenate-serrate from the middle. Female perianth becoming oblong narrowed upwards, enclosing 2 carpels, each with a distinct style (according to Weddell).

B. Helferii, Bl.; D.C. Prod., XVI, I., 204; Kuss, II., 423.

Habitat.—A bush with branches having adpressed pubescence, met with in Tenasserim. (Kuss, Burm. Fl., II., 423.)

B. lobata.

The alkah sold for hemp at Almora, and is common in Garhwal and Kumaon (Baden Powell). I have been unable to recognise the plant referred to by Mr. Baden Powell, but it must be of considerable importance, since it is mentioned by several writers upon Indian Economic Science. The name B. lobata does not occur in botanical works.

B. macrophylla, Don; Brandis, For. Fl., 408.

Syn.—Urtica penduliflora, Wall.

Vern.—Sachda, gokka, Kumaon; Kamli, Nepal.

Habitat.—This broad-leaved shrub is met with from Kumaon eastward through Nepal and Sikkim to the Khäsia Hills, altitude 4,000 feet. Flowers in August to September.

Botanic Diagnosis.—Branches 4-angled, with short adpressed hairs. Leaves opposite, long lanceolate, pustulate-rugate above, the pustules terminated by a gland, softly pubescent beneath, obtusely serrate 5-costate, the lateral nerves extending through little more than the lower half, the remainder pinnervated from the midrib; stipules lanceolate, hairy on the midrib; petioles strigose, 1 in. long. Flowers monocious in long drooping axillary spikes, the clustered flowers in the axils of lanceolate bracts.

Fibre.—Its bark yields a beautiful fibre, much prized for fishing-nets.


Syn.—Urtica malabarica, Wall.

Vern.—Takbret, lepcha; Maha-deya-dal, Singh.

Habitat.—A shrub 4 feet in height, or sometimes a small tree 20 feet high, met with in the Carnatic, the Konkan, Sylhet, the Khäsia Mountains and lower Himälaya, extending to the tropical forests of Arracan. Plentiful in the moister tropical and extra-tropical forests of India and Burma; very common in Ceylon.
Fibre.—The liber yields a strong fibre. Kurz says, "The liber of this and of most Behmerias yields a strong fibre." Thwaites says that the Singhalese make fishing-lines from the fibre.


References.—Brandis, For. Fl., 403; Spence’s Encyclopaedia, 341; Davenport, U. I., 81; Atkinson’s Hist. Diss., 107; Baden Powell’s Ph. Prod., I., 503; Hem Chander Kerr’s Report on Fats, pp. 65; Lindley and Hemsley’s Treasury of Botany; Report on Rhea Fibre by Dr. Forbes Watson, 1871; reprinted with a lecture, 1884; Rhea, by W. H. Cogswell, Agri.-Hist. Soc. of India, Vol. VII., Part II., 1884; The Fibrous Plants of India, Dr. Rooke, 1855; Cyclopaedia of India, Dr. Balfour; The Rami, The Moorman, The Indian Forester, Feb., 1884; "The Tropical Agriculturist," Feb. 1884; Records of Govt. of India, Rev. and Agric. Dept.

Comm. Names.—Rhea, China-grass, Eng.; Ramie, Orthe blanc, sans dards de Chine, Fr.; Rameh, Ramie, Java, Malay.

Vern.—Schou or schou or ichou (the plant), schou-ma fibre of the scou. Chinese: Tsjo, siri, sa, mao, karoa, akaso, Jap.; Kloo, kalor, gnet. Siames: Nuam. and Sum.: Kanthara, Beng.; Rhea, Ass.; Poak, Nepal.; Guan, Burm.

For Bon-rhea, Ass., see Villebrunia appendiculata, Wedd., DC. Prod., XVI. I., 237. Kurz regards the Bon-rhea as the China-grass, cloth, which would thus be quite distinct from the Rhea fibre proper. If this be correct, we have in India been trying to produce from the wrong plant a fibre to compete with the Chinese grass-cloth. This might account for the fact that the samples of Indian rhea fibre exported to Europe have uniformly been pronounced inferior to the China fibre. It seems highly desirable that the grass-cloth of China should be carefully looked into with the object of confirming the opinion which generally prevails that it is obtained from the same species as the Rhea fibre of India. (Compare with pages 461 and 469.)

Habitat.—A shrub indigenous in India, and probably also in China, Japan, and the Indian Archipelago.

Botanic Diagnosis.—Branches terete, herbaceous, and with the petiole tomentose from long, soft, spreading hairs. Leaves alternate, broad ovate 3-6 in. long, acuminate, dentate, with large triangular slightly curved teeth, base truncate and tapering suddenly into the petiole, which is half the length of the blade or longer; upper surface of the leaf rough, pubescent, the under, white, densely matted with closely adpressed hairs. Flowers green, monocious in axillary panicles; panicles in pairs, shorter than the petiole, bearing numerous sessile flower-heads along their entire length. Female panicles lax-branched, with rounded glomeruli (covered with the long styles), occurring in 4 pairs in the axils of the upper male in the axils of the lower leaves. Style much exerted, hairy. Ovary enclosed completely by the tubular, hairy, 4-toothed female perianth.

Many unfortunate mistakes occur in the literature of this species, some of which have greatly tended to retard the development of the rhea fibre industry. The plant has been confused with many other widely different species. Bailon, for example, in his Natural History of Plants, Vol. III., p. 503, gives an illustration of a plant which, apparently by mistake, is said to be B. nivea; the leaves are opposite instead of alternating, and the inflorescence is not that of this species. The American Agriculturist, January 1884, reproduces an old plate of Manotia Puaya as an illustration of Behmeria nivea, &c.
RHEA FIBRE.

CULTIVATION AND PREPARATION.

Where Cultivated.—Assam, Eastern and Northern Bengal, also in Saharanpore and Calcutta Botanic Gardens; introduced by Agri-Horticultural Societies into Madras and Rangoon for experimental purposes. It has also been cultivated in Natal, Mauritius, Algeria, in the Island of Corsica, South France, the Channel Islands, and even in Great Britain.

Soil.—The rhea plant is exceedingly hardy, and thrives in almost any description of soil. But preference should be given to a rich, light, sandy loam, well worked and sufficiently shady. The subsoil should be good, as the roots penetrate 12 to 14 inches deep in search of nutrition.

Climate.—For profitable working, a situation should be chosen which would promote the quickest growth of the stems, and yield the greatest number of cuttings with the best quality of fibre. A situation fulfilling these conditions would most probably be found in a tropical climate with a moist atmosphere and fairly good rainfall. It would succeed in almost any part of the tropical plains of India.

Preparation of the Soil.—The land, if not naturally rich, should be manured; it should also be ploughed to a considerable depth, and tilled lightly so as to remove the weeds. Furrows or small trenches 3 feet apart should then be made, and the land kept ready to receive rhea roots or cuttings by the end of the rainy season. An analysis of rhea shows that the most favourable manure should contain nitrate of soda, seasalt, and lime. Valuable information as to the cultivation of the grasscloth plant in China, and the extraction of the fibre, appears at pages 359-360 of Dr. Forbes Royle's Fibrous Plants of India, 1855, having been translated from a Chinese treatise into French by M. Stanislas Julien and retranslated into English by Dr. Royle.

Planting and Care of the Crop.—Rhea is easily propagated. It grows readily from root or stem cuttings and from seed. Supposing the mode of propagation by root-cuttings to be adopted, the young lateral shoots with their roots should be cut off and planted in furrows before the end of the rainy season, to a depth of 3 inches; a little watering may be necessary should the weather be dry. It will be found that plants will grow rapidly to a height of 4 or 5 feet; that the roots will become stronger every year, the plant being perennial. The first crop may be ready in two months from the date of planting out, especially in favourable situations. There are many advantages in a rhea crop; it is perennial, and does not therefore require to be renewed every year. It resists variations in temperature owing to the roots penetrating into the subsoil. Year by year the roots spread, becoming stronger and more productive. The crop is never destroyed by caterpillars or other insects, owing to the quantity of tannin which the bark contains; and lastly, three or four cuttings may be taken off the same ground every year. But it has a serious disadvantage in that it is one of the most exhausting crops known, requiring the land to be left fallow before anything else can be put on the same field after the removal of the crop.

Cutting the Rhea.—Some experience is necessary to decide the right time for cutting. As a general rule, care should be taken to effect the cutting before the plant becomes covered with a hard or woody bark, the formation of which is indicated by the green skin turning brown, the discoloration commencing at the bottom of the stem. A practical way of finding whether the plant is ready for cutting is to pass the hand down the stems from top to bottom. If the leaves break off crisply, a crop of cuttings may be taken off the plants. Dr. Forbes Watson says that the

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plants are ready for cutting when 3½ to 4 feet in height. “If the length is not more than 2 feet, the fibre is very fine, but the chances are you get more waste, and not such a good percentage of fibre. In the long stems the fibre is not so fine as in the medium ones.” Care should be taken, however, not to remove more than can be treated for extraction of the fibre within the 24 hours. “Experience,” says Mr. Theo. Moerman, “has enabled us to establish the fact that the fibre of the second cutting is superior to the first, and that in every instance it is preferable to cut the stalks before the plant flowers and before it is completely mature in order to obtain a finer and softer fibre.”

**Outturn and Cost of Production.**—About four or five cuttings can be had from the same ground a year. The best crops are those cut in June to August; the February crop yields the strongest fibre. Major Ganeg reported that in Assam “The average crop of one Assam poonah (11) acres) well manured, and with a full crop of stems or reeds, was from 13 to 15 acres in Bahal, 12 in Bahal and 10 in Bahal” (Calcutta Review, 1842). But he omitted to explain whether this was the weight of stem or of fibre, or whether it was the yield of one or more cuttings. Another writer in the Review added, however, to this statement, the notice of an experiment made in the vicinity of Calcutta in 1854, and said: “A plot of ground containing 550 square yards gave an average cutting of 301½ lbs. of sticks, from which was obtained 11 lbs. of fibre. Now, 550 yards is almost one ninth of an acre; but not to overstate the returns, this may be estimated at one eighth. Hence 11 x 8 = 88 lbs. per acre, which, again, multiplied by 4, the number of cuttings, would give yearly per acre 352 lbs. of fibre.”

Dr. Forbes Watson says: “I am aware that there are some notable statements which have been found upon experiments made in Algiers. Estimates have been made, showing that you could get forty tons per acre, but I think these require to be verified before we can accept them. Anyway, I do not see that we can conclude at the present—I hope I shall be mistaken—that each crop will yield more than 250 lbs. per acre. You may, however, obtain three crops, or even four, in the year, which would bring it to 1,000 lbs. per acre.” Theo. Moerman, in his little book on “The Ramie,” says that the annual yield of fibre per acre is five or six times greater than the quantity which the cotton plant produces in the best seasons and in the most favourable climates. Mr. J. Bruckner, of New Orleans, estimated from personal experience that each cutting of the Ramie, after the plant has reached the height of 3 or 4 feet, produces from 600 to 800 lbs. of retted disintegrated fibre per acre. Supposing the crop in question to give three cuttings in the year, the total output per acre would be from 1,800 to 2,400 lbs. of fibre. M. Edouard Nicolle of Jersey, however, affirms (says Mr. Moerman) that in his Ramie plantations he obtains annually at Jersey three crops which yield a total of 11,350 lbs. of raw fibre (or bark separated from the centre wood of the stalks), which gives him from 5,000 to 7,875 lbs. of fine fibre ready to be combed out and used in filatures.” There must apparently be some mistake, for further on Mr. Moerman makes M. Nicolle say that he obtained a total annual return of 5,625 lbs. of the fibre containing bark, which “are equal to a minimum of 3,437.5 lbs. of well-retted and thoroughly-cleaned fibre ready for use at filatures.”

In China, according to Spons’ Encyc. (p. 932), “The stems are gathered for industrial purposes in the first year when about 1 foot high. In the tenth month of every year, before cutting the offsets, the ground is covered with a thick layer of horse or cow dung; in the second month the manure is raked off, to allow the new shoots to come up freely. In the second year the stems are again cut. At the end of three years, the roots are very strong, and send up many shoots. Cropping then takes place
three times a year, the stems being cut when the suckers from the root-stock are about $\frac{1}{6}$ inch high. The first harvest is got in at about the beginning of the fifth month; the second in the middle of the sixth or beginning of the seventh month; and the third, in the middle of the eighth or beginning of the ninth month. The stems of the second crop grow fastest and yield the best fibre. After the crop the stocks are covered with manure and immediately watered. A well-cared-for plantation lasts for 80 to 100 years. The principal points to be investigated in order to determine the best methods of growing the plants on a commercial scale are as follows: (1) Influences of irrigation and manuring, especially the effect of returning to the soil the waste portions of the plant. (2) The variation of the amount and quality of the fibre according to the season. (3) The comparative quality of the fibre of short stems (3 feet) and that of full-grown stems (5-8 feet). (4) The effect of the density of growth upon the thickness and the straightness and branchiness of the stems, and upon the yield per acre, especially in connection with the prospect of a greater number of crops annually and the condition of limited height. (5) The best and cheapest methods of gathering, stripping, and sorting the stems.

Separation of Fibre.—The modes by which this is accomplished by manual labour and by machinery will be found under another heading (see page 622), but it may not be out of place to say something here as to the condition of the stems most favourable for the extraction of the fibre. They require to be acted upon while green, and at most within a few hours after they are cut. Major-General Hyde, who presided at a meeting of the Society of Arts (London, 12th December 1883), at which Dr. Forbes Watson delivered a lecture on Rhea with special reference to Messrs. Death and Ellwood's patent "Universal Fibre extractor," in summing up the discussions which followed the lecture, while referring to certain experiments performed by Mr. Greig, said: "The fibre was placed in a shed, and remained there until Monday morning, and on Monday morning the mass, as high as that table, was like a large mass of sugarcane glued up together with the fibre in it; nothing could be done with it, and it had to be thrown away. That showed the absolute necessity of attacking the stem the instant it was cut, with a running stream of water to carry away the gum whilst it was in its natural state. It was then easily attacked, but let it wait or dry in any way, then the difficulty commenced and increased. The colour of the fibre was also darkened in proportion with the delay in removing the juice."

The Gum of Rhea Fibre.

When the experiments with Mr. Greig's machine were concluded, all the rollers, &c., were found to be thickly covered with a very hard varnish,—so hard that it could only be taken off by a chipping chisel. It had the appearance of lac. The analysis of this dry juice has been published as follows: "The juice contains 62 per cent., by weight, of oxalate of lime; and, besides this, some alumina, oxide of iron, and other mineral matters which dissolve in hydrochloric acid; the residue, insoluble in dilute hydrochloric acid, consists of colouring and resinous matter, and forms 25 per cent. by weight of the dry juice." (Foot-note to Dr. Forbes Watson's Lecture before the Society of Arts, p. 13.)

Value of the Prepared Fibre.

China-grass fetches about £49 to £50 a ton in London; Indian rhea fibre a slightly lower figure. According to Dr. Forbes Watson, Messrs. Death and Ellwood's "Universal fibre extractor" could turn out the

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fibre at "from £7 to £9 a ton, calculated at 100 lbs. of fibre for the working day per machine." "Such being the case, the result will be that China-grass may be introduced at a much cheaper price than hitherto. What that price will be I cannot say, but I think it will be possible to sell at £30 to £35 a ton, possibly less." (For Death and Ellwood's Machine see page 481.) Mr. Oddy, in the discussion which followed Dr. Forbes Watson's lecture at the Society of Arts, said that "for rhea at £30 a ton there was no limit, practically, to the quantity which could be sold; at £40 it would go slowly; at £50, with the present price of wool, it was barred." A manufacturer remarked—"If you bring it down to £35 you will sell a lot; if you bring it to £30 nobody knows the quantity we can use." Mr. Haworth, at the same meeting, said that a larger quantity of rhea would one day be sold than of jute at the present day.

**History of the Rhea Industry.**

In the Ramayana mention is made of the nettle-cloth, and it is praised for its beauty and fineness. There is therefore some *prima facie* evidence that a nettle fibre has been known for several centuries in India. So early as in the reign of Queen Elizabeth in England, Lobel the botanist relates that in Calcutta, in the East Indies, the people manufactured from the fibres of a species of nettle a very fine and delicate tissue. Later, these fine cloths were imported into Europe, but principally from Java to the Netherlands, where this cloth was in great demand under the name of neteldok. a name indicating the origin of these cloths. The word *netel* means nettle and *dok* tissue. From that time attempts were made, and with success, to imitate with flax fibre the beautiful and fine tissue of the ramie, of which, after all, it is but a weak counterfeit. (Thos. Moorman.)

Dr. Roxburgh, without apparently being aware of the existence of rhea in Assam, and of the natives of Bengal, and of the fact that it was being cultivated and used by the natives there, procured from Sumatra in 1809 four plants of the *Callea*, and planted them in the Botanical Gardens, Calcutta. He gave the plant the name *Urtica tenacissima*. These imported plants grew and multiplied so rapidly that shortly after he had several thousands. About this time the discovery was made by Dr. Buchanan Hamilton that the *konkura* of Rungpore and Dinagepore was identical with the plants Dr. Roxburgh was cultivating. In 1810, Dr. Buchanan sent to England three bales of fibre from the plants grown by Dr. Roxburgh. The experiments made with this fibre showed that a cord spun from it sustained a weight of 252 lbs. against 84 lbs. required by Her Majesty's Dockyard to be borne by Russian hemp of the same size. In 1814 more bales of the fibre were sent by Dr. Buchanan to the Court of Directors (England). In 1816 the Court sent out several of the machines then recently patented by Messrs. Hill and Bundy to be used in the preparation of rhea. From this date, however, the interest in rhea fibre seems to have fallen off until 1840, when the discovery by Colonel Jenkins of the same plant growing wild in Assam again caused attention to be directed to it. A few specimens from Assam were sent to the Agri.-Horticultural Society of Calcutta, and from cuttings thus obtained plants were grown in the Society's Garden. From this date the society received contributions from several writers, from time to time, giving new facts regarding the growth and preparation of the fibre in Northern India. Dr. McGowan furnished information and samples from China, and Dr. Falconer and afterwards Sir William Hooker identified Rhea as the same plant from which the Chinese grass-cloth is prepared. (Compare with remarks at pages 464 and 479.)
Rhea Fibre.

In 1851 several specimens of rhea in various stages of preparation were forwarded to the London Exhibition; they attracted considerable attention and were awarded no less than three prize medals. The following year a consignment of the fibre from Assam was forwarded by the Government of India to the Court of Directors; it was experimented with by Dr. Forbes Royce, the result being that its average strength, as compared with Russian hemp, was declared to be in the ratio of 250 to 160.

**Efforts to Extend Rhea Cultivation.**

In 1854 the Court of Directors asked the Government of India to furnish 10 tons of the raw fibre, but owing to its limited cultivation only one-third of the quantity could be supplied. Sir Frederick Halliday, then Lieutenant-Governor of Bengal, directed the purchase, during the ensuing three years, of a quantity of fibre up to 10 tons a year, in order to encourage the cultivation. These purchases were transmitted to London and sold. The fibre had by this time become known in England and France, and as it was thought that its further development might be safely left to private enterprise, the experimental consignments were discontinued.

The demand continued satisfactory, though on a rather small scale, but was supplied chiefly by China and only to a very slight extent by India.

In 1872, however, the fibre seems to have been making rapid progress; China supplied through London between 200 to 300 tons, valued at about £30 a ton. In that year a sudden change occurred: the demand fell off and the price came down to from £30 to £40 a ton for the China, and from £19 to £20 a ton for the Indian fibre. Rhea waste began to command a readier sale than the combed fibre, for it was found by the manufacturers that in the waste state it was procurable at a smaller cost and therefore more profitable, since it was used in the end (owing to the want of proper extraction) both waste and combed fibre had to be treated with the same care, trouble, and expense. (Journ. Soc. Arts.)

In 1880 the Rajah of Dina Nagar intended undertaking the cultivation of rhea in his estate. He tried to purchase a supply of roots from the cultivators; but as soon as the news of the project spread over the districts, exorbitant prices were demanded. The Rajah then procured 25 mounds of roots from Saharanpur, 11 mounds from the Calcutta Botanic Garden, and 11 mounds from the Bally Paper Mills. With the latter supplies, 10 bighas were planted in May and June, and it was the intention of the Rajah to plant a hundred acres of land with rhea. The results of these experiments have not as yet been made public.

In 1881 Messrs. Burrows, Thomson, and Mylne, estate-holders in the Shahabad District (Bengal), intended, among other things, to induce their tenants to grow rhea and to prepare the fibre as a domestic industry. They wrote: "We see no reason why its preparation by hand should not become as successful in India as it is in China. Certain kinds of available and cheap labour are as plentiful in the former as in the latter country. The *parda-nasheen* women and girls, in vast numbers, of poor high-caste families, confined as they are by custom to their houses, cannot assist the male members of the family in any out-door work, or contribute to the general earnings, except to a very small extent by cotton-spinning, and the demand for this homespun yarn decreases as mills are adopted to produce it cheaper and better." In 1882 it was ascertained that these gentlemen were growing the rhea plant and were trying several methods of preparing the fibre; that they had sent to England some of the fibre, treated in a way likely to suit the manufacturers of England and France, and were awaiting the result before encouraging an extended cultivation of the plant. The final result has not as yet been made public.
More recently rhea has in Europe acquired a position of considerably augmented importance as an industrial product. Large plantations have now been organised in Italy. Portugal has already planted a million roots, and Spain has taken important steps in the matter. France seems to have given the lead in the movement, and during 1882 several million root-plants were imported. The plantations in Algiers and Egypt have also been materially increased. (Journal of Society of Arts.)

**Properties and Uses of Rhea Fibre.**

Rhea has been recognised as pre-eminent amongst fibres for strength, fineness, and lustre. Experiments made by Dr. Forbes Royle as to strength showed that its average power, as compared with Russian hemp, was in the ratio of 280 to 150. Its fineness has been demonstrated by Dr. Forbes Watson, who showed that “the mean diameter of the ultimate fibres of flax is about \( \frac{1}{160} \) of an inch, of jute \( \frac{1}{140} \) of hemp \( \frac{1}{160} \) of rhea from Assam about \( \frac{1}{140} \), and of Chinese rhea \( \frac{1}{160} \) of an inch. The length of the fibre varies from 2'36 inch to 7'87 inch, and even 9'84 inch; the mean diameter is about \( \frac{1}{0003} \) of an inch (Spots' Encycl.). Regarding silkiness, jute is the only fibre known commercially which can compete with rhea, but jute is far inferior to it in strength and durability. Rhea has, besides, a high resisting power when submitted to the influence of moisture and variations of atmospheric condition. This power may, to some extent, be tested by the action of high-pressure steam on fibres. Experiments were carried out under the direction of Dr. Forbes Watson with this object: the fibres of rhea and of other plants were exposed for two hours to steam of about two atmospheres and then boiled in water for three hours, and the loss in weight ascertained. They were then again exposed to the action of steam at the same pressure for four hours and the loss in weight again ascertained. “The percentage loss of a specimen of Chinese rhea amounted only to 0'85, and of Assam rhea to 1'51, while flax lost 3'50 per cent., Italian hemp 6'18, Russian hemp 8'44, and jute even 21'39 per cent.” Dr. Forbes Watson says: “A very characteristic, and in some respects unfavourable, quality of the Rhea is the comparative stiffness and brittleness of the fibre, and most of the difficulties which in spinning and manufacturing it have to be overcome are due to this circumstance. It is this stiffness which prevents rhea, although so strong in its usual condition, from sustaining as easily as other fibres the effect of a sharp bend or kink. Thus, if a knot be tied with a small bundle of fibres, the rhea will break very readily, much more so than flax, for instance, although all fibres will break more readily under such conditions. Another consequence of this stiffness is that the fibre does not twist easily, and the yarn spun from rhea is often very rough, notwithstanding the smoothness and silkiness of the individual filaments. This roughness is due to the projecting ends of the ultimate fibres, turned outside by the twist which the yarn receives in spinning. On the other hand, the stiffness or hairiness has also certain advantages, as, in consequence of this, rhea readily combines with wool. Thus rhea, in virtue of its quality, has a wide range of affinity with other fibres, though it is not perfectly similar to any of them. This explains why its experimental applications cover such a wide field. It has been actually tried as a substitute for cotton, hemp, flax, wool, and silk.” In his more recent lecture before the Society of Arts upon this fibre, Dr. Forbes Watson says: “Now, what is rhea good for? It is difficult to say what it is not good for. It is the strongest fibre in nature.”

**Rhea with Cotton.**—The first trials in the use of rhea with cotton were made in 1882 in England and France. Rhea fibre from China was cut into length of two inches and treated with alkalis and oil, giving a
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material suitable for admixture with cotton. This cottonised rhea was the subject of various experiments; it was mixed with cotton, was spun, and the yarn woven into different fabrics and dyed and printed without any difficulty. The fabrics so made gained in strength and acquired a certain amount of gloss. But considering the matter in a commercial point of view, it may be said that rhea will never pay as a mixture with cotton; it will always remain too valuable a material to be used as an admixture with or even as a substitute for cotton, the cost of extraction being prohibitive of such use. This was true some few years ago, but it seems probable that new machinery will lower the price of rhea until admixture with cotton will be possible. Mr. W. Haworth, speaking of the use of rhea with cotton, says: “Rhea would make the warps of the finest cotton goods, and the wefts could be made of Sea Island or other fine cotton. It could be used for the finest materials up to the coarsest.”

Rhea with Flax.—The probability of its being used with flax occurred to the early experimenters, but experience soon showed that it was necessary to overcome technical difficulties before rhea could be spun successfully on flax machinery. These were subsequently overcome, and Moerman in his pamphlet on rhea mentions the fact that he examined specimens spun in some French and Belgian mills by flax machinery on cold-water frames, and that they were smooth and glossy, the gloss being secured by passing the fabric between cylinders. Dr. Forbes Watson in his report (1875) wrote: “If, as seems probable, rhea could be worked up on the same machinery as flax, the development of the rhea trade would be immensely facilitated, inasmuch as there would then be an immediate and practically unlimited field for its consumption.” In his lecture (1883) he says: “Many years ago, one of the largest flax-spinners in the kingdom spent a considerable sum—£20,000, I believe—in trying to use China grass in the place of flax; but the experiment was given up, owing to the hairy character of the yarns produced. It is, however, quite possible to prepare rhea in a way which would enable it to be spun on flax machines; and we find tablecloths and beautiful fabrics of this material equal to anything that could be produced from flax.”

Rhea with Wool.—In combination with wool, rhea seems to have a chance of success, and its application in this manner attracted most attention and for a time achieved the greatest share of success, since it was less costly than wool and bore a striking similarity to it. “The prepared rhea, or China grass, cut up into suitable lengths, has, in fact,” says Dr. Forbes Watson, “been found capable of being spun on worsted machinery, and then used like mohair or other long-stapled wools, for the manufacture of certain kinds of fabrics which depend for their effect on the gloss of the material. These fabrics were made, as a rule, with cotton warps, rhea yarn of comparatively little twist being used as weft. The use was mainly for ladies’ dresses, and at first it seemed as if the success was complete. But after a certain time the inferiority of the new fabrics for ladies’ dresses became manifest. Although everything that could be desired as regarded appearance and finish, there was the fatal objection that in wear they became easily creased, as the vegetable rhea fibre is wanting in the great elasticity possessed by wool. In view of such an inferiority, the prices then ruling for rhea made its use for this purpose no longer remunerative. The new trade collapsed as rapidly as it had sprung up, and since 1872 the matter is again one of experiment. The creasing, however, is to be got over by mixture with wool or by the use of very thick cotton warps, and fabrics of a new kind have been manufactured on a small scale, and have found a ready sale.”
Dr. Forbes Watson’s report is full of useful information, and the following passage may also be quoted: “There is sufficient evidence that at prices of the raw material permanently lowered” —by more efficient and less costly modes of extraction and preparation of the fibre, as well as by extended cultivation of the plant—“there would be a larger field for the use of rhea as a substitute for long-stapled wool. Even if its use for ladies’ dresses were not again resumed, there are hangings, carriage linings, carpets, and other manufactures for which the suitability of rhea has been established, and for which its application continues to engage the attention of some of our most eminent manufacturers. There are several circumstances favouring the use of rhea in this line rather than in competition with flax. The material competed with is higher priced than flax, the better classes of wool varying from £130 to £280 per ton, whilst those which in their raw state are lower priced contain such a proportion of dirt that the price for the really available fibre is here also, in reality, not much lower. There is also the circumstance that the rhea combing waste, or noils, has been found very suitable for mixture in bulk with rough kinds of wool, and capable of being used for blankets, as also, possibly, for giving strength to shoddy, and for a variety of other rough purposes.”

Rhea with Silk.—As a mixture with silk, rhea has a formidable rival in jute; and although the subject of using rhea as a substitute for or admixture with silk has been repeatedly taken up in England and in Lyons, and by the application of rhea it has been found possible to imitate, to a certain extent, the effects of silk in certain mixed fabrics, the special use of rhea for this object has never acquired any real footing. Dr. Forbes Watson says, however, that “rhea is prepared in various ways, so as to leave the gloss upon it, giving it all the appearance of silk, and it is certainly far superior even for mixing with silk than jute.”

Rhea and Hemp.—In Assam and Bengal where the rhea grows, the use to which it is commonly put is the same as that for which hemp in Europe is used,—i.e., it is employed for nets, fishing-lines, and other purposes for which strength, lightness, and power of resisting water are essential. Viewed as a material for such use, rhea figures prominently in its chances of success. Hemp is, it is true, lower priced than rhea; but it suffers a greater loss in weight in the process of heckling than rhea, while the latter is superior in strength and in resistance to water; and lighter cordage of it would do the same work as heavier ones of hemp. “For many purposes,” says Dr. Forbes Watson, “such as ships’ rigging, the increase in lightness is in itself an important consideration, apart from the saving of the material.” “On all these grounds rhea may be substituted with advantage for hemp, even if it be at a considerably higher price than hemp. The same may be said of its cognate use for canvas and sail-cloth instead of flax. In that case also the superior strength of rhea results in the double advantage of a saving in material and of greater lightness, and would enable it to compete successfully with flax, even if this latter were considerably cheaper per ton.”

Rhea as a Rope and Cord Fibre.—The great strength of the fibre, its lightness and power of endurance under water, are qualities which place it in the first rank of fibres suitable for ropes and cables.

Local Applications of the Fibre.—In Upper Assam the dooras or fishermen cultivate the rhea plant, and extract the fibre by manual labour, employing it in the construction of their fishing-nets.

In the Rungpore and Dinagepore districts a limited amount of rhea is regularly cultivated in some localities, especially along the banks of the
Rhea Fibre.

Attri and Teesta rivers, where fishermen reside. The cultivators find a ready and remunerative sale for the fibre; but they have seldom over a few square yards under plant; and although it is cultivated all over these districts, the cultivation is only practised on a small scale. In Bhagulpore, people of the dhanaok caste are said to prepare rhea fibre and to sell it to the silk and tusser weavers in the district, the inference to be drawn being that the weavers mix rhea with silk.

As a paper material, Rhea is, of course, not likely to be of much use, owing to its value and high price. But some of the waste can undoubtedly be used for this purpose, chiefly as an admixture to impart strength and cohesion to very inferior materials.

When dried, the leaves are very fibrous and may be used as a paper material. Theo. Moereman, in his little book on "The Ramie," mentions that about 6,750 lbs. of dried leaves may be obtained from an acre.

Minor uses of Rhea Fibre.—Amongst the minor uses of rhea, may be mentioned the fact that it is sometimes used for packing of steam-engines. As a curiosity, it deserves to be mentioned that rhea fibre is now in use for polishing ivory, such as billiard balls, &c." Experiments have recently been made to turn rhea fibre into a material closely resembling leather to be used as a substitute for leather bands.

METHODS OF TREATING AND SEPARATING THE FIBRE.

Manual Labour.

The real difficulty in the way of an extended utilisation of the rhea fibre is the decoction of the stems, or, in other words, the extraction of the fibres, at a reasonable rate, and in a condition fit for commerce. Dr. Forbes Watson, in a lecture before the Society of Arts, explained the constituents of the rhea stem. He said: "You will observe, on breaking this sample of green rhea, I succeed in getting off a certain quantity of green fibre, tearing it down in large pieces. I wish to infer, in the first place, to the composition of the component parts of this bark. The outside portion consists of a film to which a very distinguished chemist has applied the term cutose. Below that there is a bark which contains the green colouring matter of the plant, that is called vasculose, and next to that comes the fibre itself. That fibre, and the bark attached to it, is united to the stem by another principle which is called pectose." The difficulty consists in getting the bark and the other matters separated from the fibre. To accomplish this various contrivances and machinery have been specially introduced and patented.

In China, Borneo, and Sumatra the following system is adopted: "The stalks are cut and collected in bundles, and are then thrown into still pools and kept there for several days until the process of retting, so as to cause the bark to separate easily from the wooden parts, is sufficiently advanced. At this stage the bundles of stalks are removed from the water, and all the cortical bark or raw fibre is immediately collected. To do this the bark on the stalks is split in the centre; two fingers are inserted between the wood and the bark and slipped along the whole length of the stalk between the wood and the bark, which brings out the fibre in two strips or ribbons. These strips are spread out on fields to complete and finish off the process of retting by exposure to the dew; but those who are more skillful collect these strips of bark into bundles, and again for a second time throw them into water to effect a cleansing by a fresh and more complete process of retting. By this second steeping another fermentation and decomposition is brought about of the sap or pith incrust in the fibres. This process completes more thoroughly the retting which is not effected by the simple exposure to the dew."

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MACHINERY.

After this second retting, it only remains to work up and comb out the fibre, and thus prepare it to be spun to any quality of fineness. (Theo. Moerman.)

In Java the natives do not, apparently, resort to retting in pools. The same author explains the mode adopted, thus: "After dividing the stalks into halves lengthwise, they remove the bark, from which they then separate the epidermis and the adhesive portions by scraping it with a knife until the fibre begins to appear. This is white, with a slight shade of green. They content themselves with washing this fibre several times in water, and then dry it; but this manipulation, as will be easily understood, is not sufficient to entirely get rid of the glutinous matter which adheres to the fibres." In Borneo and Sumatra the following mode is in practice: The stalks are collected in bundles and are exposed for four or five days to the action of water. This destroys the thin bark and much of the gummy matter, and partially separates the fibre, which is then taken out, dried, and exposed to the dew for several days.

In Upper Assam the following method is practised: "The operator holds the stalk in both hands nearly in the middle, and pressing the forefinger and thumb of both hands firmly, gives it a peculiar twist, and breaks through the inner pith. Then passing the fingers of his right and left hand rapidly, alternately, towards each end, the bark with fibre is completely separated from the stalk, in two strands. The strands of bark and fibre are now made up into bundles of convenient size, tied at the smaller end with a shred of fibre, and put into clean water for a few hours, which I think causes the tannin or colouring matter to wash out. The cleaning process is as follows: the bundles by means of the tie at the smaller end are put on a hook fastened in a post at a convenient height for the operator, who takes each strand separately by the larger end in his left hand, passes the thumb of his right hand quickly along the inner side, by which operation the outer bark is completely separated from the fibre; and the riband of fibre is then thoroughly cleaned by two or three scrapings with a small knife. This completes the operation, with some loss, however, say one fifth; and if quickly dried in the sun it might at once be made up for exportation; but the appearance of the fibre is much improved by exposure (immediately after cleaning) on the grass to a night's heavy dew, in September or October, or a shower of rain during the rainy season. After drying the colour improves, and there is no risk from mildew on the voyage homewards." (Major Hanney, in the Fibrous Plants of India, by J. Forbes Royles, 1855, p. 382)

MACHINERY USED IN SEPARATION OF THE FIBRE.

The rhea fibre (or China grass) having been made known in Europe at the beginning of the present century, the attention of experts seems immediately to have been turned to the question of improvements in the extraction and preparation of the fibre. The first patent was taken out by a Mr. James Lee "for separating the fibre by mechanical means and without the aid of water-retting." No tangible results, however, seem to have been obtained so far as can be ascertained from the employment of this machinery. Meanwhile attention continued to be devoted to the question, and among other inventions may be cited the chemical process of Messrs. L. W. Wright & Co., for which these gentlemen obtained a patent in 1849. Their process "consists, essentially, in a very ingenious arrangement for boiling the stems in an alkaline solution, after they have previously been steeped for 24 hours in water at a temperature of 90°. The fibre is then thoroughly washed with pure water, and finally subjected to the action of a current of high-pressure steam till nearly dry." At the London International Exhibition of 1851
these gentlemen exhibited samples of rhea prepared by their process and received a silver medal. To other exhibitors were also awarded prizes; but still the question of the preparation of the fibre remained unsolved.

In 1869 the Government of India turned its attention to the utilisation of the rhea fibre, and issued a Resolution in which it expressed the conviction that the value of the rhea fibre was undoubted, that all the conditions necessary for its cultivation on a large scale were present in India, and that the only obstacle to the development of an extensive trade in this product was want of suitable machinery for the separation of the fibre from the stems and bark of the plant in its green or freshly-cut state. To encourage the invention of such machinery an announcement was made by the Government of India in June 1870 that a public competition would be held and a prize of £5,000 would be given for the best machinery. No fewer than 32 competitors entered their names, but at the last moment only one of them, Mr. Greig, of Edinburgh, appeared in India. The trial took place at Saharanpur, where a plantation of rhea had been established for the purpose. It was found that the cost of preparing the clean fibre by this machinery amounted to more than £15 a ton, and at the same time the fibre was pronounced defective in quality and was valued at £28 a ton only in England, and declared suitable for cordage only. Under these circumstances the full amount of the prize was not awarded, but in consideration of the fact that the machine was a bold fide and meritorious attempt to meet the requirements of the case, a donation of £1,500 was given to the inventor.

The following year (1873) fresh trials were arranged to take place in England under the superintendence of Dr. Forbes Watson, with a supply of rhea stems from the south of France. A notification was issued by the India Office, and 200 applicants responded. The trial did not, however, prove a success, as the supply of plants was less and of poorer quality than had been expected. In the latter end of the same year, a fresh offer of plants was made by Dr. Forbes Watson to those who wished to continue their experiments, and upwards of 100 asked for fresh supplies. These were procured from the district of Vaucluse (France) and made over to the applicants. The results have not been made public.

Meanwhile the demand for rhea fibre in Europe seemed to continue. Having reconsidered the matter, the Government of India, in a Resolution dated August 1877, renewed the offer of rewards. The terms now offered were that a reward of £30,000 would be given to the inventor of the best machine or process which would separate the bark and fibre from the stem, and the fibre from the bark of the Bahmeria nivea, and a further reward of £10,000 to the inventor of the next best machine or process, provided it was adjudged to possess merit, and to be capable of adaptation to practical uses. The machine or process required was to be "capable of producing, by animal, water, or steam power, a ton of dressed fibre of a quality which shall average in value not less than £4.50 per ton in the English market, at a total cost, including all processes of preparation and all needful allowance for wear and tear, and not more than £15 per ton laid down at any port of shipment in India, and £50 in England after payment of all the charges usual in trade before goods reach the hands of the manufacturer." The machinery was to be simple, strong, durable and inexpensive, and suited for erection in plantations where rhea was grown. The competition was to take place at Saharanpur, the Government agreeing to provide accommodation for the competing machines, as well as affording the motive power required. The Government was also to pay for the transport of all machines from the sea-coast to Saharanpur up to a limit of one ton for each machine,
and to allow a free second class ticket by rail to that station to any person in charge of a machine.

The trials were fixed to commence on the 15th September 1879, and a Committee of judges was appointed to conduct them. Twenty-four applications for permission to compete were received; but only ten competitors ultimately arrived at Saharanpur, and, of these, three withdrew from the competition. The trials were held in September and October 1879.

The fibre turned out by each of the competing machines was carefully packed and despatched to the Secretary of State, with a view to its being tested and reported on by experts in the trade in England. The reports received from the Secretary of State (August 1880) stated that the samples were far inferior to the fibre imported from China, the value of which at that period was £50 a ton. As no competitor had produced a fibre of a value even approaching the amount fixed in the Resolution of August 1877, the Committee did not recommend the grant of either of the prizes to any of the competitors. They were, however, of opinion that some of the machines possessed sufficient merit to warrant the grant of a reward to the owners, and the gentlemen mentioned by them as deserving of remuneration were Messrs. Nagoua, Vander Ploeg, and Cameron. The fibre turned out by Mr. Vander Ploeg was valued less highly than that produced by Messrs. Nagoua, and Cameron; but the Committee attributed this to the fact that he aimed at producing the fibre in a finished state fit for the spinner (a condition in which it was understood that the English dealer did not require it), and not to the inability of his machines to yield as good fibre as those of Messrs. Nagoua, and Cameron. The Committee remarked also that there was little novelty in Mr. Cameron's process, and that it was only an improvement on a method by which fibre was actually extracted from various plants by the natives of India. The same method was also applied in many of the Indian jails for the extraction of aloe fibre. The process was simple enough, and might be employed by the natives without special instruction, and any kind of stem, green or dry, short or long, could be treated by it; but it would be difficult of application in a rhea plantation, where the stems of many acres of land would have to be worked off quickly. Having regard to these circumstances, the Committee recommended that a grant of £5,000 each be made to Messrs. Nagoua, and Vander Ploeg, and another of £1,000 to Mr. Cameron.

The Government of India reviewed the above facts in a Resolution, dated March 1881, and decided, in concurrence with the Committee, that, as none of the fibre produced came up to the conditions prescribed, the prizes offered in 1877 could not be awarded. At the same time the Government of India agreed in the Committee's opinion that some recognition of their efforts was due to the three gentlemen whose machines yielded the best results or appeared to possess superior merit, and sanctioned the grant to them of the sums recommended by the Committee. The Government of India further stated that, "From the low valuation put by the English firms on the samples of fibre produced at the late competition, it does not seem probable that Indian rhea fibre will be able, for the present at least, to compete successfully with the Chinese product; while the experience which has been so far gained also points to the conclusion that in most parts of India the cultivation of rhea cannot be undertaken with profit. Rhea is naturally an equatorial plant, and it requires a moist air, a rich soil and plenty of water, while extremes of temperature are unfavourable to it. Such conditions may be found in parts of Burma, in Upper Assam, and in some districts of Eastern and Northern Bengal;
Rhea Fibre.

BOHEMIA
nivea.

MACHINERY.

rhea can be grown in such places with only so much care as is ed in an ordinary well-farmed field for a rather superior crop, it is le that it may succeed commercially. Until, however, private rie has shown that the cultivation of the plant can be undertaken rofit in these or other parts of the country, and that real need has for an improved method of preparing the fibre in order to stimulate duction, the Government of India thinks it advisable to renew the which it has now made for the second time without result, of rewards itable machines. But in order to aid persons who are anxious to cultivation of the plant in localities which are prima facie suit- the Government will be willing to place roots at their disposal. A bout two or three acres will, therefore, continue to be kept under n the Botanical Gardens at Howrah for the supply of roots to ing growers.

Sample of China grass, valued at £50 a ton in the English market, posited in the Economic Museum at Calcutta, and, in accordance he recommendation of the Committee, specimens of the fibre pro- by the several competitors at the trials at Saharanpur, with the ions of the experts noted on them, were also deposited in the Museum pletion by the public. It seems remarkable that so many fruitless pts should have been made in India and scarcely any effort put to ascertain why it was that the China grass-cloth was uniformly or to the Indian article. This would have settled the question whether rhea is in reality the same thing as China grass-cloth. If in demand of the Chinese mode of separation of the fibre than we as yet s. It is remarkable, however, that Chinese grass-cloth should be finer than rhea; that on being boiled, it should lose only 80, while under the same treatment parts with 151 of its weight. These and facts, in addition to the pronounced superior quality and therefore at price paid for China grass-cloth as compared with rhea, would seem firm the suspicion that these two fibres may after all be obtained different plants.

Is remark is made purely as a suggestion, but it seems highly desir- that we should not only thoroughly examine all the plants met with ia which afford rhea-like fibres, as well as re-examine the plant which the Chinese grass-cloth is obtained, before much more money at on experiments with new machinery.

The withdrawal of the stimulus afforded by the Government prizes did waver, damp inventive ardour; and among other new machines noted those of Messieurs Fairer and Frémy, and of Mr. H. C. commonly known as Messrs. Death and Ellwood’s Universal Fibre 

Messieurs Fairer and Frémy’s invention consists in submitting the to the action of steam for a period varying from 10 to 25 minutes, ring to the length of time the plant has been cut. After steaming, bre and its adjuncts are easily stripped from the wood. It then rs in strips or ribands, containing the objectionable gum and outer. To remove these, the strips are subjected to a chemical process in disolves out the cutose, vacuole and pectose, and releases re in its clean, silky, white condition, ready for the spinner.

Messrs. Death and Ellwood give the following specification of their e: “The universal fibre-cleaning machine, invented by Mr. H. ith, manufactured and improved by Messrs. Death and Ellwood of ter, and brought to public notice by the General Fibre Company udon, is a very simple, compact, and well-designed machine. It
consists of a cast-iron drum, perfectly balanced, on which eight gun-metal beaters are bolted. The drum revolves in front of a table or feed-plate fixed below the centre of the drum so as to give a scraping action when the beaters pass it. The feed-plate is adjustable to and from the beaters by set screws, so that a fine or thick fibre can be cleaned. Immediately below the feed-table is a jet pipe which throws a strong, thin, flat sheet of water against the whole width of the drum. These are the essential parts of the machine, and they are mounted on a cast-iron frame, which carries them as well as a trough to receive and let out water, refuse and waste, and to prevent the water being thrown about. Two men feed the machine; each taking from three to five leaves or stems at a time, places the thick ends upon the feed-table and pushes them against the revolving drum provided with beaters. These smash the woody parts of stems, disengage the pulpy matters of leaves, loosen all refuse matter, and by their action draw the crushed stems or leaves under the drum: here the sheet of water presses the stems or leaves against the beaters, a beating and scraping action continues, and the sheet of water, acting as a cleanser as well as an elastic cushion or backing to the fibre while it is struck by the beaters, ensures a thorough cleaning. The stems or leaves are allowed to pass half way into the machine, and when withdrawn all extractive matter has gone and clean fibre is obtained. This is held in the hands of the operators, who then pass and withdraw the thin ends in the same way. The result is clean pure fibre, which is then hung up to dry, and when dry is ready to be baled at once. The cost of a single machine is £55, that of a double one complete is £100. A semi-portable engine to work two of the machines is supplied by the General Fibre Company of London for £82-10. On comparatively small plantations, instead of the steam-engine, bullock gear can be used which, for a single machine, is supplied at £30 by the Company."

Extracted from Hanlon and Liotard's report to Government of Bengal.) Dr. Forbes Watson gives, in his lecture on rhea, delivered before the Society of Arts (London, 1883), an interesting history of the circumstances which suggested to Mr. Smith's mind the idea of the Universal Fibre Extractor: "What first suggested it to his mind was noticing the great aloeos, the stems of which grow up to 30 or 40 feet. Mr. Smith observed during the monsoon in Mauritius that where the inner leaves were dashed against these great stems, they were broken up, the result being that the fibres were washed away and the fibres were left hanging. This suggested to his mind the idea of a machine in which a rush of water would play the same part."

Some few months ago a series of experiments were performed, under the joint direction of the Government of India and Government of Bengal, with fibre-extracting machines suitable for all fibres. Some nine exhibitors came forward, but the committee awarded the prize of £2,000 to Messrs. Death and Ellwood. The committee consisted of Messrs. J. W. Hanlon and L. Liotard, assisted by the Agri-Horticultural Society of India. In concluding their report upon "The Universal Fibre-cleaning machine," the members of the committee, in recommending the prize to be awarded to Messrs. Death and Ellwood, say: "We are satisfied that as an extractor of fibres Messrs. Death and Ellwood's machine is a distinct advance in mechanism of this class, that it extracts fibres in their natural colour, and in good merchantable condition, that it operates on all plants with the same facility, and that it is suited to the requirements of this country, and is likely to prove of great service to its fibre industry." Dr. Forbes Watson, speaking of this machine in his lecture before the Society of Arts, 1883, says: "It is provided with what are called beaters,—that is to say, a certain number of projecting ribs,—and it revolves in front of a feeding-table at a great rate, being worked at 600 revolutions a minute.
Non-Stinging Nettles.

**BCEHMERIA platyphylla.**

"This operation goes on in front of the feeding-table as it is called, and constitutes the whole machine, as regards the mechanical portion, with the exception of the water. Below, and at an angle of about 45°, a strong flattened jet of water passes, and I will tell you what the effect of that is. The cylinder, remember, is rapidly revolving; you feed in at the side here, the beaters catch and break up the stalks into very small pieces, and the jet of water, coming from below, meets the fibre, and keeps it up against the beaters, so that it is really beaten in a stream of water. The result of this is, you not only get the fibre cleared of a large portion of its gum, but you have next to no waste, and what little there is is excellent for many purposes—it can be made use of, as most other waste products can. This explains the secret of the success of the invention, and how it solves the problem of a machine for cleaning rhea."

**Food.**—When green the leaves are very much liked by cattle, and are nutritious. When salted they will curdle milk like rennet. (Lindley's Vegetable Kingdom.)

I am indebted to Mr. L. Liottard, of the Revenue and Agricultural Department, for much assistance in collecting many of the extracts compiled in the preceding pages regarding rhea fibre.

**BCEHMERIA platyphylla,** Don.; Brandis, For. Fl., 403.

**Syn.**—B. macrostachya, Wedd.; *Urtica macrostachya,* Wall.

**Vern.**—Gareloa (Kumaon), Hind.; Kamli, Nepal.

**Habitat.**—A large shrub or small tree, met with in the outer Himálaya up to 7,000 feet, in the Khásia Hills, East Bengal, South India, and Ceylon.

**Botanic Diagnosis.**—Branches 4-sided. Leaves opposite broad ovate; petiole < ½ the length of the leaf or longer. Styles hairy exerted (rarely shorter than the female perianth tube). One of the commonest and most variable species in the genus.

**Structure of the Wood.**—Moderately hard, reddish brown, with occasional concentric bands of darker and lighter colour.

The following may be enumerated as the principal Indian varieties:

**Hamiltoniana,** as in DC. Prod., XVI; I., 213.


**Vern.**—Tukur, Lepcha; Sopsha, Bum. (Kurr.)

**Habitat.**—An evergreen, small tree, often 20 feet in height, met with in the lower tropical Himálaya from Sikkim and Bhután eastward to Burma. "Plentiful in the tropical forests, especially along chongs of the western slopes of the Pegu Yomah and Martaban east of Toungfoo." (Kurr.)

**Botanic Diagnosis.**—Leaves opposite, long acuminate, minutely toothed ½ in. long, 3-nerved with a gland at the basilar nerve axil. Styles shorter than the perianth. Kurr regards this as distinct, but the only character in view of this view is apparently the short style.

**Fibre.**—"Strong cordage can be obtained from the liber." (Kurr.)

**Microstachya,** Wedd. in DC. Prod., XVI, I., 211.

**Syn.**—*Splittgerbera microstachya,* Wight, Jc., I., 1077; *Bcehmeria mauritiana,* Wedd.; *B. Wightiana,* Wedd.; *Urtica caudata,* Poir.

**Habitat.**—A large bush met with on the Nilgiri Hills and Ceylon, th long petiolate leaves and female spikes generally undivided.

**Fibre.**—610

**Food.**—Leaves. 600

**Timber.**—607

**Fibre.**—609

**Fibre.**—610
**BÖHMERIA**

**travancorica.**

Non-stinging Nettles.


*Vern.*—

**Habitat.**—A small bush met with in the Konkan, in Nepal, the Khásia Hills, and Ceylon, ascending to 1,500 feet in altitude, with roundish abruptly acuminate leaves.

δ, scabrella, *Wedd.* in *DC. Prod.*, XVI, I, 211.


**Fibre.**

**611**

**Habitat.**—A shrubby, spreading form, met with in Nepal, Assam, Khásia Hills, Chittagong, the Nilgiri hills, Ceylon, and Java, with small cordate, serrate, rough leaves and flower-spikes erect, as long as the leaf or shorter; male ones crowded, short, and in the lower axes; female ones above and generally solitary.

Apparently not put to any economic use, although all the species of this genus are known to yield good fibres. Flowers at the end of the rains, and the seeds ripe in the cold season. (*Rosk.*)

**Fibre.**

**612**

*B. Zeylanica, Wedd.*

Common in the Central Provinces and Ceylon up to an elevation of 6,000 feet.

**613**

**Böhmcrria polystachya, Wedd.**

*Syn.*—*Urtica polystachya*, *Wall.*

**Habitat.**—A Nepal species apparently not put to any economic purpose. It is also met with in East Kumaon.

**614**

**B. rugulosa, Wedd.; Brandis, For. Fl., 403.**

*Syn.*—*Urtica rugulosa*, and *U. venosa*, *Wall*; *B. nervosa*, *Madden*.

*Vern.*—Geti, gainiti, Hind.; Dar, Nepal; Sedeng, Lepcha.

**Habitat.**—A small tree with greyish-brown branches, met with in Garhwal, Kumaon, Nepal, Sikkim, and Bhutan.

**Botanic Diagnosis.**—Branches terete when young, as also the petioles and under sides of the leaves, hoary. Leaves alternate, elliptic-lanceolate, 3-5 in. long, obtusely dentate, with 3 longitudinal nerves from the base to the apex, each pennivenued, the lateral branching veins on the inside anastomosing with each other, those on the outside with an intramarginal vein; petiole many times shorter than the leaf. Flowers dicocous in round sessile clusters, each cluster in the axil of a cordate membranous bract. Brandis says the leaves very much resemble those of *Sarcochlamys pulcherrima*, but that it is readily distinguished by the long simple flower-spikes.

**Timber.**

**615**

**Structure of the Wood.**—Red, moderately hard, even-grained, durable, seasons well. A nice wood, easy to cut and work. Weight 41 lbs. per cubic foot.

It is used in Kumaon and Nepal for making bowls; in Sikkim for milk-pails, churns, and other dairy utensils. The Lepchans make cups, bowls, and tobacco-boxes of it.

**B. salicifolia, Don; syn. for *Debregeasia bicolor*, which see.**

**616**

**B. travancorica, Wedd.**

**Habitat.**—A small tree of the Wynaad, South Kanara Ghâts, and the Travancore hills up to 4,500 feet.

**617**
Products of India.

The Hog-weed.

**BOERHAAVIA, Linn.; Gen. Pl., III., 5.**

A genus of spreading, herbaceous plants, belonging to the Nyctagineae, comprising some 30 species, widely dispersed throughout the warm regions of the globe.

Annual or perennial plants, woody below, glabrously glandular or pubescent, branches few, spreading. Leaves opposite subsesile or petiolate, equal or unequal, entire or sinuate, fleshy. Flowers few and small, in umbelate or capitulate panicles, sessile or pedunculate, flowers articulated to the peduncle, bracts often deciduous; the young fruit frequently covered with glandular hairs. Perianth tubular, short or long; base ovate, contracted above the fruit; limb infundibuliform, margin 5-lobed; lobes distinct plicate, deciduous. Stamens 1-5 exserted filaments thin, unequal, free above, connate below, anthers didymous. Ovary sessile, 3-5-nerved, the erect, attenuated into the peltate stigma. Fruit lateral, yellow, oblong, young, obovoid, 5-costate or 5-angled, glandular; ripe fruit oblong, 1-celled, 1-seeded; embryo usually coaduplicate.

**Boerhaavia diffusa, Linn.; Wight, Ic., t. 874; Nyctagineae.**

**The Spreading Hog-weed.**

_Syn._—B. procumbens, Roxb.; Fl. Ind., Ed. C.B.C., 49; B. erecta, G. Don.; Roxb., Fl. Ind.; DC. Prodr., XIII., 1., 452.

_Vern._—Sant, Hind.; Gddha purna, punarnabha, sveta punarnabha, Beng.; Punarnava, visha kharpara, nathagun (1 simikta), Sans.; jam-tops, Singh.; Punarnava, khopara, ghetauli, Bomb.; Vakka kharpara, lokhi sathuri, moto satol, Guj.; Punarnava, satodiputchees, Ceych.; Vasa, Mar.; Thikri-ba-hur, Duk.; Nakbel, Sind.; Mukaratte-kire, mukkarrat, Tam.; Atika mamiddi, Tel.

_Habitat._—A troublesome weed found all over India.

_Botanic Diagnosis._—There are two well-marked varieties of this plant, one with white and the other with red flowers. In Bengal, the former is called _shvet-purna_ and the latter _gudha purna_. This is, perhaps, one of the most abundant and troublesome of weeds, changing its appearance completely according to as it is found growing on the top of a ruined wall or on an exposed situation in poor soil, or under shade and in good soil. All the forms are doubtless referable to one species. Some are short, erect, branched; others tall, straggling, or even climbers.

_Food._—The Rev. A. Campbell, Santal Missionary, Gobindpur, has furnished me with a most interesting series of specimens of this plant. The small bushy form found in the wild state is used, it appears, by the Santals as a medicine, but the plants which spring up in their vegetable gardens are cultivated as pot-herbs. They do not sow or propagate the plant; it exists in a state of semi-cultivation only, but at the same time it greatly improves, becoming a climber and producing large succulent leaves. I have received specimens from Mr. Campbell quite six feet in length, the whole plant so completely altered that, but for the flower and fruit, it is recognised with difficulty. In this half-cultivated condition it occurs in every Santal village, and constitutes a considerable article of food. The cultivation of this plant as a pot-herb is a fact which does not seem to have attracted much attention; it is alluded to in a few words by Balfour, and is included in his list of green vegetables used in the Madras Presidency. We may here what may be viewed as the first approach to the cultivation of a herbaceous wild plant as an article of food. From its succulent nature it seems highly probable that, under careful management, considerable improvement might be effected. With the present outcry for new fodder plants before us, it is worth suggesting that there would seem to be some hope of finding in this hardy indigenous plant a useful addition to our list of fodder plants. Indeed, the cultivation of an indigenous plant, such as this, seems much more hopeful than fruitless attempts to

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introduce delicate exotics, which at most are capable of being cultivated only in special or peculiar, and therefore limited tracts of country, or during certain, seasons of the year. *Berhavia* is a perennial which, in its wild state, luxuriates on the poorest waste lands. With the slightest effort, a field of it might be raised which would continue to yield green fodder throughout the year, and it therefore seems worth ascertaining whether cattle would thrive on such a crop. Lanan in his *Hortus Jamaicensis* says that in Jamaica the leaves are given to hogs, hence the English name Hog-weed. It is given to cattle in Bengal as a medicinal food and is supposed to increase the quantity of milk. (*Babu T. N. Mukerji.*) (See *Ainslie, Balfour, Druce, &c.*)

**Medicine.** — The *root*, used in infusion or given in powder, acts as a laxative, diuretic, anthelmintic, and cooling medicine. It has been found to be a very good expectorant and has been prescribed in several cases of asthma with marked success. Taken in large doses it acts as an emetic. (*Ainslie, O'Shaugnessy, 312; Pharm. of Ind.; &c.*) The root is said to be a strong emetic. (*Bomb. Gaz., IV., 146.*) "In Goa the herb is esteemed as a diuretic in gonorrhoea. In Bombay the plant is much used as an external application to dropical swellings." A poultice of the leaves is reported to be useful in abscesses. (*Dymock, Mat. Med., W. Ind., 540.*) "One of its Sanskrit synonyms—sothagyni—means cure for dropsy. Adecocion of *punarnava* root is recommended to be given with the addition of powdered chireta and ginger in anasarca." "It is an excellent medicine prepared with a decoction of the root and a number of the usual aromatics in the form of a paste, is rubbed on the body in general anasarca, complicated with jaundice. It is called *Punarnava taila*." (*U. C. Dutt, Mat. Med., Hindust., 222.*) "The Peruvians give an infusion of the *Berhavia scandens* in cases of gonorrhoea." (*Ainslie, II., 205.*).

**Special Opinions.** — "The root of this is much used here in the cure of bronchitic asthma; smoking is not allowed." (*Surgeon-Major P. N. Mukerji, Cuttack, Orissa.*) "Expectorant, antispasmodic, and tonic; dose of the infusion 1 to 2 oz." (*Surgeon W. Barren, Bhuj, Cutch.*) "An infusion of the dry herb with nitrate of potash has been found by me to be very efficacious in dropical affections. In slight cases a decoction of the fresh herb boiled and salted, and eaten with bread (chappati), without any other treatment, seems to do good." (*Asst. Surgeon Nona Chunder Dutt, Durbehanga.*) "The white variety is preferred to the red. The root is a good medicine for dropsy and asthma." (*Surgeon-Major Bankabehary Gupta, Pooree.*) "The root bruised in water is a common application to the feet in cases of general debility." (*Sakharam Apte, Ratn., L. M., Gergaum, Bombay.*) "Assistant Surgeon Moti Lal Mookerji extols this plant as a diuretic, especially in dropsy." (*Surgeon-Major A. Sanders, Chittagong.*)
Habitat.—A large tree, trunk without prickles, met with in Chittagong, Burma, and the Andaman Islands.

Botanic Diagnosis.—Trunk without prickles; leaflets 7-9, ovate, cuspidate-acuminate, glaucous beneath; filaments slender, $\frac{1}{2}$ the length of the petals.

Properties and Uses—

Gum.—It yields a brown gum.

Structure of the Wood.—Similar to that of B. malabaricum, but pores smaller and more scanty. The wood is also more durable than that of B. malabaricum. The specimen from the Andamans had been 12 years in Calcutta in the rough, and was only slightly discoloured on being cut up. (Gamble.)

Bombax malabaricum, DC.; Fl. Br. Ind., I., 349; Wight, Ic., t. 29.

SILK COTTON-TREE.

Syn.—B. heptaphylla, Caw.; Roxb., Fl. Ind., Ed. C.B.C., 574; Salamalia malabarica, Schott.; Gossampinus ruksa, Ham.

Vern.—Semur or semail, shemul, semur, sagram, samin, ragat-semail, ragatsemail, kentil-semail, Hind.; Rakto-semail, simul, Beng.; Simbal, Hazara; Shravan, Sutlej; Del., Kol.; Edel, Santa; Simur, Mal. (S. P.); Boura, Simuri, Utria; Belichak, panche, Garko; Sunga, Lenchka; Semar or semur, C. P.; Saur, saer, somur, semul, shemul, Bomb.; Sàvara, simlo, samar, kante savar, kantiri savar, shevoeri, samari, savari, Mar.; Rait-semailo, shemolo, shimlo, shimul, shimmer, Guj.; Kánton-ká-khati, kánton-ká-semail, likkkáyên, Dérk; Mundia-biraga-chetté, Tel.; Fulé, mul-llavu-maram, mulilatu, Tam.; Pulamaram, mul-llavo, mulilla-lóla, Mal.; Mulai-báragamár, bursa, Kan.; Wallaaka, Gond; Katzeri, Brit.; Lépanty, Magh.; Sárnal,astic, Sáns.; Kattu-imbél, Singh.; Léptan, didíc, lépán-bín, Burm.

Habitat.—A very large, deciduous tree, with branches in whorls, spreading horizontally, and the stem with large thorny butresses. Met with throughout the hotter forests of India and Burma. It is abundant on the eastern side of India, ascending the mountains to 4,000 feet in altitude. Distributed in Bengal and Sumatra. It is the largest and most characteristic tree of eastern Rájpútaná. (Rájpútaná Gás., p. 25.)

Botanic Diagnosis.—Trunk and branches covered with large corky prickles; leaflets 5-7, quite entire, cuspidate, base tapering; filaments ligulate, half the length of the petals; capsule oblong-obtuse.

Properties and Uses—

Gum.—Mócharas (i.e., the juice—ras of the móchar), mòcharas, mòcherus, mucherus, and various other forms of the word, are names given to a brown, astrigent, gum-like substance, frequently seen in Indian bazaars. It occurs in the form of light or dark brown tears, which are often hollow, much resembling galls. It is sometimes called supári-há-phul (i.e., flowers of the supári, or betel-nut palm). It is difficult to account for this latter name; the word phul is certainly used very frequently with a wide meaning, so much so that it would be quite easy to understand its being applied to the large gall-like tears of this gum. It is much more difficult to account for the supposition that they were the phul (flowers) of the supári, unless we imagine that, as with Catechu at the present day, this astrigent gum was formerly eaten in phu along with the betel-nut. It seems quite satisfactorily proved that Dr. Birdwood was mistaken when he stated that he believed the mócharas was "a kind of gall produced on the Areca Catechu" (Bombay Prod., 10). "Dr. Birdwood affirms that he has himself gathered precisely identical excrences from Areca Catechu." (Dr. Cooke's Report on Gums, 1874, p. 40.) It is a remarkable fact that no one has as yet confirmed Dr. Birdwood's observation regarding these gall-like excrences occurring upon Areca Catechu,

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but while this is so, his statement regarding them has passed into the literature of the subject. (See Baden Powell, P&. Prod., 1, 319, 397; Cooke's Report on Gums and Resins, 40; Atkinson's Gums and Gum-resins, 27, &c.) Dr. Dymock, however, in his recent work on the Materia Medica of Western India, attributes mócharas to Bombax, but makes no mention of Birdwood's astringent gall-like excrescences, while discussing the properties of the Betel-nut palm. Dr. Birdwood affirms that "all his attempts to obtain gum of any kind from Bombax completely failed in Bombay, and he has no hesitation in saying that the red cotton-tree affords no gum whatever." (Cooke's Report.) Dr. Stewart in his Punjáb Products (p. 24) says: "The gum which exudes from the bark is given often with Aegae for dysentery and diarrhoea." Several other more recent observers have, however, collected and described the gum obtained from Bombax malabaricum, and there would thus seem no ground for doubting that Bombax is the chief source of the mócharas of our bazaars. Indeed, it is highly probable that the other gums sold under that name are only substitutes or adulterants. In an interesting letter addressed to the Indian Forester (Vol. VIII, 153) Mr. Baden Powell gives a detailed account of a tree of Bombax malabaricum which in his private garden at Lahore yielded a quantity of mócharas. It appears that if the tree is artificially wounded this substance will not be produced. The formation of the gum is due to some functional disease, and commences below the bark like a large swelling. After removing the mass of dark-coloured and decayed mócharas, Mr. Powell watched closely the formation of new gum. He says: "To my surprise, it issued in various-shaped masses, or worm-like pieces, as if one squeezed oil-paint out of a tube; this gradually cured up or coagulated into a mass, as chance would have it. It consisted of a rather firm, slightly translucent, dirty-whitish-yellow jelly. To the taste it was almost insipid, but with a slight roughness, indicating astringency. It proved wholly insoluble in cold water, and nearly so in boiling water, though I think it went into a pulp under such treatment. It did not appear either soluble in pure spirits of wine, but imparted a red colour to the liquid."

"This jelly, when dried by the air and heat of the sun, acquired a dark-brown colour; the surface dried first, and the inner part gradually shrunk afterwards, accounting for the blister-like irregular pieces." Mr. Atkinson, in his Himalayan Districts, says: "The gum of this tree is known as mócharas."

Dr. Moodeen Sheriff, in his admirable "Supplement to the Pharmacopoeia of India," attributes a portion at least of the mócharas to Bombax malabaricum, but makes no mention of the so-called supârâ-kâ-phul. He states that there are two varieties of the mócharas. "Both occur in very irregular, nodular, smooth, and shell-like pieces, opaque and dark brown in colour, the difference being, one is very hard and broken with difficulty, and the other is brittle and easily broken, and less astringent in taste. The latter is the inferior of the two, and is the produce of Bombax malabaricum. No gum is produced from this tree on making incisions (however deep), but occasionally a very small quantity of it is exuded spontaneously. It is of a yellowish red or flesh colour at the beginning for some days, and then becomes deep brown. After some months it gradually and occasionally acquires the form I have described." This account was published in 1869, and it entirely concurs with Mr. Baden Powell's personal observations published in the Indian Forester in 1882, from which an extract has already been given. The bulk of the evidence which has since come to light goes a long way to show that both forms of mócharas described by Moodeen Sheriff are in all probability derived from Bombax.

The following extract from Dr. Dymock's Materia Medica of Western
India (published 1883) will be found to convey the main facts known regarding mócharas.

**DESCRIPTION.**—When first exuded it is a whitish fungous mass which gradually turns red, and finally dries into brittle mahogany-coloured tears. The larger tears are hollow in the centre, the cavity being produced during the gradual drying of the jelly-like mass which first exudes. Dry mócharas when soaked in water swells up, and resumes very much the appearance of the fresh exudation. The taste is purely astringent like tannin.

**Microscopic Structure.**—Mócharas is not a simple juice, but the product of a diseased action, which consists in a proliferation of the parenchym cells of the bark. Upon making a section of the diseased part, a number of small cavities are seen which contain a semi-transparent jelly-like substance, consisting of oblong cells with botryoidal nuclei. At the margin of the cavity the columns of healthy cells are seen breaking up, and the cells separating to join the jelly-like mass; this gradually increases in size and finds its way to the surface to be extruded as mócharas. Upon its first appearance it is of an opaque, yellowish-white colour, firm externally, but semi-fluid internally, and there is no central cavity. The cause of the diseased condition of the bark which produces mócharas has not been determined.

**Commerce.**—Mócharas is collected by Bhels and wandering tribes in Western India. It is sold by all the druggists. Value Rs per Surat maund of 37½ lbs. The gum of Moringa (shégua) is frequently mixed with mócharas; though similar in colour, it may readily be distinguished by its weight and solidity.

**Fibre.**—The inner bark of the tree yields a good fibre suitable for cordage. The seeds yield the so-called red silk-cotton or sinal cotton, a fibre too short and too soft to be spun, but largely used for stuffing pillows, &c. It has also been talked of as a paper fibre. The smoothness of the cotton prevents cohesion or felting, and hence in the textile industries this fibre could only be used to mix with others, imparting a silky gloss to the fabric. A writer in The Tropical Agriculturist, speaking of the imbut (which is either this tree or the white silk-cotton tree), says: “I believe this product (tree cotton) will become far more important than Ceara rubber. Civilization is rapidly opening its mind to the fact that palan (the Singhalese for cotton-wool) makes a sufficiently soft bed, at a comparatively small cost, while in it the manufacturers of gun-cotton have found a cheaper and equally efficient raw material, as a succedaneum, to that used formerly.”

**The Kapok Fibre.**—The demand for new fibres has recently directed attention to the subject of silk-cottons, and it seems that the produce of two, if not three, very different trees have, in Government reports and public newspapers, been confused with each other. Much of what has or can be written regarding one of these fibres is probably applicable to the others, but it seems desirable that they should be carefully distinguished. In a correspondence regarding silk substitutes from Messrs. Manning, Collyer, & Co., London, forwarded to the Government of India by Her Majesty’s Secretary of State, silk-cotton or kapok was incidentally disused. Samples of silk-cotton were accordingly forwarded for examination, with the result that Messrs. Manning, Collyer, & Co. reported that the semenl cotton supplied them was better known as kapok, and that there was but a small demand in England for the article. A considerable trade, they added, exists “in Holland, where, however, the longer-stapled qualities from Java are much preferred.” The sample supplied “being on the seed will lose very considerably in cleaning, and the present estimated value is 2d. to 2½d. per lb.; possibly with regular
supplies rather more might be obtained, say 3d. a lb." Mr. Oolyer,
sparking at a meeting of the Society of Arts (London, 1883), said that the
Dutch were far in advance of us in using silk-cotton. At the Amster-
dam Exhibition and in Holland, Mr. Oolyer remarks that silk-cotton
fetches 8d. a lb., whereas in England only 2d. can be got. The quality
of the fibre was, however, better. In a further article in the Journal of
the Society of Arts, Mr. Oolyer goes into the subject of silk-cotton,
and mentions several species, but appears to have overlooked entirely
the simal tree of India—Bombax malabaricum.

Through the kindness of Professor W. T. Thiselton Dyer of Keswick
have seen a circular on the kapok fibre issued by Messrs. J. C. Küchen
& Co., Rotterdam (dated November 1883). From this interesting
paper it appears that the chief use of the fibre is in upholstery. The
kapok is, however, quite distinct from the simal, and since the former
fetches a much higher price than the latter, it seems desirable that the
two should be carefully distinguished in all experimental or commer-
cial consignments. The kapok is obtained from Eriodendron anfractus,
the white silk-cotton, while the simal is the fibre from the seeds of Bombax
malabaricum, the red silk-cotton. Since both trees occur abundantly
in India, to participate in the new and apparently considerable trade in
kapok, all that seems necessary is for India to direct its attention to the
correct plant.

The following brief notice of the Indian silk-cottsons may help to
remove ambiguity, but the reader is referred for fuller details to the
accounts given under each in their respective alphabetical positions in this
work. The plants are enumerated in the order of probable merit.

1st—Eriodendron anfractus, DC.

The Kapok, or White Silk-Cotton.

This is particularly plentiful in the Konkan, but it grows in most parts
of India, and its cultivation could be extended. As a road-side tree,
while affording shade, it might be made to yield a distinct revenue to the
country.

2nd—Bombax malabaricum, DC.

The Simal, or Red Silk-Cotton.

This is the commonest of the silk-cotton trees, occurring throughout the
peninsula, but more particularly in the eastern side, and ascending the
hills to 4,000 feet in altitude.

3rd—Coclospermum Gossypium, DC.

The Kambi, or Galgal.

A common tree of the lower hills of India from Garhwal, Bundelkhand,
Behar, Orissa, and westwards to the Deccan. It has large yellow flowers,
and is not uncommon in cultivation throughout the country, especially in
South India. It does not appear that the samples of this form of silk-
cotton have been consigned to Europe and declared as such, so that its
peculiar merits have not been definitely determined.

4th—Calotropis gigantea—the Madar and other Asclepiadaceae and
Apocynaceae—yield silky hairs—the coma of the seeds. These are gener-
ally classed as silk-cottons, but with the exception of madar none of these
fibres have as yet been experimented with. The natives of India regard
the madar silk-cotton as much cooler than simal, and affirm that it has a
soothing effect.

Oil.—Cookes, in his Oils and Oil-seeds, makes mention of this plant as
yielding an oil, but gives no other information about it.

Food.—The flower-buds are eaten as a pot-herb.

The Assistant Commissioner of Balaghat, in Mr. Liottard's note on

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Mócharas as a Medicine.

Móchara, says that this constitutes a regular article of food. “Of the minor forest produce, about 5,000 maunds of sínál are used as food.” Monkeys eat the young flower-buds. (Ulwar Gaz., 32.)

**Fodder.**—The leaves and twigs are lopped for fodder.

**Medicine.**—The gum or dried juice, mócha-ras, which the tree yields, is used as an aphrodisiac. This gum contains a large proportion of tannic and gallic acids, and may be successfully employed in cases requiring astringents. It has also tonic and alterative properties; it is regarded as a styptic, and is used in diarrhoea, dysentery, and menorrhagia. In Rewa Kantha, Gujárdí, this gum is known as komarkax; it is “ground to powder and drunk in milk as a tonic.” (Bomb. Gaz., VI, 14.) The gum of the semul tree, mócha-ras, is given to children as a laxative, and the dried flowers are used as demulcent (Irvine). The dry flowers, with poppy seeds, goat’s milk, and sugar, are boiled and insipiated, and of this conserve two drachms are given three times a day in hemorrhoids. (Medical Topography of Deccá, by Dr. J. Taylor, 56.)

A decoction of the root gives a gummy substance, used in the Deccán as a tonic medicine. May not part of the mócharas sold by our druggists be this resinous extract? The roots have stimulant and tonic properties attributed to them. They have come to bear the name of musila, but this must not be confused with saféd-musli. The Pharmacopoeia of India, while not exactly making this mistake, publishes a note regarding saféd-musli under Bombax, and then proceeds to say that the roots sold under that name appear not to belong to Bombax, but to be the roots of some monocotyledonous plant. Both musila-símál and saféd-musli exist, however, and have separate properties attributed to them. The Ulwar Gazetteer says (page 32): “The roots of this plant are called musila, and they are much used in medicine.” “Musli-simbal is a light woody fibrous root of a brownish colour, with a thin epidermis, easily detached, and a very fibrous thick tuber. It acts as a stimulant and tonic, and some consider it in large doses emetic. It is said to contain 10 per cent. of resin.” (Baden Powell, Panjab Products, I., 333.) The young roots dried in the shade and powdered form the chief ingredient in the musli-simul, a medicine highly thought of as an aphrodisiac; it is also given in impotence.

The bark and the root are also emetic. The leaves are made into a paste and used as an external application.

**Special Opinions.**—Its gum (mócharas) is useful in diarrhoea of children, dose 20-30 grains, with equal parts of sugar.” (Surgeon J. Anderson, M.B., Bijnor.) “The tap-root of the young plant is used for gonorrhoea and dysentery.” (Surgeon-Major P. N. Mukerji, Cuttack, Orissa.) “The leaves singed and beaten or rubbed with water to a pulp make a useful application for glandular swellings.” (Mr. W. Forsyth, Civil Medical Officer, Dinajpur.)

**Structure of the Wood.**—White when fresh cut, turning dark on exposure; very soft, perishable; no heartwood; no annual rings. The wood of old trees is often of a dull-red colour. It is not durable, except under water, when it lasts tolerably well.

It is used for planking, packing-cases, and tea-boxes, toys, scabbards, fishing-floats, coffins, and the lining of wells. In the Konkan, Bengal, and Burma, the trunk is often hollowed out to make canoes and water-troughs.

Dr. Buchanan says it is the timber commonly employed by the natives of Behar “for making doors and window-shutters; for it lasts well in such situations, and is very strong to resist the attacks of robbers.” (Statistics of Dinajpur.) It is used as firewood in the Konkan. (Bomb. Gaz., XII, 40.)

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BORAGINEÆ

The Borage Family.

**Domestic Uses.** — The cotton is made into tinder. The tree is often mentioned in the Vedas. It is the Yudhrajvina, or tree of Yama, the Indian god of Death.

**Bonduc,** see Cassipina Bonduscilla, Roxb.; Leguminosæ.

**BORAGINEÆ.**

Herbs, shrubs or trees, often hispid or scabrous. *Leaves* alternate, very rarely opposite, extispulate, mostly entire. *Flowers* usually in dichotomous scorpionid cymes, rarely solitary and axillary. *Calyx* inferior, 5-, rarely 6-toothed or -lobed, usually persistent in fruit. *Corolla* gamopetalous, often with scales in the throat, rarely 4-6-lobed, imbricate (rarely twisted) in the bud. *Stamens* as many as the corolla-lobes, alternate with them, upon the corolla-tube. *Ovary* superior; cells 2, 2-ovuled, or 4-1-ovuled; style terminal or from between the ovary-lobes, long or short, stigma capitulate or 2-lobed, rarely the style twice bid; ovules sub-erect from the inner basal angle of the cell. *Fruit* drupaceous or dividing into 2-4 nutlets. *Seeds* erect or oblique, testa membranous, albumen fleshy, copious, spearing or o; embryo straight or curved, radicle superior. Species 1,200 throughout the world.

**Tribe I. Cordiæ.** Trees or shrubs. *Style* terminal on the entire ovary-twice bipartite. *Drupa* 4-1-seeded; albumen o; cotyledons pale longitudinally.

-Calyx-teeth very short, irregular . . . . 1. Cordia.

**Tribe II. Ehretiæ.** *Style* terminal on the entire ovary, simple, bipartite, or styles 2. *Drupa* with 2 2-ovuled or 4 1-ovuled pyrenes, or of 4-1 nuts.

-Trees or shrubs. *Style* 2-fid . . . . 2. Ehretia.


-Virgate shrub. *Style* 1, stigma capitate. . . . 4. Rhabdia.

**Tribe III. Heliotropiæ.** *Style* terminal on the entire ovary, depressed—conic at the apex, or with a horizontal ring below the stigma—*Fruit* as of Ehretiæ.

-Shrubs, often scandent. *Style* short, shortly 2-lobed . . . . 5. Toutefortia.

-Herbs, style dilated at the apex or above the base . 6. Heliotropium.

**Tribe IV. Boragœæ.** Herbs. *Style* simple or bifid, rising from between the ovary lobes (except in Trichodesma). *Nutlets* 4, rarely 3-1 by suppression (2 in Rochelia); albumen o.

**Sub-tribe I. Cynoglossæ.** *Nutlets* attached to a convex or conical carpophore, scar continued to the apex of the nutlets, which are often depressed produced, or saccate at the base.

- *Fruiting calyx enlarged, enclosing the nutlets.*

-Anthers conically convenient, lanceolate, subexsert 7. Trichodesma.

- **Nutlets depressed, their bases produced downwards.**


-Stamens included. Margins of nutlets reflexed over their backs . . . . 9. Omphalodes.

-Stamens exerted; anthers large, linear oblong . . . . 10. Cynoglossum.

-Stamens exerted; anthers small, shortly oblong . . . . 11. Lindelia.

-Racemes ebracteate. Margin of the nutlets glabrous, often reflexed . . . . 13. Paracaryum.

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The Borage Family.

Racemes bracteate. Margin of the nutlets glabrous, scarcely reflexed.

Sub-tribe II. Eritrichiæ. Nutlets attached to a convex or conical carpophore, scar in the middle or lower half of the nutlets, which are not depressed at the base, but are produced at the apex above the scar, free round the base of the style.

* Scar in the basal half of the nutlet.

Racemes bracteate. Nutlets 2, 1-seeded.

- 16. Rochelia.

** Scar in the middle of the inner face of the nutlets.

† Scar small, without a prominent, thickened, incurved margin.

Flowers axillary, subsessile. Fruiting calyx enlarged.
- 17. Asperugo.

Almost stemless. Fruiting calyx not enlarged.

†† Scar depressed, with a thickened incurved margin.

Flowers axillary, pedicelled.

Flowers axillary, subsessile.
- 20. Gastrocotyle.

Sub-tribe III. Anchusaæ. Nutlets on a flat or nearly flat receptacle; scar basal, prominent, hollowed out, with a prominent thickened margin.

* Corolla-throat closed by 5 scales.

Corolla-tube straight.

Corolla-tube curved.
- 22. Lycopsis.

** Corolla-throat naked or hairy within, but without scales.

Racemes dense. Calyx large.

Sub-tribe IV. Lithospermaæ. Nutlets on a flat or nearly flat receptacle; scar basal, but little hollowed out, without a prominent margin.

* Racemes bracteate, corolla-lobes distinct.

Corolla-tube cylindric. Anthers included.

Corolla-tube cylindric. Anthers exerted.
- 25. Moontia.

Corolla-tube short. Nutlets tetrahedral.


** Racemes bracteate, corolla-lobes distinct.

Corolla-throat naked or with small scales.

Corolla-throat densely filled with hairs.
- 29. Sericostema.

Hispid spreading herbs. Corolla yellow, tube elongate.

Sub-erect herbs. Corolla purple, tube elongate.
- 31. Macrotemia.

*** Corolla-lobes reduced to minute teeth.

Anthers lanceolate, connivent in a cone.
- 32. Onosma.

The preceding extract from the *Flora of British India* will doubtless be found useful to the student of Economic Botany. It will at least serve to direct his attention to the names of Boraginaceous genera, to identify which it will, however, be necessary to consult the *Flora,* since an analysis can at most isolate the tribes or more marked genera, and is of use only when the reader possesses a perfect and typical specimen. As formed at the present day, the Boragineæ may briefly be said to embrace two very different groups of plants, the one tropical or warm-temperate trees, shrubs, or herbs, and the other temperate or extra-tropical herbs. This is not absolutely correct, but it is so far as to make a statement of the distribution of the Indian Borage worts somewhat misleading. The herbaceous or
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<th>BORAGO</th>
<th>.The Borage Family.</th>
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| indica | what may be called the true or more typical Boragineae (the members of the tribe Borageae) are almost entirely temperate. They abound in the southern part of Europe, the Levant, and the temperate regions of Asia. They are less frequent in northern latitudes, and almost disappear from the tropics. This fact is so well-known—the Forget-me-nots being viewed as a most typical feature of the temperate regions—that an analysis of the Indian species of Boragineae will assign to the plains a very misleading proportion; but it must be borne in mind that these belong chiefly to the tribes Cordiaceae, Ehretiaceae, and Heliotropheae, which might be viewed as constituting a separate order, and indeed the Cordiaceae have been treated as such by many authors.

In Boragineae there are in all 1,200 species, of which India possesses 139. Of the latter, 51 or 36.7 per cent. are confined to the plains; 25 or 20.1 per cent. ascend to 5,000 feet in altitude; 30 or 21.6 per cent. to 10,000 feet; and 30 or 21.6 per cent. are met with above that altitude. Thus 51 are tropical and 98 temperate. This is an approximately correct statement only, since some of those included in the second group ascend from the plains to the hills and thus overlap the division into tropical and temperate.

Their distribution over India shows a corresponding temperate character, the majority occurring in the North-West Provinces and the Panjab, the plains of which are much colder than the plains of the eastern side of India, and have accordingly a much larger number of species, especially of cold-season annuals. The eastern side of India has 24 species or 17.2 per cent.; South India 14 or 10.0 per cent.; Western India 11 or 7.9 per cent.; Sind 6 or 4.3 per cent.; and the Panjab and North-West Provinces 59 species or 42.4 per cent. Distributed over two or more of these divisions—that is, occurring throughout India, there are 25 species or 17.9 per cent. Near all the species thrown into this last group are distributed to North India (i.e., Panjab and North-West Provinces, &c.), so that it is quite clear that the region of Boragineae, as far as India is concerned, must be viewed as the hills, plains, and mountains of the northern section of the empire.

The affinities of the Boragineae are with Labiatae and Verbenaceae, but they form so well-marked an assemblage that it is not necessary to enter into this subject. The Cordiaceae differ from the more typical Boragineae in being arborescent, and in having a twice-forked terminal style, baccate fruit, and plaited cotyledons.

Properties and Uses.—Few are of any very great importance. Many species contain a mucilage to which is often combined a bitter astringent principle. The Comfrey root (Symphytum officinale) was formerly used in hemoptysis. The Boragos are regarded as diuretics. Cynoglossum yields a poisonous narcotic root. The sweetly-scented Heliotrope (Heliotropium pterium) belongs to this natural order, and so of course do the favourite Forget-me-nots (Myosotis). The fruits of some of the Ehretiaceae are edible, and the roots of Anchusa, Onosma, Alkanna, and Arnebia afford the dye Alkanet. One of the most curious and interesting members of this order is the drug sold in India under the name of Guazabon, which recent investigation seems to have proved to be a species of Echiun; it is imported from Persia. Some doubt also prevails as to the drug Rattanjet. While various substances are sold under that name, the true article appears to be the root of some Boragineae, a very probably a species of Onosma.

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<td>Syn. for Trichodesma indicum, Br., which see</td>
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B. 661


An erect, graceful palm, with a terminal crown of fan-shaped leaves, belonging to the tribe Borassae of the Natural Order Palmae. It is a native of Africa, but at the present day exists in a state of cultivation throughout India. It is almost unnecessary to give an enumeration of the generic characters of this well-known palm. There is only one species, and, as far as the plains are concerned, it is the only palm with fan-shaped leaves. The flowers are dioecious, occurring in panicked spikes; male thick, cylindrical; flowers fasciculate in the axis of broad, whorled, imbricate, connate bracts; ovary scaly.

The generic name is Bopanas, the Greek name for a palm fruit.

Borassus flabelliformis, Linn.; Palme.

The Palmyra Palm; Brab Tree.

Vern.—Tāl, tāla, tār, tāri, Hind.; Tāl, Beng.; Tāle, Santal; Tāl, tāl, tēla-a-tēla; Gaj.; Dvāl or tād, Surat.; Tāl-kus, Sām.; Tāticha-ha, tāda, tālāt, Mār.; Potu tāl (the male tree), pēnī tālī (the female), tālī-chetti, Tel.; Panas-maram or pānna-maram, panam, panni, pampăi (t) Tām.; Panī, Mal.; Tāl, tālī, pān-nara, Kan.; Tāl, Sans.; Dārakhe-tāri, Pers.; Tāl-gass, Tal, Singh.; Hān, tan, Burm.

Habitat.—A tall palm with cylindrical stem, cultivated throughout tropical India, and beyond the tropics in Bengal and the southern part of the North-West Provinces. The young stems are covered with dry leaves, or rather with the lower part of the petioles, while the old stems are marked with the hard, black, long and narrow scars of the fallen petioles. In Upper India it is chiefly seen on embankments around tanks, but in Bengal it luxuriates in the mixed cocoanut and date-palm jungles. Brandis says it extends up both sides of the Persian Gulf, attaining about the same latitude as in North-West India. It is also cultivated in Prome, in Ceylon, and in the Indian Archipelago. "It thrives in this district, although it never grows spontaneously; and is finely adapted for covering the naked sides of tanks which are now almost entirely useless." (Buchanan's Statistics of Dinajpore, p. 150.)

Synopsis of the Economic Uses.—Every part of this plant is made use of in some way or other. A Tamil poem enumerates some 800 uses to which the various parts are put. The Tropical Agriculturist (June 1884) publishes a list of the more important of these uses, enumerated by Mr. Robert O. D. Asbury of Jaffna, Ceylon, arranged in seven groups as follows: Group I., Wooden utensils; Group II., Food materials; Group III., Leaves; Group IV., Fibre; Group V., School things and toys; Group VI., Toddy-drawers' utensils; Group VII., Miscellaneous.

THE GUM.

Gum.—A gum, obtained from this palm, is said to have been sent from Madras to the Panjab Exhibition; it is black and has a shining fracture.

FIBRE.

Fibre.—The fibre extracted from the leaf-stalks is used for rope and twine-making, and may also be used for paper. This fibre is strong and wiry, and is about 2 feet long. In Ceylon it is extracted and the ropes and string, largely used for cattle yokes and other agricultural purposes, are made of it. In Madras it is also made into rope and twine. In Bengal the twine are too scattered to admit of an extended trade in this fibre. The long cord-like and dark-coloured fibro-vascular bundles are carefully extracted, however, while preparing dug-outs, &c. By the

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The Palmyra,

BORASSUS flabelliformis.

fishermen these are made into invisible fish-traps. For this purpose they are platted into a long tapering tube, the meshes of which are 2 inches in size. This tube is placed in a dividing wall of weeds run across the tank; it thus forms what appears a natural and apparently easy passage from one expanse of water to another. At the end of the passage is placed, however, a noose made also of the tār fibre. In darting through the passage this trap is so arranged that the fish must run its head into the noose and is thus firmly secured. The fishermen put the tār fibre through some process of preparation, but it is not spun or twisted in any way, a single thread or fibro-vascular bundle being used.

Coir or fibre from the pericarp is doubtless prepared in many parts of India, but no definite information can be obtained. The leaves are made into fans or worked into boxes and baskets and into many minor objects; amongst these may be mentioned a braid platted of thin strips of the leaves, and used for ornamental purposes. They are also extensively used for thatching buts.

§ “Ropes for country craft are made from the leaf and leaf-stalks, mats are also made from them, and the hoods which labourers wear in the monsoon, called in Mahattia Khori. The leaves are also used for thatching buts.” (Surgeon-Major W. Dymock, Bombay.)

MEDICINE.

Medicine.—The juice of this plant is used as a stimulant and amphigromatic. When freshly drawn, it is exceedingly sweet, and, if taken regularly for several mornings in succession, acts as a laxative. It is also useful in inflammatory affections and dyspepsia. The fermented juice called tāri or toddy is intoxicating. The juice of the dry spadix is an antacid in heartburn; U. O. Dutt says that it is regarded by the Hindus as useful in spleen. The terminal bud of the tāl tree is regarded as nutritious, diuretic, and tonic. The root is regarded as cooling and restorative. (U. C. Dutt.) “A useful stimulating application, called Toddy Poultice, is prepared by adding fresh-drawn toddy to rice-flour till it has the consistency of a soft poultice, and this being subjected to a gentle fire, fermentation takes place. This, spread on a cloth and applied to the affected part, acts as a valuable stimulating application to gangrenous ulcerations, carbuncles, and indolent ulcers.” (Drury’s Useful Plants.) “The juice of the Fresh Pettiols is given as a stimulant amphigromatic, and is used by native physicians as an adjunct to stimulating drugs in the low stages of intermittent and remittent fevers.” “The Pulp of the ripe fruit is applied externally in skin diseases.” (Babu T. N. Mukerji, in his Amsterdam Catalogue.) The light-brown, COTTON-LIKE SUBSTANCE from the outside of the base of the fronds, is employed by the Singhalese doctors as a styptic to arrest haemorrhage from superficial wounds.

Special Opinions.—§ “Vinegar, toddy, and a spirituous liquor are made from this tree. The juice, slightly fermented, is used in diabetes. The ash of the spadix is given internally in bilious affections.” (Surgeon G. A. Emerson, Calcutta.) “The expressed juice of the leaf-stalk and young root is used in cases of gastric catarrh and to check hiccup. The fresh juice is diuretic and used in gonorrhoea. The fermented juice is uncertain in its action and sometimes acts as a drastic purgative.” (Brigat Surgeon J. H. Thornton, B.A., M.B., Monghyr.) “Fresh juice is cooling and is considered as a luxury in the hot season.” (Assistant Surgeon Shy Chunder Bhattacharji, Chinda, Central Provinces.) “An extract of the green leaves is used internally in secondary syphilis.” (Surgeon-Major J. F. L. Rutton, M.D., Salem.) “The fresh juice obtained by cutting the spadix is a good diuretic and is useful in cases of dropsy.” The fermented
Products of India.

Borassus flabelliformis.

**MEDICINE.**

**FOOD.**

The Juice, Toddy, and Sugar.

By far the most important product of this plant is the juice—Ras—obtained on tapping the flower-stalk. This, before sunrise, is sweet and agreeable to the taste, and while fresh is either consumed as a beverage or boiled down to sugar. In the Madras Presidency the quantity of jaggery sugar made from the juice of this palm is very considerable. After sunrise the juice rapidly ferments, however, and is then converted into toddy—tari—an intoxicating drink. Dr. Alnial (Mat. Ind., i., p. 451) describes four kinds of toddy which were prepared in his time, but makes no mention of the date-palm toddy. He gives preference to cocoanut-palm juice, after that to palmyra, then the toddy from Caryota urens, and last of all that from the New tree. In most parts of India toddy is extracted from some palm or other, but in Bengal one might almost say the date palm was exclusively used for this purpose. The Palmyra, on the other hand, is the toddy palm of South India, of the Konkan, of Burma, and of Ceylon.

Definite information cannot, however, be obtained regarding the amount of Palmyra toddy, or of the sugar actually prepared in India, since, in the returns given for this substance, separate records are not kept of the trees from which the palm toddy and sugar are obtained. In another part of this work, under the heading "Toddy," further details will be given, but the following abstract may be found useful:

(1) The fresh juice is called ras. If not consumed before sunrise it turns milky, and rapidly ferments.

(2) The fresh juice if boiled down yields molasses or jaggery from which sugar may be refined. The juice collected for this purpose has a small piece of lime placed in it to prevent fermentation while suspended from the tree.

(3) The fermentation is accelerated by placing in the liquid what are known as fermentation-seed,—that is, rice saturated with old or fermented ras. The fermented liquid is called toddy or tari.

(4) If distilled, palm-wine or arak is the result.

(5) By destructive distillation a good quality of vinegar is produced from the juice.

The various methods of extracting the juice, and of preparing either of the five substances above briefly enumerated, will be best shown by republicating from standard authors an account of the industry as practised in Madras, Bombay, Ceylon, Burma, and Bengal—

"The mode of procuring the vinous sap is as follows: The spadix or young flowering branch is cut off near the top, and an earthen chatty

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or pitcher then tied on to the stump; into this the juice runs. Every morning it is emptied and replaced, the stump being again cut, the vessel placed as before, and so on, until the whole has been gradually exhausted and cut away. It is known in Tamil as the Pannungkhullu. It is from this liquor that sugar is extracted, and by the same process as that described for procuring the toddy, except that the inside of the earthen vessel or receiver is powdered with chunam, which prevents any fermentation; the juice is then boiled down, and dried by exposure. Some few trees that from unknown causes do not flower in spring, put out their flowers in the cold season, and give a scanty supply; but in spring many are rendered artificially barren by breaking off the flowering-bud as it begins to form. These also flower in the winter season, and are called Basant. They do not give above 2½ maunds of juice, but this is of as much value as the 6 maunds which a tree gives in spring. Either the male or female will answer for the spring or winter crop, but the female alone will yield juice in the rainy season. When this is wanted, the fruit is allowed to form, and afterwards the point of the spadix or stem which supports the clusters is cut and allowed to bleed. (Drury, Useful Plants, p. 83.)

In the Konkan, Thana District, "the fan palm is the chief liquor-bearing tree. It grows wild all over the district, and is found by tens of thousands in the coast sub-divisions. The trees are of different sexes, the male being called talai, and the female ted. The juice of both is equally good. The trees are also known as shitolini, dongri, and thalasani, according to how they have been planted by the owner or grown on uplands or on lowlands. Fan palms artificially reared grow rather more quickly than wild ones. The ground is not ploughed, but a hole, about a foot deep, is made, and the seed buried in it in Jesith (May–June). No watering is necessary, and the only tending the plant requires is the heaping of earth round the base of the stem to quicken the growth. In about twelve years it is ready for tapping, and will yield liquor for about fifty years, or, as the saying is, to the grandson of the man who planted it. In the case of the male palm, talai, the juice is drawn from the lendis, which are finger-like growths, from twelve to fifteen inches long, given out in clusters at the top of the tree. Some of the fingers in the cluster are single, others spring in threes from a common base. Each finger is beaten with a piece of stick called tapurali, three times in three lines along its whole length, and all the fingers of the cluster are tied together. In three or four days, the points of the fingers are cut by the ait, a sharply-curved knife with a keen flat and broad blade. The points are cut daily for about a fortnight, when the juice begins to come. Under the tips of the fingers earthen pots are placed into which the juice is allowed to drop, and to keep off the crows a sheath of straw is bound round the lendis so as to close the mouth of the jar. The female tree gives out spikes from twelve to fifteen inches long, with the fruit seated all round the sides of the spike, as in a head of Indian-corn. The spikes are known as sapat koti, gangra, and pendli, according to the juice issues when the berries, taiguda, are still minute, fairly grown, or very large. In trees which yield juice while the berries are still very small, sapat koti, the spike, is beaten, and on the third day its point is cut, and the sides rubbed with the hand so as to brush off the incipient fruit. In ten or twelve days the juice begins to drop. In trees which yield juice when the spike is fairly grown, gangra, the spike, must be beaten on the interstices between the berries with a long stone, called a dagdi gunda, or, if the interstices are very fine, with an iron pin called lohandi gunda. On the third day the tip is cut, and in about fifteen days the juice begins to flow. In trees which
yield juice when the fruit is large, péndí, the parts of the spike visible between the berries, are beaten in the same way, and a month afterwards the end of the spike is cut daily for about a fortnight, when the juice generally begins to come. As the gangara and péndí are cut, the fruit on the sides has to be gradually removed. A fan palm tree will yield from six to sixteen pints (three to eight shers) of juice every twenty-four hours. Almost the whole is given off during the night. When the juice has begun to flow, the fingers of the male tree and the spike of the female tree must have their points cut morning and evening. The distillation of palm juice is simple. The juice is put into an earthen jar, madhō, and allowed to stand for five days. It is then placed over a fire, and the spirit, rising as vapour, passes through a pipe into another jar into which it is precipitated in a liquid form by the action of cold water. One hundred shers of juice yield about twenty-five shers of spirit.” (Bomb. Gaz., Vol. XIII, Pt. 1, pp. 22-23.)

In Kolāhá District, “with few exceptions these palms are self-sown and no care is taken of them, except that a few thorns are sometimes set round seedlings to keep cattle away. The tree is full-grown at twenty-five or thirty years. It is tapped for about thirty years more, and is said to live about forty years after it has grown too old to be tapped. Both the male and female trees are tapped. The spathe, paygi, of the male tree is called lendī. Vigorous trees throw out from three to five sapthes a year, some in November, sargacha hangam, and the rest in February, bhār kāla. Trees that are not in full vigour throw out spathes in November only. The spathe is gently bruised with a piece of wood, the bruised parts bound together, a slice is cut off the point of the spathe by the drawer’s sharp and broad-bladed knife, ānt, and a pot is tied over the end to catch the juice. The tree is then tapped twice a day, a little slice being cut off the end of the spathe at each tapping. Under this process each spathe lasts, according to its length, from a month to a month and a half. The tapping season continues from October to May. The drawer is paid at the rate of 18 (8 annas) a month for each tree. Each tree yields about 3½ pints (1½ shers) a day, which at 9d. the pint (6 pies the sher) is worth 14d. (9 pies), or 2s. 9d. (R1-6-0) a month. Taking five months as the average time during which tapping lasts, the approximate gross profits are 14s. (R7). Deducting from this 6s. (R3) paid to Government and 5s. (R2-8) to the Bhandārī, the net profit on each tree is about 3s. (R1-8). This was the state of affairs before 1879-80, when the tree-tax was raised to 12s. (R5); since this change the tapping of palmrya trees has ceased, except in Allīgā. Palmrya juice can be distilled, but this is never done, as the supply of cocoa-palm liquor is in excess of the demand.” (Bomb. Gaz., Vol. XII, p. 29.)

Little more than 20 years ago, the Bombay Government, becoming alarmed at the amount of spirituous liquor which was consumed, gave orders that, in Surat, large numbers of this noble tree and of the date palm should be destroyed. But in 1868 the total number of toddy-yielding trees was estimated at 1,437,711, of which 47,810 were palmrya palms. (Bomb. Gaz., II., 39.)

The following extracts from Simmonds’ Tropical Agriculture—originally written by Mr. W. Fergusson—will be found to convey the more important facts regarding the extraction of toddy as practised in Ceylon:

“At the season when the inflorescence begins to appear, when the spathes have had time to burst, the ‘toddy-drawer’ is at work in the palmrya groves. His practised eye soon fixes on those trees fit for the ‘scraping knife,’ and if they have not dropped the foot-stalk
of the leaves, the first operation, if the trees are valuable, is to wrench them off. ‘An expert climber can draw toddy from about forty trees in a few hours. In Jaffna a distinction is made between toddy and sweet toddy; the former, called by the Tamils ‘culloo,’ is the fermented, the latter the unfermented, juice.’

‘The juice of the palmrya is richer in saccharine matter than that of most other palms, in consequence, perhaps, of the tree more generally growing in dry sandy soil, and in a dry climate. The great fault of the jaggery made at Jaffna seems to arise from the too free application of lime, a small quantity of which is absolutely necessary to prevent fermentation.’

‘According to Forbes, three quarts of toddy will make 1 lb. of jaggery. Malcolm remarks that jaggery resembles maple sugar, and that in the neighbourhood of Ava 1 lb. sells for the third of a penny. In Jaffna 3 lbs. are sold for 2d. The usual process of making jaggery, as pursued at Jaffna, is exceedingly simple. The sweet toddy is boiled until it becomes a thick syrup, a small quantity of scraped cocoanut kernel is thrown in, that it may be ascertained by the feel if the syrup has reached the proper consistency, and then it is poured into small baskets of palmrya leaf, where it cools and hardens into jaggery. In these small plaited palmrya baskets it is kept for home consumption, sent coastwise, chiefly to Colombo, or exported beyond seas to be refined. To make vellum or crystallized jaggery, which is extensively used as a medicine, the process is nearly the same as for the common sugar, only the syrup is not boiled for so long a period.’

‘Toddle serves extensively as yeast, and throughout Ceylon no other is employed by the bakers; large quantities of it are also converted into vinegar, used for pickling gherkins, limes, the undeveloped leaves of the cocoanut and palmrya trees, and other substances; but by far the greatest quantity is boiled down for jaggery or sugar. About 1,000 tons are said to be manufactured of it in Ceylon.’ (Tropical Agriculture, Simmonds, 265.)

Dr. Brandis says: ‘The most valuable produce of the tree is the sweet sap which runs from the peduncles cut before flowering, and collected in bamboo tubes or in earthen pots tied to the cut peduncle. Nearly all the sugar made in Burma, and a large proportion of the sugar made in South India and the Konkan, is the produce of this palm.’

The practice of extracting juice from the sáli palm is almost unknown in Bengal, or at all events it is rarely if ever done, the date palm taking its place. Sugar is accordingly not made from this palm in Bengal, but sugar-candy manufactured from it is imported into Calcutta from Ceylon, Madras, and the Archipelago. This is chiefly used in medicine as a remedy for cough and pulmonary affections.’ (Bakh T. N. Mukerji.)

The Fruit and Seed.

The tree flowers in March, and the young fruits ripen in April and May and the mature fruits in July and August. These are about 57 inches in diameter, green when young, but becoming brownish black, shaded with yellow, as they mature. They form large clusters in the axis of the upper leaves. Normally each fruit contains three nuts or by abortion only one or two. The pericarp consists of three distinct layers, distinctly the epicarp or outer skin of the fruit, the mesocarp or fibrous and succulent layer within the epicarp, and last of all the stony endocarp or shell of each nut. Within the shell occurs an arge solitary seed, which consists of a thin seed-coat, in contact with the shell on the one side, and with a layer of albuminous matter on the other. When young, the interior of the albumen is filled with a jelly-like fluid. As it matures, the
albumen becomes hard and firmly attached to the shell, the liquid being deposited with the growth of the embryo. Ultimately the embryo fills completely the central space, taking the place of the liquid now deposited as albumen.

It has been thought desirable to give the above detailed description of the structure of this fruit in order to remove the ambiguity which exists regarding the economic uses of its various parts.

The Unripe Fruit.—About April to May a certain number of the fruits are removed from the trees. The epicarp and mesocarp are removed and rejected, the shell is split open and the seed obtained. This constitutes the edible structure sold in Bengal under the name of talsans. The soft albumenous layer and the jelly-like fluid contained within it are eaten fresh, being regarded as cool and refreshing. They are sometimes cut into small pieces and flavoured with sugar and rose-water; in this condition they are viewed as a delicacy. In India it is very rarely the case that either the fresh seed or the above preparation from it is eaten by Europeans.

The Ripe Fruit.—In July and August, when the fruits are ripe, they are removed from the tree. The mesocarp or succulent and fibrous layer, after being passed through a preparatory process, is eaten as an article of food. “The yellow pulp surrounding the seeds of the ripe fruit is sweet, heavy, and indigestible. It is extracted by rubbing the seeds over a wooden scraper, and with the addition of a little lime it settles into a jelly, which is a ready mode of taking the pulp. It is also made into cakes with flour and other ingredients.” (U. Č., Dutt, Hindú Mat. Ind., 249.) By seed in the above passage should be understood nut; the fibrous tissue which ramifies through the succulent mesocarp is attached to the endocarp or shell of the nut. The succulent pulp scraped away from this tissue has a peculiar odour, and is sweetish; it is either eaten raw, or is mashed and strained with a little flour and sugar, completely mixed up to form a mass, and is then made into small flat cakes and fried in ghee or mustard oil; the cakes are known as pátáli, or pithá. “In order to make the first kind of cake (pátáli), the scraped pulp is mixed with lime, and coconut spread evenly on a plate in which it is allowed to stand for an hour, after which it is found in a solid state, owing to the effect of the lime on the pulp. In order to make pithá, the pulp is mixed with rice or wheaten flour and then fried n oil. In Bengal tál pulp is not preserved, does not form an important article of food, and there is no trade in it. In short, the tál occupies a very unimportant place among the Bengal fruits.” (Babu T. N. Makerji, Renuka and Agricultural Department.)

In Ceylon this pulp is known as Punátá. “The pulp of the fruit is preserved for use in the following manner: The ripe fruits are put into baskets containing water, and are then squeezed by the hand till the pulp forms a jelly. Layers of this jelly are spread on palmyra-leaf mats to dry on stages. Layer after layer is deposited to the number of about fifteen. These are left in the sun about a fortnight or three weeks, only covered at night, and protected from the dew and rain. The best sort is called Pimatos, and the tough withery kind made from the remaining fruits gathered at the end of the season, which is much in favour, Tot Punátá. Punátá is sold by the mat at 3r. to 6s. each, and is the chief food of the islanders of Ceylon, and of the poorer classes of the peninsula, for several months of the year.” (Tropical Agriculture, Simmonds, 267.)

Germinated Seed.—After scraping off the succulent tissue of the mesocarp, the nuts are found to be perfectly solid, and so hard that it is almost impossible to break them. If thrown aside in a heap or buried in

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flabelliformis.
The Palmyra.

Embryo. 704
Flour. 705
the earth for two or three months, however, they germinate. The very
young seedling or tip of the root and young stem are eaten as a vegetable
or pickled. The most valuable part is, however, the seed or rather embryo
within the nut. This is removed by splitting open the nut and removing
the large embryo, which is often as much as an inch and a half in length.
This is either eaten dry or after being roasted or cooked in various ways,
or it is reduced to a flour not unlike tapioca. This forms an important
article of food in most parts of India where the palm is grown to any
very considerable extent. "The developed embryo is sweet in taste, and
is considered nourishing. It is sometimes preserved in sugar, but in
Bengal it is not an article of commerce. It is called tal-att (tapha) in
Bengali. The tap-root and young plants are not edible, but are used
in medicine as a stimulant." (Babu T. N. Mukerji.)

In Ceylon they are known as Kelingoe. "The nuts are collected and
buried in heaps on the ground. When dug up after the space of three
months, the young shoots are called kelingoes; they supply the inhabitants
with a nourishing aliment. In size, colour, and shape they resemble a
parsnip, and look like a cold potato. In its fresh state it will keep good for
a couple of months, and when well dried in the sun, for a whole year. In
this state they are called odials. When reduced to flour or meal, the
favourite cool or gruel is made of it." (Tropical Agriculture, Simmonds,
207.)

According to Balfour, Drury, &c., the root is stated to be used as an
article of food and to afford a kind of tapioca. I have not been able to
have this statement confirmed, and suspect that the germinating seedling
what is meant. The young leaf-bud or cabbage, as with most other
palms, may be eaten, but the tree would be killed were this practice fol-
lowed; it is thus scarcely correct to enumerate this amongst the properties
of the plant.

TIMBER.

Structure of the Wood.—The outer shell of hard wood consists of an
almost solid mass of thick fibro-vascular bundles, more scattered in the
male than in the female trees. The centre is soft, but only rarely hollow.
Brandis says: "Forked and branching stems are occasionally found."
The outer hard woody shell is the part used as timber. The trees
after being felled are cut lengthwise into two, the soft fibrous part re-
moved, and the hard outer portion adapted to the purpose for which it is
intended. From the structure of the fibres it splits easily, but is stated to
support a greater cross strain than any other known wood. Iron nails,
however, rapidly decay it, so that, except for posts, it is not generally
serviceable for house-building. The hollowed-out halves are used as
water-pipes, gutters, or open water-channels. They are made into dug-
out canoes. The swollen, rounded, and lower end forms the front of the
canoes, and the tapering end has either a piece of the original wood, 6 inches
in length, or a lump of mud, placed in it to close the mouth. The rounded
end from which the mass of rootlets spring requires no protection, for it is
nearly as hard as the outer shell of the stem proper. The timber is used
for posts, rafters, and a number of minor purposes; it is, in fact, the timber
most used, of all the Palm family, for house-building and other domestic
purposes. A small export trade is done in the wood for making walking-
sticks, umbrella-handles, rulers, and other small and ornamental purposes.
In India it is often made into shuttles.

A rule exists in many parts of India (an unwritten law), that for every
palmyra palm that is felled another must be planted. This is a very
fortunate arrangement, for it would be difficult to find a tree regarding the
uses of which so much might be written. Mr. Vincent, in his report of the
forests of Ceylon, says of it: “The Tamils throughout the Jaffna peninsula derive no small portion of their food from the palmyra products, whilst a large number may be said to live on the tree entirely. In spring they make jaggery (a kind of sugar); during the rest of the year they live on the money so earned, and on Panam and Kellingoes.”

**DOMESTIC AND SACRED USES.**

It has already been stated that in a Tamil poem 800 articles are described as prepared from the palmyra palm; a large number of these are minor domestic appliances which need not be enumerated in this work; a few of the more important may, however, be mentioned:

**Domestic.—The Leaves.**—These are made into fans and large punkhas, variously lacquered or plain, and into baskets of marvellous decorative designs, both for domestic and ornamental purposes. In Madras neat work-baskets are made of palmyra leaf. A single leaf is often held over the head as a kind of umbrella. Strips of the leaf, carefully cut, smoothed, and slowly dried in the sun and rubbed with oil, were formerly used in place of paper for writing letters and books on, and to this day are so used in Orissa and South India. For this purpose a steel pen or style is employed. During the operation of writing, the leaf is held in the left hand and the letters are scratched upon the surface. In order that the characters may be better seen, ink made of lamp-black or some other colouring substance, and gum, is rubbed over the surface. “On such slips all the letters and edicts of the Dutch Government used to be written, and sent round open and unsealed. When a single slip was not sufficient, several were bound together by means of a hole made at one end, and a thread on which they were strung. If a book had to be made for the use of the Wihares or any other purpose, they sought for broad and handsome slips of talapat leaves, upon which they engraved the characters very elegantly and accurately, with the addition of various figures delineated upon them by way of ornament. All the slips had then two holes made in them, and were strung upon an elegantly twisted silken cord, and covered with two thin wooden boards. By means of the cord the leaves are held even together, and by being drawn out when required for use, they are separated from each other at pleasure. In the finer binding of these kind of books the boards are lacquered, the edges of the leaves cut smooth and gilded, and the title is written on the upper board; the two cords are fastened by a knot or jewel, secured at a little distance from the boards, so as to prevent the book from falling to pieces, but sufficiently distant to admit of the upper leaves being turned back while the lower ones are read. The more elegant books are in general wrapped up in silk cloth, and bound round by a riband, in which the Burmese have the art to weave the title of the book. The palmyra books are never much beyond 2 feet in length and 2 inches in breadth, as the parchment-like ribs between the little ribs will not admit of their increase in size.” (Mr. W. Ferguson’s account, reprinted in Tropical Agriculture by Simmonds.)

In the road-side schools of Bengal and most parts of India long strips of palmyra palm-leaf constitute the note-books and exercise-books used by the boys. They are carried to and from school generally wrapped up in the little piece of matting upon which the pupil sits. Instead of a style, however, they use a reed pen, covering the strips of palm leaf all over with large black characters. When the lesson or exercise is finished, these strips are taken to the nearest tank and washed clean again.

It is almost impossible to enumerate all the purposes to which the palmyra is put; suffice it to say that a very large number of the articles of domestic use are, in the rural districts of India, constructed from some part

**School-books.**

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of this most useful palm. Caps and rain-hats, cups and rice-jugs, plates, water-pails, water-baskets, cooly-baskets, baskets for storing grain, oil-press baskets, betel-nut baskets, clothes-baskets, sieves, books, toys, and other miscellaneous articles, mats, puckhas, screens, fences, and thatching, are all frequently made of this substance, to a greater extent of course in some districts than in others, depending upon the prevalence of the palm.

The juice.—"Amongst a variety of purposes to which it is put, is that of being mixed with the white of eggs, and with lime from burnt coral or shells. The result is a tenacious mortar, capable of receiving so beautiful a polish that it can with difficulty be distinguished from the finest white marbles." (Tropical Agriculture.)

Sacred Uses.—The palmrya palm is one of the trees looked upon by the Hindus with veneration. It is accordingly planted for the public good, the following being the trees the planting of which secures the kingdom of heaven: 1. Pipal; 2. Champaka; 3. Nagakesara; 7. Tai; and 12. Narikela. According to some authors it is the Kalpa or Ilpa, the Kalpastru, Kalpavriksha or Kalpavriksha of the Vedic writings, being regarded as the symbol of vegetation, of universal life, and of immortality. It is also by some authors viewed as the sacred tree of Buddha. It is frequently seen on Buddhist sculptures.

The existence of the names which are now applied to this palm in the Sanskrit writings is no absolute proof that the modern usage or adaptation of these names is correct. Botanical evidence is entirely opposed to the tal palm being a native of India, the tree having been introduced from Africa. Moreover, this palm does not grow so far to the north as the Panjab even in the present day, so that the names which are found in the Vedic writings of a date prior to the invasion of Northern India in all probability refer to a totally different plant. This is the more probable when it is recalled that Nanoechops Richelliana, Wend., a palm which in its fan-shaped leaves and in other respects resembles the palmrya, is a native of the Trans-Indus mountains of Western Sind, and of the Salt-Range, passing to Beluchistan, Afghanistan, and Persia. Although rarely more than 20 to 25 feet in height, the uses to which this palm is put, and the fact of its luxuriant growth on low arid mountain tracts where few trees of any description are found, might naturally have combined to assign to it a high place in the esteem of the Vedic poets. But without hazardizing any very definite opinion as to what may have been the Kelpa tree of the ancients, there seems very little doubt as to the Palmrya palm having been introduced into India long after the Vedic invasion.

BORAX.

This is the Borate of Sodium, or rather Borate of Sodium, Na₂B₄O₇·10H₂O. Borax or Borate de Soude, Fr.; Borax, Borates Natron, Germ.; Borax, It.; Borax, Sp.

Vern.—Sohâga, tinkél, Hind.; Sohâga or sohâga, Beng.; Sohâga, Drik.; Kuddia-bhâr, tankan-bhâr, Guj.;Venkârama, pusârâ, Singh.; Labhâya, lethâna, Burm.; Venkârama or venkârama, Tam.; Veiliârama, elelgam, Tel.; Pankârama, sellâkârama, Mâl.; Biligârâ, Kan.; Tan-kâna, Nâm.: Bârakesâgahâ or bûrûz-es-sâghâh, bûrûz, milkus-sâghâh, Arab.; Tinkur tankâr, Pers.; Sohâga, tinkûr or tinkal, tsâlû (one variety being the tsâlû of water or borax, and the other tsâlû mending or flower borax; Bârâ- Paniu, Pê, Prou., l., 94, Pê.; Varût, Kashmir; Sal, shal, châsal, Thibetan. (Dr. Aitchison adds that it is called âdû when collected from earth, and chê-sal when from water.)

The word Borax is of Arabic origin, and Tincal (which by Balfour and most other authors is given as an old English name for Borax) is a Europeanised corruption of the Thibetan name Tchuchal (chê-sal).
History of Borax.

or of the Persian Tankār and the Sanskrit Tankana; indeed, the word Tinkal is of common use on the Panjāb frontier. Taana-khar, Turki; Tankād and Tankā, Chinese. It would seem probable that the article was first consigned to Europe from South India, and with it the name Tinkal.

§ 5. Bārak properly means that which is put in dough to make it inflated and shining—Papri-lon or Papri khan—i.e., Carbonate of Soda and Potash. Bārak-e-sūgāh is Borax, because it polishes silver. There are also other kinds of Bārak. Tankār is a Persian word, and means Borax; it is probably derived from the same source as the Sanskrit Tankana. The Persians also call Borax Būreh." (Surgeon-Major W. Dymock, Bombay.)

HISTORY OF BORAX.

The word "Borax," as stated above, has come commercially to mean Bicarbonate of Soda, but various other borates are met with in trade, and Boracic acid itself has come into use as a source of borax or as a substitute for it; hence the word "Borax" should be employed with some caution.

(a) Borax proper is a native borate of sodium found along with common salt on the shores of certain lakes in the Panjāb, frontier of Tibet, and in Tibet itself. It is probably also met with in Persia and on the China-Thibetan frontier. Outside this limit it is found in California, in Peru, and in Ceylon.

(b) One of the most important sources is the artificially-prepared borax from the Lagoons of Monte Cereba in Tuscany. From the volcanic fissures of that region hot aqueous vapour is emitted. This is collected in artificial basins called lagoons. In course of time the water condensing in these basins is found to be charged with boracic acid. This is removed by crystallization, and, by the action of carbonate of soda, is in solution converted into Borax. The discovery of this process of making artificial borax is due to Cartier and Payen, and it is regularly practised in France.

In England the Italian boracic acid is neutralised by mixing the dry acid with soda ash and exposing the mixture to the heat of a reverberatory furnace. By this latter process ammonia is liberated and collected as a by-product.

(c) The borates of lime or double borates of lime and soda. These occur in immense reniform blocks, and are generally associated with gypsum and common salt. They are almost completely soluble in acids.

(d) Borate of magnesia is also a convenient source of boracic acid, containing about 70 per cent. when pure. This is found generally in nodules associated with gypsum and potash salts.

The supply of boracic acid being a monopoly in the hands of Count Lardarel, some years ago (1855) an effort was made to open up the Indian trade in native borax. An address was submitted to Lord Dalhousie, in which it was pointed out that the imports into England of Italian boracic acid were at that time 1,100 tons, and only 300 to 600 tons of Indian borax. An enquiry was accordingly instituted, which resulted in some interesting facts regarding the Ladak borax having been brought to light, but down to the present date no appreciable development of the trade seems to have taken place. In Cunningham's Ladak (pp. 259-40) occurs an account of the Pugā borax and sulphur mines. Captain W. C. Hay visited the Pugā valley, and the following passages may be reprinted from his report: "It is a small valley, which may roughly be calculated at two miles in length, and three quarters of a mile in breadth (i.e., the portion from whence the sohdād or tínūlī is collected); it extends east and west, and has a fine stream running through it into the River Indus; but the portion producing the borate of soda is, if not

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<table>
<thead>
<tr>
<th>BORAX</th>
<th>Natural and Artificial,</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUNJAB BORAX</td>
<td>watered by, still under the influence of, thermal springs, varying in fou places, where I took the temperature, from 130, 140, 150, to 167 degrees,—the temperature of the streams into which these empty being in July 56 degrees.</td>
</tr>
</tbody>
</table>

"I ascertained, as nearly as I could, that the entire produce of the valley might be roughly calculated at 20,000 kutch maunds (a kutch maund is equal to about 32 lbs.), the greater portion of which found its way to Râmpur in Bishahr; some to Kûlû vid Mandi to the lower hills, and a small quantity vid Chamba to Nârpûr. Nearly all that going vid Râmpur is taken into the lower hills in the neighbourhood of Sabâthu, Bhajî, &c., where wood is procurable, and where, during winter, it is refined by the carriers who go there to graze their flocks. It thus becomes borax, in which state it nearly all finds its way to Jâgâdri in the plains, and thence, I presume, goes down the River Jumna or Ganges. It is probable that little, if any, finds its way to England."

"Pugâ is not, however, the only place where the sohâga is produced; there is another locality near Rodok yielding it, from which the route to the plains is vid the Nite Pass. This borax is said to be of a very superior quality, nearly pure, and requiring little or no cleaning; but it is produced from a portion of Thibet in Changthân, subject to China. Doubtless, other localities exist, if the jealousy of the factors could be overcome, and enable us to explore. Nearly all the Trans-Himalaya lakes seem to contain salts of various descriptions, well worthy of chemical analysis; to this I shall advert in a future paragraph."

"The transport of this tincal is almost entirely effected on goats and sheep, being the animals at present best adapted to the mountainous pathways. The trade being to a certain extent precarious, the profits the merchants demand to protect themselves from loss would, at a first view appear large; when, however, the severity of the climate which they have to encounter, and the losses from snow falling over precipices, &c., are taken into consideration, it is not so exorbitant."

"The price of three sheep-loads at Pugâ I have stated to be one rupee; the average journey of a laden sheep being about a kâs per diem, it takes nearly one month to reach Kûlû from Pugâ, where the same sells for eight rupees, and if cleaned as borax, it sells at Sultânpur (Kûlû) at five rupees the kutch or kachchâ maund; and if taken to the lower hills at Kudli, Sisova, and Teki, at six rupees the kutch maund. After it is purchased by the Jagâdri merchants, I cannot say what expenses attend it, but the difficulties are over, and the prices here quoted clearly show the immense risk that is run on the first month's journey, compared to the second from Sultânpur to the lower hills, which occupies upwards of a fortnight and sometimes a month, as the sheep get out of condition, and are soon tired after the long journey."

"At present the people depend entirely upon falls of snow, as rain never falls in those regions, and they suppose that snow is necessary to produce the sohâga, which probably might be equally well produced by flooding. The time, I am informed, required for its reproduction, is only ten or twelve days; but the sun in July and August is so very powerful that probably a succession of evaporation might be caused; this would form ground for a chemical report."

Davies, in his Report on the Trade and Resources of the countries on the north-western boundary of British India, says that "Borax goes to Kashmir, but in larger quantities to Râmpur, and from thence to Kur-rachee."
Lord Hay, then Deputy Commissioner of Simla, in a report upon the Panjâb Borax, says: "The people who are engaged in the sohâdâ trade are chiefly Kanâwaris and Khâmpos (a class of wandering traders) of Lahoul, Thibet, and Spiti. In the summer months they resort to the Pûgâ mines and other places, to which the sohâdâ found in Tartary is brought, and return in the autumn before the passes are closed to the lower hills, where they remain during the winter pasturing their flocks, refining their sohâdâ, effecting sales of it to the Simla merchants, and making purchases of miscellaneous goods to take back with them in the ensuing summer.

"The refining process is exceedingly simple, and consists of dissolving the crude borax in two parts of hot or ten parts of cold water, and then allowing it to crystallize." "Formerly it was the custom to cover over the crude borax with ghâr to prevent efflorescence; this practice has been, I believe, discontinued of late years." *

"To Râmpûr and Sultânûr, about 2,500 maunds, or 90 tons, are annually brought. Last year it sold at Simla for nine rupees a maund or £25 a ton, and at Jagândrî it is now selling for twelve rupees or £37 a ton.

"The trade of borax with Kdûl is almost entirely confined to the merchants of Jagândrî."

In a letter from Mr. Edgeworth to the Secretary to the Chief Commissioner, Panjâb (Feb. 1854), occurs the following interesting information: "From Jagândrî to Furruckabad it is taken on hackeries, 25 maunds on each, for hire of which Rs50 are paid, and from thence by water; the price of boat-hire varying considerably. These statistics, however, would be a guide to any European merchant wishing to engage in the trade."

"To give an idea of the increase in the borax trade with India during the last few years, it is only necessary to mention that while in the year 1846-47, when the price was Rs9 a maund, only 1,731 maunds were exported from Calcutta, during the last six months of 1854 the large amount of 10,896 maunds, at Rs22 per maund, have been shipped for Europe."

[The above extracts from Captain Hay's report, from Lord Hay's report, and from Mr. Edgeworth's letter, are reprinted from Mr. Baden Powell's Panjâb Products (Vol. I., pp. 90 to 95).]

Mr. Atkinson, in his Economic Minerals of the North-Western Provinces, gives some interesting information regarding borax, from which the following note regarding the purification of the substance will be found useful: "The borax is pounded and placed in shallow tubes, and then covered with water to the extent of a few inches; to this is added a solution of about two pounds of lime dissolved in two parts of water for every ten maunds (820 pounds) of borax, and the whole mass is well stirred every six hours. Next day it is drained on sieves or cloth, and after this is again dissolved in 2½ times its weight of boiling water, and about sixteen pounds of lime added for the above quantity. It is then filtered, evaporation takes place, and subsequently it is crystallized in funnel-shaped vessels, usually of kansa, an alloy of copper and zinc, or lead. The loss in weight is about 20 per cent." (p. 34).

In a report published in 1877 by the Secretary to the Government of the North-Western Provinces and Oudh will be found some interesting information regarding the Thibetan trade in Borax. The Secretary goes into the subject of the amount of uncleaned borax brought into Barmdeo,

* Dr. Dynock of Bombay informs me that this practice is not discontinued, and that the Hakims prefer it: it reaches Bombay by way of Kurrachi.
BORAX

with the view of ascertaining whether it was possible to educate the Bhotias to select and clean their borax before carrying it across the frontier. By a process of sifting, the borax is referred to two classes—

\textit{chauki}, or large crystals of borax; and \textit{reg}, or borax dust. The former is so pure that it requires no further cleansing, but the latter has to be boiled once or twice in order to separate the dirt. The result shows that of 100 maunds of the article as imported into the North-West Provinces, 50 maunds of \textit{chauki} are separate, and the 40 maunds of \textit{reg} become reduced by first boiling to 10 maunds of \textit{kunj} and 30 of \textit{kandis}; the latter by further boiling yields 5 maunds more of the purified borax or \textit{kunj} and 25 maunds of dirt, so that of 100 maunds of the article as imported, 25 maunds are rejected as dirt. It seemed absurd that these 25 maunds should be carried across the frontier when the borax might easily be purified in Thibet. The sifting at least could be effected, but the boiling might, from difficulty in fuel, be impossible. It was found, however, that there were other difficulties connected with the system of monopoly; the Bhotias who carry it across the Himālayas do not bring it from the borax-fields.

The region of Indian borax may be said to commence in the west, at the valley of Puga in Ladak, passing east to the lakes of Rudokh. Along this tract of country, and extending considerably to the east, a chain of salt lakes occurs, most of which in all probability afford borax. To the south of Lhasa, at the Yamdok Cho, borax is known to have been collected from time immemorial. Holes are dug in the arid soil of many parts of the deserts of Tartary, wherein tincal collects, and is periodically gathered.

**TRADE IN BORAX.**

Borax is chiefly imported into India through the North-West and the Panjáb Himālaya. The following statement shows the principal imports:

\textit{From Thibet into the North-West Provinces.}

<table>
<thead>
<tr>
<th>Years</th>
<th>Weight in Maunds</th>
<th>Value in Rupees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1882-83</td>
<td>21,527</td>
<td>1,72,216</td>
</tr>
<tr>
<td>1883-84</td>
<td>33,896</td>
<td>3,37,038</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>YEARS</th>
<th>Weight in Maunds</th>
<th>Value in Rupees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1882-83</td>
<td>9,179</td>
<td>63,896</td>
</tr>
<tr>
<td>1883-84</td>
<td>9,088</td>
<td>73,081</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>18,267</td>
<td>137,977</td>
</tr>
</tbody>
</table>

\textit{From Ladak and Thibet into the Panjáb.}

<table>
<thead>
<tr>
<th>YEARS</th>
<th>Weight in Maunds</th>
<th>Value in Rupees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1882-83</td>
<td>5,588</td>
<td>15,528</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>11,757</td>
<td>79,442</td>
</tr>
<tr>
<td>1883-84</td>
<td>3,33</td>
<td>20,028</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>12,486</td>
<td>99,470</td>
</tr>
</tbody>
</table>

B. 745
Products of India.

brought into N.-W. Provinces.

Thus it would appear that the total imports into India across the frontier in 1883-84 amounted to 46,282 maunds (≈33,058 cwt.), valued at £431,047. The foreign exports of that year were 16,216 cwt., valued at £3,58,318, showing that whereas only 16,216 were exported, there were consumed in the country 16,842 cwt. During the year there were also imported from foreign countries 38 cwt., valued at £1,493. These figures give some idea of the importance of borax as an article of internal trade, and they show at the same time its enhanced value from its entrance into India until it is exported to foreign countries.

§ "Three kinds of Borax are met with in the Bombay market,—viz., European, Cawnpore (Thibetan), and Kurrachie (Teliya Tankankar). The European can often be purchased at the same price as the impure Thibetan; it is imported in casks. The Thibetan occurs in circular cakes, thin at the edges, as if crystallized in a basin. The Teliya Tankankar is in thin flaky crystals with a greasy surface." (Surgeon-Major W. Dymock, Bombay.)

For the past few years the exports have been steadily decreasing—a natural consequence of the discovery of extensive beds of borax in America, and of the greatly extended trade in the artificially-prepared article. Indeed, India cannot hope to compete in the foreign trade in borax, but the internal consumption, which is very considerable, will always make the trans-frontier imports of importance. It is noteworthy that while the external trade has been falling off year by year, the internal trade seems to have correspondingly increased.

The following analysis of the exports to foreign countries for the past year shows the province from which imported and the country to which exported:

**Analysis of the Trade in Borax for 1883-84.**

<table>
<thead>
<tr>
<th>Presidency from which exported</th>
<th>Weight in Cwt.</th>
<th>Value in Rupees</th>
<th>Country to which exported</th>
<th>Weight in Cwt.</th>
<th>Value in Rupees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bengal</td>
<td>16,095</td>
<td>3,54,699</td>
<td>United Kingdom</td>
<td>14,134</td>
<td>2,92,585</td>
</tr>
<tr>
<td>Bombay</td>
<td>1,214</td>
<td>3,58,189</td>
<td>Arabia</td>
<td>38</td>
<td>1,130</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>China—Hongkong</td>
<td>1,713</td>
<td>56,424</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Straits Settlements</td>
<td>258</td>
<td>6,147</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Turkey in Asia</td>
<td>36</td>
<td>1,057</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Other countries</td>
<td>37</td>
<td>1,175</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16,216</strong></td>
<td><strong>3,58,518</strong></td>
<td><strong>Total</strong></td>
<td><strong>16,216</strong></td>
<td><strong>3,58,518</strong></td>
</tr>
</tbody>
</table>

**Properties and Tests for Borax.**—A salt occurring in colourless, transparent, shining, monoclinic prisms, odourless, slightly effervescent, having a cooling, sweet taste, with an alkaline reaction. It is a detergent to the mouth, clearing the throat. It has the composition Na₂B₄O₇ with 10 molecules of water of crystallization. This is what is called prismatic borax, but if crystallized at 70° it forms octahedra, having only 5 molecules of water. When a solution of borax is evaporated at 100° C., the salt is left as a transparent, amorphous, brittle mass, containing only four molecules of water. When heated a dry powder of borax begins to lose its water, then melts; on further heating it swells up, forming a porous mass; and at a red-heat fuses, forming a colourless glass, from which water of crystallization has been completely expelled. This forms the borax.

B. 746
Properties, Tests, and Uses of Borax.

Borax is extensively used in chemical analysis. If touched with a metallic salt, the borax bead will, in the reducing flame of the blow-pipe, become coloured red with sub-oxide of copper, green with ferrous oxide, &c.; and in the oxidizing flame, red with ferric oxide, violet with manganese salts, blue with cobalt oxide, &c. These beautiful reactions form convenient tests for the metallic salts.

Borax itself may be readily detected by a number of delicate tests. An aqueous solution, on the addition of sulphuric acid, should deposit shining crystalline scales which will be found to impart a brilliant green colour to the flame of a spirit-lamp. This convenient test will establish the presence of the merest trace of borax. The chief adulterants are phosphate of sodium and alum. The former may be readily detected by the fact that it will quickly effloresce in the heat of a drying-room, and the latter by the brilliant cobalt blue produced before the blow-pipe when a piece of alum is touched with a solution of cobalt chloride.

Borax has the property of rendering cream of tartar soluble, but for this purpose boric acid may be substituted for borax. One of the most curious properties of borax has recently attracted much attention—namely, its power of destroying fermentation. Schussler (Pharm. Journ., 3rd Series, V, 846, abstracted into the Year-Book of Pharm., 1879) demonstrated the action of this substance upon the protoplasm of vegetable cells, and proved beyond doubt that the yeast plant is rapidly destroyed, fermentation being therefore impossible in the presence of borax. He further showed that, in consequence of this fact, both animal and vegetable matter might be preserved for years without undergoing putrefaction. This fact justifies the theory of the value of borax as an antiseptic lotion.

The Uses of Borax.

Dye.—It is used as a mordant in dyeing, especially in calico-printing along with turmeric.

Medicine.—“Borax was known to the ancient Hindüs from a very remote period and is mentioned by Susruta.” It is viewed by the native doctors as a tonic, and is regarded as useful in loss of appetite, painful dyspepsia, cough, asthma, &c. (U.C. Dutt.) As an antiseptic lotion and as a stimulating wash for hot eruptions on the body and scaly skin diseases, borax may be said to be an established remedy. It exerts a peculiar detergent action on the mucous membrane; it is accordingly regarded as a useful drug in aphtous and other ulcerations of the mouth, and in pruritus, not only of the external body, but also of the urethra and vagina. Internally, it is very little used by European physicians, but has been prescribed in dyspical affections and epilepsy. It is supposed to possess a powerful influence over the uterus, promoting menstruation and facilitating parturition; it has also been used in dysmenorrhea, and as an astringent in uterine hemorrhage it has been used with alleged benefit.

Special Opinions.—“Used as a detergent in various affections of the skin, also as an ingredient of spleen powders.” (Brigade Surgeon S. H. Shircore, Moorsheadabad.) “It is used as a germicide in thrush and ringworm, but not so efficacious as boracic acid.” (Brigade Surgeon G. A. Watson, Allahabad.) “Bazar borax used in hospital practice, in the form of ointment, in psoriasis and eczema and as a lotion in pruritus and herpes circinatus. Dissolved in acetic acid it forms the common solution used for ringworm. It is found very useful in allaying the irritation of prurigo and erythema.” (Assistant Surgeon Jaswant Rai, Mooltan.) “Efficacious application and gargle for apthous sores.” (Assistant Surgeon Shish Chunder Bhuttacharji, Chanda, Central Provinces.)
Frankincense.

ful as a local application in aphthae, sore nipples, ulcers, ringworm, &c." (Brigade Surgeon T. H. Thornton, B.A., M.B., Monghyr.) "Borax is considered by the Hakims a powerful promoter of digestion, it taken in 10 to 15 grain doses, about an hour after meals with a little water." (Assistant Surgeon Mukund Lal, Agra.) "A handful or so to the bath relieves lichen tropicus." (Surgeon-Major G. Y. Hunter, Karachi.) "Useful with honey in thrush." (Surgeon-Major C. R. G. Parker, Pollaravaram, Madras.) "I constantly use this for sore mouth in conjunction with glycerine as a gargle." (Surgeon-Major H. D. Cook, Calcutta, Malabar.) "Burnt borax is used in dyspepsia attended with acidity—dose 10 grains." (Surgeon-Major E. C. Bensley, Rajahboy.) "It is also found to be of use in parasitic skin diseases, especially the ringworm or eczema caused by the parasite called chambal." (Assistant Surgeon Bhugwan Das, Rawal Pindi, Panjab.) "A very useful hemostatic in menorrhagia, a good lotion in thrush and ringworm, and pruriginous eruptions." (Brigade Surgeon W. R. Rice, M.D., Subbulpore.) "Mixed with other substances, as bark, charcoal, &c., as a dentifrice, acts in whitening the teeth." (Honorary Surgeon P. Kinley, Chiecoole, Ganjam, Madras.)

Industrial Uses.—The most important use of this substance is unquestionably in "the glazing of all descriptions of pottery and china-ware, as well as for enamelling clock and watch faces, iron plates, &c." (Speck's Encyc.) It is also largely used in the process of soldering oxidizable metals, its action being to clean the surfaces by fusing away the oxides into a borax bead. It is extensively used by Indian goldsmiths and in the manufacture of artificial gems. It is also, along with shell-lac, made into a useful varnish. The dentist finds it valuable in making plates for artificial teeth. Plumbago and other pots are found to last much longer if painted with borax. For household purposes its uses are practically unlimited, it being in some respects superior to soda. As a substitute for soap, it cleanses fabrics without injuring the colours.

Borax is sold in every Indian bazar, and appears to be used for a variety of purposes which have not been carefully investigated and made public.

**Boswellia***, Roxb.; Gen. Pl., 1, 222.

A genus of balsamiferous trees, belonging to the Natural Order Burseraceae; there are in all about six species, natives of India and tropical Africa,—one species, with two distinct varieties, being plentiful at the foot of the Western Himalaya, Central India, Rajputana, the Deccan, the Circars, and the Konkan.

Bark frequently papyraceous. Leaves alternate, extispulate, imparipinate, deciduous, opposite sessile usually serate leaflets. Flowers small, white, hermaphrodite, in axillary racemes or panicles. Carys small, 5-toothed, persistent. Petals 5, distinct, narrowed at the base, imbricate. Disk annular-crenate. Stamens 10, 5 long, 5 short, inserted at the base of the disk. Ovary sessile, 3-celled; style short, stigma 3-lobed; ovules 2 in each cell, pendulous. Drupes trigonous, containing 3 1-seeded pyrenes which finally separate. Seeds compressed, pendulous.

The genus is named in honour of Dr. John Boswell of Edinburgh.

**Boswellia** (Species not satisfactorily determined).

**The True Frankincense or Olibanum of European commerce.**


**Gum.**—It is probable that several species yield Olibanum, of which B. Carterii is perhaps one of the most important. They are trees inhabiting the Somali coast of Africa to Cape Guardafui, and also the south coast of Arabia.
The Arabs, as early as the tenth century, carried Olibanum to India, and the Indian names for it have, through the lapse of time, become almost hopelessly mixed up with those given to the Indian species of this genus, and also with those given to the Balsamodendrons. It is impossible, therefore, to fix definitely the names of the balsamiferous plants. Mohammedan writers distinguish several kinds of the imported or African and Arabian Olibanum:

1st.—Kundur Zakar, or male Frankincense. This is esteemed the best quality, and consists of deep yellow tears. It should burn readily and not emit much smoke.

2nd.—Kundur Und, or female Frankincense.

3rd.—Kundur Madharaj. This consists of artificially-prepared tears made by shaking the moist exudation in a basket.

4th.—Kishar or gishar Kundur, or Kashfa. This consists of the bark of the tree coated with the exudation. This is the Dhiq of the Bombay market, and, under that name, forms a distinct article of commerce.

5th.—Dukak or daqqaq Kundur, or dust of Olibanum. This meets the demand of the Indian and Chinese markets, the finer qualities of Olibanum being exported from Bombay, after assortment, to Europe. (Surgeon-Major Dymock.)

The Pharmacographia gives an enumeration of the plants supposed to yield Olibanum or gum-resins which have been or may be mistaken for that substance, of which the following may be given as an abstract:

I.—B. Carterii, Birdw.—This includes three forms—

(a) Meddu or Mohr madaw, yielding the Luban bedou or Luban sheheri of Playfair. Hildebrandt describes this as a tree indigenous to the limestone range of Ahl or Serrutin, the northern part of the Somali country. This is the plant represented by Bentley and Trimen in their Medicinal Plants, figure 58.

(b) A form sent by Playfair, along with the preceding, having almost entire leaves, velvety below, glabrous above. 

Maghirayt d’sheetas of the Maharas.

II.—B. Bhu-madina, Birdw.—Very nearly allied to, if indeed specifically distinct from, B. Carterii.

III.—A species which yields Luban bedawi. It is a native of Burder Murayah, Somali country; never found on the hills close to the sea, but further inland and on the highest ground.

IV.—B. neglecta, S. Le M. Moore. The vernacular name of this tree is given as Marlo or Mohr add.

V.—B. Freereana, Birdw.—This is a well-marked species known to the natives as Yejgar. It yields the fragrant resin sold as Luban Meyra or Luban-mati. This the authors of the Pharmacographia regard as most probably the substance originally known as Elemi. Luban-mati differs from the samples of true Olibanum in not containing gum; it may be described as composed of resin and an essential oil. (Flüchiger in Pharm. Journal, 3rd Series, VII., 805.) Dr. Dymock says this is sold in Bombay as Pándhri Eesh. It is the plant which yields the stalactitic Olibanum, a substance which differs chiefly from the other forms in the absence of soluble gum.

VI.—B. Papyriforma, Endl. Richard (1). This is the makur of Sennaar and the mountainous regions, on the Abyssinian rivers Takaze and Mareb, ascending to 4,000 feet above the level of the sea. It appears to grow in the outer parts of North-Eastern Africa. While this yields a resin, there is not the slightest “reason for attributing any commercial Olibanum” to it. It is probably more nearly allied to Luban-mati than to Olibanum.

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VII.—*B. serrata*, Roxb. (see page 515).

**HISTORY OF OLIBANUM.**

This substance, being an essential ingredient in incense, has been known from extreme antiquity. Many centuries before Christ the drug was one of the most important articles of trade which the Phenicians and Egyptians carried on with Arabia. Frankincense is mentioned by Herodotus (B.C. 484) and by Theophrastus (B.C. 376-287) as an article produced in the country of the Sabaeans (the south shores of Arabia?), where it was found in 1844-46 by Carter. The Arabs seem to have procured it from the ancient Sabaeans, and it is an interesting fact that they took it into China amongst other articles as early as the tenth century, and that this trade has existed down to the present date. The Arabs also brought it to India, where it was known to the Sanskrit writers under the name *Kundura*, a word derived from the Arabic and Persian name *Kundur*. Diodorus (B.C. 50) refers to frankincense as one of the products of the rich country owned by the Arabs. Strabo (B.C. 54 to A.D. 24) mentions frankincense and balsam as met with in the country of the Sabaeans, and Pliny (A.D. 23-79) says there is no country which bringeth forth frankincense but Arabia. Arrian (A.D. 90) describes Makulla as the coast of the country of frankincense. Ptolemy, Dioscorides, Marco Polo, Garcia de Orta, Celsius, Linnaeus, and many others mention this gum-resin.”


**MEDICINE.**

Description of Olibanum.—Olibanum, as met with in European commerce, may be described as a dry gum-resin, consisting of tears often an inch in length, and of an ovate or oblong, clavate or stalactiform form, and mixed with impurities. The pieces are light yellow to brown, or pale green, or colourless. The odour is balsamic and resinous, especially while being burned. In taste it is bitter and terebinthinous, dissolving in the mouth. By heat it softens without actually fusing, decomposing at high temperatures.

“Olibanum is considered by the Mohammedans to be hot and dry, and to have dissipative, astringent, and detergent properties. It is used internally and externally in much the same way as we use the products of the Pines and Firs. Recently olibanum has been made official in the *Pharmacopoeia of India*, where it is recommended in chronic pulmonary affections, such as broncho-rhea and chronic laryngitis, employed both internally and in the form of fumigation. In the same work an ointment has been introduced which is said to be a good stimulant application to caruncles, ulcerations, boils, &c. I have found that a good imitation of commercial Burgundy Pitch may be made by incorporating melted olibanum with water in a steam bath; a sufficiently good quality for this purpose can be purchased for Rs12 per cwt.” (Surgeon-Major W. Dymock, Bombay.)

Chemical Composition.—The following extract from the *Pharmacographia* will be found to contain all that is known of the chemistry of this substance: “Cold water quickly changes olibanum into a soft whitish pulp, which when rubbed down into a mortar forms an emulsion. Immersed in spirit of wine, a tear of olibanum is not altered much in form, but it becomes of an almost pure opaque white. In the first case the water dissolves the gum, while in the second the alcohol removes the resin. We find that pure olibanum treated with spirit of wine leaves 27 to 35 of
gum, which forms a thick mucilage with three parts of water. Dissolved in 5 parts of water it yields a neutral solution, which is precipitated by perchloride of iron as well as by silicate of sodium, but not by neutral acetate of lead. It is consequently a gum of the same class as gum arabic, if not identical with it. Its solution contains the same amount of lime as gum arabic affords.

"The resin of olibanum has been examined by Hlasiwetz (1869), according to whom it is a uniform substance having the composition \( C_9 H_8O_5 \). We find that it is not soluble in alkalis, nor have we succeeded in converting it into a crystalline body by the action of dilute alcohol. It is not uniformly distributed throughout the tears; if they are broken after having been acted upon by dilute alcohol, it now and then happens that a clear stratification is perceptible, showing a concentric arrangement.

"Olibanum contains an essential oil, of which Braconnot (1868) obtained 5 per cent., Stenhouse (1840) 4 per cent., and Karbatow (1871-1874) 7 per cent. According to Stenhouse it has a sp. gr. of 0.986, a boiling point of 179\(^\circ\) C., and an odour resembling that of turpentine, but more agreeable. Karbatow separated this oil into two portions, the one of which has the formula \( C_9H_4 \), boils at 158\(^\circ\) C., and combines with HCl to form crystals; the other contains oxygen. The bitter principle of olibanum forms an amorphous brown mass.

"The resin of olibanum submitted to destructive distillation affords no umbelliferone. Heated with strong nitric acid it develops no peculiar colour, but at length camphoric acid (see Camphor) is formed, which may also be obtained from many resins and essential oils if submitted to the same oxidizing agent." (Pharmaceutical, Flück. and Humb, pp. 138, 139.)

TRADE INOLibanum.

"Bombay is the centre of the Olibanum trade. The houses which deal in gum have agents in Arabia and Africa who buy it up and forward it here in a mixed condition. It passes through the Custom House as "Eseth, and is next sorted into four or five different qualities. The first, consisting of all the large clean tears, is destined for the European market. The intermediate qualities, and the last, which is only the dust and refuse, supply the Indian and China requirements. The Kishar Kundur or Kasif of the Arabs forms a distinct article of commerce under the Indian name of Dhíp. The method of collecting Olibanum in Africa has been described by Oruttenden (Trans., Bomb. Geog. Soc., VII., 1846, 121). Carter in the same publication has described the collection of the drug in Southern Arabia. In both localities a simple incision in the tumid bark is made and the product collected as soon as it becomes sufficiently hard. The collection is carried on from March to September in Africa, and from May to December in Arabia.

"Olibanum is shipped from Makulla, Aden, and other neighbour ports to Bombay; as already mentioned, it is there sorted for the different markets. The trade is in the hands of Hojas and Bunnias. The price varies from 84 per cwt. for the dust to 920 per cwt. for the finest tears. Bombay exports from 25,000 to 30,000 cwt. annually. Nearly four fifths of this quantity go to Europe, and the rest to China." (Dymock, Med. M., W. Ind., 122.)

It would appear that a certain amount of the Olibanum met with in commerce is exported direct from Egypt to Europe. This is the so-

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* I obtained 32\(^\circ\)4 per cent. from the finest tears of the kind called Fausa bedomi, with which I was presented by Captain Hunter of Aden.—F. A. F.
Indian Olibanum

BOSWELLA serrata.

called African Olibanum, the term “Indian Olibanum” being in the trade applied to the same article which reaches Europe via India, coming originally from the Red Sea ports to India, and thereafter being re-exported to Europe. It seems a mistake to suppose that any of the Indian article is obtained from the indigenous Indian plant.

**Boswellia serrata**, Roxb., ex Colebr., in Asiat. Res., ix, 379, l. 5; Fl. Br. Ind., I, 528; Burseraceae.

Sometimes called the **Indian Olibanum Tree**.

**Syn.**—B. thurifera, Roxb., ex Planch.; B. glabra, Roxb.; B. thurifera, Colebr. (as in Gamble’s Manual of Timbers); Libanus thurifera, Colebr.

**Vern.**—(The gum-resin) Salhe, satali, or zalai, selgá, selgán, kundur, salphe, lubán, HIND.; Lubán, zalai, kundro, BENG.; Salaya, Lohar-ducga; Salja, Santhal; Anduku, anduga, guggar, dúmsal, KUMOON; Salla, bor-salai, ganga, GOND.; Sláli or sali, (in NAGPUR), C. P.; Sílkar, ULWÁR; Salai, salga, guggu, salaya-dhup, salaphali, BOMB.; Salaphali, MÁN.; Kundur, DUR.; Dhúp, mukul salai, gugali, GUJ.; Sāliya gugul, CUNJ.; Kangli, guggu, kándrikam movada, kundurukkam-pikhi, parangi-châmbi-ráni, TAM.; Parangi-bhumí, andugapiscuns, anduku, Ándú, Tel.; Vella-kundirikka, MÁN.; Chittu, KÁN.; Salas-nírásu allukái, kunduran guggulá, SANS.; Bastoi, kundur, lubán, ÁRAK.; Kundur, PERC.; Thâlikam, BURM.; Kundrikam, SINGH.

It is probable that the name Gugul should have been restricted to this plant, but modern use has extended it to include **Balsamodendron Mukul**. There are two varieties, both of which yield the gum-resin incorrectly called Indian Olibanum:—

**Var. ist—serrata proper.**

**Habitat.**—A moderate-sized gregarious tree of the intermediate, northern, and southern dry zones, Sub-Himalayan tract from the Sutlej to Nepal, the drier forests of Central India from Berar to Rájputana, and southward to the Deccan, the Circars, and the Konkan. Frequent on the eastern slopes of the Pegu Yomah and Maritaban, Burma. (KURZ.)

**Botanic Diagnosis.**—This is **B. thurifera**, Roxb., and is characterised by the leaflets being sessile, pubescent, coarsely crenate-serrate; racemes axillary, shorter than the leaves.

**Properties and Uses**—

**Gum-resin.**—The gum-resin, SALAI guggul, occurs as a transparent golden yellow, semi-fluid substance, which slowly hardens with time. **Moodeen Sheriff** says that when it is found in the soft massive form it is known as Gandah ferazzah; in tears (?) true olibanum) it is known as kundur. It is pungent, having a slightly aromatic taste and balsamic resinous odour. It becomes opaque when immersed in alcohol or in water, the proportion of resin to gum being much smaller than in frankincense. The opaque, soft, whitish mass produced by water when rubbed in a mortar forms an emulsion. Indian Olibanum is consumed almost entirely in Central and Northern India, and is never exported.

In the Upper Godaveri it yields plentifully the resin Olibanum (C. P. Gazetteer, 507). A sweet-scented gum, “burnt in religious ceremonies and sometimes used to strengthen limes” in Rewa Kantha, Gujarát. (Bombay Gazetteer, VI., 13.) A very common tree on all trappean hills, conspicuous by its white and scaly bark. No such substance as frankincense is extracted from it in Khándesh. The gummy wood is, however, used for torches.

**Sir J. D. Hooker**, in his Himalayan Journals (Vol. I, 29), says that while travelling on the mountain tracts of Behar he came across a small forest of this tree near Belcuppé. The gum was flowing abundantly from

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the trunk, very fragrant and transparent. Dr. Irvine, in his *Topography of Ajmere* (p. 135), says that the tree is very plentiful in the Ajmir hills. The *gundabirosa* is the prepared gum-resin, and is similar in appearance and qualities to Venice turpentine. It is brought from Mewar, Harowtee, and the Shekawattee hills, and is considered stimulating. An oil is distilled from it said to cure gonorrhea. The gum-resin is also made into ointment. It is much used in painting, especially by the *lahkerias* men who paint with coloured lac (?)

Care must be taken not to confuse this gum-resin with the Olibanum or Frankincense of commerce, or with Mulk (see Boswellia sp., and Balsamodendron Mulk). The Sanskrit name *Kundur*, derived from the Arabic word *Kundur*, is most probably wrongly applied to the gum-resin of this species. It should be restricted to frankincense, a substance which reaches India from Arabia and Africa. The true Sanskrit name for this plant is most probably *Sallaki*, from which is derived the Hindi word *Salai*. It would also appear that this is the *Guggulu* of Sanskrit writers, which is described as moist, viscid, fragrant, and of golden colour when freshly exuded. Gum-gugul of the present day is Indian Bedellum (*Balsamodendron Mulk*). (Surgeon-Major Dymock, *Mat. Med.*, *W. Ind.*, 1823.)

**Medicine.**—Very little of a definite nature is known of the medicinal virtues of this gum. It is probable that all that has been written on the subject should be considered as applying exclusively to imported Olibanum. Dr. Dymock says that the *Guggulu* of the Sanskrit was regarded as a demulcent, aperient, alternative, and a purifier of the blood. The gum at the present day is used in rheumatism, nervous diseases, scrofulous affections, urinary disorders, and skin diseases, and is generally combined with aromatics. It is regarded as a diaphoretic and astringent, and is used in the preparation of ointment for sores. It is also prescribed with clarified butter in syphilitic diseases; with coconut oil for sores, and as a stimulant in pulmonary disease. Mixed with gum acacia it is used as a corrective for foul breath; taken for any length of time in 3 doses it is said to reduce obesity.

**Special Opinions.**—§ "The gum-resin is used to promote the absorption of bubo, and is applied locally. The oil in 10 or 20 minim doses is useful in gonorrhea, taken in demulcent drinks." (Surgeon C. M. Russel, *Sarun, Bengal.*) "Refrigerant, diuretic, emmenagogue, and colic; doses 5 to 40 grains, used in aphthae, placenta prema, amenorrhea, dysmenorrhea, sore nipple, gonorrhea, ringworm." (Choona Lall, *Hospital Assistant, Jubbulpore.*) "Astringent, applied in the form of an ointment to chronic ulcers, diseased bones, buboes, &c." (Surgeon W. Barren, *Bhuj, Cutch.*)

**Food.**—"The flowers and seed-nut are eaten by the Bhils." (Bombay Gaz., XII., 27.)

**Structure of the Wood.**—Wood rough, white when fresh cut, darkening on exposure, moderately hard. It is not durable, but it has been reported that five sleepers made of it and soaked for some time in a tank filled with the leaves of *Bohera* (*Terminalia bellerica*), put down in June 1876 on the Holkar and Neemuch State Railway, are still (1881) perfectly sound and good. (*Indore Forest Report, 1876-77*, quoted in *Indian Agriculturist* of May 1878.) The timber is recommended for tea-boxes. (*Indian Forester, IX.*, 377.)

It is used for fuel and for making charcoal, which in Nimar is employed for iron-smelting. This is "a common, and though not very large, a very beautiful tree (in Panch Mahals). Its narrow-pointed leaflets and drooping branches give it something the look of the English garden acacia. Its grey flakey bark is noticeable. It yields a cheap resin, and
besides for fuel, its wood is used in making platters." (Bombay Gazetteer, Ill., 109.)

Var. 2nd—glabra, sp., Roxb.


Habitat.—A moderate-sized tree of North-West India. Leaflets nearly or quite glabrous, and generally entire or nearly so; racemes terminal, sub-panicked.

It seems probable that this form yields the solid rounded pieces or tears described by some authors as of Indian origin, owing to its drying more rapidly than the gum-resin from B. serrata. Royce describes picking tears off the trees, and states that these burn rapidly with a bright light, diffusing a pleasant odour.

For further particulars regarding the Boswellias and Frankincense, the reader is referred to Dr. Dyck's 'Materia Medica of Western India' (from which much of the above information has been obtained); to Dr. Birdwood's 'Monograph of the Genus Boswellia in the Linnaean Society's Transactions,' XXVII; to "Olibanum" in Flückiger and Hamby's Pharmacographia (p. 133, Ed. 1870); Bentley and Trimen's Medicinal Plants, 58; Pharmacopoeia of India, 52; Royce's Illustrations of the Botany of the Himalaya, p. 177; Ainslie, Vol. I., p. 136; Moodion Sheriff's Supplement to the Indian Pharmacopoeia; Spons' Encyclopaedia.

BOTRYCHIUM, Sw.; Syn. Fil., 447.

A genus of ferns belonging to the sub-order Ophioglossaceae, distinguished by having the fructification in a compound or racemiform panicle, forming a separate branch of the frond.


Habitat.—The Himalaya from Kumaon to Bhutan, the Khásia Hills; very common at altitudes from 5,000 to 8,000 feet.

Food.—Sir J. D. Hooker, in his Himalayan Journals, says (Vol. I., 28): "This large succulent fern grows plentifully at the Rakliang Pass in Sikkim; it is boiled and eaten both here and in New Zealand."


Fleshy, leafless herbs, with thick 4-angular stems, angles toothed. Flowers terminal, rather large, solitary or umbel-like, more or less purple. Sepals narrow. Corona campanulate or rotate, lobes 5, short, broad, valvate. Corona annular, adnate to the column, 5-lobed, lobes 2-fid, subulate, erect or spreading, with a linear fleshy process on the inner face at the sinus infixed over the anther. Columns minute, short; anther-tips inappendulate; pollen-masses one in each cell; semi-elliptic, erect, suborbicular, compressed. Stigma low, conical, 5-angular, tip truncate, depressed. Follicles slender, straight, terete, smooth. Seeds flat, winged, comose.

*Botucosia Aucheriana*, Decne.; Fl. Br. Ind., IV., 78; Asclepiadaceae.

Vern.—Charangl, canungi, pawanne, pamanke, Pa.

Habitat.—Found in the western part of the outer Himalaya, in the Salt-Range and Trans-Indus, ascending to 3,000 feet.

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**BRAGANTIA.** The Bragantia.

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<td><strong>MEDICINE.</strong> Stems.</td>
<td>Medicine.—The juicy stems are considered stomachic, carminative, and tonic. Bellaw states that they are also used as vermifuge. Masson mentions that, dried and powdered, they are taken as stimulant.</td>
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**BOUCA, Meeën.** Gen. Pl., I., 420.

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A genus of trees belonging to the Natural Order ANACARDIACEAE, containing some five species, natives of tropical Asia and the Malay Archipelago.

- **Leaves** opposite, petiolated, coriaceous, glabrous, quite entire. **Flowers** small, in axillary and terminal panicles, polygamous. **Seeds** 3-5, deciduous, ovate.
- **Petals** 3-5, imbricate. **Disk** very small. **Stamens** 3-5, inserted within the disk, all fertile. **Ovary** sessile, style short, terminal stigma obscure, unequally 3-lobed; ovule ascending from the wall of the cavity. **Drupes** fleshy, stone thin, fibrous, 1-seeded, 1-seeded. **Seed** sub-erect; cotyledons fleshy; radicula very short, inferior.


**Syn.**—B. OPPOSITIFOLIA, Meeën.; Kurr., i., 366; MANGIFERA OPPOSITIFOLIATA, Rott. (Fl. Ind., Ed. C.B.C., ii. 215).

**Vern.**—Meriam, mayan, or mai-eran, BUM.

**Habitat.**—A moderate-sized, evergreen tree, met with in Burma and the Andaman Islands.

**Food.**—The tree has an edible fruit, for which it is often cultivated.

**Timber.**—Structure of the Wood.—Grey, hard, with a dark reddish-brown heartwood. Weight 55 lbs. per cubic foot.

It is not specially used, but it is said by Roxburgh to be very durable.

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**BOWS AND ARROWS,** Timbers used for.

- **Acacia Catechm.**
- **Areca Catechm.**
- **Cephalostachyum capitatum.**
- **Dendrocalamus strictus** and other Bamboos.
- **Dolichandra stipulata.**
- **Garcinia speciosa.**
- **Grewia oppositifolia.**
- **Grewia vestita.**
- **Lagerstromia tementosa.**
- **Parrotia Jacquemontiana.**
- **Reeds, various species used for arrows.**
- **Shorea siamensis.**
- **Taxus baccata.**

**Boxwood,** see Buxus.

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**BOXWOOD,** Timbers used as substitutes for.

- **Atalanta monophylla.**
- **Catechu religiosa.**
- **Celastrus spinosus.**
- **Chloroxylon Swietenia.**
- **Dodonaea viscosa.**
- **Gardenia gummi-fera.**
- **G. latifolia.**
- **Hemicycla sepiaria.**
- **Homonoa symphyllifolia.**
- **Ixora parviflora.**
- **Memecylon edule.**
- **Murraya exotica.**
- **Olea ferruginea.**
- **Psalidium Guyava.**
- **Punica Granatum.**
- **Santalum album.**
- **Sonneratia acida.**
- **Viburnum eburneum.**

**Brachyramphus sonchifolius,** DC., see *Lactuca remotifolia,* DC. Compositae.

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**BRAGANTIA, Lour.; Gen. Pl., III., 122.**

A genus of small bushes belonging to the Natural Order ARISTOLOCHIACEAE, and containing 3 species, natives of India and the Malay Archipelago.

**Leaves** alternate, shortly petiolate, 3-5-nerved, oblong-lanceolate or oblong-linear, glabrous.
The Brassaiopea.

BRASSAIOPIES SPECIOSA.

Flowers forming a lax cymose-corymb or short racemose cyme. Perianth single, bell-shaped, adnate to the ovary and articulated to the top; teeth 5, equal, deciduous. Stamens 6-12, arranged in one series on a disk around the base of the style and slightly adherent to it; filaments free or slightly united below, often united by three. Ovary inferior, 4-locular, style short, bearing 3-many stigmatic arms; ovules many, arranged on 2 series and pendulous. Fruit somewhat like a silique, slender, about 4 inches long, terete. Seeds oblong, 3-angled.

The wood of the stem is very peculiar, differing in a remarkable degree from that of the ordinary exogens.

Bragantia Wallichii, R. Br.; Wight, Ic., t. 520; DC. Prodr., XV., pl. 1., 430.

Vern.—Albam, Mal.

Habitat.—A small bush, with decumbent branches, met with in the southern half of the Bombay Presidency, near the coast, and in Madras and Ceylon.

Medicine.—"The whole plant, mixed with oil and reduced to an ointment, is said to be very efficacious in the treatment of psora or inveterate ulcers. Like other plants belonging to the same natural order, it is supposed to have virtues in the cure of snake-bites, he juice of the leaves, mixed with the Vassumbh (Acorus Calamus) root, the root itself rubbed up with lime-juice, and made into a poultice and externally applied, are the chief modes of administering it among the natives." (Drury's Useful Plants, 86.) This is regarded as one of the most powerful antidotes to poison known on the west coast. A Malabar proverb says: "As soon as the Albam root enters the body, poison leaves it." B. tomentosa, Blume, a native of Japan, according to Horsfield, is bitter and is regarded as an emmenagogue." (Compare with Pharm. of India, p. 99; Drury's Useful Plants; Fra. Bartolomeo's Voyage to the East Indies, p. 416.)

Bran.—A coarse product of wheat, separated from the latter in the milling process. See Triticum sativum.


Large shrubs or trees, glabrous and tomentose, armed or not. Leaves digitate, or palmate or angled; stipules connate within the petiole, not prominent. Umbels in large compound panicles, young parts at least stellately tomentose; bracts not large, often persistent; pedicels rising from a dense cluster of persistent bracteoles, not jointed under the flower; flowers often polygamous. Calyx 5-toothed. Petals 5, valvate. Stamens 5. Ovary 2-lobed; styles 2, united, long or short. Fruit broadly globose or turbinate, 2- or by abortion 1-seeded. Seed not compressed; albumen ruminated.

Brassaiopis mitis, C. B. Clarke; Fl. Br. Ind., II., 736; Araliaceae.

Vern.—Mochini, Nepal; Sunsong, Lepcha.

Habitat.—A small tree of Sikkim Himálaya, above 5,000 feet; common at Darjiling.

Structure of the Wood.—Soft, white, spongy. Weight 24 lbs. per cubic foot.

B. speciosa, Dene, & Planch.; Fl. Br. Ind., II., 737.

Syn.—B. floribunda, Seem.

Habitat.—A small tree, met with from Nepál to Assam and Chittagong.

Structure of the Wood.—White, soft, resembling the preceding.

B. 798
BRASSICA, Linn.; Gen. Pl., L. 84.

A remarkable group of plants, belonging to the Natural Order Cruciferæ. There are supposed to be some 80 species, natives of the temperate regions of the Old World; but under cultivation the forms have been increased almost indefinitely.

Glabrous or hispid herbs; root-stocks often woody. Leaves large, pinnatifid or lyrate, rarely entire. Flowers yellow, in long racemes. Sepals erect or spreading, lateral, usually saccate at the base. Pods elongate, terete or angular, often with an indehiscent 1-seeded beak; valves convex, 1-3-nerved, lateral nerves flexuous; style beaked or ensiform; stigma truncate or 2-lobed. Seeds 1-serial, globose or sub-compressed; cotyledons incumbent, concave or conduplicate, the radicle within the longitudinal fold.

The generic name is derived from the Latin Brassica and the Celtic Brac, or Brat Scotch. Nearly all the species of this interesting and most valuable genus exist entirely in a state of cultivation. They are antiscorbic. It may be stated that no plant with a 4-merous condition of the corolla, and with 4 long and 2 short stamens, is known to be poisonous. These are the eye-marks of the Cruciferæ, a family which yields the majority of the vegetables used by the inhabitants of temperate countries. Of the Cruciferae genera, Brassica is the most important. To it belongs the mustard, the cabbage, the cauliflower, the broccoli, the borecole, and the turnip, with their innumerable varieties. The following are the important Indian wild or cultivated species, with their principal culinary forms.

The various species of Brassica met with in India may conveniently be referred to two important sections:

1st.—Those which may be regarded as of Asiatic origin,—i.e., are either indigenous to Asia or were introduced at an early date.

2nd.—Modern introductions, or the species which may be viewed as most probably European forms of the genus.

The former includes the varieties and races of Brassica campestris, B. juncea, and B. chinensis; the latter, B. alba, B. nigra, B.oleracea, and B. rapa. The European members are easily recognised, and there can be no possible confusion regarding them; but unfortunately it is quite otherwise with the Asiatic forms. Messrs. Duthie and Fuller (Field and Garden Crops) have, however, contributed a most valuable paper on this subject, which has gone a long way to clearing up many of the doubtful points regarding these plants. I take the liberty to reproduce here their most useful analysis of the botanical characters of the Asiatic species:

* Foliage usually glaucous and smooth, rarely hispid; leaves ampli-caul, auricled; seeds yellow or brown.

† Corymbos few-flowered; sepals erect; pods very thick, not torulose, 2-3-4-valved; seeds large, yellow or brown.

Pods erect, 2-valved . . . . . B. glauca, Rosb.
Pods pendulous, 3-4-valved . . . . B. trilocularia.
Pods erect, 4-valved . . . . . B. quadrivalvis.

‡ Corymbos many-flowered; sepals spreading; pods stoutish, somewhat torulose; seeds brown or reddish brown, rather large, minutely rugose.

Pods not torulose, slender, with a long tapering beak; seeds dark brown . . B. dichotoma, Rosb.

B. 799
Pods somewhat torulose, short, with sharp beak; seeds reddish brown. **B. glauca, Royle, var. Toria.**

Foliage usually bright green and more or less hispid; leaves stalked or the upper ones sessile, not amplexicaul; pods thin, torulose; seeds small, dark brown or reddish brown, distinctly reticulated. **B. juncea and B. chinensis.**

From an agricultural point of view the Asiatic forms may be referred to three important sections:

(a) *Sardón,* may be called the Indian rape and colza series.

(b) *Toria,* is exported either as mustard or as rape.

(c) *Rāi,* commonly known as Indian mustard.

How far it is possible to separate the *sardón* into groups corresponding to the rape and the colza of Europe may be doubted, but the line which separates these from *toria* and from *rāi* is well marked and should be carefully observed. The various forms of *sardón* are seldom grown alone, but constitute an element in mixed crops, being generally sown, in Upper India at least, along with nearly every crop of wheat and barley. On the other hand, *toria* is nearly always grown by itself.

If not destroyed by blight, *sardón or toria* (lath) is a most valuable crop,—much more so in fact than either wheat or barley. The danger of blight is, however, very considerable, and few small cultivators care to risk an entire failure in the hope of a good crop, which, if good, is of course very remunerative; hence the rapes and also mustard are generally grown as mixed crops. In India, as a whole, mustard (*rāi*) is not so extensively cultivated as rape. It is a mixed crop, the weight of oil obtained is only one fourth instead of one third, and it is also less esteemed as an article of food. It is a little difficult to determine what is meant by mustard in the returns of Indian export trade, but that the amount of true mustard must be very small seems beyond doubt; indeed, it is highly probable that neither *Brassica alba* nor *Brassica nigra*—the true mustards of European commerce—are ever exported from India. It seems quite likely that the better classes of each of the above Asiatic crops are exported as Mustard and the inferior as Rape.


**The White Mustard.**

**Vern.**—*Sūfīd-rāi, sufīd-rāvīn,* Hind.; *Dhāp-rāi, BENG.; Pān-

**ahora-mohare, MAR.; Ujlo-rāi, GUJ.; Vellai-kaduy, TAM.; Tella-

**avala, TEL.; Vella-kutuka, MALL.; Bili-sāvare, KAN.; Siddhārtha,

**ahvetasawrakop, SANS.; Khordale-ulayas, ARAB.; Sifandāne-supiś, PERS.;

**uddu-abbe, SINGH.; Aphiya-munntiyāzi, BURM.*

**Habitat.**—This is supposed to be a native of the more southern portions of Europe and of Western Asia.

**Botanic Diagnosis.**—This is the plant which yields the so-called "White Mustard." It is by no means a common plant, but may be recognised by its large yellow flowers, and spreading, hispid, few-seeded pods, with a long empty and flat beak. (Compare with *B. Nigra.*)

**Properties and Use.**—

The seeds, large and white.

The flour, rarely used alone.

The oil, little known.

The plant is also eaten as salad, the seeds being sown thickly, and the young seedling plants cut when about 2 inches high; the leaves and young sprouts are also eaten as a green vegetable. The cake is much used in Europe to feed sheep. It is regarded as fattening for sheep; black oil-cake is not considered so good for this purpose.

**B. 803**
BRASSICA campestris.

“When triturated with water, the seeds form a yellowish emulsion of very pungent taste, but it is inodorous, and does not, under any circumstances, yield a volatile oil. The powdered seeds made into a paste with cold water act as a highly stimulating cataplasm. The entire seeds yield to cold water an abundance of mucilage.” (Flück. and Hanb., Pharmac.)

Medicine.—White mustard alone must be regarded as useless, but it is invariably mixed with black in the preparation of mustard flour.

Chemistry.—The vesicating or stimulating properties of white mustard are due to sulphocyanate of acryln. It does not pre-exist in the seed and cannot be obtained by distillation. (For further information see B. nigra.)

Brassica campestris, Linn.; Fl. Br. Ind., I., 156.

To this species belong the turnip, the rape, coleseed, colza, and other forms known in Europe. The Indian examples may be said to be represented by sarsón and tória. It is necessary to make some attempt at referring the Indian forms to their sub-species and varieties, but until the subject has been more carefully investigated, very little of a definite and trustworthy nature can be given. The greatest possible difficulty exists in separating the economic and trade facts which have appeared in Indian works and reports on the subject; mistakes are almost unavoidable. But before attempting to establish the varieties of the Indian members of this species, it may be found convenient to give in this place a brief indication of the arrangement adopted in Europe, so that comparison may be possible with the Indian plants.

European Forms of Brassica campestris.

Sub-species I.—campestris proper.

Colza, Wild Nave or Navette, Colesseed, Swedish Turnip, Eng.; Chou des champs, Navette, Fr.

Botanic Diagnosis.—Root tuberous. Leaves glaucous, radical, hispid, upper glabrous. Racemes close, the open flowers rising above the buds, and caducous before the corymb lengthens into the raceme.

This is the wild coleseed of the fields of England and of many parts of Europe. It is sometimes cultivated in France for its seed—the colza, colza, or colsat, the chou olefere of the French. It is unfortunate that in England, and, indeed, in many parts of the Continent, the name coleseed or colza has been applied to rape as a synonymous term. They are perfectly distinct; the seed-produce of colza is much greater in quantity though inferior in value to rape. Colza is much grown in France and Belgium, but by the British farmer it is supposed to exhaust the soil. The Swedish turnip is a cultivated form of this plant, bearing the same relation to the normal form which the khol-rabi does to the cabbage.

It seems very probable that the hairy plants which Roxburgh called Sinapis dichotoma and S. trifoliaria, as also Brassica quadrioculata, H.-f. & T., should be viewed as forms of this sub-species and not of Napus, as stated by Messrs. Duthie and Fuller. The nature of the seed and of the oil yielded by these forms corresponds with that of the French and Belgium plant, thus affording additional corroborative to the above suggestion, based on the agreement of the botanical characters which exists between them. As cultivated crops, however, they are quite distinct from rape. It would therefore be of considerable practical advantage to have the returns of these forms declared separately from those which more properly should be called Indian rape. This would be of importance even although it must be admitted that dried specimens of the former plant can hardly be distinguished from the latter.

B. 809
The Corresponding Indian Forms.

**BRASSICA campestris.**

**810**

**SUB-SPECIES 2—Napus.**


**Botanic Diagnosis.** — Root fusiform. Leaves all glabrous and glaucous. Raceme elongated at the time when the flowers expand. *(Note.—The character of the raceme of this and of the preceding sub-species would appear to have been reversed in some recent works on this genus.)*

Although *Napus* is largely seen as a weed of cultivation in corn-fields, especially in Scotland, it may be viewed as an escape from cultivation. As a crop the seeds yield the rape oil of commerce.

It seems probable that to this sub-species should be referred *Sinapis glabra*, Roxb., and *S. giauca*, Reyle.

**THE TURNIP.**

**811**

**SUB-SPECIES 3—Rapa.**


**Botanic Diagnosis.** — Root tuberous. Radical leaves green, not glaucous, hispid; stem leaves glaucous and glabrous. Flowers falling off before the corymb lengths into a raceme.

**Habitat.** — Grown as a garden crop all over India.

**Properties and Use.**

The young leaves used as food.
The root largely used as food.
The seeds are chiefly used for propagation, but an oil is also prepared from them. The common cultivated Turnip may almost be said to be acclimatised in India, and to have gained great favour with the natives as a vegetable. The Brahmans and Baniyas have a prejudice against it, however, from a suspicion of a relation to beef or animal matter.

**Indian Forms.**

Speaking of the forms of *B. campestris* met with in the North-West Provinces, Mr. Atkinson, in the manuscript which he has most obligingly placed at my disposal, says: "The varieties known as *S. giauca* and *S. dichotoma* are well marked and are known by different names in almost every district, and appear to be entitled to specific notice." These forms, he goes on to say, are "extensively cultivated in almost every district in the N.-W. Provinces on account of the oil obtained from the seed. They are, however, sparsely grown in the Benares District, because there they are peculiarly subject to the attack of labb, a small black fly."

**812**

**Var. 1—dichotoma,** sp., Roxb.

It seems probable, as already indicated, that, owing to the hairiness of the leaves, this should be viewed as a form of the sub-species *B. campestris proper*; thus corresponding to the Swedish turnip and colza series.

**KALI SARSÓN** (The Indian commercial name).

**Syn.** — *Sinapis dichotoma*, Roxb.; *S. brassicata*, Roxb.


**Botanic Diagnosis.** — Upper leaves lyrate or entire, amplexicaul, lower auricled, deeply pinnatifid; the ground ones being more or less hairy;

**B. 812**
**BRASSICA campestris.**

**Rape-seed.**

Used for culinary purposes. Pods sub-cylindrical, 2-3 inches long, with a long tapering beak; seeds small, dark or light brown, smooth or minutely rugose.

I am inclined to think a serious mistake has been made by European authors in regarding this variety as identical with *S. glauca*, Roxb. The latter plant yields a decidedly superior oil, and both seeds and plant are readily distinguished by the most ordinary native, and their properties narrated with precision.

Oil.—Colza oil is used by the natives of India chiefly to anoint the body and for illuminating purposes.

§ "On this side of India the oil (Sarsain, Guz.) is used for pickles and culinary purposes: the oil-cake is given to cattle." (Assistant Surgeon Sukhrádám Arjum Rávat, Girgaum, Bombay.) It seems probable that the above remark should be transferred to the next variety. (G. Watt.)

**Var. 2—glauca, sp., Roxb.**

This seems to belong to the sub-species *Napus*.

RAPE-SEED, RARA-SARSON (the Indian commercial name). Roxburgh calls this "White Mustard."

**Syn.**—*Sinapis glauca*, Roxb.


§ "Raira, i.e., like mustard." (Dr. W. Dymock, Bombay.)

**Botanic Diagnosis.**—The leaves are amplexicaul, the lower deeply pinnatifid, the ground ones being quite glabrous; used for culinary purposes. Pods very thick, laterally compressed, § to § inch in length, with a broad flattened beak; seeds round, smooth, light yellow or white, but occasionally deeper coloured.

Oil.—It is highly probable that a great part of the so-called mustard oil of India should be transferred to this position under the name of sarson or Indian rape oil. How far the oil from the next variety, toria, may also belong to this class cannot at present be determined, but it has been deemed advisable to give here an abstract of all the available information regarding Indian rape oil. Speaking of this plant, Roxburgh says: "The entire seed is used for various economical purposes; an oil is also expressed from it, which is much used in the diet of the Hindús." "Rape oil is expressed after the ordinary fashion of the oil-presser or teli, who returns to the cultivator one third of the weight of the seed in oil." (Duthie and Fuller.) "The oil is expressed in the same manner as til by means of a large wooden mortar and pestle worked by cattle. In Bulandshahar the seed sells at 12 sees for the rupee; one maund yields 13 sees of oil and 27 sees of cake at a cost of 12 annas. The oil sells at 34 sees per rupee and the cake at 35. The oil is used in the preparation of condiments, such as pickles, preserves, curries, and for other culinary purposes. It is also used for burning, though, from its strong odour, it is not a favourite with Europeans. It is, however, capable of purification by agitation in a leaden vessel or with sulphuric acid and water." (Mr. Atkenson’s MSS.) The oil which is most esteemed as an article of food amongst the Hindús is that obtained from *B. juncas*, which see.

**Special Opinions.**—§ "Combined with camphor, it forms an efficacious embrocation in muscular rheumatism, stiff neck, &c. Pure oil, commonly used by natives of Bengal to anoint the body before bathing, strengthens the skin and keeps it cool and healthy. Sometimes used by suicides to dissolve opium, thus hastening the effect of the narcotic. The seeds pounded and mixed with hot water form an efficient counter-irritant.

B. 821
Rape-seed. 

BRASSICA campestris.

poulite.” (Assistant Surgeon Shib Chunder Bhuttacharji, Central Provinces.) “The oil is also used as an external application in dengue fever with great benefit.” (Surgeon-Major S. A. G. Jayabar, Muscat, Arabia.) “Is much used for rubbing on the chest in bronchitis, especially of children.” (Surgeon-Major P. N. Mukerji, Cuttack, Orissa.) “Similar action to mustard, but less effective.” (Surgeon W. Barren, Bhuj, Cutch.)

Var. 3—Toria, Duthie and Fuller.

It seems probable that this should be viewed as a variety of the subspecies *Napus*; it has some resemblance to the summer rape of Germany, the navette d’été of France.

Syn.—*Sinapis glauca*, Royle.

Vern.—*Tori, törïya, khelïya, lahi or lai*, also *dain, and déin-lai*, Hind. ; *Tuwëka, Sans.*

Botanic Diagnosis.—The whole plant quite smooth and glaucous, 2-3 feet in height. Lower leaves lyrate or pinnatifid, upper amplexicaul, lanceolate, entire. The leaves are used for culinary purposes. Flowers bright yellow, sepals spreading. Pods rather slender, 1½ to 1½ long, transversely compressed, and more or less torulose; beak about ½ inch long. Seeds small, roundish or semi-compressed, reddish brown, finely rugose.

No definite information can be obtained regarding the oil expressed from the seeds of this form, except that the oil is regularly expressed, and that this plant is the staple mustard crop of the hills.

As a rule, it is grown alone and is produced in the greatest abundance in the districts which border on the Himalayan Terai. In the Northwest Provinces and Oudh, it occupies annually about 35,000 acres, in the 30 temporarily-settled districts, yielding 4 to 6 maunds of seed per acre.

RAPE-SEED.

From the preceding remarks the reader may have gathered that the Indian forms of *Brassica campestris* may, with at least a certain degree of accuracy, be referred to three primary sections:

Section I.—*Colza*, which corresponds to Roxburgh’s *Sinapis dichotoma*, and the abnormal forms of that plant which have come to be known as *B. trilocularis* and *B. quadrilocularis*.

Section II.—Rape or *Sinapis glauca*, Roxb.

Section III.—*Toria*, or another form, most probably of rape, which has received the name of *S. glauca*, Royle.

There is every reason to suppose that II. and III. are commercially known as rape, although perhaps the last may occasionally be classed as mustard. These three forms individually represent agricultural products of the greatest importance to India. They would seem sufficiently distinct to have justified their retention at least as varieties, very much corresponding to the original species. The natives display a highly-developed power of observation in this direction; they have long become perfectly familiar with these plants, and can, as a rule, name them with unerring certainty.

In our trade returns, however, rape is always spoken of as if there was only one plant concerned. It has hence become necessary to discuss the subject of rape collectively, although it must be remarked that it is very desirable that an effort be made to distinguish the three forms, and, if possible, to publish separate returns for each.

Food.—Whether or not it may be found correct to botanically sub-divide the Indian forms of *B. campestris* into two or three primary sections, resembling rape and colza, and to identify these sections with the corresponding European forms, it cannot be doubted but that such a classification would serve a commercial purpose. It would separate the oil which in Indian commerce is called rape oil, from that which might with
advantage, in order to remove confusion, receive the name of colza, as well as both these from mustard oil and the other oils obtained from the remaining members of the genus. It will be enough, however, to suggest this separation; subsequent research may reveal further corrections and subdivisions, for there are many points which it is difficult to settle definitely in the present state of information. Perhaps the best botanical character that can be cited in support of the proposed separation is the glabrous nature of the ground leaves of the forms above referred to as Nasturtium (rape), and the more or less hairy ground leaves of S. dichotoma, corresponding with those of Nasturtium (colza). The seeds in the former are smooth and light, in the latter smooth or rough, but dark coloured. Rape oil (S. glucina) is regarded as better in quality than (colza oil) the oil from S. dichotoma, the latter being used chiefly to anoint the body, while the former is largely used in cookery, and is exported to Europe for illuminating purposes and to meet a demand in the India-rubber manufacture. As already stated, in the trade record of the exportation of rape oil and seed from India, apparently both the above are included as different qualities of rape, if not also the oil expressed from B. juncea and Eruc sativa.

In his Panjab Products, Mr. Baden Powell has mistaken these plants; he identifies sarson or rape with Sinapis juncea, mustard with S. campestris, of which he apparently views S. alba and S. nigra as varieties. Regarding Mr. Atkinson as correct, I have in substance followed the admirable division given by him in his Himalayan Districts, page 70, also in the private MSS. from which one or two passages have already been extracted.

In European commerce, rape and colza are names which unfortunately have come to be used almost synonymously. The separation here recommended is, of the probably corresponding Indian forms has been deemed advisable, chiefly with a view to more clearly identifying the Indian oils allied to mustard. The oils obtained from these are even more distinct than the oils from the European plants, and their respective properties are well understood and appreciated by the natives of India. Some such separation seems highly desirable. Simmonds, in his Tropical Agriculture (1877), remarks of Indian so-called rape-seed, that "the prices in the London market in the beginning of 1877 were, for Calcutta brown, 59s. 6d. to 6s. per quarter, and for Ferozepore 59s." Under mustard he seems to include S. chinensis, S. dichotoma, S. pekinensis, S. ramosa, S. glauca, and S. juncea as the mustard-yielding species of Asia. The majority of these plants are those which yield the so-called rape-seed as exported from India; Brassica (Sinapis) juncea alone falling within these pronounced to be mustard. In fact it is probable, as already stated, that the bulk of the seed exported from India as mustard is obtained from B. juncea, and not from B. alba and B. nigra, the true mustards.

"In India, rape-seed is very commonly sown mixed with mustard-seed, and almost as an auxiliary with grain crops. It prefers loams, and does not thrive on clay soils. The sowing takes place in October, and the harvest in the following February, the plants being cut somewhat prematurely, otherwise the pods would burst and much of the seed be lost. The latter is ripened by exposure to the sun for 3 or 4 days on the threshing-floor, and is then easily dislodged." "The Indian seed known as "Guzerat Rape," largely crushed at Dantzig, is found to yield 32 per cent. more oil than European seed, and leaves a cake richer in fatty matter and albuminoids; it is shipped from Bombay and brings the highest price of any." (Spons' Encyc.)

A good deal has been written regarding the superiority of this so-called Guzerat rape. It seems to be a superior quality of var. Turia or var.
Trade in Rape and Mustard.

**BRASSICA campestris.**

**giansa.** In the Bombay Gazetteer occurs the following notice of this form: "Rape-seed, sardón, Brassica Napus, holds the first place among oil-seeds and the third place among crops in general (in Kadi sub-division). Land intended for it is left fallow for four months and ploughed twenty times before the seed is sown. The crop does not require any watering. The seed is sown through drills in November at the rate of from 2 to 3 sirs to the bigha and reaped in March, and the average yield varies from 400 to 800 lbs. When the crop is grown in bajarevada land, the yield is small and rarely exceeds 200 lbs. The rape-seed grown in this division is of a better description than any in Gujarát, and has a larger grain. The produce forms one of the chief articles of export." (Bomb. Gaz., VII., 67.)

The Kew Report of 1877 says: "Gujarat rape-seed has been crushed at Dantzig, and is found to yield 13.5 per cent. more oil than rape; the cake also yields 10 per cent. fatty matter and 34 per cent. albuminoids, both being in excess of the amounts yielded by ordinary rape."

In an official correspondence with the Home Department regarding a proposed future edition of the Pharmacopæa of India, the Bombay Committee describe a Gujarát plant under the name B. juncea; from the botanical characters given, one is compelled to believe this must be B. campestris, var. Toria. The leaves are said to be glabrous and attenuated at the base, the upper ones lanceolate and entire. The seeds are oblong, light brown, and minutely reticulated. These are certainly not the characters of the hairy, petiolate, non-attenuated leaves of B. juncea, nor the characters of the seed of that plant. If this presumption proves correct, it is a remarkable fact that the medicinal virtues of the mustard should be attributed to a form of rape. It is probable, however, that the botanical description is not that of the plant for which the medicinal virtues have been given. A chemical analysis of the Gujarát seed would put at rest all possible misunderstandings. (See Chemical note regarding mustard and rape.)

**TRADE RETURNS.**

**INTRA-STATE TRADE.**

In the returns of Internal Trade, the quotations are sometimes given as "Rape," mustard not being mentioned; sometimes as "Mustard," and apparently no rape; and again as "Rape and Mustard" jointly. It is thus impossible to separate these so as to show the relation of each to the foreign exports which are published separately for Rape and for Mustard. Of rape and mustard, the North-West Provinces and Oudh exported 1,545,327 cwt., valued at Rs.60,66,668 during the year 1883-84; Bombay imported 1,250,945 cwt., valued at Rs.60,85,833, and Calcutta imported 2,773,621 cwt., the bulk of which was borne by the East Indian Railway.

**EXTERNAL TRADE.**

The following table shows the exports of rape-seed to other countries by sea during the six years ending 1883-84:

<table>
<thead>
<tr>
<th>YEARS</th>
<th>Quantity in Cwt.</th>
<th>Value in Rupees.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1875-76</td>
<td>2,155,476</td>
<td>1,36,67,869</td>
</tr>
<tr>
<td>1876-77</td>
<td>1,350,572</td>
<td>85,37,717</td>
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<tr>
<td>1877-78</td>
<td>1,355,886</td>
<td>67,10,339</td>
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<td>1878-79</td>
<td>1,055,691</td>
<td>103,19,978</td>
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<td>1879-80</td>
<td>2,811,420</td>
<td>1,57,05,233</td>
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<td>1880-81</td>
<td>3,945,727</td>
<td>2,44,14,331</td>
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</table>

B. 832
BRASSICA juncea.

Indian Mustard.

The following analysis of the exports of rape-seed for the year 1883-84 shows the Presidencies or Provinces whence exported, and the countries to which consigned:

<table>
<thead>
<tr>
<th>Presidency or Province from which exported</th>
<th>Quantity in Cwt.</th>
<th>Value in Rupees.</th>
<th>Country to which exported</th>
<th>Quantity in Cwt.</th>
<th>Value in Rupees.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bengal</td>
<td>1,592,023</td>
<td>89,34,889</td>
<td>United Kingdom</td>
<td>1,970,015</td>
<td>1,07,06,471</td>
</tr>
<tr>
<td>Bombay</td>
<td>1,302,623</td>
<td>97,12,685</td>
<td>Austria</td>
<td>2,400</td>
<td>18,300</td>
</tr>
<tr>
<td>Sind</td>
<td>887,970</td>
<td>57,29,168</td>
<td>Belgium</td>
<td>671,979</td>
<td>45,35,759</td>
</tr>
<tr>
<td>Madras</td>
<td>63,111</td>
<td>3,37,589</td>
<td>Denmark</td>
<td>4,910</td>
<td>34,729</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>France</td>
<td>770,904</td>
<td>55,02,402</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Germany</td>
<td>304,754</td>
<td>21,75,708</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Italy</td>
<td>34,821</td>
<td>26,51,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Egypt</td>
<td>178,293</td>
<td>10,92,083</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Aden</td>
<td>1,400</td>
<td>10,65</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Other countries</td>
<td>172</td>
<td>81</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3,945,727</td>
<td>2,44,14,331</td>
<td>TOTAL</td>
<td>3,945,727</td>
<td>2,44,14,331</td>
</tr>
</tbody>
</table>


The Rāi of Indian Mustard.

Syn.—Sinapis ramosa, Roxb.; S. cuneifolia, Roxb.; S. rugosa, Rox.; S. nurcea, Linn.; S. juncea, Linn.

Vern.—Rāi, sarson, sarson-lahi, gohana-sarson, bari-rāi, bāli, bēdākhi-rāi, khakki-rāi, Hind.; Rāi sariska, Beng.; Arā, Khas.; Rāi, Guj., Kutch; Rāi, sarson, rajikā, Bom.; Mohari, riha, Mar.; Rājikā, Sans.; Abba, Singh.

Habitat.—Cultivated abundantly in India; it extends westward to Egypt, and eastward to China. This is in fact the plant which in India bears the name of mustard, and takes the place of B. nigra in all warm countries. In the North-West Provinces and Oudh it is generally sown on borders of fields of wheat, barley, or peas, sometimes broadcast. 3 lbs. per acre of seed being required, and yielding an outturn of 3 to 4 maunds to the acre. It is largely grown in the south of Russia and in the steppes north-east of the Caspian, flourishing on saline soils. At Sarepta, Saratov, it has been largely cultivated for a century, and it is also grown in Central Africa.

Botanic Diagnosis.—"A tall, erect annual, 3-5 feet in height, with bright green foliage, rarely glaucous, more or less hispid towards the base; stems much-branched, smooth, terete, often tinged purplish red, especially at the joints. Leaves not amplexicaul, the lower ones stalked, lyrate or pinnatifid, margin variously serrate-dentate, often very hispid, especially when young; petioles channelled, upper leaves sub-sessile, linear-lanceolate, smooth, dentate, or the uppermost quite entire. Racemes terminal; flowers stalked; pedicels elongated in fruit, divaricate, calyx with linear boat-shaped spreading sepals. Petals small, bright yellow. Pods slender, 1-2 inch long, sub-compressed torulose; beak about ¼ the length of the pod; valves with a prominent midrib. Seeds small, sub-globose, dark or reddish brown, with a rough reticulated testa." (Duthie and Fuller.)

§ "The measurement of the seeds might be given, as our brown musturd is very much larger than the Guzarat mustard, and has ovate-lanceolate or runcinate toothed leaves." (Surgeon-Major W. Dymock, Bombay.) The seeds of this species are much smaller than those of any of the preceding forms. (G. Watt.)
Cultivation of Indian Mustard.—In Bengal this is a much more important crop than rape. In the Mymensingh district (see Hunter's Statistical Account of Bengal) it is sown in dry land, in October, and cut in February. It is sometimes sown alone or as a mixed crop with peas, mustard, barley, &c., grown on high lands. In Cuttack it is described as sown in October and reaped in January, and as luxuriating on soils where salt is deposited. In Jalpaiguri Mustard is extensively grown as an oil-seed, and, next to rice, is the most important crop of the district. It is sown broadcast on highlands in November and December and is reaped in March and April. The young leaves of the plant are used as a vegetable. In the Administration Report of Bengal for 1882-83 it is stated that "in Bengal proper, mustard seed is of greater importance than linseed. Of all descriptions of oil, mustard oil is the most largely consumed and most relished by the people. Poor lands and lands recently reclaimed from jungle are generally sown with it, the yield being considerable in comparison with the small amount of labour required for cultivating and preparing the land." "This species is not cultivated in the North-West Provinces to the same extent as B. campestris, sarson, though it is the staple crop of Kumaon. The seeds are exported for their oil." (Mr. Atkinson's MSS.) Detailed information regarding the relative amount of this crop, as compared with rape, cannot be obtained from the provincial reports, but it may be stated that it is a much more important crop in Bengal than in the other provinces.

Properties and Uses—

Food.—The leaves are used as a vegetable. In Kumaon the plant is cultivated chiefly for its leaves, which are eaten. (Atkinson.) When the supply of fodder happens to run short in January or February, the mustard crop is frequently cut green and given to cattle.

The seeds are small, round, dark, distinctly reticulated. About 15 to 20 occur in each cell of the pod; in these respects B. juncea seems recognisable from the other members of the genus, most of which have large light-colored or yellow seeds, generally smooth, with rarely more than half the number of seeds in the pod.

Ground into flour, they are used largely as an adulterant with the true mustard. The seeds, whole or broken, are often used to flavour curries. By pressure they yield more than 20 per cent. of a fixed oil which is used in Russia in place of olive oil.

Indian Mustard Oil.—Roxburgh apparently regarded this oil as inferior to rape oil. This does not appear to be the case. It is of a much purer kind than that from B. campestris; it has not the peculiar rancid smell characteristic of rape and colza; it is clearer in colour and is used almost entirely as an article of food, being the oil most generally employed in the plains of India for that purpose. This seems to be the oil called mustard oil so largely prepared in our jails by convict labour. The seeds are reported to yield from 20 to 25 per cent. of oil.

Mustard Flour.—As has been already stated, this plant may be called the Indian Mustard. In point of structure it is perhaps more nearly allied to the true Mustard than to any other member of the genus. Its properties seem also very similar, and, in fact, the seeds are largely used to adulterate, or as a substitute for, mustard in the preparation of "Mustard flour."

Medicine.—"The seeds commonly met with in the bazaars of India, which, from their colour, may be denominated Brown Mustard Seed, possess properties similar to those of the Black and White Mustard Seed, for which they may be employed as an efficient substitute, especially in the preparation of mustard poultices." (Pharm. of Ind.)

Under the name of B. juncea the Bombay Pharmacopoeia Committee

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BRASSICA nigra. Black Mustard.

give the following: "Externally used in internal congestions, in spasmodic, neuralgic, and rheumatic affections, and in morbid states of the cerebro-spinal system, as an emetic in ebrietates and other cases where it is desirable simply to empty the stomach without inducing a depressing influence in the system. In native practice, for external use, it is often combined with moringa bark or garlic, which greatly increases its activity. Taken internally in moderate quantities it acts as a digestive." (Compare with the note regarding above under Rape, page 841.) The United States Dispensatory says: "The mustard flour which the seeds yield is of a very fine yellow, and affords on distillation the oil of black mustard." (15th Ed., p. 1305.) "The seeds closely resemble those of B. nigra, and afford when distilled the same essential oil." (Flück. and Hanb. Pharmacog., 69.)

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Brassica nigra, Koch; Fl. Br. Ind., I., 156.

The Black or True Mustard, Eng.; Moutarde Noire, Fr.; Mustert, Seufsmamen, Ger.; Senapa, It.; Mostarda, Por.

Syn. — Sinapis erysinoidea, Roxb.; Sinapis nigra, Linn.

Vern. — Rāi, kalī rāi, tārd, tārd maṛa, laht, bāṇḍarāi rāi, jaj rāi, māna, ghorrāi, makra-rāi, &c.; Hind.; Rāi sarīthā, Beng.; Rāi, kalī rāi, &c.; Rāi, sarān, Bom.; Kādākh, Tan.; Awala, Tel.; Bāla sahēva, bāla sahēva, kān.; Rājānd (1), sarshah, Sans.; Sarshaf (the name by which it is known in Indian hospitals), Pers.; Khārdal or khandal, Mar.; Ġamala, Singh.; Jīdīsai, Chinises.

§ "Madras vernacular names are the same as those given in page 56 under var. 1.—dichotoma, sp., Roxb." (Mooden Sheriff.)

Habitat. — Cultivated in various parts of India and Thibet, chiefly on the hills. It is found wild over the whole of Europe, excepting in the extreme north.

Botanic Diagnosis. — This may be distinguished from B. alba by its stem-clasping or adpressed and nearly glabrous short pods.

History. — Mustard was well known to the ancients. It is mentioned by Theophratus, Dioscorides, Pliny; and it has been cultivated as an article of food in Europe since the thirteenth century. Its essential oil was first noticed in 1600.

Food. — The leaves are all petioled, the lower lyrate and the upper entire. They are used for culinary purposes.

The seeds are about 1/8 to 1/6 of an inch oblong, and dark-coloured, with a reticulated surface.

True Mustard Oil. — A bland oil, expressed from the seed, is used for various economic purposes. About 23 per cent. is usually expressed. The oil is inodorous, non-drying, and solidifies at 0° F. It consists essentially of glycerides, of stearic, oleic, erucic, and brassic acids, the last being homologous with oleic acid. An essential oil is obtained through the action of water. (See Chemical Composition.)

Medicine. — The seeds of this plant are used in medicine as potter, being a useful and simple rubefacient and vesicant. Mustard poultices prove highly serviceable in cases of febrile and inflammatory disases, internal congestions, spasmodic, neuralgic, and rheumatic affections. Mustard flour in water is highly recommended as a speedy and safe emetic. The bland oil is largely prescribed by native doctors.

The seeds or flour act as a digestive condiment if taken moderately. If swallowed whole they operate as a laxative, and for this purpose are sometimes prescribed in dyspepsia and other complaints attended with torpid bowels.

Chemical Composition. — "Both black and white mustard seeds contain a fixed non-drying oil which is obtained by expression, the amount varying

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from 25 to 35 per cent.; this forms the mustard oil of commerce. Mustard oil contains erucic, stearic, oleic, and sinapoleic acids. White mustard-seed oil, in addition to these acids, contains tienic acid. (Flüchter.) On distillation black mustard yields a volatile oil, the essential oil of mustard. This volatile oil does not exist ready formed in the seeds, but is a product of the action of the myrosin on myronate of potash, now called sinigrin. While the seeds are dry these bodies do not come in contact, but directly water is added, the myrosin decomposes the sinigrin into sulphocyanid of allyl, essential oil of mustard, sugar, and a potash salt of sulphuric acid. It is to the essential oil of mustard that the pungent smell and taste of mustard is due. Applied to the skin it causes almost instant vesication. Myrosin is an albuminous principle, and at a temperature of 140° Fahr. coagulates, and then ceases to have the power of decomposing sinigrin. When, therefore, the pungency of mustard is required, boiling water should never be employed in the preparation. White mustard seeds do not yield this volatile oil on distillation with water. The seeds contain, in addition to myrosin, a crystalline principle of sulphosinapisin—sinabin. In the presence of water and myrosin this body splits up into sulphocyanate of acryl, sulphate of sinapine, and glucose. The vesicating properties of white mustard are due to the first mentioned of these bodies. (Surgeon C. T. H. Warden, Prof. of Chemistry, Calcutta.)

Special Opinions.—§ "The pure fresh oil is a stimulant and mild counter-irritant when applied externally. As such it is very useful in mild attacks of sore throat, internal congestion, and chronic muscular rheumatism. The oil is also used as an article of diet and is rubbed on the skin before bathing." (Surgeon D. Basu, Bardipore.) "Mustard oil with camphor may be rubbed in rheumatism with advantage. Mustard poultices should be removed when the skin is reddened, otherwise troublesome vesication is caused, intractable ulcers resulting." "The small black variety called benarasy rai is as good a rubefacient as English mustard." (Bolly Chund Sen, Teacher of Medicine.) "In common oil-mills in jails a mound of good seed yields 13 seers of oil. The oil rubbed on the feet and the bridge of the nose cures a head-cold in one night. I have never seen it fail. In slight bronchitic affections of children it makes a very useful mild counter-irritant application to the chest. It is also a very useful application in ordinary sore throat." (Surgeon K. D. Ghose, Khooolna.) "The oil rubbed over the chest in children has a great effect in relieving bronchial irritation. In influenza the oil rubbed on the feet after a footbath gives immediate relief. A little rubbed on the nose stops the running within a few hours." (Surgeon K. D. Ghose, Bankura.) "Mustard oil is very useful as a liniment to the chest in cases of bronchitis." (Hony. Surgeon P. Kinsley, Ganjam, Madras.)

Mustard oil—

1. Is used by natives to anoint the body before bathing. It prevents excessive perspiration and prickly heat, also protects the skin from the direct rays of the sun.

2. Is used to anoint infants; after oiling they are exposed to the sun. This process is said to render the skin tolerant of the excessive heat.

3. As a substitute for lard or ghee, it is extensively used in cooking.

4. Internally, a few drops taken after meals promote digestion and act as a mild cholagogue and diuretic.

5. The oil is very efficacious as a stimulating liniment in cough, catarrh, &c." (Surgeon L. Dutt, Fupna.)
MUSTARD.

The majority of the plants to which Europeans in India give the name of mustard should be transferred bodily to rape and its associates, to which they are certainly much more nearly allied. The true mustard is very scarce in India, and seems to have been introduced. Anville fixes its introduction within the present century, and the first time Roxburgh saw the plant was when raised from seed sent him from the Wynnaad in South India. It is nowhere extensively cultivated, but is met with chiefly on the hills, and it is more than probable that it existed on the Himalaya from remote times, although unknown to the fathers of Indian botanical science. It is quite likely, however, that the ancient Sanskrit writers had not seen the true black and white mustard, and that the word ṛṣīkā may have originally denoted a form of Brassica juncea, and the word siddhārtha a form of B. campestris. Nowadays these names are chiefly applied to the true black and white mustard, B. nigra and B. alba, respectively. Brassica juncea is the principal source of Indian mustard.

The seeds of the black and white mustard are ground into what is known as mustard flour. The French mustard flour is much darker in colour than the English, because the seeds are not first husked. It is much more acrid and pungent, for the husk contains the principal store of pungency. Mustard flour is never prepared in India, or, at all events, never used as a condiment, except in making pickles from green mangoes and other sub-acid fruits. The seeds are ground and used as a poultice, and the expressed oil is also used medicinally. In Japan and China, mustard is regarded as a medicine of great importance. The ancient Hindūs do not appear to have known the essential oil of mustard. This oil, as already stated, does not exist in the seeds, but is chemically produced by the action of water, as, for example, when a seed or a little of the flour is put into the mouth. Chemically, mustard seed consists of a bland fixed oil (obtained by pressure) and a peculiar inodorous substance called myronic acid, together with a third substance which has been called myrosyne. By the action of water upon these substances the essential oil is produced, which is known chemically as pyrosyne.

White mustard is much inferior commercially, but is generally mixed with black mustard. It is said to be cultivated at Peropur, but is scarcely known in India. The white oil-cake is a valued food for sheep.

In the preparation of mustard flour, the relative quantities of black and white mustard used are commonly two parts of black to three of white, but the proportions vary. In Russia, B. juncea is ground into mustard flour, and so may most of the other Indian species; but they yield an inferior article to the true mustard flour of commerce, and, as already indicated, their true position is with the rape and colza of Europe. It is much to be regretted that the true mustard B. nigra and B. alba, the rape B. Napus (or in India B. glaucas), the colza B. campestris proper (or in India B. dichotoma), and B. juncea, if not also Eruca sativa, have become hopelessly confused in our trade reports under the common name of rape and mustard. A considerable injury has thereby been done, and a check given to the development of foreign trade in these seeds. It will require time and careful observation to remove this fully, and to identify and distinguish the commercial products.

The quantity of pure mustard produced in India cannot at present be very great. From the confusion referred to above, it is impossible to arrive at any very definite information, since we cannot determine how far the term “Mustard” may be confined to the products of Brassis alba and nigra. The true mustard is cultivated chiefly on the hills, and
is used in medicine or for culinary purposes. In the official Catalogue of the Paris Exhibition of 1867, it is stated that 3,000 tons of flour, equal to 2,000,000 francs worth, were annually produced in France.

**Trade Returns.**

The Annual Statement of the Trade and Navigation of British India with Foreign Countries gives the following figures as the exports from India for the past five years under the head of "Mustard":—

**Exportation of Mustard.**

<table>
<thead>
<tr>
<th>YEARS</th>
<th>Quantity in Cwt.</th>
<th>Value in Rupees.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1879-80</td>
<td>2,350</td>
<td>15,181</td>
</tr>
<tr>
<td>1880-81</td>
<td>17,448</td>
<td>1,03,240</td>
</tr>
<tr>
<td>1881-82</td>
<td>24,340</td>
<td>1,44,508</td>
</tr>
<tr>
<td>1882-83</td>
<td>23,145</td>
<td>1,37,759</td>
</tr>
<tr>
<td>1883-84</td>
<td>10,111</td>
<td>64,513</td>
</tr>
</tbody>
</table>

The following analysis of the exports of mustard for the year 1883-84 is interesting, as showing the relative quantities produced in the various provinces and the more important foreign countries to which exported:—

<table>
<thead>
<tr>
<th>Presidency from which exported</th>
<th>Quantity in Cwt.</th>
<th>Value in Rupees.</th>
<th>Country to which exported</th>
<th>Quantity in Cwt.</th>
<th>Value in Rupees.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bengal</td>
<td>471</td>
<td>2,860</td>
<td>Belgium</td>
<td>357</td>
<td>2,176</td>
</tr>
<tr>
<td>Bombay</td>
<td>9,260</td>
<td>59,061</td>
<td>France</td>
<td>7,993</td>
<td>49,680</td>
</tr>
<tr>
<td>Madras</td>
<td>380</td>
<td>2,592</td>
<td>Mauritius</td>
<td>399</td>
<td>2,533</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>United States</td>
<td>675</td>
<td>4,725</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ceylon</td>
<td>200</td>
<td>1,391</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Straits Settlements</td>
<td>237</td>
<td>1,477</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Other countries</td>
<td>340</td>
<td>2,212</td>
</tr>
<tr>
<td>Total</td>
<td>10,111</td>
<td>64,513</td>
<td>Total</td>
<td>16,111</td>
<td>64,513</td>
</tr>
</tbody>
</table>

**Brassica oleracea, Linn.; DC. Prod., I., 213.**

**The Cabbage and its Associates.**


*Habitat.*—A much-valued cold season vegetable, introduced by Europeans into India. A large, coarse form, extensively cultivated by the natives, has become perfectly acclimatised, and the early cabbages met with in the market are the young heads of this plant.

*Medicine.*—The seeds are diuretic, laxative, stomachic, and anthelmintic. The leaves form a good application in gout and rheumatism.

To this species the Cabbage and all its associates belong; these are supposed to have been produced by cultivating the European Wild Colewort or Wild Cabbage.
The following are the principal forms:—

B. (oleracea) sylvestris—The Wild Colewort.
B. (oleracea) sanguinea—The Green Kale or Borecole.
B. (oleracea) bulleata—The Savoy Cabbage.
B. (oleracea) gemmifera—The Brussels Sprout.
B. (oleracea) capitata—The Red and White Cabbage.
B. (oleracea) cauliflora—The Turnip-stemmed Cabbage or Kol Rohi.
B. (oleracea) botrytis—The Cauliflower and Broccoli.

Brassica quadrivalvis, H. f. & T. T., see B. trilobularis. H. f. & T. T.

B. Tournefortii, Gousan.; Fl. Br. Ind., I., 156.

Habitat.—Is said to be cultivated between Ajmir and Delhi, but is unknown commercially.

The flowers are pale yellow, and the seeds large and compressed.


Will probably prove a cultivated form of B. campestris as already indicated, being very nearly allied to the hairy form known as var. dichotoma. The seeds are large and white. An interesting series of specimens prepared by Mr. Duthie, Superintendent of the Botanic Gardens, Saharanpur, has been placed in the Calcutta Botanic Gardens herbarium. These seem to prove that the number of the valves in the fruit is of little or no importance, but depends more upon treatment than upon specific peculiarities.


Brayera antheminctica, Kunth.; Rosaceae. DC. Prod., II., 588.

Vern.—Casoo or Komso (?) ; Kabýn, kafás, Arab. and Hind.

Habitat.—Native of Abyssinia; imported into India, and sold by druggists.

Medicine.—The dried flowers and tops are antheminctic.

§ "A bazar commercial article in Bombay; it comes direct from Africa." (Surgeon-Major W. Dymock, Bombay.)

Bread-fruit tree, see Artocarpus incisa, Linn.; Urticacœae.


Breynia rhamnoides, Müller-Arg.; Euphorbiaceæ. DC. Prod., XV., pl. 2, 440.

Syn.—Phyllanthus sepiaria, Roș.; Melanthus rhamnoides, Wigg., t. 1898.

Vern.—Trıkbar, Oudh.

Habitat.—A large shrub or small tree; common in the Oudh forests, and in Banda, Bengal, and South India.

BRICK-CLAYS.

"Terre à briques, Fr.; Ziegelerde, Ger.; Argilla da Fabbricazione, Ital.

"In the neighbourhood of most of the large rivers in India, clays are to be found more or less suitable for brick-making; but little selection of good deposits has as yet been exercised, except in the larger cities, or in

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connection with railway works. As a rule, Indian-made bricks do not bear any reputation for strength or durability, though in many cases their inferiority is due to the system of manufacture rather than to the material available.

"The largest brick factory in India is the Government one at Akra near Calcutta. Within the last fifteen years the demand for first-rate bricks in Madras has increased enormously, and this has been met by very excellent productions from the numerous seams of clay in the alluvial deposits of that part of the Coromandel. On the west coast, and particularly at Cannanore, the clays have been largely utilised in the brick and tile productions of the Basel Mission. (See 'Manual of the Geology of India,' Pt. III., p. 569.)" (Contributed by Superintendent, Geological Survey of India.)

**BRIDGES**—Timber used in the construction of.

[Note.—Nearly every timber might be used for this purpose, but the following are those specially mentioned by authors.]

- Afzelia bijuga
- Albizzia procera
- Alnus nitida (hooked sticks for rope bridges)
- Bassia longifolia
- Bicochus javanica
- Calamus montanus
- Calophyllum tomentosum
- Cedrela serrata
- Cedrus Deodara
- Eucalyptus Globulus
- Fagraea fragrans
- Garcinia speciosa
- Hardwickia binata
- Mesua ferrea
- Mimusops littoralis
- Quercus annulata (used for the same purposes as Q. lamellosa)
- Q. lamellosa
- Parrotia Jacquemontiana
- Pinus Gerardiana
- Salyx daphnoides
- Schima Wallichii
- Shorea robusta
- Tectona grandis
- Xydia dolabiformis

**BRIEDELIA, Willd.; Gen. Pl., III., 267.**

A genus of trees, shrubs, or climbers, belonging to the Natural Order EUPHORBIAEAE. There are 25 species, natives of tropical Asia, Africa, the Malay, and Australia.

*Leaves* alternate, entire, short-petioled, generally distichous, with prominent parallel and lateral nerves. *Flowers* numerous, subsessile, in axillary clusters; bractssmall, scale-like, in male flowers numerous, subsessile, in the female few or solitary and often petiolate. *Calyx-tube* turbinate, segments 5-valvate in bud. *Petals* 5, small, scale-like, stalked or spathulate blade often dentate. In *male flowers*, stamens 5, inserted on a central column placed on a flat sinuate disc. *Female flowers*, ovary 2-celled, the base enclosed in the calyx-tube, and surrounded by an inner membranous, cup-shaped or tubular disc, variously lobed or laciniate, which is inserted at the mouth of the calyx-tube and is generally surrounded at its base by an outer fleshy annular disc; style 3-bifid, more or less connate at the base. *Fruit* a berry, enclosing 2 indehiscent cocci.

**Briedelia montana, Willd.; Brandis, For. Fl., 450; Gamble's Man. Timb., 357.**

*Vern.—Kargula, khaja, geia, kusi, Hind.; Geia, Nepal; Kaisha, Ass.; Kurgula, Kumaon; Azãin, Mar.; Cutch; Asano, Bomb., Guj.; Ratufoda, Goa; Vengé-maram, vengé, Tam.; Gundevingula, pantangi, Ann., Tel.*

*Habitat.—* A moderate-sized tree of the Sub-Himalaya, from Jhelum eastward, ascending to 4,000 feet; Oudh and Bengal.

*Botanic Diagnosis.* —"Branchlets and leaves wholly glabrous; bracteoles numerous, thinly membranous." (Brandis.)

B. 863
**BRIEDELIA stipularis.**

**The Briedelia.**

**DYE.**

**MEDICINE.**

**865**

**FOOD.**

**866**

**TIMBER.**

**867**

**868**

**Dye.—Dr. Dymock** thinks that the leaves might be used in tanning.

**Medicine.—**Reported to possess anthelmintic properties. Much used in Bombay and Goas as an astringent medicine. The bark, if soaked in water gives out much mucilage. The fibrous portion is very tough and strong. "Briedelia bark is well known as a valuable astringent in Western India." (Surgeon-Major Dymock, Mat. Med., W. Ind., 589.)

**Fodder.**—The leaves are lopped for cattle fodder.

**Structure of the Wood.**—Grey, beautifully mottled; annual rings distinctly marked by darker and firmer wood on the outside of each ring. Weight 46 to 59 (!) lbs. per cubic foot.

It is very similar to that of B. retusa, and might be used for the same purposes.


**Syn.**—B. crenulata, Roxb., and B. spinosa, Wild.; Roxb., Fl. Ind., 8d. C.B.C., 796.

**Vern.**—Pathar, mark, Pb.; Khéja, kazi, gamal, Hind.; Kharaka, kaun, Kol.; Karike, Bhumij; Kanj, kazi, Kharwar; Kéj, Monghyre; Képala, Santal; Lambana, Ajmer; Gauli, Garhwal; Angur, Banswara; Lambana, angnara, Rajputana; Grie, Nepal; Panya, Lechja; Nanda, Rajbanshi; Katkakshen, Machi; Kasli, Garo; Kamhti, Chittagong; Kazi, kari, Uriya; Multu-veingay, kamanji, Tam.; Koramán, pedha-inien, dantí-bura, dudi maddi, koramad, durumudali, Tel.; Kaire, Gond; Karla, Kubú; Gáunian, kali-an, asana, Mar, Bhi, Phataphod, assana, asana, Bombr.; Sun, Duk.; Assia, goj; Kan.; Adamara, Tinvelly; Turicayen, selgji; Teicchi, selche, Burm.; Katta kaala, kat-takaala, Singh.

**Habitat.**—A large deciduous tree, with thorns on the bark of the young stems; found in the Sub-Himalayan tract, from the Chenab eastwards ascending to 3,600 feet; in Oudh, Bengal, Central and South India, and in Burma.

**Botanic Diagnosis.**—"Branchlets and under-side of the leaves tomentose; bracteoles few, coriaceous. Lateral nerves 15-20 pairs; calyx slightly enlarged in fruit." (Brandis.)

**Dye.**—The bark is used in tanning.

**Medicine.**—The bark possesses medicinal properties similar to those of the preceding.

"Used as a liniment with gingelly oil in rheumatism." (Surgeon-Major F. J. L. Ratton, M.D., Siemen.)

**Food.**—The sweetish fruit is eaten, especially by wild pigeons. The leaves are cut to feed cattle and are said to free them from worms.

**Structure of the Wood.**— Sapwood small; heartwood grey to olive-brown, close-grained, durable, seasons well, and is moderately hard; the annual rings marked by concentric lines. It has a mottled grain and takes a beautiful polish.

It is used for cattle-yokes, agricultural implements, carts, and building. It stands well under water and is accordingly used for well-curbs.

**B. stipularis, Bl.; Gamble's Man. Timb., 356.**

**Syn.**—B. scandens, Roxb.; Fl. Ind., Ed. C.B.C., 796.

**Vern.**—Gourkassí, Uriya; Madladh, undergápa, Oudh; Lélima, Nepal; Dantélóra, siri-ámen or chirí-ámen, Tel.; Kíhur, kohi, Ass.; Harikana, Beng.; Sin-ma-no-pjin, Burm.

**Habitat.**—A large, straggling or climbing shrub, met with in the Sub-Himalayan tract from the Jumna to Surba, ascending to altitude 2,000 feet; abundant in the Oudh forests, also in Bengal, Burmah, South India, the Malay Peninsula, and Ceylon.

**Botanic Diagnosis.**—"Branchlets and under-side of the leaves tomen-
Grass.

BROMUS

arvensis.

Structure of the Wood.—Greyish brown, moderately hard. It is used for fuel in the Sunderbans.

Briedelia tomentosa, Bl.; Gamble’s Man. Timb., 357.

Syn.—B. lancefolia, Roxb., Fl. Ind., Ed. C.B.C., 706.
Vern.—Silki, Nepal; Mantet, Lercha; Sirai, mindr; Benc.

Habitat.—A small evergreen tree, met with in North-East Himálaya, ascending to 2,000 feet; in Eastern Bengal and in Burma.

Botanic Diagnosis.—Young branchlets pubescent or tomentose. Leaves small, glaucous, sparingly and minutely pubescent beneath. Structure of the Wood.—Light olive-brown, hard, close-grained. Weight 64 lbs. per cubic foot.

Brinjal, see Solanum Melongena, Linn.

Brocoli, see Brassica (oleracea) botrytis.

BROMELIACEÆ.

A Natural Order of monocotyledons in which the ovary is generally inferior, occasionally only half-inferior and sometimes even altogether superior. They belong to the Cohort Amómales. Flowers distinct and hermaphrodite, regular, with a 2-serial perianth. Calyx 3, green, the two posterior coherent; corolla 3, coloured, coherent and usually furnished with a nectariferous crest, spirally twisted in activation or rarely valvate, marcescent and again twisted with age. Stamens all perfect epigynous, perigynous, or hypogynous; filaments subulate and usually dilated at the base, free or connate and more or less adnate to the inner perianth-segments (corolla); anthers intorse 2-celled, basi- or dorsi-fixed, erect or incumbent. Ovary from position of the stamens must of course be completely inferior (in the Tribe Bromélieae, e.g., Ananas, &c.), half-inferior or superior (in Tribes Pitcairnieae and Tillandnieae). Ovules anatropous, numerous, 2-serial at the inner angle of the cells, horizontal or ascending, rarely definite and pendulous from the top of the inner angle (Ananas). Fruit a 3-celled berry or a cepticidally 3-valved capsule, rarely loculicidal. Sometimes, as in the pine-apple, the individual fruits are coalesced into a succulent infrutescence crowned with a tuft of leaves. Seeds usually numerous, albumen farinaceous, with the embryo outside.

The Bromélieae are all tropical, American, and often epiphytic plants. In point of structure they are intermediate between the monocotyledon with a free, and those with an adherent, ovary.

As far as India is concerned, they are of little or no value, except the pine-apple, which is perhaps one of our most valuable fruits, and the fibre of which seems to have a good future before it (see Ananas).


Fodder. 879

Bromus arvensis, Linn.; Du Hié’s Grasses, 42; Gramineae.

Syn.—B. versicolor, Poll.; B. multiflorus, Host.; Serraficalis arvensis, Poll.

Habitat.—The North-West Himálaya.

B. 879
BROUSSONETIA
papyrifera.

880

Bromus asper, Linn.; Duthie's Grasses, 42.

Hairy-stalked Bromo Grass.

Syn.—B. ramosus, Huds.; B. montanus, Pott.; B. hirsutus, Curt.; Festuca aspera, Mert. and Koch.

Habitat.—A perennial grass found in North-West Himalaya.

Botanic Diagnosis.—Leaves broad, hairy. Panicle drooping, with long slightly divided branches; spikelets lanceolate; flowers remote, linear-lanceolate, lower pale hairy, 5-7-ribbed, lower flower twice the length of the upper glume and longer than its awn.

Fodder.—A good fodder grass for tracts sheltered by woods.


Prairie Grass of Australia.

Syn.—Cerotchoia pendula, Schrad.

Recently introduced for trial cultivation in the Botanical Gardens at Saharanpur and elsewhere. Mr. Duthie remarks: "Mueller describes this as one of the richest of all grasses, growing continuously and spreading readily from seeds, particularly on fertile and somewhat humid soil."

Broom, see Cytisus scoparius, Linn.; Leguminosae.


A genus of trees, with milky or opaline juice, containing 2 or 3 species, belonging to the Natural Order Urticaceae and the Tribe Morus, natives of the Malayas, China, and Japan.

Leaves alternate (in B. papyrifera sometimes almost opposite), simple, petiolate, ovate-dentate, or when young 3-5-lobed, upper surface rough, under-surface soft tomentose, pennivenescent or at the base 3-costate; stipules lateral, membranaceous and deciduous. Inflorescence axillary, male in cylindrical cumbins, female in compact, tomentose, round heads, with a greatly swollen receptacle; bracts interposed, truncate or clawed at the apex. Flowers dioecious (very much resembling those of Morus). Male perianth of 4 segments, free or connate at the base, membranous, valvate. Stamens 4, coiled up in bud, expanding with elasticity when mature. Ovary small, rudimentary. Female perianth ovoid, or tubular at the mouth, 3-4-dentate. Ovary included within the tubular perianth, stipitate, 1-locular; style subulate, entire (not bifid as in Morus). Fruit stipitate, girt at the base with the persistent perianth, drupaceous (in Morus the succulent sepals contain the nutritious substance); mesocarp thin, except at the base and margins, where it is thick, succulent and edible, forming a forceful band which assists to eject the ripe seed. Seed solitary, finally separating from the endocarp; embryo incurved, subequal, oblong; radicle accumbent, ascending; albumen fleshy and thick, a layer protruded between the folds of the embryo.

The genus is named in honour of P. N. V. Broussonet, a naturalist who published in 1782 an account of the fishes of Barberry.

Broussonetia papyrifera, Vent.; Kurs. For. Fl., Burm., II., 467; Urticaceae.

The Paper-Mulberry or Tapa-cloth.

Vern.—Malaing, Burm.; Aka kumso, kenama kumso, Japan.

Habitat.—A small tree, native of Japan, China, Polynesia, Siam, and said also to be wild in the Martaban hills.

Fibre.—The Japanese make paper from the bark of this tree, and the Burmese their curious papier-mâché school slates (Parabatik). The Tapa-cloth of the South Sea Islands is made from it; also the Karens’ mulberry paper-cloth.

B. 888
Perhaps no fibrous plant deserves to be more carefully investigated than this. Much time has apparently been wasted with experiments upon bamboo and rhea. It is probable that in both cases the experiments would have been much more profitable had they been directed to this fibre, with the view of discovering how far the paper-mulberry could economically be cultivated both as a paper-supply and as a new textile fibre. The Agricultural Department of India, during 1883, sent consignments of the seeds of this plant to British Burma. Plants were raised successfully and are reported (1884) to be growing vigorously. An attempt made during the rainy season to test the coppicing power of the plants at the Forest Garden of Tharawaddy was so successful that the portion coppiced could only be detected from the rest of the plantation by a close examination of the stools. Dr. King, in his annual report on the Botanical Gardens, Calcutta, for 1883-84, writes: "Some months ago I cut some branches of a paper mulberry tree (Broussonetia papyrifera) two years old, and had the bark removed. The latter was reported on by a paper-maker and pronounced, as I expected, an admirable paper material. Experience in this garden has already proved that this tree grows easily and rapidly in Lower Bengal, and I am assured by Mr. Maries, Superintendent of the Gardens of His Highness the Maharajah of Durbhanga, that it also grows well at Durbhanga—a much drier part of the province. If, therefore, villagers would take to growing this tree by the borders of their gardens and in the odd corners and scraps of ground in which Bengal abounds, there is a reasonable prospect that the province might produce in quantity one of the very best paper fibres known—a fibre at once strong and fine, and that has the great merit of requiring very little bleach. With the view of extending the cultivation of this tree, I am having thousands of young plants prepared for issue and for planting out in blank spots along the garden boundary."

"The Japanese are reported to propagate the plant very much as willows are grown in England. They use only the young shoots for the manufacture of paper. The stems are lopped into convenient pieces, and boiled until the bark separates from the wood. The dried bark is next moistened by soaking for a few hours in water. It is then scraped to remove superfluous matter, and thereafter boiled in wood-ashes until the fibres are thoroughly separated. After the boiling has been completed the fibre is beaten with wooden mallets until it is reduced to a paper pulp." (Roye, Fibrous Pl., 342.) Roye points out that the process of paper-making described by Kämpfer, as practised in Japan, so closely resembles the Nepa paper-making as to suggest that the practice was introduced to India through China.

The tapa or kapa paper-mulberry cloth already alluded to is in the South Sea Islands prepared in a somewhat similar way from the bark of this plant. The bark is soaked for a considerable time until it separates from the wood. It is then beaten out to the required degree of thinness. Mucilage from arrowroot is sometimes used both to join the pieces together and to give adhesiveness to the fabric. This is cut up into garments which are either worn plain or variously coloured and printed.

**Prospects as a Paper Material.**

Both as a future textile fibre and for the manufacture of paper, this is perhaps one of the most valuable fibres not at present being used by European commerce. In the Kew Report, 1879, p. 33, interesting information is given regarding this fibre. "A sample of the bark which came into the hands of Mr. Routledge is stated by him to be 'nearly, if not
BROUSSONETIA
papyrifera.

Paper-Mulberry.

This page contains a passage about the cultivation of Broussonetia papyrifera, also known as Paper-Mulberry. The passage describes the best fibre the author has seen, the method of cultivating the plant, and its cultivation and propagation techniques. The text also mentions that the plant requires very little chemical treatment and provides an excellent yield when used for paper production. The passage highlights its suitability for use as a paper fibre and its cultivation methods in Japan. Additionally, it notes the plant's propagation by layering and division of roots, and its suitability for use in silkworms.

The text also mentions the seasonal harvesting of the plant, which varies in different provinces. The annual harvest of pulp from this plant has not yet been ascertained, but it is considered inferior to bamboo. The passage concludes with a note about the selection of seedlings for transplantation, emphasizing the need for healthy and thriving plants.

This passage is part of a larger text, possibly a scientific or agricultural publication, discussing the economic and practical uses of Broussonetia papyrifera.
Mangrove Bark.

**BRUGUIERA gymnorhiza.**

common timber trees. Being such an easily raised tree and so useful a one, I think I should not be wrong in recommending it to the attention of any person who may be in a position to extend its cultivation in Upper India. (Annual Report, Botanic Gardens, Saharanpur 1881-82.)

"The seedlings alluded to in my last report have done remarkably well. Should it ever be under consideration to cultivate this plant on a large scale, I can safely say that there need be no anxiety as to its not thriving to perfection in this climate. It is easily cultivated both by seed and from cuttings. Several of the plants are already in fruit. (Annual Report on Saharanpur Garden for 1882-83.) Mr. J. F. Duthie.)

**Structure of the Wood.**—Light-coloured, even-grained, not hard nor heavy.

**BROWNOWIA, Roxb.; Gen. Pl., I., 231.**

A genus of lofty trees belonging to the Natural Order Tiliaceae; it comprises three species confined to tropical Asia.

Whole plant stellately pubescent or scaly. Leaves entire, 3-5-nerved. Flowers numerous, small, in large terminal or axillary panicles. Calyx bell-shaped, irregularly 3-5-6. Petals 5, without gland. Stamens many, free, springing from a raised torus. Staminodes 5, within the stamens, opposite the petals and petaled. Anthers sub-globose. Ovary 2-celled, each cell 2-ovulate; styles awl-shaped, slightly coherent; ovules ascending. Carpels ultimately nearly free, 2-valved, 1-seeded. Albumen none; cotyledons thick, fleshy.

**Brownlowia elata, Roxb.; Fl. Br. Ind., I., 381; Bot. Reg., I. 1472.**

**Syn.—Humea elata, Roxb.; Fl. Ind., Ed. C.B.C., 496.**

**Vern.—Masjeet, Chittagong.**

Habitat.—A lofty tree of the tidal forests of Chittagong and Tenasserim.

**B. lanceolata, Benth.; Fl. Br. Ind., I., 381.**

Habitat.—A tree of the tidal forests of the Sunderbuns, Arracan, and Tenasserim.

**B. peltata, Benth.; Kurz, For. Fl. Burm., I., 153.**

Habitat.—A small tree of Tenasserim.

**Brucea Nima (?) quassioidea, Ham., see Picrasma quassioidea, Benth.; Simarubaceae.**

**BRUGUIERA, Lam.; Gen. Pl., I., 679.**

A genus of trees belonging to the Rhizophoraceae, comprising some eight species, natives of the tropics of the Old World.

Leaves opposite, coriaceous, oblong, entire, stipulate; pedicels axillary, recurved, one to many-flowered. Calyx 8-14-merous, adnate to the base of the ovary. Petals 8-14, oblong 2-6, appendiculate, embracing the stamens which spring elastically from them when mature. Stamens 10-28, filaments filiform, anthers linear, mucronate, about as long as the filaments. Ovary 2-4-celled, included in the calyx-tube; cells 2-ovulate; style filiform; stigma 2-4 lobed, minute. Fruit turbinate, coriaceous, crowned with the calyx- limb, 1-celled and 1-seeded.

**Bruguiera gymnorhiza, Lam.; Fl. Br. Ind., II., 437; Rhizophoraceae.**

One of the forms of the Mangrove.

**Syn.—B. Rheddi, Bl. (Beddome, c.); Rhizophora gymnorhiza; Roxb., Fl. Ind., Ed. C.B.C., 390.**

**Vern.—Kobra, kannra, Beng.; Byabo, Burm.**

Habitat.—A small evergreen tree of the shores and tidal creeks of India, Burma, and the Andaman Islands.

B. 898
<table>
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<th>BRYONIA laciniosa.</th>
<th>The Bryony.</th>
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**Tan.**—The bark is valuable, and with *Rhizophora mucronata*, Lam., constitutes the tan known commercially as Mangrove bark (which see). It is a useful astringent, used also in dyeing black.

**Structure of the Wood.**—Heartwood small, red, extremely hard. Weight 54 lbs. per cubic foot.

Used for firewood, house-posts, planks, and articles of native furniture.

**BRUNELLA, Linn.; Gen. Pl., II., 1203.**

A genus of perennial procumbent herbs belonging to the Labiatae; there are 2 to 3 species, natives of the temperate regions.

**Leaves** entire or inciso-dentate or even pinnatifid. **Flowers** 6 in a whorl, forming a dense terminal spike with two broad kidney-shaped bracts under each whorl. Calyx reddish purple, ultimately closed and compressed, upper lip flat, truncate, 3-toothed, lower bifid. Corolla ringent, upper lip concave, entire. Two inferior stamens, the longest anthers all 2-celled; filaments biseriate, one branch barren.

**Brunella (Prunella) vulgaris, Linn.**

**Self-heal.**

**Vern.**—Aśiṭākhādāś, Pa.; Uṣṭākhādāś, Sind.

**Habitat.**—A small-branched, erect or creeping herb of the Himalayas, from 3,000 to 10,000 feet.

**Medicine.**—Regarded as an expectorant and antispasmodic.

"The green leaves, smeared with castor oil and warmed over the fire, are applied externally to the anus in cases of painful piles."

(Surgeon-Major Thompson, M.D., Madras.)

**Brussels sprout, see Brassica (oleracea) gemmifera.**

**BRYONIA, Linn.; Gen. Pl., I., 829.**

A genus of climbing herbs belonging to the Natural Order Cucurbitaceae. There are in all 12 species, inhabitants of the warm and temperate zones of the Old World.

**Leaves** peltate, palmately 5-lobed or 3-5-angular. **Flowers** small, yellowish, males and females clustered in the same axis (in the Indian species shortly pedicellate). **Male**—calyx-tube widely campanulate, 5-toothed; corolla 5-petose; stamens 5, inserted low down the calyx-tube; anthers free, two 2-celled, one 1-celled, cells curved or somewhat sigmoid, never quite conduplicate, connective, not produced; rudiment of ovary o. **Female**—calyx and corolla as in the male; ovary ovoid, 5-lobed at the top, no disc at the base; in the Indian species; ovaries many, horizontal, placenta 3. **Berry** spheric, indehiscent. **Seeds** not very many, oblong or ovoid, compressed.

The generic name *Bryonia* from βρωνία and βρωνίνα to be full of, or to swell.

**Bryonia callosa, Rotl., syn. for Cucumis trigonum, Roxb., which see.**

**B. epigaea, Rotl., see Corallocarpus epigaea, Hook. f.**

**B. laciniosa, Linn.; Fl. Br. Ind., II., 623; Wight, Ic., t. 500.**

**The Bryony.**

**Vern.**—Garga-nari, Hind.; Mala, Beng.; Kamal-cheda-dole, Bom.; Neyomaka, Mal.; Linga-danda, Tel.

**Habitat.**—Throughout India, from the Himalayas to Ceylon.

**Medicine.**—"The whole plant is collected when in fruit for medicinal use. It is bitter and aperient, and is considered to have tonic properties."

(Dymock.) Used as a medicine by the Santals.

**Food.**—The leaves are boiled and eaten as greens.

B. 906
The Buchanania.


A genus of herbaceous perennials belonging to the CASSUCEAE: there are 4 species in tropical Africa, one of which extends throughout the tropical regions of the whole world.

Tall erect herbs. Leaves opposite, crenate. Flowers large, pendent, in spreading panicles with opposite branches. Calyx with a long inflated tube; lobes 4, short, valvate. Corolla with a campanulate tube and shortly 4-fid limb. Stamens 8, in two series, inserted on the middle of the corolla-tube. Hypogynous scales 4, obtuse. Carpel 4, free or connate at the base, attenuated into long styles; ovules numerous. Follicles 4, many-seeded.

The generic word is derived from sphyros, to be full of, or to burst forth; and a phyllon, a leaf, in allusion to the succulent nature of the leaves, and probably also because the leaves have the power of rooting by buds produced in the serrations on the margin of the leaves.

BRYOPHYLLUM calycinum, Salis.; Fl. Br. India, II, 413.


Habitat. — A succulent plant, with thick, fleshy leaves, from the crenulations of which, in contact with the ground, bulbules are produced which develop into new plants. Common throughout Bengal and the hotter moist parts of India to Ceylon and Malacca.

History. — According to Roxburgh, this plant was introduced into the Calcutta Botanic Gardens from the Moluccas. Voigt adds that it was brought by Lady Clive in 1790. As already stated, it is now found nearly over the greater part of the hot moist parts of India. In Lower Bengal it is one of the most abundant of gregarious herbs, and it has even spread through Assam and Sylhet to the valley of Mānipur. It is met with in fact throughout India, although less abundantly than in Bengal. Dr. Dymock appears to regard it as a native of the Deccan and of the Konkan, but the Bombay Flora (Dals. and Gages, 1866) gives it as merely common in the Warree country and near Belgaum.

Medicine. — "The leaves, slightly toasted, are used by the natives as an application to wounds, bruises, boils, and bites of venomous insects."

"I have seen decidedly beneficial effects follow their application to contused wounds; swelling and discoloration were prevented, and union of the cut parts took place much more rapidly than it does with ordinary treatment by water-dressing." (Dymock, p. 297.)

§ "Used in the form of poultice and powder for sloughing ulcers, it is a disinfectant." (Surgeon W. Barren, Bhuj, Cutch.)

BUCHANANIA, Roxb.; Gen. Pl., I, 421.

A genus of trees belonging to the Natural Order ANACARDIACEA; there are some 20 species, natives of tropical Asia, Australia, and the Pacific Islands.

B. 912
Buchanania latifolia. The Chironji.

Leaves alternate, petiolate, simple, quite entire. Panicles terminal and axillary, crowded. Flowers small, white, hermaphrodite. Calyx short, 5-toothed or -lobed, persistent, imbricate. Petals 4-5, oblong, recurved, imbricate. Disk orbicular, 5-lobed. Stamens 8-10, free, inserted at the base of the disk. Carpels 5-6, free, seated in the cavity of the disk, one fertile, the rest imperfect; style short, stigma truncate; ovule 1, pendulous from a basal funicle. Drupes small, flesh scanty; stone crustaceous or bony, 2-valved. Seed gibbous, acute at one end; cotyledons thick; radicle superior.

The genus is named in honour of the late distinguished Indian botanist, Dr. Buchanan Hamilton.

Buchanania latifolia, Roxb.; Fl. Br. Ind., II., 23.

Vern.—Piyār, pīyāl, pīyālā, chirōnjī (the kernel), Hind.; Chirōnjī (the fruit), pīyāl, Bêng.; Chiraunlī (the fruit), chirōnjī, Pb.; Pīyl, poyal, maris, kathkhalwa, Garhwaïl; Pīyl, pīyāl, pīyālā, Oudh.; Tarum, Kol.; Pīyl, Bhumij; Pīyl, Kharwaï; Tarej, Santal; Charu, Ura; Achār, chār, chirōnjī (the fruit), C. P.; Sārēkā, herka, Gond.; Tar; Kurk, Sir, Bhil; Chārā-bērōljī (the kernel), Duk.; Pīyl, charrī, Bomb.; Charwāri, Hyderabad; Monda or katimango, marum, tam mōā, aima, kāma-maram (the plant), kāma-pālay or kāma pāray (the fruit), kāma-pāray (the kernel), Tam.; Charā, charā manṣālī, chinnā mora, morī, chārā-chettu or sērā-chettu, chārā-māmālī, jārā, māmālī (the plant), chārā-māmā (the fruit), charā-pāray (the kernel), Tel.; Nāskul, markhalu, Kam.; Kāla maram, Māla; Chārā-dī, Gy.; Cotch; Pīyl-chār, Mark.; Pīylā, chārā, chinnī, Sans.; Loenhā, jumbo, lambokes, lambo or leend-pō, lomopomā, Birm.

References.—Roxb. Fl. Ind., Ed. C. B. C., 365; Voigt, 273; Brandis, For. Fl., 127; Gamble, Man. Timb., 105; Kurz, For. Fl. Burm., 1, 87; Beddome, t. 185; Dals. and Gibe., Bomb. Pl., 52; Stewart’s Ph. Fl., 46; Lisbon’s Useful Fl., Bomb., 53; Dury’s Us. Fl. Ind., 85.

Habitat.—A tree, leafless only for a very short time. Found in the Sub-Himalayan tract from the Satlej eastward, ascending to 2,000 feet; throughout India and Burma, common in the hotter and drier parts of the empire, and frequently associated with the sal, the mahāś, and the dāk.

Properties and Uses—

Gum.—A pellucid gum exudes from wounds on the stem (Brandis), more than half soluble in water, and is reported to resemble Bassora Gum. (See Bassora and also Cochlospermum.) It occurs in irregular broken fragments, brittle, pale, horn-coloured, tinged with brown, tasteless, soluble in water, except a small insoluble portion of basorine. It has been pronounced as having adhesive properties, similar to the inferior kinds of gum arabic, and as suitable for dressing textiles. The bark and the fruits furnish a natural varnish.

Tan.—The bark is used in tanning.

Oil.—The kernels of the fruit yield an oil called Chironji, but owing to their being so much prized as a sweetmeat when cooked, this oil is rarely prepared. It is pale straw-coloured, limpid, sweet and wholesome. The kernels when broken readily yield this oil, 50 per cent. being obtained. (Agri.-Hort. Soc. Jour. Ind., XII., 346.)

Medicine.—The gum is said to be administered in diarrhoea. The oil is used as a substitute for almond oil in native medicinal preparations and confectionery. It is also applied to glandular swellings of the neck. According to Dr. Irvine (Medical Topography, Aymir, 131), the seed is very palatable and nutritious, especially when roasted; it is used also in medicine and is considered healing. The fresh fruit is very agreeable.

Special Opinions.—“The fruits are said to be sweet and laxative. They are used to relieve thirst, burning of the body, and fever.” (Dr. U. C. Dutt, Scrammores.) “Used to improve the flavour of drugs in general.” (Surgeon W. Barren, Bhaij, Cutch.)

B. 919
**BUDDLEIA**

**FOOD.**—"The kernel is a common substitute for almonds amongst the natives. It is largely used in sweetmeats. Its flavour is described as between that of the pistachio and the almond. It is eaten roasted with milk." (Lisboa, *Useful Plants of the Bombay Presidency*, p. 150.)

The fruit is eaten by the hill tribes of Central India. Having first pounded them, along with the contained kernels, they dry them in the sun. As required, this is baked into a sort of bread and eaten.

"The forest tribes gather the seed and take out the kernel, which they exchange for grain, salt, and cloth. The kernel is an important article of trade, being largely used in native sweetmeats. Oil is also extracted from it." (Bomb. Gaz., VII., 37.)

§ "The fruit is sold in Bombay under the name of chara-bhār." (Surgeon-Major W. Dymock, Bombay.)

**FODDER.**—The leaves are said to be given as fodder (Bomb. Gaz., X., 407.)

**Structure of the Wood.**—Greyish brown, moderately hard, with a small dark-coloured heartwood. It seasons well and is fairly durable if kept dry. Weight 30 to 36 lbs. per cubic foot.

The wood "seasons well, is easily worked, and if kept dry is fairly durable." (Bomb. Gaz., VII., 37.) "The heartwood is hard, but the rest of the wood is poor. A seasoned cubic foot weighs 30 pounds." (Bomb. Gaz., XV., 64.)

It is used for boxes, bedsteads, bullock-yokes, doors, window-frames, tables, &c.

**BUCKLANDIA, Br.; Gen. Pl., I., 668.**

A tree attaining a height of 80 feet. Leaves alternate, cordate-ovate, acuminate, entire, long-petioled; stipules solitary or in pairs, large, oblong, coriaceous, deciduous. Inflorescence of 2-5-peduncled heads, at first enclosed between a pair of stipules; flowers adnate by their calyces, about 8 in a head, polygamous. Calyx-tube adnate to the ovary; limb 5-lobed. Petals in the 8 lower linear spathulate, fleshy, variable in number; in the 6 rudimentary. Stamens 10-14 (in the 4 zone); filaments long. Ovary half inferior, 2-celled; styles 2, separate, soon divergents; ovules 6 in each cell in two rows. Capsule nearly superior, woody, sub-globose, endocarp horny, showing a tendency to separate from the exocarp. Seeds 6 in each cell, oblong, trigonous; the upper wingless, solid, without any embryo, the lower one in each cell winged and fertile.

**Bucklandia populnea, R. Br.; Fl. Br. Ind., II., 429; Hamamelidaceae.**

**Vern.**—Pipi, NEPAL; Singliang, LECHA; Dingdah, KHASIA.

**Habitat.**—A large evergreen tree met with in the Eastern Himalaya, Khasia Hills, and hills of Martaban, from 3,000 to 8,000 feet.

**Structure of the Wood.**—Greyish brown, rough, moderately hard, close-grained, durable. Is very much used in Darjiling for planking and for door and window-frames.

**Buckthorn, see Rhamnus catharticus, Linn., Rhamnaceae.**

**Buck-wheat or Brauk, see Fagopyrum esculentum, Marnch.**

**BUDDLEIA, Linn.; Gen. Pl., II., 793.**

A genus of Loganiaceae, comprising some 70 species, natives of the tropical and sub-tropical regions of Asia, America, and Africa.

Trees, shrubs, or herbs. Leaves opposite, entire or crenate, united by a stipular line. Cymes dense, globose or corymbiform, axillary or in a thyrsoid terminal panicle. Calyx campanulate, 4-merous. Corolla urn-shaped; lobes 4, imbricate in bud. Stamens 4, on the corolla tube; anthers subsessile.

**B. 928**
Bupleurum. The Hare's-ear.

Buddelia asiatica, Lour.; Fl. Br. Ind., IV, 82.

Syn.—B. neemda, Buch.; Roxb., Fl. Ind., Ed. C.B.C., 133; Wait., IC., I, 894, 133.

Vern.—Bhat, dhaulu, shištra, Kumaon; Bana, Simla; Nepal; Pundam, Lepcha; Nimbo, Buddhola, Chittagong; Kyma, miku, Burm.

Habitat.—A large evergreen shrub of the Sub-Himalayan tract from the Indus eastward, ascending to 4,000 feet; Bengal, Burma, South India; chiefly found in second-growth forests, deserted village sites, and savannahs.

Structure of the Wood.—Grey, moderately hard. Weight 44 lbs. per cubic foot.


Vern.—Puri singhiti, Nepal; Pya-ching, Bhutia.

Habitat.—A small tree of the Eastern Himalaya, from 9,000 to 12,000 feet.

Structure of the Wood.—Reddish brown, soft.

B. paniculata, Wall.; Fl. Br. Ind., IV, 81.

Syn.—B. crispa, Benth.

Vern.—Spera wuna, Afg.; Dholtu, ghátta, soothera, sudhari, N-W. Himalaya; Sinha, Nepal.

Habitat.—A large evergreen shrub of the Himalaya, from the Indus to Bhutan, ascending to 7,000 feet.

Structure of the Wood.—White, moderately hard, close-grained. Weight 41 lbs. per cubic foot.

Buffalo grass or Gama grass, see Tripsacum dactyloides (?).

Bullock's heart, see Anona reticulata, Linn.


A genus of Umbelliferae, comprising some 60 species, natives of Europe and temperate Asia. It is at once recognized from all its associates by its glabrous and glaucous, entire, thick leaves.

Glabrous herbs or shrubs. Leaves entire. Umbels compound; bracts and bracteoles foliaceous, setaceous, or o. Flowers yellow or luid, pollicelled or subbaccate. Calyx-teeth o. Petals obvate, emarginate. Styles short. Fruit laterally compressed, slightly constricted at the commissure; carpels terete or subpentagonal; primary ridges distinct, sometimes subulate, rarely obscure; secondary 0 or obscure; vittie 1-3 between the primary ridges, rarely 0 or many; carpophore entire 2-ed or 2-partite. Disc depressed, rarely prominent in fruit. Seed terete, sometimes slightly grooved on the inner face.

The generic name is the Greek βουτλευρον—βουτ (bous), the ox, and πλευρόν (pleuron), a rib, a name which probably indicates a resemblance to the curved lanceolate and entire leaves. Latin Bupleuron, Russ. Bupleur, It. Bupleuro, and Fr. Bupleur. They are generally known in English as the Hare's-ear.

**Vern.**—Kalí sawar, sīpil, Pn.

**Habitat.**—Met with in the mountainous tracts of Northern India, from 3,000 to 12,000 feet, extending from Kashmir to the Khāsia Hills.

**Medicine.**—This, as also other members of the genus, is reputed to have stimulant properties.

**Food.**—The root is said to be eaten.

**BURSERACEÆ.**

"Balsamiferous trees or shrubs. Leaves alternate (very rarely opposite), imparipinnate or trifoliolate (very rarely unifoliolate), stipulate or exstipulate. Inflorescence racemose or paniculate. Flowers regular, small, hermaphrodite or often polygamous. Calyx free, 3-6-lobed, imbricate or valvate, often minute. Petals 3-6, distinct, rarely connate, imbricate or valvate. Disk annular or cupular, usually conspicuous, free or adnate to the base of the calyx. Stamens as many or twice as many as petals, inserted at the base or margin of the disk, equal or unequal; filaments free, rarely connate at the base, smooth; anthers dorsifix, rarely adnate, 2-locular, dehiscing longitudinally. Ovary free, rarely 1-, more often 2-5-celled; style simple, stigma undivided or 2-5-lobed; ovules 2 or rarely 1 in each cell, anatropous, axile, usually pendulous, rarely ascending; micropyle superior, raphe ventral. Fruit drupaceous, indehiscent, containing 2-5 pyrenes, rarely pseudo-capsular and dehiscent. Seeds solitary, pendulous; testa membranous, albumen o; cotyledons usually membranous, contortuplicate, rarely fleshy and planoconvex; radicle superior."

"Drupe valvatoely dehiscent, pyrenes separating.

1. Boswellia.

Drupe trigonous.

2. Tricoma.

Drupe indehiscent, pyrenes not separating.

Stamens 5-10—


Calyx 5-fid, urceolate. Disk clothing tube of calyx.

Calyx 4-toothed, urceolate. Disk cupular.

Flowers few, fasiculate.

4. Balsamodendron.

Stamens 5-10—

5. Protium.

Calyx 4-6-toothed, small. Disk clothing base of calyx. Inflorescence paniculate.

Calyx 4-6-lobed, imbricate. Disk annular.

Calyx usually 3-fid, valvate. Drupe ellipsoid, usually trigonous; style terminal.

Calyx 3-fid, valvate. Drupe usually gibbous; style lateral.

Calyx 3-partite, large, valvate. Drupe globose.


Stamens 5.

7. Canarium.

8. Santiria.


10. Filicium."

(Fl. Br. Ind., I., 527.)

There are about 160 species of Balsamiferous trees and shrubs belonging to this Natural Order in the world, all inhabitants of the tropical regions. In India there are 39 species referred to 10 genera. Of these, 34 or 87.2 per cent. are confined to the plains, 5 or 12.8 per cent. ascend to 5,000 feet and 1 or 2.5 per cent. reach higher altitudes. Their distribution over India is also striking: 28 or 71.8 per cent. occur in the eastern division of India, the majority being natives of Malacca. In South India 2 species occur, 2
in North India which also extend to Bombay, and another species confined to Sind; 5 species are general over the greater part of India.

**BURSERA, Linn.;** *Gen. Pl.*, I., 324.

A genus of *Bursaraceae*, containing some forty species, mostly natives of tropical America.

Balsamiferous trees. *Leaves* alternate, imparipinnate, or rarely 1-foliolate. *Panicels* short, branched. *Flowers* hermaphrodite or polygamous. *Calyx* small, 4-6 parted or toothed, imbricate. *Petals* 4-6, short, patent at length reflexed, usually valvate. *Disk* annular, crenate. *Stamens* 8-12, nearly equal, inserted at the base of the disk. *Ovary* free, ovoid or sub-globose, 3-5-celled; style very short, stigma 3-5-lobed; ovules 2 in each cell. *Drupes* globose or ovoid, with 3-5 pyrenes.

This genus is named after Joachim Burser, a friend of Caspar Bauhin, Professor of Botany at Sara, Naples.


**Vern.**—*Murtenga, Ass.; Chitreka, Tel. (on the Sircars); Thad-i-ben, Burm.*

**Habitat.**—A large, evergreen tree of the eastern moist zone of Bengal, Assam, Chittagong, and Burma.

**Structure of the Wood.**—Hard sapwood light brown, heartwood red, close-grained. Weight 40 lbs. per cubic foot.

Good for furniture.

**BUTEA, Roxb.;** *Gen. Pl.*, I., 533.

An elegant genus of *Leguminosae*, with large orange-red flowers, containing three species, all Indian.

Erect trees or climbing shrubs, with 3-foliolate, stipulate leaves. *Flowers* densely fascicled, large, showy in axillary racemes or terminal racemes or panicles. *Calyx* broadly campanulate; teeth short, deltoid. *Corolla* much exerted; petals nearly equal in length, the keel much curved, sub-obtuse or acute, *Stamens* didynamous; anthers uniform. *Ovary* sessile or stalked, 2-ovuled; style filiform, curved, bearded, stigma capitiate. *Pod* firm, l一名ute, splitting round the single apical seed, the lowest part indehiscent.

A genus named after John, Earl of Bute.


**Butea Gum; Bengal Kino; sometimes called the Bastard Teak.**

**Vern.**—*Deš, pala, tērō-kā-pin, khāhia, kambri, chichra, HIND; Palo, Beng.; Chaluka, Bandelkhand; Murut, Kol.; Murub, Sattal; Pharsa, Bajgas; Paras, faras, Behar; Palasi, būlyettra, Nepā; Lako-hāng, Lencha; Palas, Mechi; Poras, Ukhra; Chilla, puri-pālas, chāntī, C.P.; Mur, Gond, Kurka; Palās, bāhū, kāhī, Bom.; Palas-kā-har, tērō-kā-har, Duk.; Kāhā, kākād, kākā-nu-hād, Gōj.; Kāhār, palās, Cutch; Paras, palas, phalasi-char-pahā; kāhritcho-yādha, Mar.; Porasam, porasa, murukka, purasak, puraka, palasam, Tam.; Mōda, moh, tēla mōdu, mīdu gāthi, pal ashmu, palāsamam, palāsamam, kimukam, motuk, palās, madagur ma dus, Tel.; Mīdu, horn, mīdu gāt, mīdu gāthi, kāh, Pālak, murukka-maram, Mal.; Kinilaka, palāna, Sans.; Durakka, palah, Pers.; Gazzakala, or gaskoda, caluka, bōliya, Sindh; Fouk, pāv, pin, Burm.*

**Habitat.**—A moderate-sized, deciduous tree, found throughout India and Burma, extending in the North-West Himalaya as far as the Jhelum. This is one of the most beautiful trees of the plains and lower hills of India. Although many of its properties are much appreciated by the natives, it must be admitted that the tree seems comparatively neglected.
Bengal Kino.

“A waving, well-wooded country, set thick with bright scarlet flowering apple trees, gives some idea of many a Panch Mahal landscape when the khakhra is in bloom. In habit of growth it is not unlike the apple tree, and the leaves dropping when the flowers come, the top and outer branches stand out like sprays of unbroken scarlet. In the bud, the dark olive-green velvet of the calyx is scarcely less beautiful than the full flower.” (Bomb. Gaz., III, 109.) Nearly every part of this interesting plant may be put to some useful purpose, and a little careful investigation seems all that is necessary to raise the gum at least to the position of an important commercial product.

THE GUM.

Gum.—It yields naturally, or from artificial scars on the bark, a gum which is sold as “Bengal Kino” or chhuné-gônd. This occurs in the form of round tears, as large as a pea, often fragmentary, of an intense ruby colour and astringent taste. This gum may be purified by solution in water. It is translucent, but with age it darkens and becomes opaque. It is brittle, heat rendering it more so instead of melting it. It is generally known as Kamarbas in the bazaars of the North-West Provinces, Khâkhar-gônd in Bombay, and Chûndy-gônd, kingâ-gônd, and pâlás-khô-gônd in Madras and some other places. In native medicine, Bengal kino is largely used as an astringent—a substitute for true kino. It is also employed in tanning.

Chemical Composition.—An aqueous solution of this gum by the action of persulphate of iron is changed into a dirty-green colour; a larger quantity occasioning a bright green precipitate. Acids throw down an orange or dirty-yellow pigment from the solution. A few drops of caustic potash change the colour to crimson, becoming grey with excess, until the whole of the colour is destroyed. Similar changes are effected by the action of caustic soda and ammonia. Carbonates of potash and of soda deepen the colour of the solution, but not so much as caustic potash. Metallic solutions, like acetate of lead, precipitate the whole of the colouring matter. Attempts have been made to fix these colours in the fibre of cotton, silk, wool, &c., with different mordants, but with very unsatisfactory results. (Prof. Salley, in Journ. Royal Asiatic Society, 1836, and reproduced in several subsequent publications.) Roxburgh’s experiments with this gum are of sufficient importance to justify their being reproduced here: “This gum held in the flame of a candle swells and burns away slowly without smell or the least flame into a coal, and then into fine, light, white ashes. Held in the mouth it soon dissolves; its taste is strongly but simply astringent. Heat does not soften it, but rather renders it more brittle. Pure water dissolves it perfectly; the solution is of a deep clear red colour. It is in a great measure soluble in spirits, but this solution is paler, and a little turbid; the solution also becomes watery when spirit is added, and the spirituous more clear by the addition of water; diluted vitriolic acids render both solutions turbid and caustic; vegetable alkali changes the colour of the watery solution to a clean, deep, fiery blood-red. The spirituous it also deepens, but in a less degree. Sal martis changes the watery solution into a good durable ink.”

Roxburgh pointed out that the Butea kino differs from the true kino in that it is more soluble and the solution more astringent in water than in spirit, while it is just the reverse with true kino. This property would thus admit of Butea kino being used where the presence of spirit was objectionable. According to the authors of the Pharmacographia, “This substance has a pure astringent taste, but no odour. It yielded us 18 per cent. of ash and contained 13.5 per cent. of water. Either
removes from it a small quantity of pyrocatechin. Boiling alcohol dissolves this kino to the extent of 40 per cent.; the solution, which is but little coloured, produces an abundant greyish-green precipitate with perchloride of iron, and a white one with acetate of lead. It may be hence inferred that a tannic acid, probably kino-tannic acid, constitutes about half the weight of the drug, the remainder of which is formed of a soluble mucilaginous substance which we have not isolated in a state of purity" (p. 198).

The Uses of the Gum may be said to be almost confined to medical science. As an astringent drug it is extensively used in India, and to a limited extent in Europe also. For industrial purposes the gum has made no progress, but there seems a good future for it both as a dye and tan. The natives of India are said to use it to precipitate and purify blue indigo. It is described as one of the best gums of the Central Provinces. In the Bombay Presidency it is said to be specially collected by the Nākdās. (Bomb. Gaz., III., 109.) From wounds in the bark a ruby-coloured astringent gum exudes, which loses colour by exposure, but it may be preserved by the gum being closely confined in a bottle. (Lisboa, Useful Plants in the Bombay Presidency, 243.) It is almost needless to republish the numerous references to this gum; suffice it to say that as the tree occurs throughout India, and grows at first rapidly, attaining its full size in little more than ten years, and requires no special care whatever, the supply of the gum and of the other products might be indefinitely extended should necessity arise. The so-called gum obtainable in our bazaars is an exudation of a gummy sap from incisions on the bark. This hardens on exposure to the air into beautiful red-coloured transparent tears, which darken and become opaque with age unless kept in air-tight bottles. It would be interesting to have the timber of this tree treated in the same manner as in the preparation of Catechu, and it seems just possible, were this done, that a pure tanning extract might be obtained which would prove more suitable for industrial purposes than the gum at present met with in commerce. This is worthy of a trial, for, if found serviceable, the preparation of the extract might be combined with the separation of the bark fibre as a paper material. If at the same time the flowers as a dye-stuff could be made to give an additional return, Butea cultivation would become a profitable industry.

Lac.—The lac insect is reared upon this tree in many parts of India—Chutia Nagpur, Central Provinces, the Deccan, Baroda, and Gujarāt, &c. Commercially this is regarded as the second best quality of lac. (See Lac.)

DYE PROPERTIES.

Dye and Tan.—The Gum, as already stated, may be used both as a dye and tan, but, except in India, it is not in much demand for these purposes, and can hardly be viewed as a commercial product. By chemical actions special pigments and dyes may be prepared from it, which seems to deserve further and more careful attention. (See the account given under Gum.) As a tan the chief drawback to it seems to be the presence of so much gummy matter and a colouring agent mixed up with the tanning principle, the former of which retards its action. The following report by Mr. Tiel of an experiment with this gum as a tan is extracted from the Journal of the Agri.-Horticultural Society of India, Vol. VIII., 25, for 1851: "A piece of small calfskin, after being prepared in the usual way for the reception of tanning, was, on the 15th of July, immersed in a decoction of the 'dhāh-palas,' which was found readily soluble in cold water; the decoction was changed at intervals, as is usual, four times, each succession of liquor

B. 949
The Tesu Dye.

being increased in strength to that which preceded it; each liquor was found to darken in colour in proportion to the time it was exposed to the action of the atmosphere. The skin during the process was constantly worked and attended to, and would, with like care, have been thoroughly tanned in five days with babul bark. On the 21st July a piece of the skin was cut to dry out, to see if it really was tanned, and although it was highly coloured through, and had all the appearance of being thoroughly tanned, yet after being well washed, as is usual in currying, and dried out, it became as hard and as unpliant as a raw skin. Although it was highly coloured through, little or no tannin had combined with the skin. The tanning process was continued, adding gradually, as was required, more of the substance, until the 1st August, when another piece of the skin was tried by drying out, and with the same result as the first. From thence to the 15th and 23rd August, respectively, when the whole two seers were consumed, the remainder of the skin was finally dried out, and found to be scarcely one-third tanned. It is therefore said to be of no use as a tanning substance, but it might, perhaps, be worthy of attention as a dyeing substance (for its colour seems very fast), or for tanning, could its astrangent qualities, which are considerable, be easily deprived of so much colouring and gummy matters."

The flowers, called té-su, késu, kasauna, or palás-kè-phul, yield a brilliant but fleeting yellow dye, much used by the natives of India, especially during the Hél festival. This is extracted either by expressing the coloured sap of the fresh flowers, or as a decoction or infusion from the dried flowers. The old leaves fade in February; the flush of new foliage appears in April and May, being preceded by a blaze of bright orange flowers, which at this season enliven the forests. No exact estimate of the number of trees, and therefore of the quantity of flowers which are annually produced, can be arrived at; but as the tree is one of the commonest plants in India, all over the drier undulations of the central plateau, the supply is practically unlimited. The flowers may be had for the gathering, as the annual production far exceeds the demand. They are collected in March and April, and as a rule are sun-dried. The petals are separated from the rest of the flower and preserved, and are in this condition sold, or when dry they are sometimes reduced to a powder. Simple immersion in water will extract the colour, but in some parts of the country the dye-stuff is boiled. The cloth to be dyed is sometimes boiled in the solution without the aid of any auxiliary or mordant. At other times the cloth, having been previously prepared by alum, lime, or ash, is then boiled with the colour, or again these substances are mixed with the dye-stuff and the cloth either boiled in the mixed dye and mordant solution, or left to steep in it for some time. The process of extraction of the dye is generally as follows. A given weight of dye is mixed thoroughly with twice as much water. After having been allowed to soak for some time, the mixture is boiled down to half its volume. It is then strained and allowed to cool. The cloth is either immersed in it before it cools, or is boiled with a required amount of the dye-solution, or is steeped in a cold dye-solution. The natives as a rule prefer the fleeting but brilliant yellow colour produced without the aid of any auxiliary, especially to dye the cloths worn at the Hél festival; the fact of the colour being fleeting is viewed rather as an advantage than otherwise, since it can be got rid of after the festival is over. The addition of an alkali, as originally pointed out by the late Dr. Roxburgh, deepens the colour into orange and makes it at the same time a little less fleeting. Alum, lime, wood-ash or sayji-malt serves this purpose.

Other vegetable substances are sometimes combined with the tesu in the production of yellow dyes, of which the following may be mentioned:

B. 953
**BUTEA frondosa.**

*Harsinghar* (Nyctanthes Arbor-tristis), *lathan* (Bixa Orellana), *dil* or *aich* (Morinda tinctoria), *haldi* or *turmeric* (Curcuma longa), *baga*um (Casalpia Sappa), *gumbeengong* (Pleiospernum spinosum): the last mentioned is regarded specially useful as a silk dye. The presence of the *tesu* seems to improve the brilliancy of these dyes, but it is doubtful if its use can be recommended, since there seems no idea of its being in these combinations more durable than when used alone. Other vegetable substances are recommended to be combined with it, from some idea of their helping to make the colour less fleeting. The following are those most frequently used for this purpose: *hari* or *hav* (Terminalia chebula), *bodh* (Symplocos racemosa). It is remarkable how extensively the bark of the last-mentioned plant is used in native dyes as an auxiliary intended to brighten and fix the colour. It is probable that the Manipur dye-auxiliary (*Garcinia pedunculata*) might with advantage be added to this list of dye-auxiliaries suitable for the *tesu* or *pald* dye. By combination with indigo, shades of green and light blue are sometimes produced. A grape-green *tesu*, *harsinghar* and indigo, with aciddilated water, are used. To give light blue (the *bajwari* colour of Cawnpore), *tesu* alun, talc and indigo are used (Mr. Buck, Dyes and Tans of N.-W. F.).

**A PIGMENT.—Dr. Roxburgh appears to be the only person who has experimented with a pigment extracted from these flowers. He says: “Amongst numberless experiments, I expressed a quantity of the juice of the fresh flowers, which was diluted with alum water, and rendered perfectly clear by depuration. It was then evaporated by the heat of the sun into a soft extract; this proves a brighter water-colour than any gamboge I have met with. It is now one year since I first used it, and it remains bright.”

“Infusions of the dried flowers yielded me an extract very little, if anything, inferior to this last mentioned. They yield also a very fine durable yellow lake, and all these in a very large proportion.” (Roxb., Fl. Ind., Ed. C.B.C., § 40.)

**THE TESU DYE.**

*Abir.*

An *Abir.—Voigt says that the yellow dye obtained from the *tesu* flowers is used at the *Holí* festival. This same fact is alluded to by several writers, but without describing the particular way in which it is used. Under the heading “*Abir*” will be found some further information, from which it will be seen that it serves as *guill* for the floor of the singara-mat, but I am unable to discover the exact preparaion which is used,—*e.g.,* a dry pigment or simply a powder of the petals mixed with the flour, or whether the decotion of the petals or a dye-solution is mixed with the flour just as it is being used. Probably in different parts of the country all three practices are followed.

Dr. Buchanan (in his *Statistical Account of Dinajpur*) says of this tree: “The flowers are not only offered to the gods, but in the festivals of spring serve to give a temporary yellow dye to the clothes of their votaries, on which account it is called *Poonati.*”

**FIBRE.**

*Fibre.—Yields a strong fibre, said to be useful for paper-making and for cordage; also the young roots yield a strong fibre known as *chowk.* This is made into ropes in Chutia Nagpur, Central Provinces, Oudh, Rajputana, and Bombay hill tracts, &c.; it is also used in some parts of India for making native sandals.

**OIL.**

*—The seeds of this tree (*paldš-pəprə* of the bazar) yield a small quantity of bright, clear oil (by some authors called *Maduga* oil); this is sometimes used medicinally.

B. 959
The Dak or Palas.

**BUTEA frondosa.**

**MEDICINE.**

**Gum.**

Dr. Waring (in his *Bazar Medicines*, p. 31) remarks that this is of little moment, since it appears to be equally effectual. He says: “It is an excellent astringent, similar to Catechu, but being mild in operation it is better adapted for children and delicate females. The dose of the powdered gum is 10 to 30 grains, with a few grains of cinnamon.” The addition of a little opium increases the efficacy.

**Juice.**

The fresh juice is used in phthisis and haemorrhagic affections. It is also employed as an application to ulcers and relaxed sore-throat. As an astringent it is given in diarrhoea and dyspepsia. In the Konkan it is prescribed for fevers. “The use of the gum as an external astringent application is mentioned by Chakradatta; it is directed to be combined with other astringents and rock-salt. He recommends this mixture as a remedy for pterygium and opacities of the cornea.” (Dr. Dymock, *Mat. Med.,* W. Ind., 1872.) U. C. Dutt informs us that the ancient Hindūs used the gum as an external astringent only.

**Seeds.**

**MEDICINE.**

Internal to them are administered as an anthelmintic, but regarding the reliance which may be put upon their action considerable difference of opinion prevails. Some medical men think that they can be advantageously substituted for Santonine, while others view them as much less powerful. They have at the same time a warm purgative action, which often proves injurious to their anthelmintic property. They are, however, largely used in the treatment of round-worm. The following extract from Dr. Waring’s *Bazar Medicines* will be found to give the leading facts regarding these seeds: “Butea seeds are thin, flat, oval or kidney-shaped, of a mahogany-brown colour, 1½ to 1¾ inches in length, almost devoid of taste and smell. European experience has confirmed the high opinion held by the Mohammedan doctors as to their power in expelling *Lumbrici*, or *Round Worm*, so common amongst the natives of India. The seeds should be first soaked in water, and the testa, or shell, carefully removed; the kernel should then be dried and reduced to powder. Of this the dose is 20 grains thrice daily for three successive days, followed on the fourth day by a dose of castor oil. Under the use of this remedy, thus administered in the practice of Dr. Oswald, 125 lumbrici in one instance, and between 70 and 80 in another, were expelled. It has the disadvantage of occasionally purging, when its vermifuge properties are not apparent; in some instances also it has been found to excite vomiting and to irritate the kidneys, and though these ill effects do not ordinarily follow, yet they indicate caution in its employment.” (*Bazar Medicines, Waring,* pp. 31-32). “In the Bhavaprakasa the use of the seeds of the *Palasia* as an aperient and anthelmintic is noticed; and they are directed to be beaten into a paste with honey for administration. Sārangadhara also recommends them as anthelmintic.” (Dr. Dymock.)

“Externally the seeds, when pounded with lemon-juice and applied to the skin, act as a rubefacient. I have used them successfully for the cure of the form of herpes known as Dhobe’s itch.” (Surgeon-Major Dymock, p. 138.) When made into a paste, they are used as a remedy for ringworm.

**Flowers.**

The flowers are astringent, depurative, diuretic, and aphrodisiac; as a poultice they are used to disperse swellings and promote diuresis and the menstrual flow. They are given to enfeebled women in cases of diarrhoea, and are applied externally in orchitis.

**Leaves.**

The leaves are described by the *Makhan-ul-Adwalya* as astringent, tonic, and aphrodisiac, are used to disperse boils and pimples, and are given internally in flatulent colic, worms, and piles.

B. 964
BUTEA frondosa.

Bark. 905

The bark, according to the *Hortus malabaricus*, is given in conjunction with ginger in cases of snake-bite. The gum and other parts of Butea superba, Rath., are also used medicinally by the natives, being viewed as possessing the same properties as the corresponding parts of B. frondosa.

Special Opinions.—§ “The charcoal from this plant was introduced by Dr. T. W. Sheppard in 1874, for bleaching the morphia manufactured at the Opium Factory, Ghazipur. It was selected after a series of experiments with the different forms of charcoal, its great advantage being its comparative freedom from saline matter; it can on this account be employed without any previous purification. Wood-charcoal possesses feebler decolorising powers than animal, but it had to be resorted to on account of the native prejudices against the use of bone-charcoal.” (Surgeon Warden, *Premier College, Calcutta Medical College*).

“I have tried the seeds of B. frondosa internally in numerous cases, and they are neither purgative nor febrifuge, at least not in one-drachm doses,—the largest quantity I have yet used. There is, however, no doubt that they are anthelmintic, at least to some extent. Administered in powder, morning and evening, for 2 or 3 days, and followed by a dose of some purgative, they generally expel from 1 to 3 or 4 round-worms; but failure is more frequent than success. That these seeds are not powerful enough to act always against the worms is proved by the expulsion of the latter in large numbers in many cases by the use of santonine, immediately after having failed with butea seeds. Both the kernel and the testa of the seeds possess the anthelmintic property. Dose of the powder for an adult, from 30 grains to 1 drachm. Four grains is an average dose for a child of 4 years.”

“The insipissated juice of this plant (the butea kino of Indian commerce) is a good astringent, and as such is useful in all the complaints in which the true kino is indicated. It has been used in the same forms as those of the latter, but in somewhat larger doses,—viz., from 15 to 40 grains.” (Honorary Surgeon Mooden Sheriff, Khan Bahadur, Madras).

“This is a fairly useful anthelmintic and a good substitute for santonine, in some cases acting very well indeed. Preparations.—Powdered seeds, dose fifteen to thirty grains twice or thrice a day, followed by castor oil on the succeeding morning. The gum has been only lately used in this hospital, but as an astringent it is found to be a useful substitute for kino in the ordinary cases of diarrhoea and dysentery, of children especially. Preparations and doses &c., are similar to kino.” (Apothecary F. G. Ashworth, Kumbakonam.) “The leaves are astringent and used by the natives as a poultice to dispel tumorous hemorrhoids, buboes, &c. The seeds are anthelmintic in doses of 20 grains. The gum is very astringent, and in doses of five grains most useful in checking serious diarrhoea. In large doses it is efficacious in hemorrhage from the stomach and bladder. A strong solution of the gum is said to be a useful application for bruises and erysipelous inflammations.” (Surgeon R. A. Barker, Doomba.) “In common use as an anthelmintic; dose for an adult, 20 grains of powdered seeds.” (Surgeon Mark Robinson, Coorg.) “Root of this tree is used as an aphrodisiac by native physicians.” (Brigade Surgeon S. M. Shirzor, Moorshedabad.) “This remedy exhibits its anthelmintic properties to perfection when used in the following formula: Powdered Butea frondosa gr. 3, powdered ginger gr. 1, santonine gr. 1; give for three successive nights, and follow by a dose of castor oil on the fourth morning.” (Honorary Surgeon Peter Anderson, Guntur, Madras.) “The seeds are used in urinary diseases. In large doses the powder acts as a purgative, also as an anthelmintic. The flowers are used in the form of poultices in bladder diseases.” (Surgeon W. Barren, Blaj.)

B. 907
Cutch.) "Anthelmintic, doses 5 to 20 grains, used in round-worm." (Chowanna Lall, Civil Hospital Assistant, Jubulpore.) "Seeds are vermifuge; dose, powder 20 grains, three times a day, sometimes causes much vomiting and purging." (Apothecary Thomas Ward, Madanapalli, Cuddapah.) "The powdered gum is a useful astringent in chronic diarrhoea, pyrosis, and dyspepsia. The seeds are a powerful anthelmintic, especially in the case of round-worms." (Brigade Surgeon J. H. Thornton, Monghyr.) "Not nearly as efficacious as santonine." (Surgeon-Major H. J. Hazlett, Ootacamund, Nilgiri Hills.) "Anthelmintic. The seeds are soaked in water, the testa removed, kernel dried and powdered; dose grains 20, three times a day for three successive days, followed by a dose of castor oil. They act effectually in expelling large numbers of Ascari lumbricoidei." (Surgeon-Major A. F. Dodson, Bangalore.) "The seeds are anthelmintic, used to expel round-worm, in doses of 10 grs. to 1 drachm of powder, according to age." (Assistant Surgeon Shib Chandar Bhuttacharyji, Chanda, Central Provinces.) "The juice I have seen used by natives in dysentery and ringworm." (Honorary Surgeon E. A. Morris, Negapatam.)

Fodder.—The leaves are used as fodder for buffaloes and elephants. The leaves are regarded as a valuable manure.

Structure of the Wood.—Dirty white, soft, not durable; no annual rings. It is said to be better under water, and so is used in North-West India for well-curb and piles. Weight 30 to 40 lbs. per cubic foot.

It "grows to a height of about fifteen feet and seldom lives more than ten years." (Bombay Gaz., VII., 40.) "The wood is coarse and poor. A seasoned cubic foot weighs 33 lbs." (Bombay Gaz., XV., Pt. 1., p. 64.)

**SACRED USES.**

Sacred and Domestic Uses.—From the name *palus* is said to be derived the name Plassey, the scene of Clive’s famous victory. This beautiful tree is sacred to Soma (Moon); the wood is sacrificial, and is frequently mentioned in the Vedas.

Dr. Buchanan, as already quoted, says the flowers are offered to the gods, and afford the yellow dye called *vasoni*. The *palus* is sometimes represented as a sacred tree of the Buddhists. The word *palasa* in Sanskrit means "leaf," but it has become a modern equivalent for the *dhuk* (*Butea frondosa*), a tree which is supposed to be imbued with the immortalising *Soma*, the beverage of the gods. Richard Folkard (in his Plant Lore) says: "This tree is supposed to have sprung from the feather of a falcon imbued with the *Soma*." He adds: "The *palasa* was much employed by the Hindús in religious ceremonies, particularly in one connected with the blessing of calves to ensure them proving good milkers." The triple leaves were deemed to typify, like the trident, the forked lightning, resembling the rod of Mercury, the Sanic and the Rowan rod. Speaking of these triple leaves Mr. Lisboa says: "The leaves of this plant are trifoliate; the middle leaflet is supposed to represent Vishnu, the left Brahma, and the right Shiv: hence its worship is enjoined in Chaturmás Mahaátma. Hence also its use in the following three great ceremonies:—

"(1) The leaves are used as platters on the occasion of the investiture of the sacred thread, when a particular part of the ceremony, called *chewal* (that is, when the barber removes the last tuft of hair from the head of the child to be invested), is being performed.

"(2) The dry twigs, under the designation of *samidhas*, are used for the feeding of *hom*, or sacred fire, in the ceremony which goes under the name of *nava grahas*, celebrated to secure the pacification of the nine
BUXUS.

Box-wood.

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<th>Stem.</th>
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<td>Flowers.</td>
<td>975</td>
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<td>Dishes.</td>
<td>976</td>
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<td>Cups.</td>
<td>977</td>
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planets (nava=nine, graha=planets) on the occasion of vastu shanti, i.e., entrance into a newly-built house, or one acquired from a non-Hindu.

"(3) The stem is used as a staff on the day of somavati, a part of the thread ceremony." (Useul Plants of the Bombay Presidency, pp. 279-80.)

Dr. U. C. Dutt says the beautiful flowers were used as ear ornaments by the ancient Hindu women and were much admired by the poets. "The leaf-dishes used at caste-feasts are made by village Brahmins. Of two kinds,—plates, patra-balis, and cups, dadiyas,—the dishes are brought into Ahmedabad in bundles of 200 plates and 100 cups, and are sold according to size; the plates at from 3d. to 6d. (2-4 annas) the hundred, and the cups at from 1d. to 2d. (1-1½ annas). Made of the dry leaves of the khadhar tree, Butea frondosa, fastened together with small slips of bamboo, they keep fit for use for two years. This industry is confined to the Daskro villages near the city (Ahmedabad), where only they find a sale." (Bombay Gaz., IV, 235.)


Vern.—Late-palath, Beng.; Badari, Singompur; Chhidta, Monghyr; Nari murup, Santal; Falali, palaivada, Borne; Yel-bhakar, Guj.; Bil palas, Dur.; Yel-gar, palaivada, Mar.; Koni-murekham, koilipalas- ham, Tam.; Tige motu, tige-mudega, tige-palasaka, barumi-chitri, tivva-muda, Tel.; Bali-mut-taga, Kan.; Vulliplatcha, valli-murukha, Mal.; Late-palika, Sars.; Samb, Gond.; Tung, Kurki; Pouknap, poukney, Burm.

Habitat.—An extensive climber, scarcely differing from the preceding except in habit. Found in the forests of the Konkan, the Central Provinces, Central India, Rajputana, Bengal, Orissa, and Burma.

Gum.—It yields a gum like that of B. frondosa.

Dye.—The root is said to yield a red dye in Burma. "A sample of red dye-wood, appears to be the root of Butea superba, a well-known creeper whose scarlet blossoms are a conspicuous feature of the forest landscape in February and March." (Indian Forestier, Vol. X, p. 75.) The information regarding this dye is exceedingly meagre; it is remarkable that no mention is made of the roots of the preceding species as affording a dye.

Fibre.—An extensive climber, scarcely differing from B. frondosa except in habit. The roots, as also the young branches, afford a strong and useful fibre prepared in Chutia Nagpur, the Central Provinces, Central India, and Rajputana.

Fodder.—The leaves are regarded as a valuable fodder.

Butter.

Vern.—Navania, Sans.; Mekha, Hind., Beng., Guj.; Mekha, Jami, Mar.

"The fatty portion of the milk of all mammalian animals is called 'Butter,' but the term in a commercial sense is restricted to that from the cow." (Spem's Encyclopedia.) In India butter is made from cows' or buffaloes' milk; it is chiefly used in the form of ghosi or clarified butter. (See Ghisi.)

BUXUS, Linn.; Gen. Pl., III, 266.

Evergreen shrubs or undershrubs, with 4-sided branchlets and opposite, exstipulate leaves. Flowers monocious, in axillary clusters. Calyx of male flower deeply 4-cleft, the segments opposite in pairs; of female flower, deeply 6-cleft, the segments in two circles of three each. Stamens 4, opposite the calyx-segments, inserted around a 4-sided rudimentary ovary. Ovary 3-celled, 3-cornered, with a flat top, the corners terminating in thick short styles, which alternate with the 3 inner calyx-segments. Capsule coriaceous, loculically 3-valved, each valve ending in 2 horns, being the valves of 2 of the styles, septa attached to the valves. Seeds 3-6, trigonous.

B. 984
Box-wood.

**Buxus sempervirens.**

**Buxus sempervirens, Linn.; Brandis, For. Fl., 447; Gamble’s Man. Timb., 369; Euphorbiaceae.**

**The Boxwood Tree, Eng.; Buchsbaum, Germ.; Bus, Fr.; Bosso, It.**

**Syn.**—B. wallichiana, Baillon.

**Vern.**—Shanda laghâne, Afg.; Chikri, Kashmir; Papri, papar, papur, paparang, shamsdad, shumaj, Pâ.

**Habitat.**—An evergreen shrub or small tree met with in the Suliman and Salt Ranges, North-West Himalaya, between 4,000 and 8,000 feet in Bhutan about 6,000 to 7,000 feet; but scattered in different parts of the Himalaya, chiefly on a calcareous soil and often in remote localities.

"The tree is, however, constant in one respect as regards its habitat, and thrives in moist and sheltered places, hugging the alluvial deposits along the banks of the perennial streams, and it does not thrive where it is exposed to winds, whether hot and dry, or cold and frosty. It also avoids the hot sides of the valley, and evidently prefers a north-west and northerly aspect." (Report on the Boxwood supply in the Panjâb by Mr. Ribben âtre, "Indian Forester," XI., 26.)

**Medicine.**—The wood is diaphoretic; leaves bitter, purgative, and diaphoretic, useful in rheumatism and syphilis. A tincture from the bark is used as a febrifuge.

**Fodder.**—Stewart says that goats will occasionally browse on the leaves, but other animals will not do so unless in times of dearth. They have been known to prove fatal to camels and cattle.

The leaves "are used in the south of France as manure for vineyards." (Gamble.)

**Structure of the Wood.**—Yellowish white, hard, smooth, very close and even-grained. Annual rings distinctly marked by a narrow line without pores. Weight 55 to 65 lbs. per cubic foot. The rate of growth is variable, generally slow.

The following extract from Mr. Gamble’s Manual of Indian Timbers will be found useful: "It is estimated that the cost per cubic foot of boxwood delivered at Saharanpur from the Kelse forest would be Rs. 8; its further cost by rail from Saharanpur to Bombay would be at least Rs. 8, or total Rs. 10 per cubic foot. Considering 1 cubic foot as weighing 60 lbs., we have the cost per ton as Rs. 112, which could only be just covered by receipts if the very best description of wood were sent down. There is consequently little likelihood of much trade in boxwood from the Himalayan forests."

"The uses of boxwood are well known. In Europe it is used for engraving, turning, carving, and mathematical instruments. In the Himalaya, small boxes to contain butter, honey, tinder, snuff, &c., are made of it, and it is carved into combs. The boxwood to be used for engraving requires very careful and lengthened seasoning. On this subject and on the other requisite characters of boxwood for commercial purposes, the following extract from a letter of Messrs. J. Gardner and Sons, of Liverpool, to the Inspector-General of Forests, dated April 3rd, 1877, will give information:—"

"The value of boxwood at Bombay of suitable texture for the English market, of which latter we can judge from a few sample pieces, will depend principally upon the quality.

"Wood from 2 to 4 inches diameter is required to be free from splits or cracks, otherwise, however free from knots and straight and round it may be, the value would not exceed £1 to £2 per ton, whilst if free from splits, round and straight, and without exceeding one knot per foot in length, the value would probably be £4 to £7 per ton. One knot per foot in length, the value would probably be £5 to £8 per ton. Two knots per foot in length, the value would probably be £5 to £8 per ton. Three or more knots per foot in length, the value would probably be £8 to £10 per ton."

"All knots or holes counted as such, however small.

"B. 990"
BUXUS
sempervirens.

Timber.

"Wood 4 inches and upwards in diameter is preferred with one split rather than sound or with more than one split, any splits after the first reducing the value on account of the additional waste in working the same."

Averaging per foot in length.

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<th>1 knot</th>
<th>2 knots</th>
<th>3 knots</th>
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<td>4 to 5 inches diameter</td>
<td>6</td>
<td>4 10s.</td>
<td>3</td>
</tr>
<tr>
<td>6 inches and upward diameter</td>
<td>12</td>
<td>9</td>
<td>4 10s.</td>
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"If the splits are twisted more than 1 inch to the foot if small, 2 inches if medium size, and 3 inches to the foot length if large, the value is reduced one half."

"The above values will, of course, vary in accordance with the supply and demand for the various sizes and qualities."

"The most suitable texture of wood will be found growing upon the sides of mountains. If grown in the plains, the growth is usually too quick, and consequently the grain is too coarse; the wood of best texture being slow growth and very fine in the grain."

"It should be cut down in the winter, and, if possible, stored at once in airy wooden sheds, well protected from sun and rain, and not to have too much air through the sides of the shed, more especially for the wood under 4 inches diameter."

"The boxwood also must not be piled upon the ground, but be well skidded under, so as to be kept quite free from the effects of any damp from the soil."

"After the trees are cut down, the longer they are left exposed, the more danger is there afterwards of the wood splitting more than is absolutely necessary during the necessary seasoning before shipment to this country."

"If shipped green there is great danger of the wood sweating and becoming milled during transit, which causes the wood afterwards to dry light and of a defective colour, and in fact rendering it of little value for commercial purposes."

"There is no occasion to strip the bark off, or to put cowdung or anything else upon the ends of the pieces to prevent their splitting."

"Boxwood is the nearest approach to ivory of any wood known, and will therefore probably gradually increase in value, as it, as well as ivory, becomes scarcer. It is now used very considerably in manufacturing concerns, but, on account of its gradual advance in price during the past few years, cheaper woods are in some instances being substituted."

"Small wood under 4 inches is used principally by flax-spinners for rollers and by turners for various purposes, rollers for rink-skates, &c., &c., and if free from splits is of equal value with the larger wood. It is imported here as small as 14 inches in diameter, but the most useful sizes are from 25 to 33 inches, and would, therefore, we suppose, be from 15 to 30 or 40 years in growing, whilst larger wood would require 50 years and upwards at least,—perhaps we ought to say 100 years and upwards. It is used principally for shuttles for weaving silk, linen and cotton, and also for rule-making and wood-engraving. Punch, The Illustrated London News, The Graphic, and all the first-class pictorial papers use large quantities of boxwood."

Messrs. Churchill and Sim, reporting on some boxwood sent to them for sale in 1850, and which fetched 21 shillings per cwt., equivalent at 60lb per cubic foot to 11s. 1d., or about 6d per cubic foot, say:—

"The pieces of boxwood were remarkably fine specimens, equal in quality to the best Abasia, and fetched a very high price, equivalent to £21 per ton. These logs were depreciated in value for ordinary purposes, owing to their having been squared, which was a mistake, as in that operation much valuable wood had been wasted, and when the bark is removed, a good protection to the log is destroyed. In the present state of the boxwood trade, and considering the fact that the supplies which have been coming forward for some time past are deteriorating in quality, from the action of the Turkish Government in closing the forests, and from other causes, the probability of a supply of this wood from India is a matter of considerable importance. The usual run of this wood would not, however, fetch the high price of this picked sample. The price realised cannot, however, be taken as any criterion, for whether supplies can be sent to this market, and sold at prices which will cover transit and freight, and then leave a profit, is very doubtful. Could this wood be regularly placed on the market at a moderate figure, there is no reason why a trade should not be developed in it."

Regarding the consignment of boxwood made to Messrs. Gardner,

B. 999
and Sons, the following extract from the Kew Report, 1881, will be found interesting:—

"Messrs. Joseph Gardner and Sons, the well-known timber merchants, wrote to Dr. Brandis, the Inspector-General of Forests in India, April 29th, 1881, on the subject: 'We bought the parcel (about 5 tons), landed ex Strathmore in London, at the high price of £30 per ton. At these high prices the consumption will be very limited indeed. Can you kindly inform us what the prospects are of securing any large quantities of this wood, say 5,000 to 10,000 tons, at about £10 per ton, in Liverpool or London? We are drawing our present supplies from Russia and Persia principally; but there are so many fiscal restrictions, and the wood is also inferior to your Indian shipments, that we should prefer drawing all our supplies from India. At anything like £30 per ton, only very small quantities can be used; at £10, however, it would probably be used very extensively for various purposes for which cheaper woods than boxwood are now used."

"To this communication Dr. Brandis replied, July 6:—"

"'The boxwood resources of the country are very limited. There is no chance of such large supplies as from 5,000 to 10,000 tons being available from India'" (p. 25).

Mr. Ribbentrop, in The Indian Forester, reports on the Panjab Boxwood as follows:—

"The cost in carriage between Saharanpur and Umballa is Rs.1-9-0 per maund; deducting this from the above, I find that boxwood from Bashahr could be landed in London at Rs1-9-4 + R3-3-2 (carriage to Umballa)=R22-4 per ton. Taking the exchange at 17. 7d., this is an expense of £18 5s. 6d. per ton for the boxwood consigned to London."

"The price quoted at home is R24 per ton weight."

"It will thus be seen that by exporting the first-class wood we will realise, it is estimated, a net profit of R75 per ton, or R55 above the price which it would fetch in the local market."

"The net value of the Bashahr box forests, which are the only ones that need be taken into consideration as regards immediate exploitation, is therefore—"

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<th>Quantity</th>
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<td>700 tons</td>
<td>R75</td>
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<td>300 tons</td>
<td>25%</td>
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="=52,100

"I roughly estimate that with strict protection and the gradual thinning out of the dominant trees of other kinds, the present growing stock will replace the mature stock in 41 years, in which time the present mature timber may be extracted, reproduction being ensured at the same time." (Indian Forester, XI., 28.)

A good deal has been written regarding this subject, and a few interesting papers have appeared upon the possible future Indian trade in this most valuable timber. It is very much to be feared, however, that, both on account of the limited amount of boxwood and the heavy transport charges, India cannot to any very great extent become a source of supply to Europe. It will only pay to export selected pieces, and there does not appear to be any local demand for second-class boxwood. This seems to be the conclusion arrived at both in Europe and in India, and accordingly, in the Kew Report, already quoted, we find the subject of boxwood substitutes urged as more worthy of attention. "It is evident, therefore, that we cannot look to India to remedy the increasing dearth of boxwood. It would be obviously much to the advantage of any of our colonies that could send into the timber trade, in quantity, any wood which would be acceptable as a boxwood substitute." For a list of probable woods of this nature, see Boxwood Substitutes, page 518.