(1) Number of pages 98

(2) Date of repair 25.7.1983.

(3) Initials of the Referencer

TAMIL NADU ARCHIVES

GOVERNMENT OF TAMIL NADU

Revenue DEPARTMENT

G.O. No. / B.P. No:	1917	Press. / Mis.
Dated	7-8-1878	-197-.

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Archives I—5,806—24-2-78.

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1917
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REPORT

BY

DR. M. C. COOKE,

ON THE

OIL SEEDS AND OILS

IN THE INDIA MUSEUM,

OR

PRODUCED IN INDIA.

PREPARED UNDER THE DIRECTION OF THE REPORTER ON THE PRODUCTS OF INDIA.

LONDON:
INDIA MUSEUM.

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NOTE.

The following Report has been prepared on the same plan as the previous one, "On the Gums, Resins, Oleo-resins, and Resinous Products in the India Museum, "or produced in India." It will be observed that notes and observations have been collected from various sources, in order that their accuracy may be tested, the native names verified, and further information obtained wherever that at present possessed may prove unsatisfactory. It only claims to be a digest of scattered and disconnected memoranda, brought together and compared, as far as possible, with the collection of seeds and oils in the India Museum, and is not presented as detailing the results of original research.

At first it was intended to include within its scope the volatile or distilled oils and Uttars for which India is so famous; but this was found to be a work of so intricate and extensive a character as necessarily to entail considerable delay in the issue of the Report; and therefore the present one has been confined exclusively to *expressed* or fatty oils, leaving for a future Report the volatile oils, which are in reality very different substances, with quite distinct functions.

No attempt has been made to embody statistics of production, of export, or of rates of prices as these could only have been given for a few of the principal articles, while, unless they were carefully verified, they might prove of but doubtful value.

It will be observed that under each article enumerated the specimens in the India Museum are quoted. This course will enable its friends in India to perceive its deficiencies, and may lead them to render it good service by supplying the desiderata thus indicated.

Oils and oil seeds sent to this department for report should be forwarded in quantities sufficient for testing their qualities and uses. Unless this be attended to, no satisfactory report can be given. New and untried oils can hardly have a value assigned to them until their capabilities are approximately determined.

J. FORBES WATSON.

Department of the Reporter on the Products of India,
India Office, London, September 1876.

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OIL SEEDS, AND OILS.

The present report deals with the oil seeds and oils of India, in so far as they are known from samples in the India Museum, and from scattered notes and memoranda published in this country and in India. Preliminary to this some general observations are essential to the comprehension of the specific details.

Oils are usually defined as liquid or solid substances characterised by an unctuous feel, inflammability, and the property of leaving a greasy stain upon paper. The distinctions of *fixed* and *volatile* indicate their different habitudes in relation to the vaporising influence of heat. It is with the *fixed* oils that this report is more immediately concerned.

Fixed oils are sometimes called "expressed oils" or "fatty oils," and are mostly derived from the fruits of plants (products of animal origin excepted, which have no place in this report), and vary in consistence from that of a firm solid fat to the greatest fluidity.

The following summary derived from a work devoted more especially to the chemical aspect of the subject, gives all that will be necessary on this aspect*:—Fixed oils when pure have little taste or smell. They are lighter than water, varying in specific gravity from 0·913 to 0·936. They differ very much in their point of congelation, olive oil becoming solid a little above 32° F., while linseed oil remains fluid at 4° below zero. They are not volatilizable without decomposition. At about 600° they boil and are converted into vapour, which when condensed is found to contain, besides other products, a large proportion of oleic and palmitic acids, together with benzoic acid, sebacic acid proceeding from the decomposition of the olein, and the vapours of acrolein, a highly volatile liquid resulting from the decomposition of glycerin, upon which the fumes of oils depend mainly for their irritating effects on the eyes and nostrils. Exposed to a red heat in close vessels, they yield, among other products of the destructive distillation of vegetables, a large quantity of the combustible compounds of carbon and hydrogen. Heated in the open air they take fire, burning with a bright flame, and producing water and carbonic acid. When kept in air-tight vessels, they remain unchanged for a great length of time; but, exposed to the atmosphere, they attract oxygen, and ultimately become concrete. Some, in drying, lose their unctuous feel and are converted into a transparent, yellowish, flexible solid. These are called *drying oils*. Others, especially such as contain mucilaginous impurities become rancid, acquiring a sharp taste and unpleasant smell. This change is owing to the formation of an acid, from which the oil may be freed by boiling it for a short time with hydrate of magnesia and water. The fixed oils are insoluble in water, but are miscible with that fluid by means of mucilage, forming mixtures which are called emulsions. They are in general very sparingly soluble in alcohol, but readily dissolved in ether, which serves to separate them from other vegetable proximate principles. By the aid of heat they dissolve sulphur and phosphorus. Chlorine and iodine are converted by them into muriatic and hydriodic acids, which, re-acting upon the oils, increase their consistence and ultimately render them as hard as wax. If to one of the fixed oils be added one tenth of its volume of chloride of sulphur a re-action speedily takes place, attended with an elevation of temperature and the escape of muriatic acid gas, and followed immediately by solidification of the oil, which is wholly converted into a firm elastic substance bearing considerable resemblance to caoutchouc. The stronger acids decompose them, giving rise, among other products, to oleic and palmitic acids. Boiled with diluted nitric acid they are converted into malic and oxalic acids, besides other substances usually resulting from the action of this acid upon vegetable matter. Several acids are dissolved by them without producing any sensible change. They combine with salifiable bases, but at the moment of combination undergo a change, by which they are resolved into a substance called glycerin, and into the oleic and palmitic or other fatty acids, which unite with the base employed. The compounds of these acids with potassa and soda are called soaps. By the addition of one part of carbonate of potassa or soda, 160 parts of oil

* Dispensatory of the United States of America, 1867.

may be brought with distilled water into the form of an emulsion. The potassa and soda soaps and the alkaline sulphurets have a similar effect, but not the bi-carbonates.

The fixed oils in their natural state consist of at least two distinct oleaginous ingredients, one liquid at ordinary temperatures, and the other concrete. The liquid is a distinct proximate principle called *olein*, the concrete consists of *stearin* or *palmitin*, the former being found most largely in animal, the latter in vegetable fats or oils, and the two not unfrequently existing together in the same oil. But several oils have peculiar constituents, differing in properties from either palmitin or stearin, and specially named according to the substance containing them, as *butyrin* in butter, &c.

It is sometimes desirable to deprive the fixed oils of colour. The following process is recommended by M. Brunner. The oil is first brought to a state of emulsion by strongly agitating it with water rendered mucilaginous by gum or starch; the emulsion is treated for each part of oil with two parts of wood charcoal, previously well heated and coarsely powdered, the finer particles being sifted out. The pasty mass is then completely dried at a heat not exceeding 212° F., and exhausted by cold ether in a percolator; finally the ethereal solution, having been allowed to stand in order that any charcoal present in it may subside, is submitted to distillation so as to separate the ether, and the oil remains colourless in the retort. (*Journ. de Pharm.*, 1858, p. 214.)

Some families of plants are much more oleaginous than others in the character of their seeds, and this fact may be kept in view when seeking new sources of oil. We may indicate the most important of these.

Palmaceæ.—Not only are the coco nut (*Cocos nucifera*) and the African palm (*Elais guineensis*) familiar examples, but species of *Attalea*, *Maurilia*, *Astrocaryum* *Ænocarpus*, &c., and many others have oleaginous seeds.

Compositæ.—This order contains some valuable oil seeds, as the safflower (*Carthamus tinctorius*), Niger seed (*Guizotia oleifera*), the Madia (*Madia sativa*), sunflower (*Helianthus*), and probably many others.

Cruciferæ, containing the numerous species of colza and mustard (*Brassica* and *Sinapis*), as well as radish, cameline (*Camelina sativa*), cress (*Lepidium sativum*), and others, has very oleaginous seeds though usually small.

Euphorbiaceæ.—This order has a large number of oleaginous seeds, such as the purging croton (*Croton tiglium*) and other species of *Croton*, castor-oil (*Ricinus communis*), several species of *Jatropha*, the candle nut (*Aleurites triloba*), the Kamala (*Mallotus Philippinensis*), and others.

Leguminosæ contains some oleaginous seeds, such as *Pongamia glabra*, the ground nut (*Arachis hypogæa*), &c., but the number is small and insignificant as compared with the immense number of species which the order includes.

Meliaceæ.—This order includes the Nim (*Azadirachta Indica*), the Carapa (*Carapa guyanensis*), and other species.

Clusiaceæ contains the cocum butter (*Garcinia Indica*), the Nagkesur (*Mesua ferrea*), several species of *Calophyllum*, and some others.

Sapotaceæ is rich in oil-yielding plants, the most important of which are the species of *Bassia*, *Lucuma*, *Mimusops*, &c.

Cucurbitaceæ.—Many of the species afford oil, but none have yet attained commercial importance.

Other genera might be enumerated which contain one or two oil-yielding plants of considerable importance, such as the *Papaveraceæ*, including the poppy, the *Linaceæ*, to which linseed belongs, the *Pedaliaceæ*, including the gingelly or sesame plant, and others of a similar character. Undoubtedly a very large number of vegetable seeds contain oil, the question at issue being simply whether the seeds could be obtained in sufficient quantity, or the extraction rendered remunerative.

Many years since the manager of a large establishment in London sent out instructions as to the most practical method of testing seeds for oil, and although these instructions have been widely circulated, they may be introduced here, especially as they have not been superseded.

It must be remembered that these remarks were made in 1853, and that all references to prices were made with regard to the condition of the market at that period:—

"Every oil or grease, whether solid or liquid, if not poisonous or acrid, like croton oil, or viscid and gummy, like castor oil, or drying, like linseed oil, must be worth in London at least 30*l*. a ton. Among greases, solid at above 60° Fahrenheit, the higher the melting point [illegible] value. For example, the

vegetable tallow of Borneo melting at about 90° Fahrenheit, is worth at least 5*l*. a ton more than the cocoa-nut oil of Ceylon melting at 70°. The effect of the soap duty having been taken off, may probably, before long, materially change the relative values of greases; but at present liquid oils, like the ground nut (*Arachis hypogea*), are worth more than soft solid oils, like the Bassia butter of India, as they require less manufacturing to fit them for use, the liquid oils, after a simple treatment in a cheap apparatus, being fit for burning in lamps, while the soft solid oils, being neither hard enough for use in candles or liquid enough for use in lamps, require to go through a press before they are saleable, except for soap making. Greases may have particular advantages, such as being little acted upon by the air, and therefore not easily becoming rancid, good qualities, which can only be ascertained by experiments; which your correspondents had perhaps better leave to us.

"Since I last had the pleasure of writing to you, we have been engaged in some experiments upon oils, for use in medicine, in which it seems probable they will take an important place. Already one vegetable oil has been found to be almost as efficacious as cod liver oil, with the advantages of being less unpleasant and cheaper. On account of this new use, it might be well to collect small quantities of oils, even if they did not obey the conditions mentioned above. The value of oil must depend a little (especially when found in out-of-the-way places) upon the way it is held in its matrix; for example, the oil of the Lumbang-nut (*Aleurites triloba*) can be separated with much less labour and simpler machinery than the cocoa-nut oil, which requires very great pressure to extract it from the copperah, or dried cocoa-nut kernel.

"Waxes are worth more than greases, on account of their very high melting points; their relative values depend upon colour, transparency, and freedom from resinous matter. Resin may be easily detected by lighting a small piece of the wax; the more smoke the greater proportion of resin, and therefore less value; the paler and more transparent the wax the better. The most valuable tree wax known is the beautiful insect wax of China.

"A simple way to try an oil nut is to crush it with a stone, and then squeeze it between your finger and thumb; if it contains any considerable quantity of grease, enough will be pressed out by this treatment, it is well to dry the kernel before squeezing; and, in the case of nuts containing grease solid at a high temperature, like that of the *Myristica sebifera*, it is well also to heat the nut. Where a stearic candle can be got, and is burned down a little until it has formed a cup, and then blown out, if into this a little of the material to be tried is placed, after a moment's burning the candle material with which the wick is saturated is burnt out, the new material to be tried in the cup takes its place, and becomes the material supplying the wick until the cup is emptied, and so can be judged of; or a piece of string dipped in the oil or melted grease makes a very tolerable wick; or, simpler still, where the nut is very full of oil, if lighted at one end it will at least show what tendency to smoke there is, and the colour of the light.

"Some of the resins ought to come in for candle making, though I believe that they have never been extensively used, except for the commonest sorts of candles, on account of their giving off so much smoke; but as some descriptions smoke less than others, there is a hope that new ones may be found smoking still less; these would then be very serviceable in candle making. The points connected with new greases, &c., that we should be most thankful for information upon are, the manner of growth, probable expense of collecting, means of transport, and quantity likely to be obtained, with small specimens of the grease, if manufactured, and of the fruit, with both its husk and hard shell where these exist."

The expression of oil is almost universal in India; as Mr. Bingham observes, "every village has its *Talee*, *i.e.*, oil presser, who, after a most primitive and laborious fashion, extracts probably $\frac{7}{10}$ of the extractable oil, and as he considers the labour of himself and family, with the solitary bullock which patiently does his work, well paid if they earn their daily food, and, like the animal he works with, asks for no more, the process if an imperfect is a tolerably cheap one."

"The village oil-crushing machine is a very simple one indeed, which it is unnecessary to describe further than to say that by the weight of the seed crusher himself, seated upon a movable horizontal lever, pressing in its turn on a perpendicular beam (or nearly so) rising from it and working with a headpiece upon the rough piece of wood in a sloping position, aided by the eternal round of the bullock most primitively attached without harness, the oil seed is crushed into paste and eventually hard cake in the large stone or wooden mortar in which this large pestle works, while the un-

purified oil runs out of the orifice below into vessels placed to receive it. A fresh charge of seed is introduced without much trouble, and the old cake extracted, and so the work goes on from one year to another, no improvement in the process being ever attempted or wished for. Indeed it is certain that if any cheap improvement should be introduced by accident, and the Talees by any chance brought to use it, then customers would either not use the oil, as not being produced according to the dustoor or custom of their forefathers, or the Ta[illegible]e himself would use it as a labour-saving machine in its primitive sense, *i.e.*, he would only work it daily long enough to provide on his simple scale for his daily wants, and then enjoy the true *otium dignitatum orientale* by an extra allowance of sleep and idleness, or perhaps in quarrelling with his fellows; but work longer or harder than necessary to secure his daily food he certainly would not."

"It has often struck me that the introduction by European firms of oil factories and oil pressing machines would be far better than buying the crude seed; and the cost of transmitting the prepared oil to the market would be far less than that of sending the seed the same distance, while the oilcake produced could be easily consumed in the country as cattle food, respecting which there would be no prejudice to overcome; while the local consumption of oil from such factories would be great after the first prejudices were overcome. The factories might deal in a great measure on the principle of barter to suit native habits, *i.e.*, giving a certain quantity of oil for a stated quantity of each kind of oil seeds, as experience might dictate, while the establishment of such factories in the interior would stimulate the production of the seed, and gradually a large commerce. The writer goes on to remark that oil factories must be worked on the site of the growth of the staple if they would succeed, and that India, whilst wanting water for irrigation, has still a vast power at command for manufacturing and other purposes; and why the water power of her streams should not be used for flour mills, oil mills, and other similar purposes is a mystery. He then gives it as his opinion that the old crushing or pounding mill of England, worked at first by water power here and there, would as a commercial speculation pay well, and at the same time by its local demand increase to indefinite extent the cultivation of oil seeds, while, by giving a purer oil, and by these improved processes extracting a larger quantity from the seed, they would be sure of local custom eventually. And again, by the lightness of their article of export as compared with sending the seed to Calcutta and thence to England, with its compactness as to bulk and non-liability to deterioration, effecting a saving in feight and insurance and a consequent saving in cost to the English consumer, they would be certain of the English market to the exclusion of foreign oils, and thus India and England might mutually benefit each other." (*Agri.-Hort. Journ.*, xii. (1862), p. 333.)

The mode of classification which would be most useful is one which our present knowledge of the properties of a large number of Indian oils does not permit to be carried out in its integrity, although the primary divisions may be adhered to. This arrangement would take the following shape:—

I.—Fatty or Expressed Oils.
- A. Waxes.
- B. Solid and Semi-Solid Fats.
- C. Fluid Oils.
  - α Sweet or Edible Oils.
  - β Drying Oils.
  - δ Lamp Oils.
  - ε Medicinal Oils.

II.—Volatile or Distilled Oils.
- A. Fragrant or Utters.
- B. Medicinal.

The subdivisions in Section C. of the first group appear to be somewhat arbitrary, since edible oils may also be applicable as lamp oils, and either of these as lubricating oils, whilst any of the three first sub-sections may also belong to the fourth. The primary and most extended use must in such cases decide the subdivision in which an oil should be placed. Although the method suggested may not by any means be a perfect one, yet it must be borne in mind that any classification to be commercially valuable must be a functional one.

In the present report, for reasons alleged, no attempt at classification can be made further than the primary groups above suggested.

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The substances known as empyreumatic oils do not come under any definition of *oils* which could be suggested, and are beyond the scope of present inquiries.

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General information on this subject will be found in—

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Report on Oils and Oil Seeds in Handbook of Economic Products of the Punjab, by B. Powell. (1868.)

A.—VEGETABLE WAX.

The substance known commercially as Vegetable Wax is represented principally by the Myrtle Wax of the Cape of Good Hope and North America, produced by several species of *Myrica*, the white wax of Japan derived from one or more species of *Rhus*, and more rarely the palm wax of South America. India is by no means rich in wax-producing plants, indeed there is no indigenous plant yet known which produces a commercial article, and the only probable source lies in introduced plants, such as the species of *Rhus*. An artificial substance has been sent from India under the name of vegetable wax, which did not meet with general favour amongst experts, it being regarded as deficient in firmness, and some other characteristics of wax. This was understood to have been manufactured from castor oil, and resembled externally "yellow soap."

The types of vegetable wax are three:—

α. Myrtle-berry wax.
β. Sumach wax.
δ. Palm wax.

To which of these groups the Petha wax can be referred we cannot determine, no specimen as yet having been sent to the Museum. If it is really anything more than a rare vegetable curiosity, it might be well that its composition and properties were more definitely ascertained.

Rhus succedanea, *Linn.*

Roxb. Fl. Ind. ii. 98; *Wi. Ic.* t. 560; *Brandis, For. Fl.* 121; *Hook. Fl. Ind.* ii. 12.
Rhus acuminata, *DCand. Prod.* ii. 68.

Leaves pinnate, 5–7 pair, smooth; petioles round and smooth; leaflets oblong, lanceolate, acuminate, shining, reticulated with veins beneath, of the same colour; drupe the size of a pea, obliquely reniform.

Hab.—Japan. Kumaon. Nepal.

Native synonyms:—

Tatri-Arkol, Arkhar, Titar, Lakhar, Rīkhūl. *Punj.*
Shash. *Kunawar.*
Fasi-no-ki. *Jap.*

Seed.—Drupes on lax drooping panicles, oblique, compressed, outline rhomboid, about ⅓ in. long, glabrous, rugose, yellow or light brown; kernel smooth, whitish, hard, enclosed by a fibrous pericarp, vegetable wax mixed with the fibres; seeds large, oily.

Wax.—A firm yellowish-white wax, with but slight odour, known in commerce as "Japan wax." Melting point below that of beeswax, varying from 120° F. to 130° F. More soluble in alcohol, saponifiable by alkalies, and said to consist of palmitic acid and glycerine. Kœmpfer states that in Japan the seed is crushed, boiled, mixed with the fruit of another tree (*Melia Azedarach?*), and pressed while hot; the result is a beautiful vegetable wax of snow white colour, of which candles are made.

Cultivation.—M. Eugène Simon says that this tree is planted in Japan along the highways when they are two years old, leaving a distance of about three feet between the stems, but if planted in squares the distance must be double. The trees are kept

low by lopping, and trimmed in the shape of pyramids. In the fifth year after planting each tree yields on an average 4 lbs. of seeds, in the eighth year 6 lbs., in the tenth year 18 lbs., in the twelfth 40 lbs., in the fifteenth 60 lbs.; in the eighteenth year the tree enters upon its decline. 400 lbs. of seed yield 100 lbs. of wax. In 1862 200 lbs. of this wax sold in London at the price of 5*l.*, so that a plantation of 10,000 trees in their prime may produce 4,000*l.* The seed is gathered towards the end of autumn, threshed, and then left to dry for a fortnight, after which it is slightly roasted. It is next crushed under a millstone, and the produce exposed to the heat of steam in canvas bags; the wax is then obtained by the action of a screw press. This wax is of the third or lowest quality. To bleach it it is rasped, rinsed in water, and then exposed to the action of the sun and dew for three days. A still higher quality is obtained by repeating this operation. (*Gard. Chron.*)

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Rhus Wallichii, *Hook.*

Hook. Fl. Ind. ii. p. 10.

Rhus verniciflera, (in part) *DCand. Prod.* ii. 68; *Brandis, For. Fl.* 120; *Royle, Illus.* 175.

Rhus juglandifolia, *Wall. Cat.* 996.

Tree; petiole tomentose, not winged; leaflets 3–5 pairs, subsessile, quite entire, densely softly tomentose beneath, panicles much shorter than the leaves, pericarp dehiscent.

Hab.—Temperate Himalayas, from Garwhal to Nepal, 6,000–7,000 feet.

Native synonyms :—

Kambal, Gadumbal, Rikhali, Rukhro, Arkhar, Arkol, Harkū Lohāna. *Punj.*
Akoria, Kaunki, Bhaliūm. *N.W.P.*
Bhalaio, Chosi. *Nep.*

Seeds.—Drupes densely crowded, ⅓ in. diameter, globose, puberulous, epicarp dry, crustaceous, bursting irregularly; stone globose, very thick, bony, surrounded by wax.

Wax.—Probably similar to the "Japan wax," but no authentic specimen is to be found in the Museum collection. Brandis states that candles are made in Japan of the wax around the fruit.

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Kœmpfer, Amœnitates Exot. (1712), p. 791.

Benincasa cerifera, *Savi.*

Mem. Cucurb. 1818, p. 6; *DC. Prod.* iii. 303.

Cucurbita cerifera, *Fisch. Cat. Hort.*

Cumbulam, *Rheed. Hort. Mal.* viii. p. 5, t. 3.

Leaves, cordate, somewhat five-lobed; lobes rather acute, crenate; tendrils simple.

Hab.—Cultivated.

Native synonyms :—

Petha, Chalkumra, Gol Kaddú. *Punj.*
Kumra. *B.*
Gal Kaddu. *H.*
Kumbulum. *Malcal.*
Kumbuli. *Tam.*
Budide gummadi. *Tel.*

Fruit.—Ovate-cylindrical, variable, short or elongated, woolly, green, covered with a glaucous waxy bloom.

Wax.—The fruit of this cucurbitaceous plant secretes upon its surface a waxy substance, which resembles the bloom found on plums and cucumbers. In this instance it is said to be produced in sufficient quantity to be collected and made into candles.

B.—SOLID AND SEMI-SOLID FATS.

Vegetable fats which are solid or semi-solid at ordinary temperatures, may be conveniently treated of separately from fluid oils, since their uses are also distinct. The majority of these are applicable for the manufacture of candles; one or two are obtainable in quantities too small for this purpose, or have a higher value for their medicinal properties. Commercially cocoa-nut oil may be accepted as the type of this group, and the chief Indian representative. No attempt has been made at indicating their relative market values, since the product of the same tree varies according to circumstances, localities, mode of preparation, &c., as in the case of other products, and any quotation of relative values would therefore have a tendency to mislead, unless a standard of quality could also be determined. No other attempt at grouping has been made than that of separating the fats employed for medicinal or similar purposes from those available for manufacture.

SECT. I.—FATS FOR MANUFACTURE.

Bassia butyracea, *Roxb.*

Roxb. Fl. Ind. ii. 527; *Brandis, For. Fl.* p. 290, t. 35.

A large tree; branchlets, petioles, pedicels, and under side of leaves with soft floccose tomentum; leaves coriaceous, clustered near the ends of branches, obovate or obovate-oblong, 6–12 in. long, on petioles 1 in. long, main lateral nerves, 15–20 pair; stipules minute, caducous; flowers numerous, near the ends of branches, below a tuft of leaves or in the axils of the lower leaves, drooping, on pedicels, 1–1½ in. long; calyx coriaceous, densely clothed with rusty tomentum; sepals 5 ovate; corolla pale yellow, tube cylindric, not fleshy, as long as calyx, limb of 8 spreading oblong obtuse divisions, as long as tube; stamens 30–40 glabrous, inserted in the mouth of the tube, filaments as long as the anthers. (*Brandis*, p. 290.)

Hab.—Sub-Himalayan tracts and outer Himalayan ranges, 1,500–4,500 feet.

Native synonyms :—

Chiura, Chaiura. *Kumaon.*

Seed.—Berry ovoid, smooth, fleshy, 1–3 seeded; seeds elliptical, narrowed towards the ends with a pale brown shining testa. (Fig. 1.)

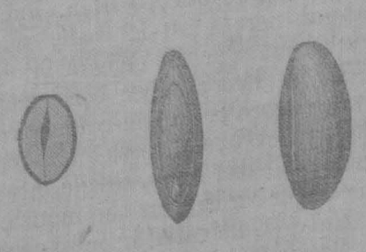


Fig. 1.

Oil.—Soft solid vegetable butter is extracted from the seeds of the consistence of fine lard, and of a delicate white colour, which does not melt in the heat of the plains, and keeps a long time without deteriorating. It is a soft solid at 95°. It melts completely at 120°. (*Brandis.*) This fat is called Chaiura-ka-pina in Kumaon, and Phulel, Phulwa, *Phulwara* in the plains.

Uses.—In medicine it is highly esteemed in rheumatism and contraction of the limbs. Perfumed with cloves or attar of roses it is used as an ointment by the wealthier classes. The butter will keep many months in India without acquiring any bad colour, taste, or smell, and might be substituted advantageously for animal butter. It makes excellent soap. When pure it burns bright without smoke or smell, and is applicable for the manufacture of candles.

Preparation.—On opening the shell of the seed or nut, which is of a fine chestnut colour, smooth and brittle, the kernel appears of the size and shape of a blanched almond. The kernels are bruised on a smooth stone to the consistency of cream, or of a fine pulpy matter, which is then put into a cloth bag, with a moderate weight laid on, and left to stand till the oil or fat is expressed, which becomes immediately of the consistency of hogs laid, is of a delicate white colour, and is solid at 95°. (*Roxb. Asiat. Res.*)

The mark or refuse after the oil is expressed are employed by the poor as an article of food.

The Museum collection includes seeds from Saharumpore, and cakes of fat from the North Western Provinces.

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Roxburgh in Asiatic Researches, vol. viii.

Bassia elliptica, *Dalz.*

Hook. Journ. Bot. iii. 36; *Bedd. Fl. Sylv.* t. 13.

ISONANDRA ACUMINATA, *Clegh.*

Large tree; bark rusty, leaves fascicled at the end of the branches, somewhat coriaceous, dark green above, paler beneath, entire long petioled, oblong obovate, tapering at the base, terminated in a sudden and blunt accumination, venation indistinct above, but marked beneath; peduncles axillary 1–3, 3–4 times longer than the petiole in fruit erect; calyx 6 parted, in 2 series, 3 outer divisions, broader and larger than the 3 inner and more leathery; coral 5–6 cleft, contorted in æstivation, deciduous, hairy on the inside of the tube at the insertion of the stamens; stamens 12–18 inserted on the inside of the tube, shorter than the corol, sessile extrorse, 2 celled, alternate in 2 rows, but the apex of all the anthers reach the same level; ovary tomentose, 6 celled, 1 ovuled, ovules attached to a basal placenta, style nearly 3 times as long as the ovary, stigma simple. (*Beddome*, l. c.)

Hab.—Western Ghats of Madras Presidency.

Native synonyms:—

Pâlâ, Pauchotee.

Fruit.—Fruit oblong, size of a large almond, 1 seeded by abortion, seed erect, exalbuminous, cotyledons fleshy.

Oil.—The "Gutta Percha seed oil," which is stated in the Madras Jury Reports for 1857 to be produced in that Presidency, was undoubtedly intended to refer to this species, and not to the *Isonandra gutta*.

There are no specimens in the Museum collection.

Bassia latifolia, *Roxb.*

Roxb. Cor. Pl. t. 19; *Roxb. Fl. Ind.* ii. 526; *Bedd. Fl. Syl.* t. 41; *Brandis, For. Fl.* 289.

Large tree; young branches, young leaves, pedicels, and petiole pubescent or tomentose; leaves coriaceous, firm, hard, clustered near ends of branches, elliptic or oblong-elliptic, 5–6 in. long, short-acuminate, on petioles 1–1½ in. long; main lateral nerves 10–12 pair, stipules subulate, ½–¾ length of the petioles; flowers numerous near the ends of branches below the terminal leaf, bud drooping, on pedicels 1–1½ in. long; calyx coriaceous, densely clothed with rusty tomentum; sepals 4–5 ovate; corolla cream-coloured; tube ovoid, fleshy, limb with 7–14, often 8 or 9, short erect ovate teeth; stamens 20–30, generally 24 or 26; anthers hisped at the back with stiff hairs, sessile, inserted in three series on the inside of the corolla tube, the upper series near the mouth. (*Brandis.*)

Hab.—Cultivated in most parts of India. Abundant in Central India.

Native synonyms:—

Madhūka. *Sans.*
Irup-mara. *Gonds.*
Moola. *H.*
Mahwah, Muhooa, Moula, Mahūa, Mohwa. *B.*
Caat-elloopei. *Tam.*
Ipie. *Tel.*
Poonnum. *Mal.*
Mourha. *Bombay.*



Fig. 2.

Seed.—Fruit green, fleshy, ovoid, 1–2 in. long. Seeds 1–4, elliptical, narrowed towards the ends, covered with a shining pale brown testa. Cotyledons oblong-elliptic, fleshy, filled with oil. (Fig. 2.)

Oil.—Greenish yellow oil is expressed from the seeds, which has at first the consistence of common oil. It remains in a concrete state at a temperature of 95°, but melts at 110°. Sp. grav. 0·9727. Soluble in ether, partially in alcohol.

Uses.—Is eaten by the Gonds and other tribes of the Satpura range, and is used to adulterate ghee. In a cold climate the oil keeps good a long time, but in the plains of India it gets a bitter taste and a rancid smell after a few months exposure to the air, separating into a heavy brown mass below, and a little clear fluid above. Used for culinary purposes and for burning.

Reports.—The oil or fat was long since submitted to the Director of Price's Patent Candle Company, and its applicability for candle manufacture ascertained. The report states that it is worth in this country, for the manufacture of candles, 8*l.* per ton less than Petersburg tallow. A great many experiments had been tried with it, and it was found to be of the same value as cocoa-nut oil, as its being harder compensates for the colour being inferior. Large quantities, it was said, could be used in this country at about 35*l.* per ton.

The report from a Committee of the Society of Arts on this oil, in 1848, is that "in appearance it consists of a number of round crystalline grains of solid matter "(stearine), embedded in an oily fluid (olein). It saponifies easily with the "production of glycerine and the usual grease acids. The resulting soap is good as "to quality and colour, and satisfactory as to quantity. The colouring matter in the "oil passes off in the spent ley, to which it communicates a brown colour, similar to "that produced by other vegetable oils. The grease acids produced after the saponi"fication of this oil are easily separated by pressure, and afford 40 per cent. of stearic "acid, which is inodorous while translucent, and appears admirably adapted for "candles. The solid and fluid parts may be more easily separated than in most oils, "and by the simple process of training, which consists in melting the oil and allowing "it to cool in a room in tubs, heated to that degree which will allow the stearine to "crystallize, leaving the olein fluid. When the crystallization is perfect, the olein is "drawn from the solid mass and two beautiful products obtained."

The olein obtained in this process from tallow is fitting for soapmaking and other rough purposes. From palm oil it is too much coloured to be applicable to many uses, but that obtained from this oil is superior to either, and in its appearance and properties resembles olive oil, and for many purposes would be as useful. (*Agri.-Hort. Journ.* vi. (1848), p. 220.)

Others reported that it appears to be similar to the African Shea butter, except that it is somewhat harder, and would be an important introduction into this country, if its price would admit of its competing with palm oil.

Mr. Bingham states that the seeds bear the local name of Quoindah, and from them is produced a rich buttery peculiar sweet thick oil, little of which, however, finds its way into the open market, as the *Quoindah* is bought up by Bunniahs and Muhajuns for the purpose of expressing the oil and adulterating the ghee, so largely used in all Indian cookery. He would say that from what he could hear and learn, but little ghee finds its way into the markets of Benares, Patna, and particularly Calcutta, without having been previously more or less adulterated with *Quoindah* oil. The yield of oil is about 33 per cent., and its residue or cake forms food for both man and cattle. (*Agri.-Hort. Journ.* xii., p. 345.)

The Museum collection includes seeds from Bengal and London market (1868); also fats from Calcutta, Allahabad, Goonah, Chota-Nagpore, and Cuddapah.

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Agri.-Hort. Soc. Journal, vi. (1848), p. 220, xii. p. 345.
Powell's Punjab Products, pp. 421.

Bassia longifolia, *L.*

DCand. Prod. viii. 197; *Roxb. Fl. Ind.* ii. 523; *Wi. Ill.* t. 147.

Tree; leaves lanceolate, acuminate at both ends, petioles slightly villous; pedicels a half shorter than the leaf, sub-erect; corolla 8–9 cleft; stamens 16–20, in two rows; calyx rufous, pubescent; berry oblong, villous, yellow, size of a large plum, 3–1 seeded; flowers whitish.

Hab.—Southern parts of Coromandel Coast. Malabar.

Native synonyms:—

Ippa, Pinna, Ippee. *Tel.*
Kat-illupi, Elupa or Elloopi. *Tam.*
Mohwa, Mohe. *H.*
Mahwa. *Guz.*
Ellupi. *Mal.*
Mee, Telmee. *Cyn.*
Madooka. *Sans.*
Mooa. *B.*

Seed.—Fruit oblong, villous, yellow, size of a large plum; seeds 1–3, almond-shaped (elliptical and pointed at the ends), with a pale brown shining testa.

Oil.—Bright yellow semi-solid oil, but will not keep more than 2–3 weeks in India in the warm season, it then becomes rancid, emitting a disagreeable odour. If well corked and secured from contact with the air, it will in cold weather keep for some months.

Uses.—As a substitute for ghee, and for burning in lamps, and frequently employed in the preparation of country soap. In medicine it is used externally in cutaneous disorders.

Preparation.—The seeds contain about 30 per cent. of oil. 12½ lbs. of seed in the ordinary native rude way of expressing produce 2 gallons of oil. The difference in colour, consistence, and flavour observable in specimens of this oil is entirely attributable to the mode of preparation, and to the presence in some cases of a very large proportion of mucilage and other extraneous matter.

foulness during combustion. In India, for making soap, anointing the person, for cookery, lamps, and in medicine.

Commerce.—The best oil is that exported from Cochin and the neighbouring ports on the Malabar coast. It usually fetches 20*s.* per ton more than the Ceylon or Coromandel coast article. The local prices vary considerably in different parts of the country. The average of 21 large stations in the Madras Presidency (in 1857) gives Rs. 4. 9. 5 per maund, or about 41*l.* per ton. The market value of Cochin oil in the London markets about the same time being 46*l.* 10*s.* per ton. (*Jury Reports*, 1857.)

The Museum collection, besides nuts from several localities, contains oil from Calcutta, Penang, Madras, Cochin, and Singapore, and candles made therefrom from Cossipore, as well as marine soap from M ras.

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United States Dispensatory, p. 150
Madras Jury Reports, 1857.

Excæcaria ebifera, *Müll.*

DC. Prod. xv. 1210; *Brandis, For. F* 441.
Croton sebiferum, *Linn.*
Stillingia sebifera, *Juss. Benth. Fl. Hongk.* 302.
Sapium sebiferum, *Roxb. Fl. Ind.* iii. 693.

Small glabrous tree; leaves rhomboid or broad ovate, entire, long acuminate, blade 2–3, petiole 1–2 in. long, main lateral nerves 6–8 pair; flowers greenish-yellow, in terminal drooping spikes 3–5 in. long, with a few female flowers at the base of the spike; male flowers unequally pedicellate, in bracteate fascicles 2–3 androus; calyx 3-fid; female flowers solitary, short, pedicellate; calyx 4-partite; capsule dry, smooth, sub-globose, acute ½-in. long; seeds 3, enclosed in a thick layer of white fatty substance, attached to a central column which splits into three slender divisions. (*Brandis.*)

Hab.—Cultivated.

Native synonyms:—

Tallow tree of China.
Pippalyang, *H.*



Fig. 4.

Seed.—Capsule (12 mm. long) black, seeds ovate, coated with a thick white sebiferous stratum. (Fig. 4, with section.)

Oil.—Sample of this fat exhibited at the Punjab Exhibition of 1864 was described as a white and solid tallow, very pure and inodorous.

Uses.—For manufacture of candles.

Preparation.—Dr. Porter Smith thus describes the process employed for obtaining the tallow from these seeds in China. The ripe nuts are bruised, and the pericarp separated by sifting. They are then steamed in wooden cylinders with numerous holes at the bottom which fit upon kettles or boilers. The tallow is softened by this process, and is separated from the albumen of the seeds by gently beating them with stone mallets, when the tallow is effectually removed by sifting the mass through hot sieves. The tallow still contains the brown testa of the seeds, which is separated by pouring it into a cylinder made up of straw rings laid one on top of the other, in which it is put into a rude press, and the tallow is squeezed through in a pure state. A picul of seeds yields from 20 to 30 catties of tallow, besides the oil which is obtained from the albumen by grinding, steaming, and pressing it subsequently. This fatty substance is of a whitish colour, hard and tasteless. It melts according to Dr. Macgowan at 104°, and is composed mainly of tri-palmatine, a substance which is saponified by alcoholic potash and produces palmitic acid. It is largely used in candle making, being mixed with white insect wax in the proportion of 3 mace of wax to ten catties of the tallow. These candles are especially used in Buddhist ceremonies. The average price is about eight Mexican dollars per picul. (*Mat. Med.*)

The tree grows equally well on low alluvial plains, on the rich mould of canals, and in sandy soils, and on the acclivities of mountains. It has been introduced into India, and is thriving well in the north-west provinces and the Punjab, especially at Paonee, in Gurhwal, at Ayar Tali, and Hawul Baugh, in Kumaon at Kangra Valley, and from the produce some maunds of seeds have been distributed.

An oil is mentioned by Dr. Porter Smith in his "Materia Medica," and referred by him to this plant, which appears to be very different. He says: "This oil is made "from the albumen of the seeds, and is clear but of a dark colour. It is obtained in "the proportion of 15 to 16 catties from one picul of berries. It is used to varnish

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"umbrellas, to dress the hair, to fill lamps, and to mix with the tallow of candles. It "has emetic qualities and acts as a purge. Is given in cases of poisoning."

The Museum collection contains seeds from Saharunpore, but no specimen of the fat.

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Journ. Agri.-Hort. Soc. India, iv. p. 113; vii. p. 164.
Porter Smith's Chinese Materia Medica.

Garcinia pictoria, *Roxb.*

Roxb. Fl. Ind. ii. 627; *Wight, Ic.* t. 102; *Bedd. Fl. Sylv.* t. 87.

A good sized tree, everywhere glabrous, leaves elliptic with a blunt rather sudden point at the apex, and gradually attenuated at the base, about 4 in. long by 1½ broad; flowers sessile, aggregated in the axils of the fallen leaves, *male* stamens numerous, closely packed on a fleshy more or less 4-sided receptacle in the centre of the flower; filaments short, anthers depressed, peltate, circumscissile, no rudiment of an ovary; *female* staminodia in a ring round the base of the ovary, filaments in 3–4 rarely 5 phalanges, each bearing 2–7 sterile clavate anthers; ovary oblong, 4-celled, stigma sessile, of 4 verrucose lobes which are 3–4 toothed at the margins. (*Bedd.*)

Hab.—Common in forests of Western India up to 3,500 feet.

Native synonyms:—

Gamboge butter. *Eng.*
Mukki. *Tam.*
Parawa, Pullowa. *Burm.*

Seed.—Fruit size of a large cherry, oval, smooth, oblong, crowned with the permanent stigma; seeds reniform, compressed.

Oil.—Semi-solid fat of a yellow colour.

Uses.—As a lamp oil by the better classes of natives, and by the poor as a substitute for ghee.

Preparation.—The oil, which is procurable in moderate quantities, is prepared by pounding the seed in a stone mortar, and boiling the mass until the butter or oil rises to the surface. Two and a half measures of seed should yield one seer and a half of butter. In the Nuggur division of Mysore it is sold at the rate of annas 1–4 per seer of 24 Rs. weight, or at 36*l.* per ton. (*Jury Reports*, 1857.)

The Museum collection includes seeds from Mangalore.

Bibliography.—Madras Exhibition Jury Reports, 1857.

Garcinia Indica, *Chois.*

DC. Prod. i. 561; *Hook. Fl. Ind.* 261.
Brindonia indica, *Du Petit Th. Dict. Sci. Nat.* v. 340.
Garcinia purpurea, *Roxb. Fl. Ind.* ii. 624; *Wi. Ill.* i. 125.
Garcinia celebica, *Desr. in Lamk. Ency.* iii. 700.

Slender tree with drooping branches; leaves obovate or oblong lanceolate, acute or acuminate, male pedicels 1–1½ in.; fruit globose, as large as an orange, purple, not furrowed.

Hab.—W. Peninsula.

Native synonyms:—

Cocum Butter. *Eng*
Moorgul mara. *Tam.*
Kokum. *Bombay.*
Brindao. *Goa.*

Seed.—Fruit spherical, size of a small orange, purple throughout, not grooved; seeds 5–8 compressed, enclosed in an acid pulp.

Oil.—White or pale greenish-yellow, solid, rather friable, with a faint but not unpleasant smell, melting at about 95°, and when cooled again remaining fluid to 75°, soluble in ether and slightly so in rectified spirits.

Use.—Extensively used to adulterate ghee. It is recommended for the preparation of ointments, suppositories, and other pharmaceutical purposes. It has been used as a local application to ulcerations, fissures of the lips, hands, &c. Described by Dr. Dymock as an excellent substitute for spermaceti ointment.

Preparation.—The oil of the seeds obtained by the following process: the seeds are first exposed for some days to the action of the sun to dry, they are then bruised and boiled in water, the oil collects on the surface, and on cooling concretes into a solid cake. The seeds yield about 10 per cent. of oil. (*Pharm. India.*)

The collection includes samples of the butter or fat from Bombay.

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Pharmacopœia of India, pp. 31, 441.
Pereira in Pharm. Journ., 1852; vi. p. 65.
Journ. Asiat. Soc. Beng., 1833; ii. 592.

Isonandra gutta, *Hook.*

Hook. Journ. Bot. vi. (1847), t. 16.

Tree; leaves on long petioles, obovate oblong, coriaceous, quite entire, slightly acuminate, shining, yellow beneath, parallel veined, attenuated at the base; flowers axillary fasciculate; peduncles 1 flowered; calyx lobes imbricated, obtuse; corolla subrotate; lobes 6, ovate, patent, stamens 12.

Hab.—Singapore, Borneo, &c.

Native synonyms:—

Gutta-percha. *Eng.*
Niatoo. *Malay.*

Seed.—Fruit sub-globose, 6 celled, with 4 abortive, the 2 fertile monospermous.

There is no doubt whatever that the seed of the true gutta-percha tree would furnish oil, but it was probably not this species, but the *Bassia elliptica* to which allusion is made in the Madras Jury Reports, 1857, as one of the products of the Madras Presidency.

No examples are in the Museum.

Sterculia fœtida, *L.*

DC. Prod. 1. 483; *Cav. Diss.* v. t. 141; *Roxb. Fl. Ind.* iii. 155; *W. & Arn. Prod.* i. 63; *Wi. Icon.* t. 181, 364; *Hook. Fl. Ind.* i. 354.

Tall tree; branches whorled, horizontal leaves crowded at ends of branches; digitate, leaflets about 6 by 2 in., pubescent when young, petiole 8 in., stipules ensiform, caducous; panicles erect, many flowered, spreading; branches glabrous, ultimate pedicels shorter than the flower, jointed in the middle; bracteoles minute; calyx ½–¾ in. diameter, dull orange coloured, campanulate, deeply 5 parted; lobes oblong, lanceolate, spreading, villous within, much longer than the tube; anthers 12–15; carpels 5, downy, style curved. (*Hooker.*)

Hab.—Western Peninsula. Birma. Ceylon.

Native synonyms:—

Jungle-baddam. *B.*
Peenaree-marum, Kudra-plukku, Pinari-marum, Kudrap-dukku. *Tam.*
Gurrapu-badam-chettu. *Tel.*

Seed.—Follicles as large as the fist, woody, oblong, boat-shaped, shortly beaked, nearly glabrous; seeds 10–15, the size of filberts, black, smooth.

Oil.—Semi-solid, appears to contain a large per-centage of stearine, but doubtful if it can be obtained in any quantity.

Preparation.—There is a little more labour required in extracting the kernel from the seed than in castor oil making; in other respects the process is just the same. The following shows the result of experiment on the produce.

	Md.	Seers.	
Original quantity of seed - -	1	2	0
Clean kernel - - -	0	22	0
Husk and sweepings - -	0	20	0
Produces of raw oil - -	0	6	5
" cake - -	0	15	4
Loss in weight - - -	0	0	7

Four seers of the above oil were boiled to extract the water, as in the manufacture of castor oil, and produced seers 3–2 of oil for the market. The remainder, or "kutcha" oil was kept as first extracted to test its keeping qualities; it appeared to get a little rancid although not more than 10 days old. (*Agri.-Hort. Journ.* viii. p. 39.)

The Museum collection includes seeds from Madras.

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Agri. Hort. Journ. viii. p. 39.
Hawkes' Report on Oils of S. India, p. 38.
Drury, Useful Plants, p. 404.

Vateria Indica, *L.*

Hook. Fl. Ind. p. 313; *Roxb. Fl. Ind.* ii. 602; *Corom. Pl.* iii. t. 288; *Wight & Arn. Prod.* 84; *Wight, Illus.* i. 88, t. 36; *Wall. Cat.* 3670; *Gærtn. Fruct.* iii. 29, t. 4. VATERIA MALABARICA, *Blume, Mus. Bot.* ii. 29; *DCand. Prod.* xvi. 2, 624; *Bedd. Fl. Sylv.* t. 84; *Rheede, Hort. Mal.* iv. t. 15.

A large tree; young branchlets and inflorescence stellately canescent; leaves 5–8 by 2½–3½ in., oblong or elliptic oblong, obtuse or minutely acuminate, base rounded or

emarginate, lateral nerves 14 pairs, slender; petiole 1½ in.; stipules ½ in., obliquely lanceolate, acute; panicle 6–8 in., terminal, loosely corymbose, branches spreading; flowers ¾ in. diam. 1-ranked, erect; pedicles ½ in.; calyx segments lanceolate, obtuse, canescent on both surfaces; petals elliptic oblong, obtuse, white; anthers glabrous. (*Hooker.*)

Hab.—Western Peninsula, from Canara to Travancore.

Native synonyms:—

Piney tallow. *Eng.*
Koondricum, Velli-koondricum. *Tam.*
Dupada-mara. *Tel.*
Vella-koodricum, Pienimarum. *Mal.*

Seeds.—Capsule 2½ and 1½ in. oblong, obtuse, coriaceous, fleshy, 3-valved.

Oil.—Solid concrete fat of a whitish or pale yellow colour, melting at 97½° F., and with a sp. grav. of 0·926.

Uses.—Available for the manufacture of candles.

Preparation.—The fat is obtained by boiling the fruit with water. It is somewhat intermediate between wax and stearine, is saponified by alkalies, and forms excellent candles. Its ultimate constituents are said to be,—

Carbon - - -	77·0
Hydrogen - - -	12·3
Oxygen - - -	10·7 (*Ure's Dictionary.*)



Fig. 5.

Lieut. Hawkes states that the oil is prepared by cleaning the seeds, then roasting, and grinding them into a mass. To 5 seers of seed add 12 seers of water, and boil until the oil rises to the surface. Remove the oil, stir the contents of the vessel, and allow it to stand until the following day, when more oil will be observed on the surface, which may be collected and the process repeated. (*Jury Reports*, 1855.)

The Museum collection includes one of the fruits contributed by Dr. Waring, and fats from Canara and Mangalore.

Bibliography.—Madras Jury Reports, 1855.

Xanthophyllum Maingayi, *Hook.*

Hook. Fl. Ind. 210.

Branches very slender, leaves membranous, elliptic-lanceolate, obtusely candate-acuminate, not glaucous beneath; principal nerves 5–6 on each side; racemes slender, simple, and panicled; calyx pubescent; ovary and style strigose; fruit densely pubescent.

Hab.—Malacca.

Native synonyms:—

Chinok, Kindok, Kindog. *My.*

Seed.—There is still doubt about the determination of this plant. Four packets were received from Province Wellesley at the same time, purporting all to belong to the same species. These were—1. Flowers and leaves of the chinok tree. 2. Fruit of the chinok tree in spirits. 3. Dry seeds of the chinok tree. 4. Solid fat from the chinok tree.

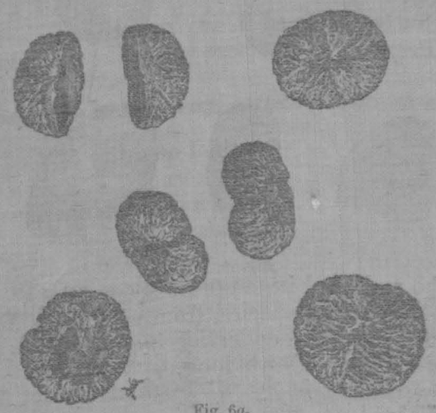


Fig. 6a.

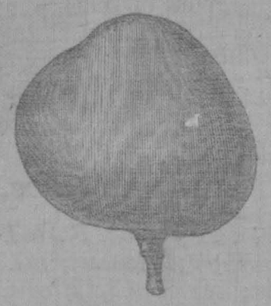


Fig. 6b.

On examination and comparison with the specimens in the Herbarium at Kew, with the assistance of Professor Oliver, the identity of the flowers and leaves with *Xanthophyllum Maingayi*, Hook. fil., was established.

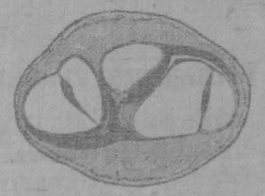


Fig. 7.

The fruit, No. 2, does not accord with the description or specimens, since it is more than 1½ inches in diameter, externally smooth, and *not* monospermous, clearly not that that of *Xanthophyllum*, as now understood. (*See* Fig. 6*b*.) The conclusion arrived at is that it can scarcely belong to the same tree as the flowers.

The dry seeds (3) are discoid, flattened, depressed beneath, ¾ inch diameter, externally rugose, composed of two equal cotyledons (fig. 6*a*.), and with no evidence of lateral compression or distortion as would take place were two or three seeds developed together, as shown in the section of the fruit (fig. 7). It is difficult to believe that the seeds and the fruit are identical. The fat (4), a solid substance not unlike the "Borneo vegetable tallow," probably belongs to one of the plants, but whether to the species of *Xanthophyllum*, from whence the flowers were derived, or to the other tree which yielded the seeds, cannot be determined. At present and in default of further information, it must be concluded that some confusion of the specimens has taken place.

The specimens were sent from Penang by J. R. Logan to the Paris Exhibition of 1867, and were said to have been obtained from Province Wellesley, where the tree is stated to be indigenous, and might be cultivated to any extent.

SECT. 2.—FATS FOR MEDICINAL USES.

Gynocardia odorata, *R.Br.*

Roxb. Cor. Pl. 95 t. 290; *Hook. Fl. Ind.* i. 195.

CHAULMOOGRA ODORATA, *Roxb. Fl. Ind.* iii. 835.

CHILMORIA DODECANDRA, *Hamilt. Trans. Linn. Soc.* xiii. 500.

Tree; branches slender, flexuous, quite glabrous, leaves oblong or linear-oblong, abruptly acuminate, shining above; flowers sweet scented, yellowish, in large fascicles on the trunk, solitary or few together in the leaf axils.

Hab.—Sikkim and Khasia Hills eastwards to Chittagong, Rangoon, and Tenasserim.

Native synonyms:—

Chaulmoogra, Piturkurra. *B.*

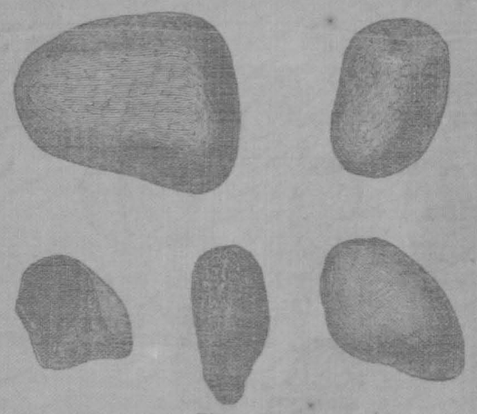


Fig. 8.

Seed.—Fruit sub-globose, 3–5 in. diam., rind thick, hard, rough; seeds 1 in. long, irregular by compression, with a grey smooth brittle testa. (Fig. 8.)

Oil.—The seeds yield by expression about 10 per cent. of a thick fixed oil, of unpleasant flavour and, rather offensive smell. (*O'Shaughnessy.*)

Uses.—The thick oil is employed by the natives in the treatment of cutaneous diseases. The seeds are said to have been used advantageously as an alterative tonic in scrofula, skin diseases, and rheumatism.

In China a seed called Ta-fung-tze is imported from Siam, where it is known as Lukrabo and used in cutaneous complaints. Dr. Porter Smith assumes it to be the produce of the present species, from which Mr. D. Hanbury has expressed his dissent.

The Museum collection includes seeds from Moulmein and Rohilcund, and fat from Calcutta and Chittagong.

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Hydnocarpus Wightiana, *Blume.*

Rumph. iv. 22; *Hook. Fl. Ind.* i. 196.

HYDNOCARPUS INEBRIANS, *Wi. Ill.* i. t. 16, and other authors.

Tall tree; leaves elliptic or oblong-lanceolate, long acuminate, entire or serrate, flowers 1 in. diam., racemed, pentandrous, three inner sepals larger, petals ciliate,

twice as long as the ovate fimbriate scales; female flowers with imperfect stamens fruit the size of a small apple. (*Hooker.*)

Hab.—Western Peninsula.

Native synonyms:—

Neeradimootoo. *Bombay.*
Maravuttie. *Tam.*
Morotti. *Mal.*

Seed.—Fruit 2–4 in. diam., tomentose (fig. 9.); seeds obtusely angular, ¾–⅞ in. long, ½ in. broad (fig. 10.)

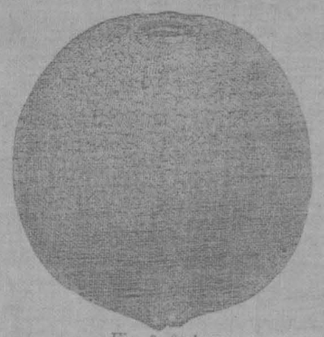


Fig. 9, fruit.



Fig. 10, seeds.

Uses.—The oil is employed on the Malabar coast in cutaneous diseases and ophthalmia, and for ulcers on the feet.

The Museum collection includes seeds from Madras and Mangalore, and fat from Mangalore and Canara.

N.B.—This is the species to which reference is made in the Pharmacopœia of India under the name of *Hydnocarpus inebrians*, including the *Hydnocarpus venenata* of Ceylon and the present species.

It is not improbable that the following will also furnish a similar oil, viz.:—

Hydnocarpus alpina, *Wt. Icon.* t. 942.

Hab.—Moist valleys of the Nilghiris.

Hydnocarpus castanea, *Hook. & Th.*

Hooker, Fl. Ind. i. 197.

Hab.—Malacca and Andamans.

As well as—

Hydnocarpus venenata, *Gærtn.*, and Hydnocarpus octandra, *Thw.*, in Ceylon.

Myristica Malabarica, *Lam.*

DC. Prod. xiv. 194; *Hook. & Thom. Fl. Ind.* i. 163.

Tree; leaves narrow oblong, or elliptic lanceolate, acute at both ends or obtuse, quite glabrous, glaucous beneath; male inflorescence axillary, dichotomously cymose, many-flowered, longer than the petiole; female few flowered, alabastrum globose, pubescent externally, tract very broad, embracing the base.

Hab.—Forests of Malabar and Travancore.

Fruit.—Fruit oblong, tawny, hairy, aril laciniose; lobes twisted and folded into a cone at the top.

Oil.—When bruised and subjected to boiling the seeds yield a quantity of yellowish concrete oil, of which specimen from Canara is in the Museum.

Uses.—This oil has been employed as an efficacious application to bad and indolent ulcers, allaying pain, cleansing the surface, and establishing healthy action. For this purpose it requires to be melted down with a small quantity of any bland oil. It was one of the oils enumerated by Lieut. Hawkes in his report on the oils of Madras Presidency.

Myristica officinalis, *L.*

Hook. Exot. Bot. t. 155.

MYRISTICA MOSCHATA, *DC. Prod.* xiv. 189.

MYRISTICA FRAGRANS, *Houtt. Hist. Nat.* ii. p. 233.

Tree; leaves ovato-elliptic, acute at the base, acuminate at the apex, lateral nerves on both sides 8–9, peduncles supra-axillary; males few flowered, females 1 flowered; pedicels nearly equalling the peduncle, bracteole under the flower broadly ovate, scale shaped; flower nodding; perigonium ovoid, half 3-cleft, nearly equalling the pedicel,

strigose externally with adpressed hairs; anthers 9–12; fruit ovoid-globose, drooping, aril laciniated, red, aromatic, covering the seed.

Hab.—Cultivated.

Native synonyms :—

Jatiphala. *Sans.*
Jaephal, Juephal. *H.*
Jaya-phula. *B.*
Jadicai. *Tam.*
Jajikaia. *Tel.*
Sadikka Jatipullum. *Cey.*

Seed.—Ovate, dark brown, shining, marked with depressions corresponding to the arillus; kernel similar in shape, internally marbled and veined.

Oil.—A volatile oil resides in the seed and also in the aril. From refuse nuts the solid fat is obtained, called "Nutmeg butter" or "Nutmeg soap," "expressed oil of nutmegs," and "oil of mace." It is a solid unctuous substance of an orange-brown colour, varying in intensity of shade, and presenting a mottled aspect, with an agreeable odour and aromatic taste. In operating upon 2 lbs. of nutmegs, first powdered and heated in a water bath, and pressed while still hot, Mr. D. Hanbury obtained 9 ounces of solid oil, equivalent to 28 per cent. This oil, which in colour, odour, and consistency did not differ from that which is imported, melted at about 45° C., and dissolved perfectly in two parts of warm ether, or in four of warm alcohol. The character and composition of nutmeg butter is detailed in "Pharmacographia."

The collection contains an excellent sample of the "butter" or "paste" from Penang.

Bibliography.—

Hanbury and Flückiger, Pharmacographia, p. 456.
Gmelin, Chemistry, xvi. p. 209.

Salvadora oleoides, *Decne.*

Jacq. Voy. Bot. t. 144; *Brandis, For. Fl.* p. 316, t. 39.
Salvadora Indica, *Royle, Ill.* p. 319.
Salvadora Persica, *Anders. Linn. Journ.* v. supp. i. 29.

Shrub or small tree, with stiff branches, ash-coloured or reddish-grey branchlets, and dull cinereous persistent foliage; leaves glaucous, linear-lanceolate, or ovate-lanceolate, blade 1½–2½ in. long, membranous when young, coriaceous and somewhat fleshy when full grown, main lateral nerves often indistinct; flowers greenish-white, sessile, in erect compact axillary paniculate spikes, often clustered and shorter than the leaves; calyx cup shaped, divided half-way, or nearly half-way, into 4 rounded obtuse lobes; corolla as long, or a little longer, than calyx. (*Brandis.*)

Hab.—Abundant in the Punjab.

Native synonyms :—

Irak-hindi. *Pers.*
Kharjal, Pilu, Kurjal. *H.*
Ughai, Coku-marum. *Tam.*
Pinna-vara-gogu, Ghunia. *Tel.*
Chardal, Chardul, Khardal. *A.*
Peeloo. *Mahr.*
Khardalo. *Syriac.*
Meetha-peero, Sadneejar. *Sindh.*
Jhal. *N.W.P.*
Kabbar, Khabhar, Jhar, Diar, Mitha-diar. *Sindh.*

Seed.—Fruit globose, 2½ lines diam., yellow when ripe, dark brown or red when dry, supported by the persistent calyx and marcescent corolla.

Oil.—A solid fat of a dull sulphury yellow colour in the Museum is referred to this source. It requires further examination. Under the name of "Kikuel" this oil is affirmed to be a product of the Madras Presidency. Sometimes "Kikuel" oil is said to be derived from *Murraya Kœnigii*, but the oil from these seeds is said to be clear and transparent.

Salvadora Persica, *L.*

Roxb. Cor. Pl. t. 26; *Fl. Ind.* i. 389; *Wi. Ic.* t. 1621; *Brandis*, p. 315.
Salvadora Wightiana, *Planch.*
Salvadora Indica, *Wi. Illus.* t. 181.
Salvadora Stocksii, *Wi. Ic.* 1621, *B.*

Large evergreen shrub or small tree, with white branches, drooping branchlets, and glaucous foliage, but much clearer and brighter green than the foliage of *S. oleoides*; leaves varying in shape from ovate to narrow lanceolate, blade 1–2 in. long; flowers greenish white, pedicellate, pedicels slender, generally ⅛th in. long, but often much shorter; panicles axillary and terminal, lax, often nodding, longer than leaves;

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branches racemose, divaricate; calyx open, cleft half-way into short broad rounded ciliate lobes; corolla cleft nearly to the base into 4 oblong lobes, twice the length of the calyx, and generally reflexed. (*Brandis.*)

Hab.—Wild in Sindh; Rajputana, Guzerat, Circars, &c.

Native synonyms :—

Mahomedan Tooth-brush tree. *Eng.*
Waragoo-wenki, Peda-vara-goki, Ghunia, Pinna-qu-chinna-vara-gogu? *Tel.*
Ughai. *Tam.*
Jhal. *Rajputana.*
Jal, Kharjal, Kurjal, Pilu. *H.*
Irak, Miswak. *P.*
Arak, Irak, Chardal, Chardul, Khardal. *A.*
Peeloo. *Mahr.*
Khardaloo. *Syriac.*
Kabbar, Pilu, Kubur, Khareedjar. *Sindh.*

Seed.—Fruit globose or sub-globose, 2–2½ lines long, fleshy, greenish yellow, red when ripe, supported by the persistent yellowish cup of the calyx.

Oil.—Probably similar in character to the last, but no authentic specimen is to be found in the Museum collection.

Addenda.

Amongst solid fats the Museum collection includes—
Vegetable Tallow from Sarawak and Borneo, and seeds.
Vegetable Tallow from Siam.
Bua Malam, seeds and solid fat.
Macassar Oil, a strong scented, semi-solid oil, obtained from Macassar for the Exhibition of 1862.

C.—Fluid Oils.

In the present section, no attempt has been made at a subsidiary classification on account of the uncertainty which exists in so many instances of the properties and uses of the resulting oil. Hence the enumeration is alphabetical, according to the scientific name of the plant.

Adenanthera pavonina, *L.*

Roxb. Fl. Ind. ii. 370; *W. & Arn. Prod.* 271; *Wi. Illus.* t. 84; *Bedd. Fl. Sylv.* t. 46; *Brandis, For. Fl.* p. 168.

A large tree; glabrous or pubescent, unarmed; leaves 1–3 feet long, abruptly bipinnate, pinnæ opposite, 4–6 pair; leaflets alternate, elliptic oblong, obtuse, 4–12 pair; racemes paniculate, cylindrical pedunculate, about 4 in. long; flowers small, yellow, fragrant, on slender pedicels. (*Brandis*, p. 108.)

Hab.—S. India. Burma. Bengal.

Native synonyms :—

Kuchandana. *S.*
Thorlagunj. *Mahr.*

Seeds.—Legumes linear, twisted, about 9 in. long; seeds shining, hard, bright scarlet, compressed, but convex on both sides, oval or orbicular.

Oil.—No specimen is contained in the collection, and its character is unknown here.

Preparation.—Dr. Brandis says that oil is expressed from the hard scarlet seeds of this tree, and the oil is enumerated in the Jury Reports (1857) as one of the products of the Madras Presidency.

Aleurites Moluccana, *Willd.*

Müll. in *DC. Prod.* xv. 723.
Aleurites triloba, *Forst. Gen.* p. 112; *Roxb. Fl. Ind.* iii. 629; *Griesb. W. I. Fl.* 37; *Lam. Ill.* t. 791.

Tree; leaves glabrescent, 3-lobed (or ovate), middle segment larger, deltoid; cymes puberisious, nearly as long as the petiole; petals spathulate, much longer than the rounded calyx.

Hab.—South Sea Islands, &c. Cultivated in India.

Native synonyms :—

Akroot, Akhrot, Akhoroot. *B.*
Akola. *H.*
Akhrotee, Kara-angolam. *Mal.*
Woodooga. *Tel.*
Bua-kara. *Borneo.*
Tel-kekune. *Cey.*
Japhal. *Bombay.*

Seeds.—Drupe two celled, fleshy, roundish, a little compressed, somewhat pointed, marked on the sides with four sutures, olive colour when ripe, 2½ in. in greatest diameter; nuts thick, very hard, dark coloured, irregularly furrowed, particularly on the exterior side, covered with a firm fleshy substance, which is white on the outside, and marked with green veins within, next to the nut, of a yellowish colour; kernels sweet, oleaginous. (Fig. 11.)

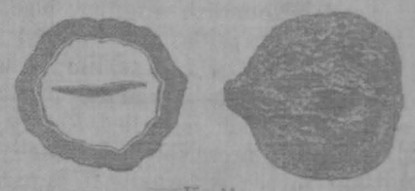


Fig. 11.

Oil.—Fixed oil obtained by expression from the kernels, commonly called Stone chestnut in the South of China; clear, limped, and almost colourless, slightly yellow, palatable oil without taste or smell; congealing at 32° F., insoluble in alcohol; readily saponifiable, and strongly drying.

Use.—Dr. O'Rorke found its medicinal action to be similar to that of castor oil, but it does not cause nausea or pain, and is free from unpleasant smell or taste. In the Sandwich Islands the kernels are employed as candles. A number of them strung upon a stick will burn for hours, giving a clear and steady light. It is a good lamp oil as a substitute for colza (*Seemann*). The Madras Drug Committee reported it superior to linseed oil for purposes connected with the arts, being what is termed a drying oil, but not drying so rapidly as linseed.

Preparation.—It is said that the oil can be separated from the nut with much less labour and simpler machinery than cocoa-nut oil. According to Simmonds, 31½ gallons of the nut yield 10 gallons of oil. About 10,000 gallons are produced annually in the Sandwich Islands. It is manufactured in Ceylon, where it is known as Kekune oil. Dr. Riddell obtained 50 per cent. of oil from the nuts.

Seeds in the Museum from Penang, and oil from the late Dr. Riddell.

Bibliography.—

Drury's Useful Plants, 2nd ed., p. 27.
Dr. Porter Smith, Chinese Materia Medica.
Pharmaceutical Journal, Nov. 1860, p. 282, ser. 2, ii. 42.
United States Dispensatory, p. 1457.
Bouchardat Annuaire, 1859, p. 117.
Pharmacopœia of India, p. 203.
Madras Med. Reports, 1855, p. 428.
Agri.-Hort. Journ. ii. p. 383, ix. p. 47, x. p. 36.

Allium cepa, *Linn.*

Lam. Ill. t. 242, f. 2; *Sibth. Grec.* t. 326.
PORRUM CEPA, *Reich Germ.* 110.

Stem fistulose, ventricose beneath, longer than the terete fistulous leaves; umbel capsuliferous, globose, segments of perianth linear elliptic, obtuse, shorter than the stamens and pistil; biennial; flowers whitish.

Hab.—Cultivated.

Native synonym :—

Piyaz, *H.*

Seed.—Black, rugulose, somewhat angular.

Oil.—Sample of oil referred to this source is in the Museum collection. It is clear, limpid, pale, with a greenish tinge, and an odour of onions. There is reason for doubt whether this sample is not largely mixed with some ordinary oil, such as that of sesame or ground nut.

Allium sativum, *Linn.*

Willd. Sp. ii. 68; *Kunth Enum.* iv. 380.
PORRUM SATIVUM, *Reich. Germ.* 110.

Bulb surrounded by smaller ones; leaves linear, entire; umbel bulbiferous, globose; spathe ovate, rounded; segments of the perianth ovate; pistil and stamens exsert; stem about 2 feet high; flowers whitish.

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Hab.—Cultivated.

Native synonyms :—

Loshoon, Lashuna, Rashoon. *B.*
Belui. *Can.*
Lahsan. *H. Dec.*
Vallai pandu. *Tam.*
Sir. *Pers.*
Ell-ulli, Vellulli. *Tel.*
Mahu-shuda. *Sans.*
Kyet-thwon-pen, Kyet-thwon-phyu. *Bum.*

Seed.—Roundish, angular, blackish, in an obtusely three-cornered or three-lobed three-celled capsule.

Oil.—Clear, colourless, limpid, with the odour and flavour of garlic.

Use.—Dr. Ainslie remarks in his Mat. Med. that an expressed oil is prepared from the garlic, which is called *Vallay poondoo unnay;* it is of a stimulating nature, and the Vytians prescribe it internally to prevent the recurrence of the cold fit of intermittent fever; externally it is used in paralytic and rheumatic affections. Samples were exhibited at the Madras Exhibition of 1857.

The essential oil of garlic is a different substance.

Sample of oil in the Museum from Madras, but not considered genuine.

Bibliography.—

Balfour's Cyclopædia of India, i. 81.
Pereira's Mat. Med. ii. p. 209.
Ainslie, Mat. Med. i. 151.
Stephenson's Medical Botany, iii. 111.

Amoora rohituka, *W. & A.*

W. & A. Prod. 119; *Bedd. Fl. Sylv.* t. 132; *Brandis, For. Fl.* p. 69.
ANDERSONIA ROHITUKA, *Roxb. Fl. Ind.* ii. 213.

Leaves coriaceous, glabrous, varying to 2 feet long, leaflets opposite, in 2–8 pairs, shortly petiolate, ovate lanceolate from unequal base, acuminate, entire; flowers in spikes, small, white, nearly sessile, subtended by minute bracts; male spikes paniculate, bisexual spikes solitary or twin, supra-axillary; calyx coriaceous, deeply cleft into 5 round obtuse lobes; petals 3; staminal tube globular, fleshy, white; anthers 6, attached half-way up the tube, ovary 3-celled; stigma sessile, 3 lobed. (*Brandis*, p. 69.)

Hab.—Oudh. Assam. E. Bengal. S. India. Ceylon.

Native synonyms :—

Harin harra, Hurin-hura, Khana, Harin-khana. *H.*
Tikhta-raj. *B.*
Chemmarum. *Mal.*
Rohitaka. *Sans.*
Sohaga. *Oudh.*

Seed.—Capsule pale yellow, soft and fleshy, obovoid, globose or pyriform, 1 in. long, 3-celled, opening longitudinally by three valves from the apex; seeds solitary, with a chestnut coloured smooth shining testa, surrounded by a scarlet arillus.

Oil.—There is no specimen of this oil in the collection, and its physical characters have not been described.

Use.—From the seeds, where the trees grow plentifully, Roxburgh says that the natives extract an oil which they use for many economical purposes. Beddome also observes that an oil is extracted from the seed in Bengal.

Bibliography.—

Roxburgh, Flora Indica, ii. 213.
Beddome, Flora Sylvatica, p. 132.
Brandis, Forest Flora, p. 69.

Amygdalus communis, *L.*

Roxb. Fl. Ind. ii. 500; *Boiss. Fl. Orient.* ii. 641.
PRUNUS AMYGDALUS, *Baillon Hist.* i. 415; *Brandis, For. Fl.* 190.

A moderate sized, deciduous, glabrous tree, with light green foliage, greyish when grown; leaves oblong lanceolate, conduplicate in bud, serrulate; petiole glandular, as long as the greatest width of the leaf, or longer; stipules subulate, fimbriate; flowers white, tinged with red, appearing before the leaves, on short peduncles, twin or solitary, from scaly buds on last year's wood; calyx campanulate. (*Brandis*, p. 190.)

Hab.—Cultivated.

Native synonyms :—

Kurwa-badam. *H.*
Badam-tulk. *P.*
Lowz-ul-murr. *A.*

Seed.—Drupe velvety, pericarp dry, separating into two valves when ripe; stone compressed, with shallow wrinkles and minute holes; cotyledons large, plano-convex, filled with oil.

Oil.—Obtained by expression from either bitter or sweet almonds, usually from the former, on account of their cheapness as well as of the greater value of the residual cake. The average produce is from 48 to 52 lbs. from 1 cwt. of almonds. When recently expressed it is turbid, but by rest and filtration becomes quite transparent. It usually possesses a slightly yellow tinge, which becomes paler by exposure to solar light. It is inodorous or nearly so, and has a purely oleaginous bland taste. It congeals less readily by cold than olive oil. [Braconnet states that at 14° F. it deposits 24 per cent. of margarine, which fuses at 43° F. The residual oleine did not congeal at the greatest degree of cold. Spec. grav. 0·911 Brandis, 0·917 Brisson, 0·920 Saussure. (*Pereira, Mat. Med.*)

Uses.—It possesses the dietetical and medicinal properties of the other fixed oils. Its local action is emollient. Swallowed in moderate doses it is nutritive, but difficult of digestion. In large doses it acts as a mild laxative (Pereira). In India Ainslie remarks that the use of this oil seems to be chiefly confined to the Mahometan practitioners, who recommend it for the same purposes that we do. It is, however, but seldom met with in the interior parts of the Peninsula.

After the expression of the bland oil from bitter almonds, the residuum, reduced to powder, and submitted to distillation with water, gives over a volatile oleaginous product known as oil of bitter almonds, which has a yellowish colour, a bitter acid burning taste, the odour of hydrocyanic acid, and is of great activity, acting upon the system in a manner analogous to hydrocyanic acid, which it contains united with benzoic acid and volatile oil. On an average 1·25 per cent. of this oil is obtained from bitter almond cake.

Almonds in the Museum from Bombay and Calcutta. Oil from Madras.

Bibliography.—

United States Dispensatory (1867), p. 573–5.
Pharmaceutical Journal, x. 297.
Journ. de Pharmacie, 1862, p. 432.
American Journal of Pharmacy, xxvi. 348.
Pereira, Materia Medica.
Hanbury and Flückiger, Pharmacographia, 217.
Pharmacopœia of India, p. 83.
O'Shaughnessy, Bengal Dispensatory, p. 321.

Amygdalus Persica, *L.*

Roxb. Fl. Ind. ii. 500.
Prunus Persica, *Benth. & Hook.; Brandis, For. Fl.* 191.
Persica vulgaris, *Mill.; Boiss. Fl. Orient.* ii. 640.

Tree; branches spreading, leaves lanceolate, glabrous, serrated; flowers sessile with reddish calyces, and pale or dark red corollas; drupe roundish, generally pointed, with a longitudinal groove; seed hard, irregularly furrowed.

Hab.—Persia. Cultivated in India.

Native synonyms :—

Peach. *Eng.*
Ghwareshtai. *Afgh.*
Aru, Rek, Chimnanu, Ghurghushtai, Mandala. *N.W.P.*

Seed.—Drupe downy or smooth, with a tender succulent sapid pericarp; stone deep, and irregularly furrowed; cotyledons large, plano-convex, filled with oil.

The kernels bear a strong resemblance to bitter almonds, for which they are frequently substituted.

Oil.—The expressed oil resembles that obtained from almonds, for which it may be substituted.

No sample is in the Museum collection.

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Anacardium occidentale. *L.*

W. & Arn. Prod. 168; *Bedd. Fl. Sylv.* t. 163; *Hook. Fl. Ind.* ii. 20.
Acajuba occidentalis, *Gaertn. Fruct.* t. 40, f. 2.
Cassuvium pomiferum, *Lam.*

Tree; leaves oval, rounded or slightly emarginate at the apex, narrower but obtuse at the base, bracteoles broadly ovate, acuminated; one stamen longer than the others; fruit sessile on the apex of the torus, reniform. (*W. & A.*)

Hab.—Introduced into India.

Native synonyms :—

Kajee, Kaju, Hijli-badam, Cajoo. *H.*
Jidi-mamidi, Munta-mamidi. *Tel.*
Kola-mavah, Mundiri, Moondri, Moondri-marum. *Tam.*
Kaju, Hijli-badam. *B.*
Jambu-monat, Cadju. *My.*
Peiteira-manjo, Parunkimavah, Kajommara. *Mal.*
The-ho-thayet, Thubbamboo. *Burm.*
Cajoo. *Dec.*
Watu-caju. *Cey.*
Jamboo-eerong. *Sumatra.*



Fig. 12.

Seed.—Nut reniform, oblique, supported on a fleshy pear-shaped enlargement of the torus and pedicel, indehiscent; pericarp thick, containing in its substance cells full of an acrid oil. (Fig. 12.)

Oil.—A light yellow bland nutritious oil, of the finest kind, in every respect equal to almond oil.

Uses.—It is a bland oil, which has been suggested for pharmaceutical purposes.

A consignment of the kernels of the nut appeared for sale in the London market many years ago as "Cassia nuts." The oil is seldom expressed in India, as the nuts are extensively eaten.

Seeds in the Museum from Bombay, Madras, Calcutta, Mangalore. Oil from Mysore and Madras.

Cashew Apple Oil.

The pericarp of the fruit contains a black acrid oil, which owing to its caustic properties is often applied to floors or wooden rafters of houses, to prevent the attacks of white ants. It requires, however, to be used cautiously. This oil is called Cardole, and is a powerful vesicating agent. It is applied to warts, corns, ulcers, &c. (*Drury.*)

It apparently closely resembles in its properties the acrid oil of the Marking nut, and has long been known to the native practitioners of India.

This substance in the Museum collection came from Mangalore and Calcutta.

Bibliography.—

O'Shaughnessy, Bengal Dispensatory, p. 280.
United States Dispensatory, p. 1461.
Journ. de Pharmacie, ser. 3, xiii. 459.
Pharmacopœia of India, p. 59.
Balfour's Cyclopædia of India, i. p. c. 68.

Anamirta cocculus, *W. & A.*

W. & Arn. Prod. 446; *Brandis, For. Fl.* 8.
Menispermum cocculus, *Linn. Roxb. Fl. Ind.* iii. 807.

A glabrous climbing shrub, bark corky; leaves coriaceous, cordate, or ovate, blade 4–8 in. long, petiole 2–6 in.; flowers greenish, in long pendulous panicles; sepals 6, with two small adpressed bracts, petals none; anthers numerous, 2 celled, on the top of a thick central column; carpels 3, on a stout trifid gynophore $\frac{1}{4}$ in. long. (*Brandis*, p. 8.)

Hab.—S. India. E. Bengal. Oudh Forests.

Native synonyms :—

Cocculus indicus. *Eng.*
Bacaen-ka-phal. *Calcutta.*
Garala-phala, Pola, Kaandaka-connuveli. *Mal.*
Hong. *Burm.*
Jermae. *Guz.*
Kakamari. *Sans.*
Kakmari. *Dec.*
Kakmari, Jermae, Kakmari-kabeenji. *H.*
Kaka-collei-verei, Kaka-coollei. *Tam.*
Kakichimpoo-vitteloo, Kakichempoo. *Tel.*
Tuba-bidji. *My.*

Fruit.—Drupes subglobose, ½ in. diam, black, glabrous; seed globose, enclosing the intruded endocarp.

The fruit contains a large proportion of fixed oil, which is enumerated in Madras Jury Reports (1857) as one of the products of that Presidency. The fat of the seed, which amounts to about half its weight, is used in India (*Pharmacographia*) for industrial purposes. Its acid constituent, formerly regarded as a peculiar substance under the name of stearophanic or anamirtic acid, was found by Heintz to be identical with stearic acid.

Seeds in the Museum collection from Calcutta and Bombay, but no sample of the oil.

Bibliography.—

Hanbury and Flückiger, Pharmacographia, p. 32.
United States Dispensatory (1867), p. 305.
Lindley, Flora Medica, p. 371.
Journ. de Pharmacie, xx. 122.
O'Shaughnessy, Bengal Dispensatory, p. 194.
Pereira, Materia Medica, ii. 666.
Guibourt, Hist. des Drogues, iii. 672.

Arachis hypogæa, *L.*

Linn. Sp. 1040; *DCand. Prod.* ii. 474; *Rumph. Amb.* v. t. 136.

Annual; branches procumbent; leaflets bijugal, obovate or oblong-oval; petiole exceeding the calyx lobes. (*Griesb. W. I. Fl.* 189.)

Hab.—Cultivated in all tropical countries.

Native synonyms :—

Moong-phullie, Booe-moong. *H.*
Nelay-cadalay, Vayer. *Tam.*
Nela-sanagalu, Veru-sanaga. *Tel.*
Velaitee-moong, Booi-sing. *Dec.*
Cachang-gorung. *Sumatra.*

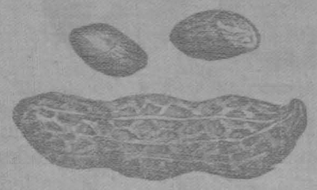


Fig.13, legume and seeds.

Seed.—Legume hypogæous, oblong, 1¼–1¾ in., nearly straight, coriaceous, with prominent longitudinal nerves and intervening reticulations, 3-seeded; seeds compressed by contact, and hence truncate, irregularly ovoid. (Fig. 13.)

Oil.—The seeds yield by expression about 43 per cent. of a clear straw-coloured edible oil, which possesses a faint odour and a mild agreeable taste. Spec. grav. 0·9242, sparingly soluble in alcohol, readily in ether and chloroform.

Uses.—An excellent substitute for olive oil, and is highly esteemed for domestic purposes; does not become rancid so quickly as other oils. It can be used for all purposes in pharmacy in place of olive oil. Dr. Ernst states that in Venezuela this oil easily gets rancid, but has an agreeable taste and smell when fresh. As a lighting oil its properties will bear comparison with other oils, since it has been shown that the brilliancy of its light was superior to that of olive oil, and its durability proved to be seven minutes beyond the combustion of the best olive oil, with the additional advantage of scarcely any smoke. It has been stated that these seeds are largely shipped to France, where they command a ready sale, are there converted into oil, and thence find their way over the world in the shape of olive oil, the skill of the French chemists enabling them to imitate the real Lucca and Florence oil, so as to deceive the nicest judges.

This oil does not seem to be used to any large extent in India, although the nut itself is much eaten by the poorer classes. It is said to be used for adulterating gingelly oil in North Arcot, where it costs from Rs. 1.8 to Rs. 2.12 per maund. In the Nellore district the seeds are procurable at Rs. 1.8 per maund, and in Tanjore about 200 acres are cultivated, producing annually 75 candies of oil at Rs. 2.6 per maund. The seeds yield about 43 per cent. of a clear straw-coloured edible oil. (*Madras Jury Reports*, 1857.)

In the Pharmacopœia of India, it is reported on the authority of the medical storekeeper at Bombay that this oil is uniformly used in Western India instead of olive oil. It is of a pale straw colour, without smell, and so pure in taste that fish can be cooked with it, and rendered quite as agreeable to the palate as with ghee or clarified butter. The annual supply from Hewrah from 1,000 to 3,000 lbs. It was prepared by hydraulic pressure and accepted by the whole medical department as a complete substitute for olive oil.

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Seeds in the Museum from Goonah, Madras, Calcutta, Bhopal, Bombay, Poona, Ahmednugger, Rangoon, Penang, Malacca, Malay Peninsula, Java.

Oil from Madras, Deccan, Mysore, Penang, Java.

Bibliography.—

O'Shaughnessy, Bengal Dispensatory, p. 304.
Madras Jury Reports, 1857.
United States Dispensatory, p. 1523.
American Journal of Pharmacy, July 1860, p. 292.
Hanbury and Flückiger, Pharmacographia, p. 163.
Pharmacopœia of India, 74, 446.
Agri.-Hort. Journ. ii. 301, ix. 76, n. s. iii. 2, 171.

Argemone Mexicana, *L.*

DC. Prod. i. 120; *Hook. Fl. Ind.* i. 117; *Roxb. Fl. Ind.* ii. 571.

Herb, with a somewhat shrubby habit, the stem glaucous, smooth, or spinulose; leaves semi-amplexicaul, pinnatefidly lobed or sinuate, spinulose; flowers orange or yellow; capsule setose, or sometimes unarmed. (*Oliv. Trop. Afr.*, p. 54.)

Hab.—Naturalized in India.

Native synonyms :—

Bherband. Bramhie, Bramhadundie, Faringee-datura, Suchianas. *H.*
Shial-kanta, Buro-shialkanta, Thialkanta. *B.*
Bramadandoo, Brumhadundoo, Brumarakash. *Tam.*
Brahmadandi. *Tel.*
Feringie-datura, Peela, Peela-datura, *Dec.*
Balu-rakkisa, Dotury. *Can.*

Seed.—Small, round, black, and roughish, about the size of rape seed. (Fig. 14.)

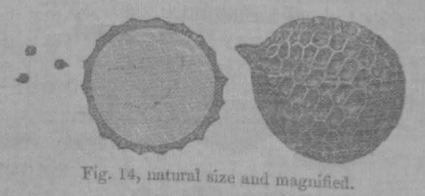


Fig. 14, natural size and magnified.

Oil.—Clear, limpid, resembling mustard seed oil, with a pale yellowish colour.

Uses.—The oil burns well, and Surgeon Thompson reports that he has used it in various cutaneous diseases as a local application with beneficial effect. It has also been commended as a lubricating oil for machinery. According to M. Lepine this oil might be advantageously used in the arts. It has been well reported on as an aperient, especially in colic.

Preparation.—The seeds yield by expression 10 seers of oil to the maund, which is nearly as much as mustard seed. After the oil is drawn, if allowed to stand for some days a whitish fibrous matter is deposited; from this the clear oil is poured off, a second deposit takes place, after which the oil remains clear and of a very fine bright colour. (*Agri.-Hort. Journ.*)

The plant grows in abundance in Bengal, and all over India, to be found on nearly every nullah and abandoned heap of rubbish; it was originally introduced from Mexico in ballast.

Seeds in the Museum from Madras. Oil from the same place.

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O'Shaughnessy, Bengal Dispensatory, p. 183.
Agri.-Hort. Journ. India, xii. (1861), p. xxi., ii. p. 207.
Pharmaceutical Journal, iv. 167, v. 23, ix. 129, xii. 192, xiii. 642.
Indian Medical Gazette, 1866, p. 206.
United States Dispensatory (1867), p. 1466.
Journ. de Pharmacie, 1861, p. 16.
Pharmacopœia of India, pp. 22, 440.
Barham, Hortus Americanus, p. 152.
Lunan, Hort. Jamaicensis, ii. 311.

Atalantia monophylla, *Corr.*

DC. Prod. i. 535; *Hook. Ind. Fl.* i. 511; *Wi. Ill.* i. 108.
Atalantia floribunda, *Wi. Icon.* t. 1611.
Atalantia platystigma, *Wi. Illus.* i. 108.
Limonia monophylla, *Linn. Roxb. Cor. Pl.* t. 82; *Fl. Ind.* ii. 378.
Turræa virens, *Hellen. in Act. Holm.* 1788, t. 10, f. 1.
Trichilia spinosa, *DC. Prod.* i. 623; *Burm. Zeyl.* t. 65, f. 1.

Large glabrous shrub, or small tree, with rigid flexuous woody branches, and usually strong axillary single spines; leaflets 1–3 in., ovate oblong or elliptic, obtuse, notched or 2 lobed at the top, coriaceous, bright green, quite entire; petiole very short, often pubescent, stipular scales subulate; flowers $\frac{3}{4}$–1 in., always fascicled in the leaf axils, pubescent pedicels $\frac{1}{4}$–$\frac{1}{2}$ in. minutely bracteolate, buds subglobose or pyriform; calyx rupturing irregularly, petals obovate-oblong, obtuse; filaments 8, rarely 5–7 connate into an irregularly cleft tube, which is antheriferous at the top, anthers broadly ovoid; ovary sessile on a small disc, 3–5 celled; berry globose. (*Hooker.*)

Hal.—Silhet. Western Peninsula. Ceylon.

Native synonyms :—

Wild Lime. *Eng.*
Catyalu-micha-maram, Kat-elle-micham-maram, Kat-elle-micha-maram, Caaty-aloo-micha-marum. *Tam.*
Adavi-nimma, Adivi-nimma, Konda-nimma. *Tel.*
Makhur-limbo. *Mahr.*
Malvâregam. *Mal.*

Seed.—Berry as large as a nutmeg, globose like a lime, usually 4 celled, cells 1 seeded.

Oil.—It is doubtful whether this is not an empyreumatic oil, and hence not entitled to be included here, but of this we have no decided information, and no specimen is in the Museum collection.

Uses.—Ainslie states that from the berry of this thorny plant is prepared a warm oil, which the native practitioners consider a valuable application in chronic rheumatism and paralytic affections. (*Mat. Med. p.* 74.)

Balanites Roxburghii, *Planch.*

Brandis, For. Fl. p. 59.

Balanites Ægyptiaca, *Wi. Ic.* t. 274.

Ximenia Ægyptiaca, *Roxb. Fl. Ind.* ii. 253.

Thorns axillary, strong, very sharp, often long, leaf and flower bearing, young parts pubescent, in dry localities hoary-tomentose; leaflets lanceolate, oblong or obovate, nearly sessile, on a common petiole less than $\frac{1}{4}$ length of leaflets; flowers small white or greenish white, fragrant, crowded in fascicles, axillary and along lateral branches; sepals oval, downy, nearly as long as petals, both spreading, reflexed, and eventually deciduous; style erect, short, stigma slightly 5 lobed. (*Brandis*, 59.)

Hab.—Common in many parts of India.

Native synonyms :—

Hingu, Ingua, Hingot, Hingota, Ingol. *H.*
Hingen *B.*
Nunjoonda. *Tam.*
Garee. *Tam.*

Seed.—Drupe ovoid, 2 in. long, 5 grooved, covered with a light grey dry rind, enclosing a bitter pulp, with an offensive greasy smell; nut exceedingly hard, tubercled outside, 1 seeded.

Oil.—No sample of this oil is in the collection, and therefore no description can be given. It appears to be little known. Brandis states that it is expressed from the seed. Sample was shown at the Madras Exhibition of 1857.

Baliospermum montanum, *Müll.*

DC. Prod. xv. 1125.

Baliospermum polyandrum, *Wi. Icon.* t. 1885.

Baliospermum Indicum, *Decne. in Jacq. Voy.* t. 155.

Baliospermum Moritzianum, *Baill. Euphorb.* p. 395.

Jatropha montana, *Wild. Sp.* iv. 563.

Croton polyandrus, *Roxb. Fl. Ind.* iii. 682.

Undershrub; upper leaves lanceolate, acute at the base, lower ones broader ovate, often cordate at the base, toothed or deeply 3-lobed, marked with long scattered hairs, inflorescence commonly bisexual, males more loose than the females and longer peduncled, all shorter than the petioles; fruit bearing pedicels deflexed, sterile; bracteoles numerous, segments of male calyx orbicular-ovate, of the female lanceolate.

Hab.—S. W. India. Bengal. Nepal. Sikkim. Burma.

Native synonyms :—

Hakon. *H.*
Duntee. *B.*
Konda-amadum. *Tel.*
Tha-dee-wa *Burm.*

Seed.—Capsule sub-globose, puberulous; seeds even, at length marbled.

Oil.—Doubtless cathartic, as this property possesses the seed. No specimen is in the Museum collection.

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Uses.—It is stated in "Pharmacographia" that the seeds partake of the nature of croton seeds, and according to Roxburgh are used by the natives of India as a purgative. The oil as a substitute for croton oil.

Bauhinia variegata, *L.*

Roxb. Fl. Ind. ii. 319; *Brandis, For. Fl.* p. 261.

Tree; young branches, under side of leaves, inflorescence, and calyx with short pubescence; leaves with cordate or rounded base, as broad as long, leaflets connate beyond the middle, 5–7 nerved; racemes short, axillary or terminal, few flowered; bracts small, broad, triangular; flowers large, fragrant; calyx spathaceous ovate, 5-toothed at apex; petals oblong; perfect stamens 5; ovary stalk cohering with calyx tube.

Hab.—Most wooded parts of India.

Native synonyms :—

Kovidara. *S.*
Kachnar. *N. I.*
Koliar, Kuräl, Padrian. *Punj.*
Khwairal, Guiral, Gwiar, Barial. *N.W.P.*

Seeds.—Legume, 6–18 in. long, linear, flat.

Oil.—These seeds have been reported as the source of oil, but of this there is no definite information.

Bombax Malabaricum, *DC.*

DC. Prod. i. 479; *Brandis, For. Fl.* p. 31.

Salmalia Malabarica, *Wi. & Arn. Prod.* i. 61.

Bombax heptaphyllum, *Roxb. Fl. Ind.* iii. 167.

Large tree; young stem and branches prickly, leaves palmate, leaflets 5–7, lanceolate acuminate, 4–8 in. long; flowers large, scarlet, occasionally white, appearing before the leaves, clustered towards the ends of the branches; calyx cup shaped, coriaceous, outside smooth, inside silky; petals oblong, obtuse, 3–6 in. stellate.

Hab.—India generally.

Native synonyms :—

Pulá, Elavum-marum, Pula-maram, Mal-ailas-maram, Mall-elava-marum, Pula-mula elavu. *Tam.*
Buruga, Konda-buruga, Pinna-buruga, Buruga-manu, Bouroga-chettu? Booraga, Mula-buraka-manu, Buraga, Borrooga. *Tel.*
Letpan, Lepan, La-i. *Burm.*
Katu-imbul-gas, Katoo-imbool-gass, Kattuimbal, Mahatelam-bu. *Cyn.*
Wallaika. *Gonds, C. P.*
Rakto-shimool, Rakta-shimlu, Rakto-shimal, Rakto-simal. *B.*
Mullelavu, Moollelavoo, Mulu-elavum. *Can.*
Mulelavu, Mulu-elavu, Moul-elavoo. *Mal.*
Rakta-simal, Simbal, Ruckta-sembul. *H.*
Kanta-sair, Sair, Sairi. *Mahr.*
Simbal. *P.*
Simal, Salmali. *Sans.*
Bouro. *Uriya.*
Saur. *Dec.*

Seed.—Fruit on a short peduncle, a hard oblong obtuse ligneous capsule 4–5 in. long, pale brown, somewhat rugose; seeds numerous, smooth, dark brown, obovoid, not $\frac{1}{2}$ in. long, enveloped in fine silky fibre.

Oil.—One of the oils enumerated by Lieut. Hawkes. No sample in Museum. Character and uses not described.

Brassica alba, *H. & T.*

Hook. & Thom. in Journ. Linn. Soc.; Hook. Fl. Ind. i. 157.

Sinapis alba, *Linn.*

Stem hisped, leaves pubescent, pinnatisect, upper segments confluent, pods spreading, cylindric, torulose, usually hirsute, beak very long, decurrent along the pod, 1 seeded.

Hab.—Cultivated at Ferozepore in the Punjab.

Native synonyms :—

Rai, Surson. *H.*

Seeds.—Pods about 1 in., stalked, spreading, cylindric, beak half as long, flattened, sometimes 2 seeded, valves and base of the beak white with hisped hairs; seeds globose, pale.

Oil.—As in other species of *Brassica.*

Uses.—Same as other species.

Brassica campestris, *Linn.*

Hook. Fl. Ind. i. 156.
SINAPIS GLAUCA, *Roxb. Fl. Ind.* iii. 118.
SINAPIS DICHOTOMA, *Roxb. Fl. Ind.* iii. 117.
Plant erect, lower leaves lyrate, upper auricled; flowers corymbose; beak of pod flat, seedless.

Hab.—Cultivated throughout India.

Native synonyms :—

Raee, Bunraee, Bubraee, Shwetraee, Jooni-raee, Sanchi-surson. *B.*
Kalie-surson, Bunga-surson, Tooria, Rai, Surson, *H.*
Kadaghoo, Kudaghoo. *Tam.*
Avaloo. *Tel.*
Kadooga. *Mal.*
Sásávee. *My.*
Gan-aba, Rata-aba. *Cey.*
Mung-nyen. *Burm.*
Suray-bij. *Sindh.*
Khurdal, Kubbr, Khardul. *A.*
Sir-shuf, Tockmé-sipeedān. *P.*

Seed.—Pods 1½–3 ins. long, glabrous, sub-erect, beak flat, seedless, valves with midrib and flexuous veins; seeds small, smooth, pale or dark. (*Hook. Fl. Ind.*)

Oil.—Clear, limpid, yellowish oil.

Uses.—The mustard seed oils, though seldom sold in the market in India, are made when required, and used in most parts in cookery. They are considered superior to all other oils for anointing the body, which they are supposed to invigorate. In medicine sometimes given internally, but more frequently employed as a rubefacient. The average price of seed in 18 large stations in all parts of the Madras Presidency (in 1854) was Rs. 1.2.8 per maund of 25 lbs., the maximum being Rs. 1.11.6 at Cannanore, and the minimum As. 10.5 at Nagpore. (*Jury Reports*, 1857.)

Mr. R. W. Bingham, reporting on the resources of the Sasseram District, states that mustard seed, or sursoon, is grown generally mixed with the rape seed, also called sursoon, although the plant is a distinctly different one, and the seed is a whitish yellow, while the seed of the rape is of a dark brown. He had never seen them grown separately, though such is the case in many parts of the country. It is grown extensively all over the district, principally for local consumption, and being sown in the month of October, is generally sown as an auxiliary with grain crops, amongst which its white and bright yellow flowers are easily distinguished. Being always sown as an auxiliary, it is impossible to ascertain what would be its yield per acre if sown separately. It loves the loams, and does not take kindly to any of the clays. It is ready before the close of February for cutting, and is always cut slightly grown, or the seed pods would burst and scatter the seed. Being cut, the plant is dried in the threshing floor by the heat of the sun, which does its work in three or four days, when the seed is easily threshed out. Cattle eat the broken stalks, but he did not imagine it was a very nutritious food for them. It is sold in the bazaars at from 16 to 20 seers per rupee, and yields under the native method of crushing 30 per cent. of a tolerably pure oil, while the residue, or cake, is used as a food for cattle. It would yield more and a purer oil under the action of the oil pressing and purifying processes of Europe, and he thinks would yield 35 to 40 per cent. of its gross weight. It is largely used by the native community with their food instead of ghee, under the name of metah, or sweet oil, although for all other purposes it passes under the name of kurwah, or bitter oil. Most natives prefer it for the preparation of their curries and other warm dishes. The native oilman gives 1 seer or 25 per cent. of the expressed oil for every four seers of seed sent him, he keeping the balance and the cake as the price of his labour, so that, with the seed at 16 seers per rupee, the value of the oil would be 4 seers per rupee. (*Agri.-Hort. Journ.* xii. 333.)

Seeds in the Museum collection from Goonah, Calcutta, Cuttack, Bombay, Dacca, Indore, Madras, Ahmednugger, Sarun, Ahmedabad, Saharunpore, Kurrachee, Surat, Gyah, Mysore, Bimlipatam, Jessore, Lucknow, Moorshedabad. And oil from Cuttack, Calcutta, Goonah.

Brassica napus, *L.*

BRASSICA CAMPESTRIS, subsp. NAPUS, *Hook. Fl. Ind.* i. 156.
Root fusiform; leaves all glabrous and glaucous; petals deciduous before the corymb lengthens.

Hab.—Cultivated.

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Native synonyms :—

Rape oil, Colza oil. *Eng.*
Sursoo. *Bombay.*
Sursul. *Guz.*

Seed.—Seeds smooth, subglobose, dark.

Oil.—Pale, limpid, clear fluid oil.

Uses.—For burning and other purposes.

Oil in the collection from Hyderabad.

Brassica juncea, *H. & T.*

Hook. & Thom., Linn. Soc. Journ. v. 170; *Hook. Fl. Ind.* i. 157.
SINAPIS JUNCEA, *Linn.*
SINAPIS RAMOSA, *Roxb. Flor. Ind.* iii. 119.
SINAPIS RUGOSA, *Roxb. Fl. Ind.* iii. 122.
SINAPIS CUNEIFOLIA, *Roxb. Fl. Ind.* iii. 121.
Erect, glabrous, lower leaves oblong lanceolate, toothed, upper narrow; pods sub-erect, torulose, beak long, seedless, lateral nerves flexuous.

Hab.—Cultivated.

Native synonyms :—

Mustard seed oil. *Eng.*
Bunga-surson. *H.*
Raee. *B.*
Kudaghoo. *Jam.*
Kadooga. *Mal.*

Seed.—Pods ½ in., linear-lanceolate, beak straight, flattened, ½ in., valves with a prominent midrib; seeds small, dark, rugose.

Oil.—Similar to that of other species of *Brassica*.

Uses.—For burning and other purposes.

Seeds in the Museum from Bombay, Indore, Surat, Bengal, Rohilcund, Mooltan, Ahmedabad, Bombay. Oil from Calcutta and Lucknow.

Brassica nigra, *Koch.*

Hook. Fl. Ind. i. 156.
SINAPIS NIGRA, *Linn.*
SINAPIS ERYSIMOIDES, *Roxb. Fl. Ind.* iii. 123.
Annual; 2–3 feet high, rigid, branched, more or less limpid; leaves all petioled, lower ligrate, upper entire; racemes naked; flowers bright yellow; pods slender, appressed to the stem.

Hab.—Cultivated in various parts of India and Thibet.

Synonyms.—The native names are very much confounded together in *mustard*, and cannot safely be indicated.

Seeds.—Pod ¼–½ in., subulate, valves keeled, torulose, cells 3–5 seeded; seeds oblong.

Oil.—As in other species of *Brassica*.

Uses.—As in the preceding.

Seed in Museum from Mysore.

Bryonia callosa, *Rottl.*

Drury, Usef. Pl. 87; *Ains. Mat. Med.* ii. 428.
Climbing shrub, spreading; stem filiform, furrowed, rough, with bristly hairs; leaves on long petioles, cordate, 3–5 lobed, roundish, toothed, scabrous and hispid on the veins below; berries globose, rather large, smooth; flowers yellow.

Hab.—Coromandel.

Native synonyms :—

Too-mutti, Thukkam kai. *Tam.*
Boddama kaia. *Tel.*

Seed.—Berries globose, seeds —— ?

Oil.—There is no sample of this oil in the collection, and its characters have not been given.

Uses.—Dr. Ainslie remarks that the seeds yield a fixed oil by boiling, which is used for lamps by the poorer classes. Lieut. Hawkes reports that it is used for burning in lamps in some parts where the fruit abounds. It is extracted by boiling in water, and is procurable only in small quantities.

Buchanania latifolia, *W. & A.*

W. & Arn. Prod. i. 169; *Roxb. Fl. Ind.* ii. 385; *Bedd. Fl. Syl.* t. 165; *Brandis, For. Fl.* 127; *Hook. Fl. Ind.* ii. 23.

Tree; 30–50 feet; leaves alternate, entire, broadly oval or obovate, obtuse; calyx small, obtusely 5-cleft; petals five, sessile, recurved; branches of the panicles hirsute, terminal, and axillary, with the flowers crowded, assuming the appearance of a corymb at the tops of the branches; fruit a drupe, with slightly fleshy-red sarcocarp; nut very hard, 2-valved, 1-celled; flowers small, greenish-white.

Hab.—Mountains of Coromandel and Malabar. Belgaum Forests. Mysore.

Native synonyms:—

Chironji, Pujal? Piar-cheronji, Charooli, Dhan, Chirauli. *H.*
Chinna-moral, Chara-chettu, Chara-pappu, Chara-namidi-chettu? Charu-mamidi, China-moralli, Jaru-mamidi, Sarapuppoo. *Tel.*
Nuskul, Noas-kool. *Can.*
Kat-maa, Kaat-mango, Moræda. *Tam.*
Lumbo, Thit-sai? *Burm.*
Piyala? *B.*
Pia-sal. *Guz.*
Char. *Mahr.*
Chara. *Sans.*
Charo, Chárú, Bhalleah. *Uriya.*
Sarapappoo, Chara, Cheronjee-kaghar-sarai.
Pyal, Charolee. *Bombay.*

Seed.—Drupe black when ripe, ½ in. long, with a compressed hard, bony putamen; the kernel called "chironji" has somewhat the taste of pistachio nuts.

Oil.—Of a pale straw colour, limpid, sweet, wholesome and esculent, although seldom extracted in India.

Uses.—An edible oil similar in its uses to olive oil.

Preparation.—The chironjee, says Mr. Bingham, is a common forest tree all over the Kymore range, and doubtless in other parts of India. It produces a small sweetish black fruit called pyar, or pyal, with a hard kernel. The Hill people dry the fruit, and then pound up pulp and kernel in a mortar as required for their bread. The kernel itself, when broken, yields the delicacy known so well in the native bazaars as chironjee, which sells at 1 or 2 seers per rupee. The taste, when parched, is agreeable to the European palate, and appears something between the pistachio and the almond. It is rather longer than a grain of barley, and each kernel contains two grains. The kernel of the chironjee, when the outer nut is removed, yields nearly 50 per cent. of a delicious and pure oil, but it is seldom met with in the market as the kernel itself finds a ready sale as a dessert to be eaten with raisins or alone. (*Agri.-Hort. Journ.*)

Seeds in Museum from Goonah, Raepore, Indore, Chutterpore, and Bombay.

Bibliography:—

Agri.-Hort. Journ. India, xii. p. 346.
Brandis, Forest Flora, p. 127.

Butea frondosa, *Roxb.*

Roxb. Fl. Ind. iii. 244; *Cor. Pl.* i. t. 21; *W. & A. Prod.* i. 261; *Brandis, For. Fl.* 142.

ERYTHRINA MONOSPERMA, *Linn.*

Middle sized tree; leaves pinnately trifoliate, leaflets large, roundish ovate, rather velvety beneath, corolla papilionaceous; racemes simple, many flowered, lax; calyx segments short, slightly acute, several times shorter than the tube; corolla densely pubescent; vexillum ovate, acute, recurved; keel and alœ incurved; legume flat, thin, with a large solitary seed at the apex; flowers in threes, bright scarlet.

Hab.—Malabar. Circars.

Native synonyms:—

Bastard teak, Dhak-kino tree, Palas tree. *Eng.*
Palas, Dhak, Parasa, Kuenee. *H.*
Modagu, Kimsukamu, Moduga-chettu, Palasamu, Tella-moduga, Togaru-moduga, Moduga, Moduga-chettoo, Motku. *Tel.*
Thoras, Mootr-mara, Thorus-mara. *Can.*
Porasan, Porasa-maram, Porassum. *Tam.*
Kinaka, Pulasa, Palas, Dhak. *B.*
Pouk, Pouk-pin, Pouk-bin, Pouk-pan. *Burm.*
Pullus. *Mahr.*
Palasi, Palassie. *Mal.*
Dhak, Palasa, Kinouka, Kinsuka, Palas. *Sans.*
Calu-kaele, Gas-kaela. *Cyn.*
Polaso, Polásu. *Uriya.*
Palas. *Dec.*
Pallus-kakria. *Bombay.*
Potash. (*Gualpara.*) *Ass.*

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Seed.—Legumes pendulous, tomentose, 4–6 in. long, 1½–2 in. broad; seed oval, flat, smooth, brown, 1½ in. long, 1 in. broad.

Oil.—Bright clear fluid oil; sample referred to this source in the Museum from Madras is a thick, dark, opaque oil, but there is some doubt as to its authenticity.

Uses.—Sometimes used medicinally.

Seeds in Museum from Bombay.

Cæsalpinia bonducella, *Roxb.*

Roxb. Fl. Ind. ii. 357; *Brandis, For. Fl.* 156.

GUILANDINA BONDUCELLA, *L.*

Scandent shrub, pubescent; branches, petioles, inflorescence armed, sparsely or densely, with short unequal slightly recurved prickles; leaves ample, 1–1½ ft. long, pinnæ 6–8 pair; leaflets opposite, 6–10 pair, elliptical, with a rounded, somewhat unequal sided base, apex mucronate, stipules large, cut into large segments; racemes axillary, many flowered, simple or branched below, bracts linear-lanceolate, with a spreading or recurved apex, projecting beyond the unopened flowers; calyx rusty tomentose, with recurved lobes, inferior lobe largest, hood-shaped; petals yellow, spreading, the upper sometimes spotted with red. (*Brandis.*)

Hab.—Naturalized in South-east and a great part of N. W. India.

Native synonyms:—

Bonduc nuts, Fever nuts. *Eng.*
Catcaleji, Kutkaranga, Ratharanj, Katkaringa, Karanjo, Karonj, Natacaranja. *H.*
Gacheha-chettu, Getsakaia. *Tel.*
Gudgega, Gutchka, Sagargota. *Dec.*
Kalichikai. *Tam.*
Kalu-wawul-setiya. *Cey.*
Kirbut, Karbat, Kachka. *Sindh.*
Koobayratchie, Puticaraja. *Sans.*
Kulunje, Caretti. *Mal.*
Nata. *B.*

Seeds.—Pods 2-valved, 2–3 in. long, 1½–1¾ in. broad, coriaceous, covered with sharp straight spreading prickles (fig. 16.); seeds 1–2, globose or ovoid, smooth, shining, bluish grey or lead coloured, ¾ in. diam. (Fig. 15.)

Oil.—The seeds contain a fixed oil, which is mentioned by Ainslie as being considered useful in convulsions and palsy.

The seeds in the Museum are from various localities, but no sample of the oil.



Fig. 15, seeds.

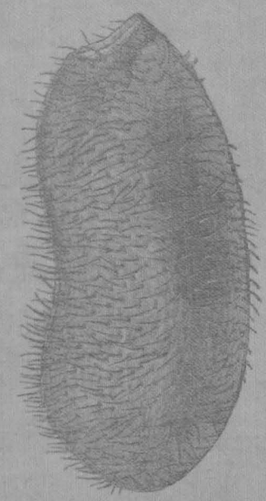


Fig. 16, pod.

Cæsalpinia digyna, *Wall.*

W. & Arn. Prod. i. 281.

CÆSALPINIA OLEOSPERMA, *Roxb. Fl. Ind.* ii. 356.

Scandent, armed with numerous small recurved prickles; pinnæ of the leaves 7–10 pair; leaflets 6–10 pair, linear-oblong, obtuse, glabrous; stipules subulate; racemes supra-axillary, simple, somewhat shorter than the leaves, pedicels long, slender; legume oblong, obliquely pointed, very protuberant at the seeds, glabrous, 2–3 seeded.

Hab.—

Native synonyms:—

Umul-koochi. *B.*
Noonee-gatcha. *Tel.*

Seed.—Legume smooth, ovate-oblong, acuminate, torulose, 2–3 seeded.

Oil.—No sample in the collection, and no information as to its property or characteristics.

Uses.—Roxburgh says an oil is expressed from the seeds, which is used for lamps.

Calophyllum inophyllum, *L.*

DCand. Prod. i. 562; *Roxb. Fl. Ind.* ii. 606; *Wi. & Arn. Prod.* 103; *Wight, Illus.* i. 128; *Wight, Icon.* t. 77; *Beddome, Flor. Sylv. Gen.* xxii.

CALOPHYLLUM BINTANGOR, *Roxb. Fl. Ind.* ii. 607.

A middling sized tree; bark grey, smooth; leaves 4–8 by 3–4 in., coriaceous, shining on both surfaces; veins many, fine, petiole ½–1¼ in.; racemes in the upper axils, loose, 4–6 in. long, shorter than the leaves, lax, few flowered; flowers ¾ in. diameter, pure white, fragrant; pedicels slender, 1–2 in.; sepals four; petals four, like the inner sepals; stamens numerous, filaments in four bundles; ovary globose, stipitate, style much exceeding the stamens, stigma peltate, lobed; fruit 1 in. diameter, globose, smooth, yellow, pulpy. (*Hook. Fl. Ind.* 273.)

Hab.—Western Peninsula; from Concan and Orissa southwards. Ceylon. Eastern Peninsula; from Pegu southwards. Andaman Islands. Malay Archipelago, &c.

Native synonyms:—

Sultanchampa, Surpunka. *H.*
Pinnay. *Tam.*
Poona. Poona-gamū. *Tel.*
Oondee. Surpunka. *Dec.*
Ponna, Poona. *Mal.*
Teldomba. *Cey.*
Poonaga. *Sans.*

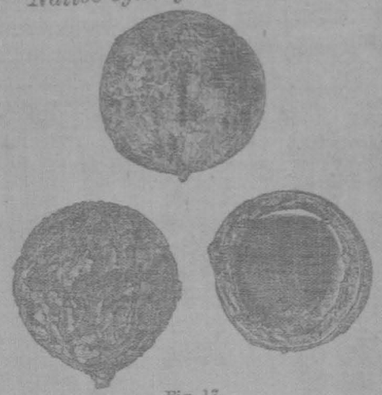


Fig. 17.

Seed.—Fruit 1 in. diam, globose, smooth, yellow, pulpy; seed globose, testa thick and spongy, externally smooth. (Fig. 17.)

Oil.—Thick, dark coloured, green, with a fragrant odour, fluid at ordinary temperatures, but begins to solidify when cooled below 50°.

Uses.—Burning in lamps, for caulking vessels, and in medicine as an external application in rheumatic affections.

Preparation.—The fresh seeds when shelled are stated to yield nearly 60 per cent. of a fragrant green oil. Old seeds afford a higher coloured and thicker product. In Tanjore 437 acres are covered with this tree, which yield 267 maunds of oil at about Rs. 20 per maund. In Tinnevelly it costs As. 4–8, and in Trichinopoly As. 4 per seer. (*Jury Reports*, 1857.)

Seeds in Museum from Bangalore and Madras. Oil from Madras and Saharunpore.

Trade.—In 1847–8, 3,871 gallons of oil and 508 cwt. of seed were exported from Madras to Ceylon and the Straits.

Bibliography.—

Exhibition Jury Reports for 1857.
Agri.-Hort. Journ. ix. 295.

Calophyllum tomentosum, *Wi.*

Wight Illus. i. 128; *Icon.* t. 110; *Hook. Fl. Ind.* i. 274; *Bedd. Fl. Sylv. Gen.* xxii.

CALOPHYLLUM ELATUM, *Bedd. Fl. Sylv.* t. 2.

Tall straight tree; young parts tomentose, leaves elliptic or linear-lanceolate, acuminate, margin waved; racemes pubescent, outer sepals smaller than the inner. (*Hooker.*)

Hab.—Moist forests in W. Peninsula, and in Ceylon.

Fruit.—Fruit ¾ in. long. obliquely ovoid, pointed.

Oil.—The seeds yield an abundance of oil in Ceylon, where it is called "Keenatel."

Uses.—No account of its use, but probably as a lamp oil.

Calophyllum Walkeri, *Wi.*

Wight Illus. i. 128, t. 45; *Hook. Fl. Ind.* i. 275; *Bedd. Fl. Sylv. Gen.* xxii.

CALOPHYLLUM DECIPIENS, *Wi. Ill.* i. 128.

Large tree; quite glabrous; leaves obovate, tip rounded or retuse; racemes in the axils of the upper leaves often collected into a terminal panicle, glabrous, outer sepals shorter than the inner. (*Hook.*)

Hab.—Southern India and Ceylon.

Native synonyms.—The native names applied to closely allied trees require more accurate determination. These names are uncertain for the different species of *Calophyllum*.

Fruit.—Fruit size of a cherry, globose.

Uses.—The seeds yield an oil used for burning.

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Calophyllum Wightianum, *Wall.*

Hook. Fl. Ind. i. 274; *Bedd. Fl. Sylv.* t. 90.

CALOPHYLLUM SPURIUM, *Choisy, DC. Prod.* i. 563; *W. & A. Prod.* i. 103.

CALOPHYLLUM DECIPIENS, *Wi. Icon.* t. 106.

Young shoots 4-gonal, often pruinose; leaves rigidly coriaceous, rounded and usually retuse at the top, veins most prominent on the under surface; racemes from the axils of all the leaves and scars of a few fallen ones, several flowered, shorter than the leaves; peduncles and pedicels slender; flowers ¼ in. diam.; sepals 4, very thin, strongly veined; petals 0; fruit ¾ in. long, ellipsoid.

Hab.—Mountains of the west coast of W. Peninsula.

Native synonyms:—

Pootungee.
Cheroo-pinnay. *Tam.*
Tsirou-panna. *Mal.*

Seed.—Drupe oblong, red and sweet, 1-celled.

Oil.—Probably not greatly differing from the oil of *C. inophyllum*; the "Hone" oil in the collection is not identified, but may belong to this species.

Uses.—For burning in lamps, also in leprosy and cutaneous affections, and in infusion mixed with honey in scabies and rheumatism.

It seems probable that this is the source of the oil which is referred in lists and catalogues to *Calophyllum calaba* and *Calophyllum spurium*.

Camellia theifera, *Griff.*

Griff. Not. iv. 558; *Hook. Fl. Ind.* i. 292.

CAMELLIA THEA, *Brandis, Forest Flor.* p. 25.

CAMELLIA BOHEA, *Griff. Not.* iv. 553.

THEA CHINENSIS, *Linn., Seem. Trans. Linn. Soc.* xxii. t. 61, *et multis aliis.*

THEA ASSAMICA, *Masters, Journ. Agri.-Hort. Soc.* iii. 63.

Shrub, glabrous, or slightly pubescent; leaves elliptic, oblong, acuminate; flowers solitary, on short 2–3 bracteate peduncles; sepals persistent, rotundate, very obtuse, glabrous, or with silky pubescence; petals white, obovate, obtuse, glabrous or pubescent on the back; stamens glabrous, the inner 5 free; ovary villous; styles 3, glabrous, connate beyond the middle; capsule glabrous; testa hard, smooth, shining.

Hab.—China, Upper Assam, &c., extensively cultivated.

Native synonyms:—

Chai. *A., Cash.*
Chá, Cha-ie. *H.*
Teh. *Mal.*
Cha-i. *Dec., P.*
Chá, Cha-ie. *Guz.*
Cha, Te. *Chin.*
Tsja. *Jap.*
Char. *Bombay.*
Tea. *Eng.*

Seeds.—Capsule hard, woody, dehiscing longitudinally, about ¾ in. diam., smooth, brownish, shining; seeds usually one, large, oily.

Oil.—Limpid, clear, tasteless oil, of an amber colour.

Uses.—It is remarked in Agri.-Hort. Journ. that Baron Liebig examined this oil, and found that it could not be discoloured by the usual means, therefore was not fit for an edible oil; that it cannot be used for burning, but that he made of it a very superior soap. With soda he produced a soap of the colour of palm soap, but much harder; with potass he produced a soft soap, without smell, of a light brown colour, both qualities being very superior for cleaning purposes. He was of opinion that the oil might eventually become an article of trade. (*Journ.* xiv. 1866, p. viii.)

Seeds in the Museum collection from Assam and oil from Penang.

Cannabis sativa, *L.*

Roxb. Fl. Ind. iii. 772.

Annual, 4–6 feet, covered all over with an extremely fine rough pubescence; stem erect, branched, green, angular; calyx 5 parted, leaves alternate or opposite, on long petioles, digitate, with linear-lanceolate, sharply serrated leaflets tapering to a long smooth point; flowers in spikes, axillary, clustered, small, greenish white, males lax and drooping, females erect, leafy at the base.

Hab.—Cultivated in the Peninsula.

Native synonyms of seed :—

Ganjar-bij. *B.*
Shah-danaj, Bazrul-ginnab. *A.*
Ganja, Gunja-virai. *Tam.*
Shah-danah, Tukhme-kinnab. *P.*
Bhang-ke-bing, Ganje-ke-bing. *H. Dec.*
Ganja-vittulu, Ganja-atta. *Cey. Tel.*
Kanchava-vitta. *Mal.*
Vajradru-bijam. *S.*
Bhensi-sejav-si. *Burm.*
Bhangi-bija. *Can.*
Bhang-nu-bi, Ganja-nu-bi. *Guz.*
Kinnabis, Defroonus. *Yonanee.*

Seed.—Ovate, slightly compressed, with a shining grey testa.

Oil.—By expression the seeds yield a pale limpid oil.

Uses.—The oil obtained by expression from the seeds of the common hemp is much used in Russia for burning in lamps, but it is unknown to the natives of India. (*Jury Reports*, 1857.) Samples have been made for exhibition purposes, with a deep green or olive green colour, and of these three samples were shown at Madras in 1857.

Seeds in Museum from Bombay, Ahmednugger, Yarkund, and oil from Madras.

Carthamus oxyacantha, *Bieb.*

Fl. Taur. ii. 283; *DC. Prod.* vi. 612.

Herb; branchlets somewhat villous, leaves oblong-lanceolate, with a spiny margin; spines equal to half the breadth of the leaf; fruit ovoid, compressed.

Hab.—In North-West Provinces and Punjab.

Native synonyms :—

Kantiari, Kandiara, Poli, Khareza. *Punj.*

Seed.—Fruit ovate, somewhat compressed, even.

Uses.—Dr. Stewart states that near Peshawar and elsewhere an oil extracted from the seeds is burned and eaten. Bellew says that it is also used medicinally.

Carthamus tinctorius, *L.*

Roxb. Fl. Ind. iii. 409.

Annual, 1–2 feet; stem erect, cylindrical, branching near the summit; leaves oval, sessile, much acuminated, somewhat spiny; heads of flowers enclosed in a roundish spiny involucre, flowers large, deep orange.

Hab.—Cultivated in the Peninsula.

Native synonyms :—

Curdy oil, Safflower oil. *Eng.*
Duhn-el-kartum, Usfer. *A.*
Koosum-ke-tel, Kurda-ka-tel, Koosumbha, Koosum. *H.*
Kajeerah, Koosumbba. *B.*
Sendoorkum. *Tam.*
Koosumba. *Tel.*
Koosumbha. *Dec.*
Cossumb. *Cey.*

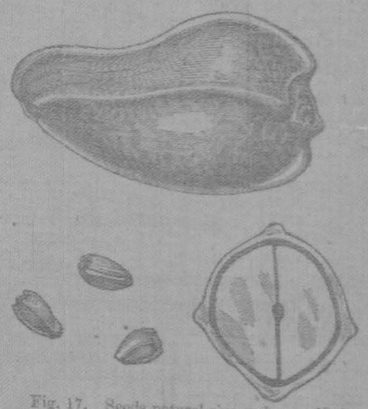


Fig. 17. Seeds natural size and magnified.

Seed.—Bluntly wedge-shaped, laterally compressed, rounded at the upper end, yellowish white.

Oil.—A light yellow, clear, limpid oil.

Uses.—As an external application in paralytic affections and for bad ulcers, for burning in lamps, and for culinary and other purposes.

Preparation.—In Mysore and Bellary the oil costs about Rs. 2.8 per maund.

Mr. R. W. Bingham, in his report on the Sasseram district, observes that there are two varieties of the safflower plant, the first being without prickles and the other prickly. They both produce the safflower dye of commerce. Owing to the prickly qualities of the *Burrya*, it is not so much sown as the kussum, as it is an unpleasant task to gather its flowers, on account of the prickles with which they are armed, and it is generally sown with the spring cereal crops as a kind of fence. Its yield of seed is large in proportion, and both kinds yield about the same quantity, the natives asserting that abstracting the flowers for dye does not affect the weight of seed. The kussum is grown largely by the *Quiries*, the same men who grow opium, and as they use both flower and seed, and irrigate freely, the plant yields largely. The oil is expressed in the same manner as the other oil seeds, after the husks have been removed, for they are thick, and would weigh about one-third of the weight of the seed. When they are removed 25 per cent. of the remainder will represent the extractable oil, which is of a light colour, and burns well. There is also another way

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of extracting the oil, which is peculiar. It renders the oil useless for burning purposes, charring it, in fact, but this is the oil used by the native agriculturist for greasing his well ropes, leathern well buckets, &c., and, in fact, all leather work used for exposure to water. It is a rude still, with the process inverted. A hole is dug in the ground deep enough to receive an earthen jar, or ghurrah, of any capacity, on the mouth of which is placed an earthen plate with a hole of about ¼ in. diameter, bored in its centre. Above this is placed another similar jar, nearly filled with the bhurrah or kussum seed inverted upon the plate; the juncture of the three is luted with clay, and earth there filled in up to some inches above the juncture of the vessels, in fact up to the swell above the neck of the upper inverted vessel. Dried cow-dung is then heaped above the upper vessel, and set on fire. The fire is kept in ignition for about half an hour, when it is removed. The upper inverted vessel is found to be about half full of charred seed, and the lower one, which was embedded in the ground, about one-third full of a black sticky oil. By this process the oil as well as the seed is charred, but the natives assert that it is all the more valuable for the preservation of leathern vessels exposed to the action of water. It might be worth the while to inquire why this should be, and whether this kind of oil would be of any commercial value in England. The yield of oil by this process is more than one-fourth larger than by the press. (*Agri.-Hort. Journ.* xii. 340.)

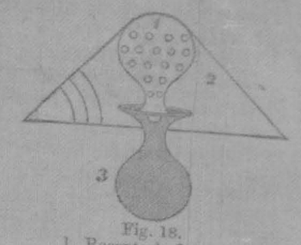


Fig. 18.
1. Receptacle for seed.
3. Piled up fuel.
2. " for oil.

Seeds in Museum from Ahmednugger, Bombay, Calcutta, Bhopal, Lucknow, Ahmedabad, Kurrachee, Poona, Dacca; and oil from Madras, Lucknow, Chota-Nagpore.

Bibliography.—

Agri.-Hort. Journ of India, xii. 340.
O'Shaughnessy, Bengal Dispensatory, p. 412.

Celastrus paniculatus, *Willd.*

Roxb. Fl. Ind. i. 621; *Wi. Ill.* t. 72; *Icon.* t. 158; *W. & Arn. Prod.* 158; *Brandis, For. Fl.* p. 82.

CELASTRUS NUTANS, *Roxb. Fl. Ind.* i. 623.

Unarmed, climbing or scrambling; leaves glabrous, broadly ovate or obovate, acuminate, crenate; flowers unisexual; cymes arranged in terminal compound elongated panicles; peduncles and pedicels pubescent; bracts fimbriate; calyx lobes rounded, toothed; disc mostly connate with the cup of the calyx; stamens inserted on its free margin, anthers attached near the base. (*Brandis.*)

Hab.—Common in many parts of India.

Native synonyms :—

Malkakni. *N.W.P.*
Malkunganee. *H.*
Valuluvy, Pedda-chintoo. *Tam.*
Bavungie. *Tel.*
Kanguni Malkunganee. *Dec.*
Kakundan, Rangul, Wabrangur. *C.P.*

Seed.—Capsule globose, generally 3-valved, 3-celled, 3-seeded; seeds enclosed in a complete red arillus.

Oil.—By expression a deep scarlet coloured oil.

Uses.—Medicinal, being applied to swellings of the body. It is also burnt in lamps and employed in some religious ceremonies.

The seeds submitted to destructive distillation yield the oleum nigrum, an empyreumatic black oily fluid, which is employed in medicine in the treatment of Beri-beri.

Seeds in Museum from Bombay and Madras; and oil from Madras.

Celastrus Senegalensis, *Lam.*

Boiss. Fl. Orient. ii. 11; *Bedd. Fl. Sylv.* t. x. 2; *Brandis, For. Fl.* p. 81.

CELASTRUS MONTANA, *Roxb. Fl. Ind.* i. 620; *W. & A. Prod.* 159; *Wi. Icon.* t. 382.

Glabrous, glaucous or pale green, usually armed with numerous straight axillary spines, generally 1–2 in. long, and often bearing leaves and flowers; leaves variable, in form and size coriaceous, entire or crenate, narrowed into petiole, obovate oblanceolate or linear spathulate; cymes axillary, often 2 or more together on short tubercular branchlets, regularly dichotomous; branches divaricate; bracts triangular, fimbriate; flowers small, pale greenish white, a large proportion sterile; lobes of calyx obtuse or acute, fimbriate; petals oblong, with entire or fimbriate edges; disc broad, flat, 10-lobed; filaments subulate; anthers round, versatile; style short; stigma 3-lobed. (*Brandis.*)

Hab.—Punjab, Salt range, Outer Himalaya, Guzerat, Deccan, and parts of the Peninsula.

Native synonyms :—

Sherawane. *Trans. Indus.*
Malkunganee. *H.*
Valuluvy, Pedda-chintoo. *Tam.*
Baikal, Gajachinni. *C. Prov.*
Bavungie. *Tel.*
Mal-kangani, Malkunganee. *Dec.*
Talkar, Dajkar, Mareila, Kingaro, Kharai. *Punj.*

Seed.—Capsule globose or ovoid, about the size of a small pea, generally 2-valved, often 1 celled, with 1–2, rarely 3 seeds, occasionally 3 valved; seeds (Brandis remarks that in some specimens an arillus is present, and in others they are apparently naked, therefore further examination is necessary).

Oil.—By expression a deep scarlet coloured oil almost of the consistency of treacle.

Uses.—Medicinal.

Cerbera manghas, *Linn.*

Flor. Zeyl. p. 44; *DCand. Prod.* viii. 353.

Leaves sub-opposite (?), lanceolate, rather obtuse, attenuated at the base, smooth, coriaceous, lateral nerves perpendicular to the central, cymes terminal, dichotomous; pedicels longer than the calyx; calyx lobes ovate-acute; drupe apple-shaped.

Hab.—Tenasserim. Martaban. Pegu.

Native synonym :—

Ka-lwa. *Burm.*

Seed.—Drupe pomiform.

Oil.—"The Burmese extract an oil which they burn in lamps, and use to anoint "their heads." No specimen is in the Museum collection.

Bibliography.—Mason's Burmah, 2nd ed. p. 515.

Cerbera odollam, *Gaert.*

Roxb. Fl. Ind. i. 692; *Wi. Ic.* t. 441; *Brandis, For. Fl.* 322.

CERBERA MANGHAS, *Sims. Bot. Mag.* t. 1844.

Large tree or shrub, wholly glabrous, with thick branches; leaves 6–12 in. long, shining, oblong-lanceolate or oblanceolate acuminate, narrowed into petiole 1–1½ in. long; main lateral nerves numerous, parallel, at right angles to midrib, joined by indistinct intramarginal veins; flowers white, sweet-scented, in a corymbose pedunculate cyme; calyx segments linear, reflexed, deciduous; bracts coloured, ½–1 in. long, caducous.

Hab.—Salt swamps, Coast of Bengal, the Peninsula, and probably Sindh.

Native synonyms :—

Caat-aralie. *Tam.*
Odallam. *Mal.*
Ka-lwa. *Burm.*

Seed.—Drupe ovoid, 2–4 in. long, endocarp thick, fibrous.

Oil.—Miquel states that the seeds afford an oil.

Uses.—For burning in lamps.

Cerbera thevetia, *L.*

Linn. sp. p. 304; *Lam. Ill.* t. 170.

THEVETIA NEREIFOLIA, *Juss.*; *DCand. Prod.* viii. 243.

Tree, 12 feet; leaves linear, entire, almost veinless, glabrous; calyx 5 cleft; segments ovate-lanceolate, acute, three times shorter than the tube of the coralla; peduncles extra-axillary at the tops of the branches, 1-flowered; corolla funnel-shaped, tube hairy within; flowers yellow, fragrant.

Hab.—Naturalized in India.

Native synonyms :—

Exile oil. *Eng.*

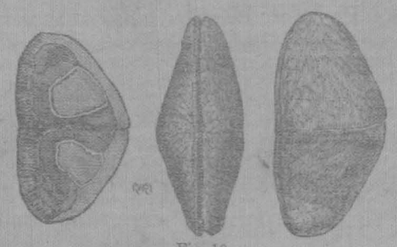


Fig. 19.

Seed.—Drupe half orbicular, truncated at the apex, 2-celled, cells bipartite.

Oil.—Of a clear bright yellow colour.

Seeds in Museum from Saharunpore, but no specimen of the oil, of which a sample was shown at Madras Exhibition of 1857.

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Cirsium, *sp.*

[As the identical species is unknown, no description can be inserted here.]

Hab.—Throughout India.

Native synonym :—

Bhur-bhur.

Several species of the common thistles of India produce small black seeds which yield a large proportion of oil. These seeds are gathered only by the poorer classes and the oil expressed for their own use. It is very smoky when burnt, but otherwise of good quality. None of these thistles are an object of cultivation, but grow abundantly in a wild state, and noted here because it is a well known oil seed. (*Agri.-Hort. Journ.* xii. p. 344.)

Citrullus colocynthis, *Schrad.*

CUCUMIS COLOCYNTHIS, *W. & A. Prod.* 1. 342; *Roxb. Fl. Ind.* iii. 179; *Wi. Icon.* t. 498.

Annual; stems scabrous; leaves smooth above, muricate beneath, with small white tubercles, many cleft, obtuse lobed; tendrils short; female flowers solitary; calyx tube globose and hispid; fruits globose, glabrous, streaked; flowers yellow.

Hab.—Peninsula. Lower India.

Native synonyms :—

Colocynth seed oil. *Eng.*
Indrayan. *H.*
Makhal. *B.*
Paycoomuti, Varriecoomuttie. *Tam.*
Putsa-kaya, Pootsakaia, Paparabudama, Eté-puchcha, Verripuchcha, Chitti-
Indrawan. *Dec.*
Peycommuttie. *Mal.*
Shetì-putsa, Tittacommodoo. *Cey.*
Tru-jo-gosht, Tru-jo-par. *Sindh.*
Hanzil. *P.*
Hanzil. *A.*

Seed.—Elliptical, flattened, smooth.

Oil.—Said to be a clear limpid oil, but no sample is to be found in the Museum collection.

Uses.—Ainslie states that it is used in many of the southern provinces for burning in lamps. Colocynth oil was shown at the Madras Exhibition of 1857.

Cleome viscosa, *L.*

Hook. Fl. Ind. i. 170; *Roxb. Fl. Ind.* ii. 128.

POLANISIA VISCOSA, *DC. Prod.* i. 242.

POLANISIA ICOSANDRA, *W. & A. Prod.* i. 22; *Wi. Ic.* t. 2.

Annual, erect, 1–3 feet, softly pubescent; leaves 3–5, foliate, leaflets ovate or obovate; flowers racemed, long-pedicelled; stamens 12–20; capsule glandular, pubescent. (*Hooker.*)

Hab.—Tropical India.

Native synonyms :—

Hoorhoorya. *H.*
Kat kuddaghoo. *Mal.*
Nahi-kuddaghoo, Nayavaylie. *Tam.*
Chorie-ajowan. *Dec.*

Seed.—Capsule 2–3½ in., striate, narrowed to the top; seeds small, granular.

Oil.—Light olive green coloured limpid oil.

Uses.—Promises to be useful for purposes requiring a very liquid oil.

This oil was exhibited at Madras by Lieut. Hawkes in 1857.

Connarus nitidus, *Roxb.*

Roxb. Hort. Beng. p. 49; *Voigt. Cat.* p. 265.

No species is included under this name in Hooker's Flora of British India, so that the source of the oil obtained in Rangoon requires to be determined.

Hab.—Silhet. British Burmah.

Native synonyms :—

Seed.—Small.

Oil.—Dr. McClelland states that in Rangoon these seeds afford a quantity of a sweet oil.

Connarus speciosus, *McClell.*

Balfour's Cyclopædia, i. p. 329.

Large tree.

This is another supposed species of which no botanical description or information can be obtained. The name is inserted here with this reservation.

Hab.—Rangoon. Pegu. Toonghoo.

Native synonyms :—

Gwai-doak, Kadon-kadet.

Seeds.—Large, but not otherwise described.

Oil.—McClelland states that the seeds yield abundantly a sweet oil.

Cornus sanguinea, *L.*

Brandis, For. Fl. p. 253.

Shrub, or small tree, pubescent, with membranous opposite, elliptic or ovate-elliptic leaves, acute or short acuminate; main lateral nerves 4 pair, arcuate, the lower 2–3 pair proceeding from the base or the lowest third of the midrib, all or the upper 3 pair meeting at the apex of the leaf; leaves 1–3 in. long, petiole ½ in. long; cymes terminal, dense-flowered, 2 in. across, peduncle longer than the cyme; flowers cream white, buds before opening ¼ in. long; berry subglobose, less than ¼ in. long, black when ripe.

Hab.—Europe, Siberia. Cashmere, 7,000 ft.

Fruit.—Berry subglobose, less than ¼ in. long, black when ripe; seeds oblong, compressed.

Oil.—The pericarp of the fruit contains oil. (*Brandis.*)

It is doubtful whether this oil is any more than a mere curiosity.

Corylus colurna, *L.*

Brandis, For. Fl. p. 494.

Corylus Jacquemontii, *Done. in Jacq. Voy. Bot.* t. 160.

Corylus lacera, *Wall.*

Small, or moderate sized tree; buds short, nearly hemispherical; leaves glabrous, ovate, acuminate, base cordate, unequally serrate, main lateral nerves 10–12 pair, each nerve terminating in a more or less distinct lobe, blade 5–6, petiole 1–1½ in. long; culkins fasciculate, scales obovate, acute, bearing along the midrib eight 1-celled anthers on short, often more or less connate filaments; fruit in clusters of 2–3; involucre subcoriaceous, double, the inner sheathing, with numerous elevated ribs, cleft into linear lanceolate serrate lobes with glandular hairs, the outer of several laciniate bracts. (*Brandis.*)

Hab.—N.W. Himalaya.

Native synonyms :—

Urni. *Jhelum.*
Winri, Wiri, Warawi Wūriya, Thangi, Thankoli. *Kash.*
Shūrli, Sharoli, Gch. *Sutlej.*
Kapasi, Bhotia, Badām. *N.W.P.*
Findak (nuts). *Punj.*

Fruits.—Fruit in clusters of 2–3, involucre subcoriaceous, double, the inner sheathing, with numerous elevated ribs, cleft into linear lanceolate, serrate lobes with glandular hairs, the outer of several laciniate bracts; nuts similar to the common European filbert.

Oil.—The oil extracted from filberts in Europe is sweet and limpid; this would doubtless partake of the same characters, but none is to be found in the Museum collections.

Probably *Corylus ferox*, Wall. would yield a similar oil.

Croton oblongifolius, *Roxb.*

Roxb. Fl. Ind. iii. 685.

Small tree; leaves oblong, serrate, two glanded at the base, smooth; racemes terminal, shorter than the leaves; flowers solitary, pale yellowish green; petals woolly, filaments twelve, distinct, woolly at the base; capsules globose, six-furrowed.

Hab.—Bengal.

Native synonyms :—

Baragach, *B.*

Seeds.—Capsule globular, tricoccous, with six furrows; seeds —— ?

Oil.—Seeds and oil said to resemble in their properties those of *Croton tiglium*; but of this further and more definite information is desirable. No sample of either in the Museum collection.

Uses.—Medicinal.

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Croton pavana, *Hamilt.*

Ham. in Trans. Linn. Soc. xiv. 259; *DC. Prod.* xv. 623.

Tree; branches shining, naked; leaves alternate, petiolate, ovate, smooth, acuminate, somewhat trinervate, serrate; stipules lateral, setaceous; racemes terminal; flowers pedicellate, small, male above, female below.

Hab.—Assam, Burmah.

Native synonym :—

Thet-yen-nee. *Burm.*

Seed.—Capsule trigonous, hispid, the cells inflated and much larger than the seeds.

Oil.—Probably not differing from that of allied species, but of this we have no definite information.

Croton tiglium, *L.*

Roxb. Fl. Ind. iii. 682; *Brandis, For. Fl.* 440.

Small tree, glabrous, without scales, pedicels and ovary hairy; leaves ovate, acuminate, serrate, with 3 basal nerves; female flowers without petals. (*Brandis.*)

Hab.—Bengal. S. India. Burma. Ceylon. Indian Archipelago.

Native synonyms :—

Jamalgota. *H.*
Jamalgota, Jyal, Rechuk. *B.*
Neervalum. *Tam.*
Naypalum. *Tel.*
Cadel avanacu, Neervaula. *Mal.*
Jayapala. *Can.*
Nepaylum. *Cey.*
Bori. *My.*
Kannakoh. *Burm.*
Batoo. *A.*
Dund. *P.*



Fig. 20.

Seed.—Capsule obtusely 3-cornered, ¾ in. long, seeds oblong, rounded at the extremities, inner surface flattened, outer convex, about the size of coffee beans. (Fig. 20.)

Oil.—The oil is orange yellow, powerfully cathartic, reddens litmus paper. Contains 45 parts of acrid acid, combined with 55 parts of bland oil.

Uses.—A drastic cathartic.

Preparation.—Croton oil, says O'Shaughnessy, is prepared by grinding the seeds, placing the powder in bags, and pressing them between plates of iron. Allow the oil to stand for 15 days, then filter. The residue of the expression is triturated with twice its weight of alcohol, and heated on the sand bath from 120° to 140° F., and the mixture pressed again. The alcohol is distilled off, the oil allowed to settle, and filtered after a fortnight. One seer of seed furnished Soubeiran by this process rather more than 11 fluid ounces of oil, six by the first step and five by alcohol.

History.—Herodotus (lib. ii. c. 94) says that, "The Egyptians who live about the fens "use an oil drawn from the fruit of the Sillicypria, which they call kiki, and they make "it in the following manner :—They plant these Sillicypria, which in Greece grow "spontaneously on the banks of the rivers and lakes; these when planted in Egypt "bear abundance of fruit, though of an offensive smell. When they have gathered it "some bruise and press out the oil, others boil and stew it, and collect the liquid that "flows from it; this is a fatty oil and no less suited for lamps than that of the olive, "but it emits an offensive smell." Upon this Blakesley comments thus :—"The Hel-"lenic name of this plant was according to Hesychius, *croton*, it being in fact that "from the seeds of which the modern croton oil is expressed." (*Blakesley, Herod.* i. p. 231, note.)

Seeds in Museum from Bombay, Mangalore, Madras, Burma; and oil from Calcutta.

Bibliography.—

United States Dispensatory (1867), p. 606.
Amer. Journ. of Pharmacy (1860), p. 307; (1864), p. 418.
Journ. de Pharmacie, 3 sér. xxxi. 28.
Woodville, Medical Botany, 3rd ed. vol. v. p. 71.
Pharmacographia, p. 508.

Cucumis melo, *L.*

Wi. & Arn. Prod. i. 341; *DCand. Prod.* iii. 300.

Stem trailing, scabrous, cirrhiferous; leaves roundish, angular, petiolate; male flowers having the tube of the calyx rather ventricose at the base, and dilated at the apex; stamens enclosed, anthers shorter than their connectives; the hermaphrodite

flowers with the anthers as in the males; stigmas 3–4, shortly 2-lobed; fruit ovate or subglobose, 8–12 furrowed, flesh sugary, yellow, red, or white.

Hab.—Native of Asia. Cultivated.

Native synonyms:—

Melon seed oil. *Eng.*
Kurbooja. *H.*
Khurbuz, Kurbooja. *B.*
Gidhro. *Sindh.*
Baka-coy. *Mal.*
Molam. *Tam.*
Rata-komadu. *Cey.*
Beteekh (Musk melon), Kirboozeb. *A.*
Labofrangee. *My.*

Seed.—Seeds elongated, elliptical, flattened, smooth.

Oil.—A sweet edible oil obtained by expression from the seeds. Lieut. Hawkes states that oil is expressed from seeds of Cucurbitaceæ in the Masulipatam and Guntoor districts, but that the bulk of the fruit is sold and eaten before it arrives at maturity.

Seeds in Museum from Madras and Ahmedabad.

Cucumis sativus, *L.*

DCand. Prod. iii. 300; *Wi. & Arn. Prod.* i. 342.

Stems rough, bearing tendrils; leaves cordate, obscurely 5-lobed, petiolate, terminal lobe the largest; flowers on short peduncles, largish, usually by threes, male flowers having the tube of the calyx tubularly campanulate, and with a spreading deflexed limb; fruit long, somewhat triquetrous, smooth or prickly, usually shining, having the carpels distinctly separable in the inside.

Hab.—Cultivated.

Native synonyms:—

Cucumber seed oil. *Eng.*
Keera. *H.*
Susha. *B.*
Moolloo-velleri. *Tam.*
Mullen-belleri. *Mal.*
Keera-kankurai. *Dec.*
Rata-kækeri, Pipingya. *Cey.*
Kusud. *A.*
Antimun. *East. Archipel.*

Seed.—Elongated, narrow, flattened, smooth.

Oil.—A pale bland oil obtained by expression.

Uses.—In cookery and for burning in lamps.

Cucumis utilissimus, *Roxb.*

Roxb. Fl. Ind. iii. 721; *W. & A. Prod.* i. 342.

Trailing, stems scabrous; leaves broad-cordate, more or less 5-lobed; lobes rounded and toothed; male flowers crowded, female solitary; fruit short, oval, when young pubescent, when old glabrous, variegated; flowers yellow.

Hab.—Cultivated.

Native synonyms:—

Kakrie. *H.*
Kaukoor-kurktee. *B.*
Doshai, Dos-kai, Pandili-dosa, Nakka-dosa. *Tel.*

Seeds.—Elongated, narrow, flattened, smooth.

Oil.—The seeds contain much farinaceous matter, mixed with a large proportion of mild oil.

Uses.—The oil is used for lamps.

Seeds and oil in the Museum from Madras.

Cucurbita citrullus, *W. & A.*

DC. Prod. iii. 301; *Rumph. Amb.* v. t. 146, f. 1.

Plant very pilose; stems trailing, cirrhiferous; leaves bluntly pinnate, or many parted, rather glaucous; flowers solitary, each furnished with one oblong bractea; fruit nearly globose, glabrous, with starry spots.

Hab.—Cultivated.

Native synonyms:—

Water melon. *Eng.*
Kharbuz. *N.W.P.*
Samanka. *H.*

Seed.—

Oil.—Clear, bland, pale coloured limpid oil.

Uses.—As a lamp oil, and probably also as an edible oil.

Oil in the Museum Collection from Madras.

Cucurbita ovifera, *Linn.*

Linn. Mant. p. 126.

Leaves cordate, angular, 5-lobed, denticulated, pubescent; calyx obovate, ending in

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a short neck, and cut round after flowering to the neck; fruit obovate or ovate, smooth, greenish or yellowish.

Hab.—Cultivated.

Native synonyms:—

Suppara-roomro, Sufura-koomra. *H.*

Seeds.—Flat, ovate, smooth.

Oil.—Mild, bland, pale coloured.

Uses.—Same as others from seeds of Cucurbitaceæ.

Seeds in the Museum collection from Bengal and Mysore.

Cucurbita pepo, *L.*

Linn. sp. 1435; *DC. Prod.* iii. 317.

Leaves cordate, obtuse, somewhat 5-lobed, denticulate; calyx ending in a neck beneath the limb; fruit roundish or oblong, smooth.

Hab.—Cultivated.

Native synonyms:—

Pumpkin seed oil. *Eng.*
Koshnanto, Koomra. *B.*
Koomra. *H.*
Boorda-gomodoo, Cumbuly, Budadi-gumadi, Potti-gumadi. *Tel.*
Cumbulam. *Mal.*
Alu-puhul. *Cey.*
Pandree-chickee. *Bombay.*

Seed.—Flattened, elongated ovate, smooth.

Oil.—A clear, limpid, pale, almost colourless sweet oil.

Uses.—An edible oil, and also for lamps.

Seeds in the Museum collection from Bombay and Ahmednugger.

Cynometra cauliflora, *L.*

W. & A. Prod. 293; *DC. Prod.* ii. 509; *Lam. Ill.* t. 331, f. 2; *Rumph. Amb.* i. t. 62.

Tree; leaflets oblong-lanceolate, acute or slightly emarginate; peduncles several, aggregated, springing from tubercles on the trunk, each bearing a raceme; stamens 10.

Hab.—North Arcot Forests.

Native synonym:—

Iripa. *Mal.*

Seed.—Legume fleshy, semi-lunate, compressed, tuberculate; seed smooth, solitary, ferruginous red, cotyledons plano-convex.

Oil.—Undescribed, and no sample is to be found in the Museum collection.

Uses.—Wholly for medicinal purposes.

Cynometra ramiflora, *L.*

W. & A. Prod. 293; *Rheede, Mal.* iv. t. 31.

Tree; leaves composed of 2–6 opposite leaflets; calyx tube very short, 4 partite, segment reflexed; petals 5, oblong lanceolate; stamens distinct, inserted with the petals into a ring lining the calyx tube; peduncle solitary, few flowered, springing from the branches among the leaves; flowers white.

Hab.—Malabar.

Native synonyms:—

Iripa. *Mal.*
Gal-mendora, Hal-mendora? Galmendora-gaha. *Cyn.*
Iroopoo. *Can.*

Seed.—Legume thick, fleshy, 1-seeded; seed somewhat reniform.

Oil.—Undescribed, and no sample in the collection.

Uses.—Applied externally in scabies, leprosy, and other cutaneous diseases.

Dalbergia lanceolaria, *L.*

Brandis, For. Fl. p. 151.

Dalbergia frondosa, *Roxb. Fl. Ind.* iii. 226; *Wi. Ic.* t. 266; *W. & A.* 266.

Tree; glabrous, inflorescence covered with ferruginous pubescence; leaflets 11–15, oval or oblong obtuse, 1–2 in. long; lateral nerves numerous, parallel veins; joined by reticulate panicles large, lax, terminal and axillary; flowers $\frac{1}{3}$–$\frac{1}{2}$ in. long, on slender pedicels, in short unilateral racemes; calyx broad-campanulate or turbinate, hairy outside, glabrous inside, the 2 upper teeth obtuse, the 3 lower teeth acute; standard obovate, thickened above the claw; stamens 10, equally diadelphous; ovary long, stipitate, generally hairy at the base, with 3 ovules. (*Brandis.*)

Hab.—S. India on the west side, Siwalik, and Outer Himalaya.
Native synonyms :—

Takoli Bithua. *N.W.P.*
Barbet, Parbati. *Baswarra.*
Gengri. *Panch Mehals.*
Harrani. *Dharwar.*

Seed.—Legume, 1½–4 in. long, ⅝–¾ in. broad, attenuated towards each end, 1–3 seeded, smooth ; seed obliquely reniform, compressed, even.
Oil.—No sample of seed or oil is in the Museum collection.
Uses.—In rheumatic affections.
Bibliography.—
Roxburgh, Flora Indica, iii. 226.
Drury's Useful Plants, p. 175.

Dalbergia latifolia, *Roxb.*

Roxb. Col. Pl. t. 113 ; *Fl. Ind.* iii. 221 ; *W. & Arn. Prod.* 264.
Wi. Ic. t. 1156 ; *Bedd. Fl. Sylv.* t. 24 ; *Brandis, For. Fl.* p. 148.
Large glabrous tree, with dark purple heartwood ; leaflets 3–7, generally 5, alternate, broad obovate or orbicular, obtuse or emarginate ; flowers greenish or yellowish white, on slender pedicels as long or nearly as long as the calyx tube, in axillary, branched, and divaricating panicles ; calyx segments oblong or ovate obtuse ; stamens 9, all united in a sheath open on the upper side ; ovary glabrous, with 5 ovules ; style slender, nearly as long as ovary ; legume oblong-linear or oblong lanceolate, 1–4 seeded. (*Brandis.*)
Hab.—Dry forests of S. and Central India, lower Bengal, &c.
Native synonyms :—

Shwet-sal, Sit-sal. *B.*
Corin-toweray, Eettie, Erupothi. *Tam.*
Viroo-goodu-chawa, Irugudichettu. *Tel.*
Ettie. *Mal.*
Biti. *Can.*
Seesoo. *Bombay.*

Seed.—Legumes oblong linear, or oblong lanceolate, 1–4 seeded ; seed reniform, compressed.
Oil.—No specimen of seed or oil in the collection.
Uses.—Uncertain, probably medicinal.
The seeds of a species of *Dalbergia* called *Kungee* are said to be employed at Malwa for the extraction of oil. It is possible that this may only be the oil of *Pongamia glabra*. Leaves and legumes recently received from India under the name of *Kungee* are certainly those of *Pongamia glabra*.

Diospyros embryopteris, *Pers. Ench.* ii. 624.

Brandis, For. Fl. 298 ; *Bedd. Fl. Sylv.* t. 62 ; *DC. Prod.* viii. 235.
DIOSPYROS GLUTINOSA, *Roxb. Fl. Ind.* ii. 533.
EMBRYOPTERIS GLUTINIFERA, *Roxb. Cor. Pl.* i. t. 70 ; *Wi. Icon.* t. 844.
Tree, 25–30 feet ; leaves alternate, linear-oblong pointed, glabrous, shining, short petioled ; male peduncles axillary, solitary, 3–4 flowered ; stamens 20 ; females 1 flowered, larger than the male ; stamens 2–4, short ; pistils 4 ; nut globular, size of a small apple, rusty-coloured, filled with pulpy juice, and covered with a rusty farina ; seeds 8 ; flowers white.
Hab.—Peninsula. Travancore. Assam. Bengal.
Native synonyms :—

Tumi, Tumiki, Tubiki, Tinduki, Tumika, Tumei. *Tel.*
Gaub, Gab. *H.*
Gaub, Tumika ? Gab. *B.*
Panichi-maram ? Tumbikai, Tumbika, Panichika. *Tam.*
Gab ? Sindica. *Sans.*
Timberee-gass, Timberri. *Cym.*
Cusharatha-mara, Kusharta-mara. *Can.*
Pani-jika, Panitsjaka. *Mal.*
Banichie ? (*Travancore.*)
Gusvakendhu. *Uriya.*
Kendu. *Ass.*


Fig. 21.

Seed.—Fruit globose, supported by the enlarged calyx lobes (Fig. 21), covered with rusty coloured mealy tomentum, glabrous at last, greyish yellow when ripe, 1½–2 in. diam. ; seeds 5–8, embedded in a viscid glutinous pulp.
Oil.—Extracted from the seeds by boiling. No sample in the Museum collection. It seems to us very doubtful whether it is really a fatty oil.
Uses.—Employed in native medicine.
Bibliography.—Drury's Useful Plants, p. 195.

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Entada scandens, *Benth.*

Benth. in Hook. Journ. Bot. iv. (1842), 332 ; *Brandis*, p. 167.
ENTADA PURSAETHA, *DC.* ; *W. & A. Prod.* 267.
MIMOSA SCANDENS, *Roxb. Fl. Ind.* ii. 554.
Large climber, stems angled, often curiously twisted and curled ; glabrous, but inflorescence pubescent ; common petiole ending in a long woody bifid tendril ; pinnæ 2 pair ; leaflets 3–4 pair, 1–3 ins. long, shiny ; flowers pale yellow, sessile, in long slender spikes, generally 4–8 on a common peduncle from the axils of the former leaves, on 2–3 year old branchlets ; pods ligneous, of an immense size, 2–4 feet long, 3–4 ins. broad, constricted between the seeds, consisting of 10–30 ; 1 seeded, flat, rounded, jointed, the valves separating from the more durable thick rim ; seeds flat, ovate, or nearly orbicular. (*Brandis.*)
Hab.—S. India, E. Bengal, Nepal, Burma, Ceylon, &c.
Native synonyms :—

Gilla. *B.*
Gardal. *Malor.*

Seed.—Pods ligneous, 2–4 feet long, 3–4 in. broad ; seeds 10–30, flat, ovate or nearly orbicular, brown, shining, testa very hard.
Oil.—Said to be expressed from the seeds, but we have no record of its properties.
Uses.—Uncertain.
Seeds in the Museum are from Madras.

Eriodendron anfractuosum, *Wi. & Arn.*

Hook. Fl. Ind. 350 ; *Wi. & Arn. Prod.* i. 61 ; *Wi. Icon.* t. 400.
BOMBAX PENTANDRUM, *Linn.*
Tree, 50–60 feet ; trunk prickly at the base ; branches growing out horizontally from the stem, three from one point ; leaflets 5–8, quite entire, or serrulated towards the point, lanceolate, mucronate, glaucous beneath ; petals 5, united at the base, filaments joined at the base, each bearing 2–3 versatile anfractuose anthers ; style, crowned with a 5–6 cleft stigma ; capsule, 5-celled, 5-valved ; cells, many seeded ; seeds embedded in silky cotton ; flowers white, springing from the branches.
Hab.—Peninsula. Travancore.
Native synonyms :—

Ilavam, Elavum-maram, Elavamaram. *Tam.*
Buruga, Boorooga, Pur Poor, Burugumanu. *Tel.*
Shwet-shimool. *B.*
Hattian, Safed-simal, Katan. *H.*
Shamicula. *Mahr.*
Pania, Paniala. *Mal.*
Imbool, Imbool-gass, Pulim. *Cyn.*
Suffaid-sembul, Shameula. *Dec.*

Seed.—Capsule oblong, like a cucumber, septa membranous, tardily dehiscing ; seeds numerous, subpyriform, black, glabrous.
Oil.—A dark brown clear oil, obtained by expression of the seeds, which was exhibited at Madras in 1857.
Uses.—Uncertain.
Seeds in the Museum from Chingleput.
Bibliography.—Drury, Useful Plants, p. 198.

Eruca sativa, *Lamk.*

Hook. Fl. Ind. i. 158.
BRASSICA ERUCA, *Linn.* ; *Hook. & Thom. Journ. Linn. Soc.* v. 171.
BRASSICA ERUCOIDES, *Roxb. Fl. Ind.* iii. 117.
Herb ; glaucous, glabrous or subhispid ; stem 6–18 in. ; leaves variously toothed, rarely obovate and subentire ; flowers large, pale yellow or white, and veined, sepals often tipped with hairs ; pods 1 in., erect, and adpressed to the stem, pedicels shorter than the calyx, valves twice as long as the broad flattened beak. (*Hook.*)
Hab.—Cultivated places in N. and C. India, W. Himalaya to 10,000 feet, and Upper Gangetic valley.
Native synonyms :—

Taramira. *H.*
Assu. *Punj.*

Seed.—Pods 1 in., valves twice as long as the broad flattened beak; seeds numerous, biseriate, globose.

Oil.—Roxburgh says that it is cultivated during the cool season for the seed, from which oil is procured by expression. The sample in the Museum has the character of colza oil, but is rather high coloured.

Cabbage seed oil was shown at the Madras Exhibition of 1857, but whether from this or another species of *Brassica* is uncertain.

Oil in the Museum from Lahore.

Euphorbia dracunculoides, *Lam.*

DC. Prod. xv. 140; *Boiss. Euphorb. Ic.* t. 91.

EUPHORBIA LANCEOLATA, *Rottl. Roth. Pl. Ind.* 229.

Annual, usually many stemmed; stems erect, leafy, from straightly branched axils; rays of the umbel 2–3 elongated, many times dichotomous; leaves narrowly linear lanceolate, acute, attenuated at base, fural ones abbreviated, lanceolate, from a broader base; lobes of the turbinate involucre ovate, denticulate ciliate, glands semilunate, transversely broader, horns of equal length or shorter than the breadth of the glands; styles free, short, 2-cleft, capsule depressed.

Hab.—Punjab. Bengal. Madras. Concan.

Native synonym:—

Jy-chee. *B.*

Seed.—Capsule deeply 3-furrowed; seed oblong, blackish, with whitish tubercles, often meeting in lines at the base.

Oil.—Limpid, clear, of a yellowish or greenish yellow colour.

Uses.—As a drying oil and for burning.

This oil having been submitted to London brokers in 1843 it was reported that it is a drying oil of a superior description, yet not more valuable than linseed oil, as it could only be used for that purpose. A portion of the samples submitted were of a yellowish colour exactly like linseed oil; the rest was of a greenish colour, having something of the appearance of bleached or refined linseed oil. (*Agri.-Hort. Journ.*)

Mr. Tonnochy considers it far more valuable than linseed oil, and that it will prove to be so on further trial. He remarks that it apparently possesses greater fluidity, and does not, like linseed oil, turn thick and ropy by age, and as it hardly emits any smoke when burning for light, and forms no head, it must be taken to be far more pure from extraneous matter than linseed oil.

The seed after it has been husked yields about $\frac{1}{8}$ to $\frac{1}{4}$ of its weight of oil, the quantity depending upon the maturity which the seed had attained at the time of being gathered.

Particulars as to cultivation are contained in Agri.-Hort. Journ. (1843), under the name of "Jy-chee."

Neither seed or oil in the Museum collection.

Bibliography.—Agri.-Hort. Journ. India, ii. p. 52, t. 89 (1843), ix. 47.

Gossypium arboreum, *Linn.*

DCand. Prod. i. 456; *Hook. Fl. Ind.* i. 347.

Arborescent or shrubby; leaves nearly glabrous, deeply palmately 5–7 lobed, lobes linear-oblong; flowers purple, rarely white; bracteoles nearly entire; cotton not readily separable from the seed.

Hab.—Plains of India.

Native synonyms.—See under *Gossypium herbaceum.*

Seeds.—Capsule about 1 in. oblong, pointed; seeds free, covered with white wool overlying a dense green down.

Oil.—Same as that obtained from other species of cotton.

Uses.—See *Gossypium herbaceum.*

Gossypium Barbadense, *Linn.*

DCand. Prod. i. 456; *Hook. Fl. Ind.* i. 347.

Herbaceous or shrubby; leaves nearly glabrous, cordate, 3–5 lobed, lobes oblong, acuminate; bracteoles very large, deeply gashed; petals convolute, yellow with a crimson spot; capsule oval, acuminate.

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Hab.—Cultivated.

Native synonyms.—Same as the native cotton, *G. herbaceum.* Yields the American (Sea-Island, New Orleans, &c.) cotton.

Seeds.—Seeds black, free or coherent, covered with readily separable white or brownish cotton.

Oil.—Not differing from that of other species of cotton.

Uses.—See *Gossypium herbaceum.*

Gossypium herbaceum, *Linn.*

DCand. Prod. i. 456; *Hook. Fl. Ind.* i. 346.

Annual or perennial, hairy or sub-glabrous; leaf-lobes broadly ovate acuminate; flowers yellow with a purple centre, rarely wholly yellow or white or purple, petals spreading; bracteoles not divided below the middle, sometimes entire or nearly so; cotton white or brownish, adherent to the seeds, overlying a grey or greenish down. (*Hooker.*)

Hab.—Cultivated in India.

Native synonyms:—

Kapase, Tula. *B.*
Kapas, Rooi. *H.*
Pungie, Paratie, Van-paratie. *Tam.*
Puttie. *Tel.*
Kapas. *Dec.*
Capas. *My.*
Kapu. *Cey.*
Kootn Beersoon. *A.*
Poombeh. *P.*

Seed.—Ovate, clad with an adherent greyish down.

Oil.—Dark turbid oil when crude, but capable of being refined into a clear amber coloured oil.

Uses.—For burning in lamps. Used medicinally as a demulcent, and is applied to lepra, scabies, and other skin diseases.

Preparation.—Cotton seed is more used as a food for cattle than as an oil producing seed, and is considered in cotton localities to be a better food for the working bullock than grain. It produces under the action of the native oil mill 25 per cent. of a good oil, which by being purified might grow into an extensive article of commerce. Mr. Bingham does not think it would answer to export the seed, as owing to the fibre adhering to it, and perhaps from other causes, it is very liable to heat and deteriorate in bulk. The oil is said to be a very useful oil, more so than most others, for machinery purposes. (*Agri.-Hort. Journ.* xii. 344.)

Seeds in the Museum from numerous localities, and refined oil.

Bibliography.—

Agri.-Hort. Journ. of India, xii. 343.
Pharmaceutical Journal, 1 ser. xvi. 334; 2 ser. vii. 226; 3 ser. 30, 485.
Hawkes' Report on Oils of S. India, p. 39.
Drury's Useful Plants, p. 234.

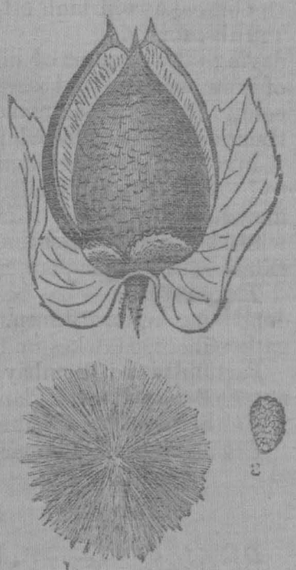


Fig. 32.

Guizotia oleifera, *DC.*

DCand. Prod. v. 551.

VERBESINA SATIVA, *Roxb. Fl. Ind.* iii. 441.

RAMTILLA OLEIFERA, *DC. in Soc. Gen.* 1833; *Wi. Contr.* p. 18.

Annual, herbaceous, erect; leaves opposite, long lanceolate, coarsely serrated; peduncles elongated, subcorymbose; flowers large, bright yellow.

Hab.—Cultivated.

Native synonyms:—

Kala-til. *H.*
Ramtil. *B.*
Valesuloo. *Tel.*



Fig. 23. Seeds, nat. size and magnified.

Seed.—Shining, black, cylindrical, tapering towards the apex. (Fig. 23.)

Oil.—Limpid, clear, pale, sweet tasted oil.

Uses.—As an edible oil, for culinary purposes amongst the poorer classes in India, as a lamp oil for burning. Lieut. Hawkes states that it is said to mix with colours as well as linseed, and to dry without litharge, although a little improves it. In the south it is used for nearly the same purposes as gingelly oil, and from its inferior quality and low price is frequently used to adulterate both this and castor oil.

Preparation.—The valuation of this oil seed in the London market by brokers in 1851 was to the following effect:—"It has been imported from Africa as Niger seed, "and from Bombay as Kersance seed, and the present value of the quality represented "by the sample is 37*s.* per quarter, taking the value of rape seed at 48*s.* The oil is "good, but the yield is only about 16 gallons against an average of about 20 from "rape seed per quarter. The cake is unfit for feeding, and could only be used for "manure owing to the horny excrescence (sic) and dry, heating property of it. The "average weight of this seed is also deficient of that of rape seed 8 lbs. per bushel, "which is of great moment in making calculations for shipment. There is no doubt "it would meet with a ready sale at its relative value to rape seed." (*Agri.-Hort. Journ.* 1851.)

Col. Sykes has remarked of this seed that in the Dekkan its oil is the great substitute for ghee with the poorer classes of cultivators and the population generally, and that the oil cake is in high esteem for milch cows, the price at Poona in Jan. 1825 being 120 lbs. for 2*s.*

As to the amount of oil yielded by the seed, it is stated by Col. Sykes that 12 seers of seed in bulk in a stone mill will produce 3 seers, or 6 lbs. of oil in weight, or 25 per cent. Experiments made by Mr. Solly and reported to a committee of the Royal Asiatic Society, fixed 35 per cent. as the yield of this seed, or about 10 per cent. less than "Til" seed (*Sesamum orientale*).

In the Nuggur division of Mysore the current price for this oil was Rs. 3.8. per maund (in 1856), but it is considered inferior to gingelly oil.

Seeds in the Museum from Poona, Mysore, Madras, Moorshedabad, Ahmednugger, Bimlipatam, Midnapore, and Bhopal. Oil from Chota-Nagpore, and Madras.

Bibliography.—

Agri.-Hort. Journ. of India (1851), viii. p. 61; ix. 47; vii. 40.
Lieut. Hawkes on the oils and oil seeds of S. India.
Birdwood, Bombay Products, p. 303.
Drury, Useful Plants, p. 238.
Simmonds's Commercial Products, p. 535.
Balfour's Dictionary, ii. 422.

Helianthus annuus, *Linn.*

DC. Prod. v. 585.

Annual; stem simple, erect; leaves alternate, petiolate, cordate or broadly ovate, trinerved, coarsely serrate; capitulum large, nodding; involucral scales broadly ovate, abruptly acuminate, ciliate.

Hab.—Cultivated.

Native synonyms:—

Sunflower. *Eng.*
Suraj-mukhi. *H.*
Suria-mukhi. *Sans.*
Aditya, Bhakti-chettu, Pedda-tringudda-chettu. *Tel.*

Seeds.—Seeds laterally compressed and angular, somewhat wedge-shaped, smooth.

Oil.—Clear fluid oil resembling that of the ground nut.

Samples of this oil sent over for valuation and report, were said to be of fine quality, ranking with Madras ground nut oil in this market, and saleable at 36*l.* per ton; olive oil at the same date being rated at from 44*l.* to 47*l.* per ton.

Cultivation.—From reports published by the Agri-Hort. Soc. of India, it appears that in Mysore 1 acre of the best land would yield about 11½ cwt. of seed, from which

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would be obtained 45 gallons of oil, worth about 140 rupees, at a total cost of 132 rupees.

Sunflower seed oil is made extensively in Russia, and the seeds are a commercial article for this purpose. Bremner says ("Interior of Russia") that the sunflower is raised in Tartary chiefly for the oil expressed from it.

Seed in the Museum from Khandeish.

Bibliography.—

Birdwood, Bombay Products, p. 303.
Simmonds' Commercial Products, p. 537.
Reports, Agri.-Hort. Soc. of India, April 1873.
Agri.-Hort. Journ. ix. 366.

Heritiera littoralis, *Dryand.*

DC. Prod. i. 484; *Hook. Fl. Ind.* i. 363; *Roxb. Fl. Ind.* iii. 142.

Tree; leaves oblong, base rounded or subcordate, coriaceous, white beneath, with flat scales; stipules lanceolate caducous; male flowers small, in axillary much branched clusters, shorter than the leaves; ripe carpels smooth, outer margin winged, inner keeled.

Hab.—Coasts of Bengal, and Eastern and Western Peninsulas, inland as far as the Khasia Hills, and Cachar.

Native synonyms:—

Doengngoen-Koutol. *My.*
Ka-na-zoe, Kon-zo-za-loo, Kunnazoo, Kannatso. *Burm.*

Seeds.—Fruit 1–4 inches, oblong, woody, smooth or tubercled.

Oil.—This tree is reported as the source of oil in the Antilles.

Uses.—Uncertain.

No sample of seed or oil in the Museum collection.

Hibiscus cannabinus, *L.*

DC. Prod. i. 450; *Hook. Fl. Ind.* i. 339; *Cav. Diss.* iii. 148, t. 52, f. 1.; *Roxb. Fl. Ind.* iii. 208; *Cor. Pl.* 1, t. 190.

Annual or perennial, prickly, stem glabrous; lower leaves entire, upper lobed, mid-nerve glandular beneath; peduncle very short; bracteoles 7–10, linear, shorter than the calyx, sepals glandular. (*Hooker.*)

Hab.—Generally cultivated.

Native synonyms:—

Maesta-pat, Mesta-paut, Nalkee, Puloa. *B.*
Palungoo. *Tam.*
Gongkura. *Tel.*
Ambaree. *Dec.*
Punday, Pundrica. *Can.*
Sunnee. *Saharunpore.*
Wilaitee-sun. *Muttra.*
Pooley-numajee. *Coimbatore.*

Seed.—Capsule globose, pointed, bristly; seeds nearly glabrous.

Oil.—The seeds have been constantly sent from India as oil seeds, but without any information as to the uses of the oil. Samples in the Museum are a clear limpid oil, which looks promising, but there is insufficient for experiment.

Seeds in the Museum from Indore, Ahmednugger, and Lucknow; and oil from Sattara and Mulkapore.

Hibiscus ficulneus, *L.*

DC. Prod. i. 448; *Hook. Fl. Ind.* i. 340.
Hibiscus prostratus, *Roxb. Fl. Ind.* iii. 206.
Hibiscus strictus, *Roxb. Fl. Ind.* iii. 206.
Hibiscus sinuatus, *Cav. Diss.* iii. t. 52, f. 2.
Abelmoschus ficulneus, *W. & A. Prod.* i. 53; *Wi. Icon.* t. 154.
Lagunea aculeata, *Cav. Diss.* iii. t. 71, f. 1.

Annual, prickly, leaves palmately, 3–5 lobed, lobes glabrous, narrowed at the base; bracteoles 5–6, lanceolate, villous, fugacious, capsule ovoid. (*Hooker.*)

Hab.—Hotter parts of India.

Native synonyms:—

Seed.—Capsule tomentose, covered with viscid points when green; seeds globose, sulcate, slightly pilose.

Oil.—There is no sample of the oil in the Museum collection. It is enumerated by Lieut. Hawkes as one of the oils of Southern India.

Hibiscus sabdariffa, *L.*

DC. Prod. i. 453; *Hook. Fl. Ind.* i. 340; *W. & A. Prod.* i. 52; *Miq. Fl. Ind. Bat.* i. pt. 2, 158; *Cav. Diss.* vi. 351, t. 198, f. 1.

Annual, glabrous, unarmed, stem purplish; leaves entire or lobed, glandular beneath; peduncles very short, thickened at the summit; bracteoles 8–12, linear, adnate to the base of the calyx, sepals bristly. (*Hooker.*)

Hab.—Generally cultivated in the hotter parts of India.

Native synonyms:—

Roselle. *Eng.*
Mesta. *B.*
Polechee. *Mal.*
Doodkooru. *Ass.*
Conapola.
Koorchi, Curayja, Inderjaw, Inderjau-shireen. *H.*
Veppalei. *Tam.*
Codaga-palla, Palla-coodija, Manoopala, Kodisa, Girimallika. *Tel.*
Codaga-palla, Palla-patta. *Mal.*
Tiwaj, Lissan-ul-asafeer. *A.*
Inderjo, Dowla-koora, Koora. *Bombay.*
La-thou. *Burm.*
Inderjau, Dudhii-ke-lakri. *H.*
Vepali, Veppaula, Veppallay. *Tam.*
Kodoga-pala, Pala-chettu, Giri-mallika, Kalin-gamu, Kodisa-pala-chettu, Kodisa-chettu, Kodisa-pala, Kola-mukki-chakka, Kutajamu, Manu-pala, Pedda-ankudu-chettu, Palavarenu Ankudu. *Tel.*
Dudkhuri. *B.*

Seed.—Seeds narrow-oblong, ½ in. long, brown, bitter, hairs silky, twice the length of the seed.

Oil.—A thick scarlet coloured medicinal oil.

In the Jury Reports (Madras, 1857) this oil is referred to *Wrightia antidysenterica*, but most probably it is the present species that was intended.

Seed in the Museum from Calcutta.

Bibliography.—

Birdwood, Bombay Products, p. 304.
Madras Jury Reports, 1857.

Holarrhena antidysenterica, *Wall.*

Brandis, For. Fl. 326.

HOLARRHENA PUBESCENS, *Wall*; *Cat.* No. 1673.
HOLARRHENA CODAGA, *Don. Wi. Ic.* t. 1297.
ECHITES ANTIDYSENTERICA, *Roxb. Hort. Beng.* p. 20.
CHONEMORPHA ANTIDYSENTERICA, *Don. Wi. Ic.* t. 439.

Small tree, glabrous or pubescent; leaves 6–12 in. long, sub-sessile, elliptic oblong, short acuminate, base obtuse; main lateral nerves 10–14 pair, joined by prominent transverse veins; flowers white, inodorous, 1–11 in. across, on slender pedicels, in sessile terminal corymbose cymes, with small lanceolate ciliate bracts; corolla tube slender, many times longer than calyx, lobes nearly as long as tube; follicles smooth, 8–15 in. long, ½ in. diam. (*Brandis.*)

Hab.—Sub-Himalayan Tract. Oudh: Bengal. Cent. and S. India.

Native synonyms:—

La-thou. *Burm.*
Inderjau, Dudhii-ke-lakri. *H.*
Vepali, Veppaula, Veppallay. *Tam.*
Kodoga-pala, Pala-chettu, Giri-mallika, Kalin-gamu, Kodisa-pala-chettu, Kodisa-chettu, Kodisa-pala, Kola-mukki-chakka, Kutajamu, Manu-pala, Pedda-ankudu-chettu, Palavarenu Ankudu. *Tel.*
Dudkhuri. *B.*
Doodkooru. *Ass.*
Conapola.
Koorchi, Curayja, Inderjaw, Inderjau-shireen. *H.*
Veppalei. *Tam.*
Codaga-palla, Palla-coodija, Manoopala, Kodisa, Girimallika. *Tel.*
Codaga-palla, Palla-patta. *Mal.*
Tiwaj, Lissan-ul-asafeer. *A.*
Inderjo, Dowla-koora, Koora. *Bombay.*

Seed.—Seeds narrow-oblong, ½ in. long, brown, bitter, hairs silky, twice the length of the seed.

Oil.—A thick scarlet coloured medicinal oil.

In the Jury Reports (Madras, 1857) this oil is referred to *Wrightia antidysenterica*, but most probably it is the present species that was intended.

Seed in the Museum from Calcutta.

Bibliography.—

Birdwood, Bombay Products, p. 304.
Madras Jury Reports, 1857.

Hura crepitans, *Linn.*

Tuss. Fl. 4, t. 5; *Desc. Fl.* ii. t. 124; *Griesebach, W. I. Fl.* p. 50.

A high tree; leaves variable, roundish, usually cordate, pointed, serrate or sub-entire; often shorter than the petiole; anthers usually 1–3 seriate; capsule polycoccous.

Hab.—Introduced into India from Jamaica. Cultivated.

Native synonyms:—

Sandbox tree. *Eng.*

Seeds.—Round, compressed, one in each cell of the polycoccous capsule.

Oil.—Clear, pale coloured fluid oil. Obtained by expression from the seeds, of which a sample was shown at the Madras Exhibition of 1857.

Uses.—Medicinal, cathartic.

No seed or oil in the Museum collection.

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Bibliography.—

Birdwood, Bombay Products, p. 308.
Hawkes's Report on Oils of S. India, p. 42.
Pharmaceutical Journal, v. 23, iv. 167, ix. 131.

Impatiens racemosa, *DC.*

DC. Prod. i. 688; *Hook. Fl. Ind.* i. 479.
IMPATIENS TINGENS, *Edgw. in Trans. Linn. Soc.* xx. 41.
IMPATIENS MICRANTHA, *Don. Prod.* 203.

Erect, quite glabrous, slender, branched; leaves petioled, elliptic-ovate, or lanceolate, acuminate crenate; peduncles lateral and subterminal, slender, erect, bracts persistent; flowers ⅓–½ in., sepals ovate, standard orbicular; wings with a filiform process descending into the spur, lip boat shaped, with a curved spur equalling the pedicel. (*Hooker.*)

Hab.—Temperate Himalayas.

Native synonyms:—

Seed.—Capsule ½–¾ in., linear-clavate, acuminate, glabrous; seeds large, oblong, compressed, rugose.

Oil.—Undescribed.

Uses.—For burning in lamps, and also as an edible oil.

No sample of the seed or oil in the Museum.

Impatiens Roylei, *Walp. Rep.* i. 475; *Hook. Fl. Ind.* i. 468.
Impatiens sulcata, *Wall. Cat.* 4764; *Hook. Fl. Ind.* i. 469.
Impatiens Edgeworthii, *Hook. Fl. Ind.* i. 476.

Hab.—Temperate Himalayas.

Native synonyms:—

Bantil, Tatura, Trual, Pallu, Tilphar, Halu, Juk. *Punj.*

The seeds of these and allied Himalayan species afford oil.

Seed.—Seeds mostly large.

Uses.—The oil expressed from the seeds is both eaten and burned on the Sutlej.

No specimens of seed or oil in the Museum.

Indigofera aspalathoides, *Vahl.*

DC. Prod. ii. 231; *W. & A. Prod.* i. 199.
INDIGOFERA ASPALATHIFOLIA, *Roxb. Fl. Ind.* iii. 371.
ASPALATHUS INDICUS, *Burm. Ind.* p. 155.
LESPEDEZA JUNCEA, *Wall. Pluk.* t. 101, f. 6.

Shrubby, erect, young parts whitish with adpressed hairs; branches slender, numerous, spreading in every direction; leaves sessile, digitately 3–5 foliolate; leaflets narrow-cuneate, small, upper surface glabrous, under with a few scattered hairs; peduncles solitary, 1-flowered, about the length of the leaves; flowers very small; corolla soon deciduous; legumes cylindrical, pointed, straight, nearly glabrous, 4–6 seeded. (*W. & A.*)

Native synonyms:—

Shevenar-vaymboo. *Tam.*
Manneli. *Mal.*

Seed.—

It is uncertain whether any oil is expressed from the seed of this plant.

Ainslie states that an oil is obtained from the root, which is used to anoint the head in erysipelas.

Further information is necessary with respect to this, which may possibly be an empyreumatic oil. No sample is to be found in the Museum collection.

Jatropha curcas, *L.*

Roxb. Fl. Ind. iii. 686; *Brandis, For. Fl.* p. 442.

Small tree or shrub; leaves scattered, broad cordate, 5-angled, smooth, panicles terminal, or from the exterior axils, cymose, many flowered; male flowers at the extremities of the ramification on short articulated pedicels, the female ones in their divisions, with pedicels not articulated; calyx 5-leaved, corolla 5-petalled, campanulate, somewhat hairy, styles 3, short; flowers small, green; ovary oblong, smooth.

Hab.—Coromandel. Travancore.

Native synonyms :—

Purging-nut oil. *Eng.*
Bag-bherindha. *H.*
Bagh-dharanda, Bag-bherenda. *B.*
Caat-amunak, Caar-noochie. *Tam.*
Nepalam, Adivieamida. *Tel.*
Erundi. *Dec.*
Caak-avenako. *Mal.*
Mara-narulle. *Can.*
Rataendaroo. *Cey.*

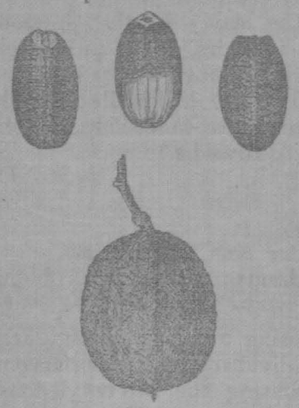


Fig. 24.

Seed.—Capsule ovoid, 1 in. long, 3-celled, 3-valved, with 3 dark brown or black seeds; seeds oval, size of a small bean (about 8 lines long), smooth, blackish, convex on one side and plane on the other, both faces showing a slight prominence; kernel white, covered with a thin membrane, inodorous, with an agreeable almond-like taste, afterwards acrid. (Fig. 24.)

Oil.—In colour somewhat paler than the best linseed oil.

Uses.—Oil employed for burning in lamps. In England as expressed from African seeds it obtained a reputation as a lubricating oil. In India the oil is considered useful as an external application in cutaneous diseases. In China the boiled oil mixed with oxide of iron is used as a varnish. According to Dr. Christison 12 or 15 drops are equal to one ounce of castor oil.

Seeds in the Museum from Khandeish and Assam; and oil from Madras and Beerbhoom.

Bibliography.—

Pharmaceutical Journal, 1st ser. v. 23, vii. 210, ix. 130.
Birdwood, Bombay Products, p. 307.
Trans. Roy. Soc. Arts, Jamaica, ii. p. 51 (1856).
Lunan, Hort. Jamaicensis, ii. 62.
Pereira, Materia Medica, ii. 426.
Hawkes's Reports on Oils of S. India, p. 34.
Pharmacopœia of India, p. 203.
Drury's Useful Plants, p. 268.
Agri.-Hort. Journ. India, x. 36.

Jatropha glandulifera, *Roxb.*

Roxb. Fl. Ind. iii. 688; *DC. Prod.* xv. 1084.

JATROPHA GLAUCA, *Vahl. ?*

Small plant, 1 foot, erect, pubescent; leaves 5–3 cleft, serrated, smooth, glaucous, almost veinless, petioles subvillose, longer than the leaves, with glandular hairs; petals of female flowers ovate, the length of the calyx; capsule muricated, as large as a hazel nut; seed size of a pea; flowers small, greenish yellow.

Hab.—Deccan. N. Circars.

Native synonyms :—

Addaley. *Tam.*
Nela-amida. *Tel.*

Seed.—Capsule tricococcous, externally rough, as large as a hazel nut; seeds the size of a pea.

Oil.—A light straw-coloured fluid oil, which in appearance approaches castor oil.

Uses.—A stimulating oil used as an external counter-irritant.

Preparation.—For preparing the oil the seeds should be collected as the capsule begins to split or change colour from green to brown; the latter should then be thrown down on a mat and covered over with another mat, and on a few hours exposure to a bright sun the seeds will have separated from the shell; for if allowed to remain on the shrub till quite ripe, the capsule bursts, and the seeds are scattered and lost.

No sample of seed or oil is in the Museum collection.

Bibliography.—

Exhibition Jury Reports (1857).
Birdwood, Bombay Products, p. 308.
Pharmacopœia of India, p. 204.
Ainslie, Materia Medica, ii. p. 6.
Drury, Useful Plants, p. 269.
Balfour's Cyclopædia, iii. 161.

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Juglans regia, *L.*

Roxb. Fl. Ind. iii. 631; *Brandis, For. Fl.* p. 497.

Large tree; leaflets elliptic-oblong, entire (rarely serrulate), subcoriaceous, glabrous, with tufts of hair in the axils of the nerves beneath, main lateral nerves prominent, 15–20 pairs, terminal leaflet largest, petiolulate, the lateral 3–4 sometimes 5–6 pair, sub-sessile nearly opposite, those nearest the base smaller, common petiole 6–12 in. long, glabrous or hoary; male catkins appearing with the leaves in the previous year's axils and on the previous year's wood, sometimes in pairs, green, pubescent, cylindric, 2–5 in. long; bracts pedicellate, oblong, with 6 perianth lobes, 10–20 stamens, the buds of the coming year's catkins being ready formed in the leaf axils; female flowers 1–3, limb of calyx minute, indistinctly toothed; petals linear-lanceolate, green, varying in length, sometimes half the length of the ovary. (*Brandis.*)

Hab.—N. W. Himalaya. Sikkim.

Native synonyms :—

Akshota, Akhota. *Sans.*
Ughz, Waghz. *Affgh.*
Kabotang, Thānka. *Pb.*
Ka. *Kunawar.*
Charmaghz. *P.*
Akhor, Khor, Krot, Dun. *Kash.*
Starga. *Ladak.*
Akhor, Khor, Kharot, Korot. *Kumaon.*

Seed.—Fruit green, ovoid, glabrous, 2 in. long, enclosing a brown, irregularly furrowed nut, which is 2 valved, acute at the upper end, and divided by 2 thin coriaceous dissepiments into 4 incomplete cells, one dissepiment separating the two cotyledons, the other dividing them at the back into 2 lobes; seed with 2 integuments, the outer yellowish brown, the inner white, very fine.

Oil.—Limpid, almost colourless, or pale yellow, sweet.

Uses.—This oil is extracted in the North of Europe with some success, and has reputation as a good edible oil, and also as a drying oil. A sample from Kangra was shown at the Punjab Exhibition. It is a valuable oil in Hill districts, but is seldom seen in the plains.

Nuts in the Museum from Delhi and Bombay.

Bibliography.—Baden Powell's Punjab Products, 433.

Kokoona Zeylanica, *Thw.*

Hook. Kew Journ. Bot. v. 380, t. 6; *Hook. Fl. Ind.* i. 616; *Bedd. Fl. Sylv.* t. 146.

Leaves on young plants 6–8 in., oblong, lanceolate, subacuminate, serrate; on adult trees $2\frac{1}{2}$–$3\frac{1}{2}$ in., elliptic or obovate, crenate, rounded at the apex or emarginate, dark green above and glabrous, paler beneath and with numerous dark red glandular dots; petals broadly ovate; fruit 1–4 in., bluntly triangular. (*Hooker.*)

Hab.—Western Peninsula. Ceylon.

Seeds.—Capsule about 4 in. long with winged seeds $3\frac{1}{2}$ in. long, of which $2\frac{1}{2}$ in. belong to the wing.

Oil.—Characters undescribed.

Uses.—An oil is expressed from the seeds, says Thwaites, which is used for burning in lamps.

No sample of seed or oil in the Museum.

Bibliography.—

Balfour's Cyclopædia, iii. 250.
Thwaites, Enum. Pl. Ceylon, p. 52.

Lactuca sativa, *L.*

DCand. Prod. vii. 138; *Roxb. Fl. Ind.* iii. 403.

Leaves erect, oblong, narrowed at the base, cauline; leaves cordate, stem corymbed.

Native synonyms :—

Lettuce seed oil. *Eng.*
Raughan-i-kahu. *Punj.*
Kahu. *H.*

Seed.—Achenes even, compressed.

Oil.—Clear, transparent, sweet oil. Sample from Lahore was shown at the Punjab Exhibition.

Seeds in the Museum are from the N. W. Provinces.

Lagenaria vulgaris, *DC.*

DC. Prod. iii. 299.

CUCURBITA LAGENARIA, *Linn.*

Plant musky scented, clothed with soft pubescence; stems climbing, tendrils 3–4 cleft; leaves cordate, nearly entire, biglandular at the base, pilose; flowers monœcious, stellate, spreading in fascicles, connectives of anthers acutely papillate; fruit pubescent, smooth when mature, flesh white.

Native synonyms:—

Kaddu, Kabuli, Kaddu, Lauki, Tumba. *Punj.*
Kodu, Lava. *B.*
Tumba, Toombe, Kaddu, Kabuli. *H.*
Soriai-kai. *Tam.*
Sorakaya, Kundanuga. *Tel.*

Seed.—Fruit shaped liked a bottle; seeds obovate, compressed, two lobed at the apex, with swollen margins.

Oil.—Qualities unknown, but probably a clear limpid oil, such as yielded by cucumber seed.

Uses.—The seeds are said to be used medicinally, but we have no report of the uses of the oil, which is cited by Mr. Baden Powell as one of the oils from Cucurbitaceous plants known in India.

Seeds in the Museum from Madras and Bombay.

Bibliography.—Balfour's Cyclopædia, iii. 372.

Lepidium sativum, *L.*

Hook. Fl. Ind. i. 159.

Annual, erect, radical leaves 2 pinnatisect; pods orbicular-ovate; wings narrow.

Hab.—Cultivated throughout India and Western Thibet.

Native synonyms:—

Aleverie, Haleem. *B.*
Adala-vitala. *Tel.*
Haleem. *Dec.*
Ahreo. *Sindh.*

Seed.—Pods deeply notched, orbicular-ovate, wings narrow, pedicels appressed.

Oil.—Somewhat similar to mustard seed oil.

"The qualities and uses have yet to be determined." Sample was exhibited at Madras in 1857.

Seeds in the Museum from Calcutta, Poona, Kurrachee, and Burmah.

Bibliography.—

Hawkes' Report on Oils of S. India, p. 37.
Balfour's Cyclopædia, iii. 461.

Linum usitatissimum, *L.*

Roxb. Fl. Ind. ii. 110; *DC. Prod.*; *W. & A. Prod.* 134; *Hook. Fl. Ind.* i. 410.

Annual, stem cylindric, erect, simple below; leaves narrow, sub-3-nerved; petals blue, styles quite free, stigmas linear clavate; capsule scarcely exceeding the narrowly white margined acuminate sepals. (*Hooker.*)

Hab.—Cultivated throughout India up to 6,000 feet in the Himalaya.

Native synonyms of oil:—

Dhonul Kattán. *Ar.*
Roghane-zaghir, Roghane-katan. *P.*
Absi-ka-tel, Tisi-ka-tel. *H.*
Alisha-virai-yenney, Atasi-nune, Madana-ginjala-nune. *Tam.*
Tisi-tail. *B.*
Alsi-ka-tel. *Dec.*
Cheruchana-vittinte-enna. *My.*
Alashi-yanne. *Can.*

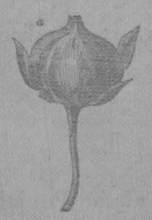


Fig. 25.

Seed.—Capsule 5-celled, septicidally splitting into 5 simple 2-seeded, or 10 1-seeded cocci; seeds compressed. (Fig. 25.)

Oil.—Is clear, yellowish brown fluid, not congealed even by the most intense frost, smoking very much when burned, readily becomes rancid, dries speedily, becoming by age of a deep colour, very acrid, and nearly opaque; odour peculiar and disagreeable.

Uses.—As an external application in burns, as an injection in spasmodic contractions of the intestines; in painting, by mixture with litharge as a drying oil, and when boiled, as a varnish.

Oil is obtained from linseed by first bruising the seeds, grinding them and subjecting them to violent pressure, either by means of wedges, or of the hydraulic or screw press. Cold drawn linseed oil is obtained cold, and is paler coloured, less odorous, and has less taste than that which is obtained when heat is applied. It is usual to employ a steam heat of about 200° F. By cold expression, the seeds yield about 20 per cent., while by the aid of heat nearly 27 per cent. of oil can be obtained. (*Ure's Dictionary.*)

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Linseed as analysed by Meyer consists of—

Fat oil	11·265
Wax	0·146
Acrid soft resin	2·488
Resinous colouring matter	0·550
Yellow extractive with tannin and salts	1·917
Sweet extractive with malic acid and some salts	10·884
Gum	6·154
Nitrogenous mucilage with acetic acid and salts	15·120
Starch with salts	1·480
Albumen	2·782
Gluten	2·932
Husk and emulsion (?)	44·382
	100·100

Lieut. Hawkes remarks on the produce of this oil in India, that in the year 1852–3, English linseed oil to the amount of 4,552 gallons, valued at Rs. 8,763, was imported into Madras, whilst at the same time 1,045 cwt. of seed was exported hence mostly to England. The fact that it can be made on the spot equal in quality and considerably less in price than the English article, needs only to be known to be taken advantage of. It would be necessary to guard against its adulteration with any of the greasy oils, which would of course infallibly destroy its drying qualities. The value of this oil in England was from 61*l.* to 66*l.* in January 1856. It is stated to be procurable in Bellary at Rs. 3. 8. 0 per maund. It was imported into England in 1851, to the amount of 608,986 quarters. Some energetic efforts have been made to improve the cultivation of linseed in the Punjab.

In 1853–4 there were 3,435 acres under cultivation in eight districts, whereas in the next year no less than 19,039 acres were so taken up, and it is estimated that the whole cultivation throughout the Punjab during that season was 50,135 acres, producing 146,508 maunds of fibre, and the increased produce of seed is estimated at 130,000 maunds, valued at Rs. 160,000. The seed sold by auction at an average rate of Rs. 4. 6. per maund of 80 lbs. (*Spectator*, Oct. 14, 1856.)

The "Scindian" newspaper also gives some idea of the progress made in linseed cultivation in Scinde:—

"We are glad to observe that the growth of linseed in Scinde is attracting the attention of the authorities. Major Wormald tried an experiment at Jermadar-ka-landee, and gives a very favourable report, which has been placed at our disposal. We have seen a specimen of the linseed, and the following is a description of its culture and growth. At Landee, the quantity of land prepared for seed was 4,658 square yards, on which was sown 126 lbs. of linseed, part on the 28th of October, and the rest on the 1st November 1856. In four months the crop was pulled up and stacked, and the produce was 1,000 lbs. of linseed, being as far as may be judged, much above the average yield of flax crops in different parts of Europe, and certainly finer linseed than any yet seen here. A sample of this linseed has been forwarded to Mr. Warwick, a merchant in Kurrachee, who pronounces it to be very fine. The stalks of this seed grew very strong, and ranged from 2 to 3 feet. No opportunity has yet been afforded of converting the stems into flax, and as the stackage will not deteriorate from their quality, opportunity may be found to complete the experiment. Major Wormald, from past experience, considers the soil in the Mulleer valley particularly suited for the growth of linseed and flax, and feels confident that if cultivated on a large scale, a fortune might soon be realised. The tenfold yielding of this valuable seed in the Mulleer Valley, owing to the rich soil, should operate as an inducement to the Commissioner to promote the growth of an article that bids fair to make so respectable a figure in the revenue of the province. The sample we have seen appears to possess the properties of the best kind. The seeds are small, bright, greyish brown, slippery elongated bodies, containing a full amount of that mealy oleaginous albumen which

yields the oil in such abundance. In short, we consider the specimen we have seen as well worthy the attention of those whose hearts are with the prosperity of Scinde."

From the Shahabad district Mr. R. W. Bingham reported in 1862 that:—

"It is cultivated as an oil seed alone. It is, however, probable, that the stunted plants grown in India would be of little use as a flax bearer, until improved cultivation had again raised its standard of height. In the Punjab and in Scinde considerable attention has of late been paid to this subject, and it would be an additional staple added to the agricultural resources of Shahabad and Behar, could it be brought under cultivation as a flax bearer here, which it doubtless could be with the same advantage as in the Punjab. It is always grown in Shahabad as an auxiliary crop with wheat, masoor, barley, and the spring crops; its bright blue flowers are a pleasing relief to the yellowish brown of the other cereals. I have never known it cultivated alone, so that I have no data as to its probable yield per beegah or acre. It would probably not be found to differ much from the linseed crops of England in that respect, were the cultivation equal, that is to say, were the same labour bestowed upon its cultivation, which, however, is not the case in this district at least. Its favourite soil appears to be the black clay (*kurile*), but it is sown largely in other soils, and the only difficulty to its indefinite extension appears to be want of facilities for carrying the crop to market. It is therefore grown in south Shahabad principally for home consumption, and is used largely for lamps under the name of *Teesee-ka Tel*. Under the native process it produces 25 per cent. of oil; what it would produce with the European method I am unable to say. The native method produces a tolerably clear looking oil, but it smokes much in burning, showing that a large proportion of vegetable fibre finds its way through the rude press into the pure oil. Considerable quantities are grown near the Ganges for export. The price varies much according to the season and the quantity in the market. I have known it sell for Rs. 40, or 4*l*. sterling per ton, and I have known it fetch double that price. Until roads, railroads, and canals, with better modes of conveyance than exist at present, equalise prices, no average of price can be given with any certainty, as one season in one part of the country may have been favourable, and in another part unfavourable, all within a radius of 20 miles, and the two places show a difference of 50 per cent. in the selling price as well as in production, thus proving how imperfect are the means of transport from one part of the country to another, which would otherwise equalise the produce in the dearest market till a medium was found, or in other words, till further export to that place was unprofitable."

In Cuttack the local committee reported in 1862 that:—

"The plant is grown all over the province, a good deal in patches of newly cleared land in the jungles of the Tributary States and Sumbulpore. The oil is extracted in two ways. It is used for burning and culinary purposes, and medicinally also. The local market is now $11\frac{1}{2}$ petuls of the seeds per rupee. Both the native methods of extracting oil are wasteful and tedious, and therefore expensive. European oil presses and a knowledge of some methods of clarifying the expressed oil, seem only to be required to render the oil seed crops of this extensive division of great value."

In Midnapore, according to R. V. Cockerell, "One maund of linseed produces 26 seers of oil; cost of conveyance to Calcutta, Rs. 14 per 100 maunds in rainy season; and in dry season, Rs. 10 per 100 maunds."

The Central Committee for Oude (Exhibition, 1862) state that, "Linseed is cultivated as a mixed crop, principally with *grain*, all over Oude. It is sown in the month of October, and never irrigated. It is never sown thickly, as the object is to get a large amount of seed for oil, and not fibre. It can be cultivated extensively, and there is no doubt that with proper treatment, profitably for its fibre. The oil is extracted by pressing. The seed sells for $18\frac{3}{4}$ seers per rupee, and the oil for 5 seers per rupee. Every 5 seers of seed yield $1\frac{1}{4}$ seers of oil by the native process of pressing. Used for cooking and burning."

The white seed is generally preferred in the markets to the red, and from Mr. H. Mornay's report in the Journal of the Agri.-Hort. Soc. of India, not without reason. The result of his experiments are stated to be that the white seed gave fully 2 per cent. more oil than the red, that the former yielded its oil much more kindly or freely than the latter, that the oil produced was of similar qualities, and that the white oil cake is far softer and sweeter than that produced from the red seed. Moreover, he adds that the sample of white linseed from the Nerbudda valley did not contain a single grain of rape seed, which he deems very important, inasmuch as all the red seed comes to market more or less mixed with this baneful seed, which is very difficult of separation, and depreciates the commercial value of the article.

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Linseed in the Museum from Ahmedabad, Ahmednugger, Assam, Bhopal, Calcutta, Cuttack, Goonah, Gyah, Indore, Jessore, Jhansee, Kurrachee, Lahore, Lucknow, Malwa, Madras, Midnapore, Mirzapore, Moonghyr, Moorshedabad, Patna, Poona, Sarun, Yarkund. Oil from Calcutta, Cuttack, Goonah, Lucknow, Madras, Mulkapore, and Sattara.

Bibliography.—

Birdwood, Bombay Products, p. 298.
Hanbury and Flückiger, Pharmacographia, p. 89.
Pharmacopœia of India, p. 37.
Dispensatory of United States, p. 514.
Hawkes' Report on Oil Seeds, p. 28.
Drury's Useful Plants, p. 278.
Balfour's Cyclopædia, iii. 482.
Agri.-Hort. Journ. India, iii. 98; ii. 449.
Pereira, Materia Medica, ii. 561.

Linum strictum, *L.*

Hook. Fl. Ind. i. 411; *Boiss. Fl. Or.* i. 852.

Annual; leaves linear, linear oblong, or lanceolate, 1-nerved, margins and keel scabrid; petals yellow, styles quite free, stigmas capitate; capsule globose, shorter than the long acuminate sepals. (*Hooker.*)

Hab.—Punjab hills. Western Thibet.

Native synonyms:—

Basant, Bab-basant? *Punj.*

Seed.—

Oil.—There is no sample in the Museum collection, but it is scarcely probable that it differs essentially from ordinary linseed oil.

Uses.—The same as linseed oil.

Cultivation.—The plant is said to be cultivated in Affghanistan for oil and fodder, but not for flax.

Litsæa, *sp.*

As this species is undetermined, no botanical description of the plant can be given.

Hab.—Punjab Himalaya, 2,500 to 6,800 feet.

Native synonyms:—

Chirndi. *Chenab.*
Chindi, Chilotú, Raui, Shalangiú. *Ravi.*
Charká. *Bias.*

Seed.—

Uses.—In some places in Chumba Dr. Stewart says that an oil expressed from the fruit is burned, and according to Madden a species of *Litsæa*, which may be this, yields a coarse oil in Kumaon.

Bibliography.—

Stewart's Punjab Plants, p. 188.
Balfour's Cyclopædia, iii. p. 482.

Luffa acutangula, *Roxb.*

Roxb. Fl. Ind. iii. 713; *W. & A. Prod.* i. 343.

Climbing; stems glabrous; leaves 5-angled or 5-lobed, male racemes long, peduncled; stamens distinct; calyx segments of the female flowers covered with glands; fruit (about 1 foot long, 2–3 in. thick) clavate, obtuse, or shortly pointed, nearly smooth, 10-angled, the angles sharp and smooth; flowers large, yellow.

Hab.—Cultivated.

Native synonyms:—

Torooi, Jinga, Turi. *H.*
Jhingo, Jinga. *B.*
Peekun-kai. *Tam.*
Beerkai, Bira-kaya. *Tel.*
Pecchenggah. *Mal.*
Toorai. *Dec.*
Djinji. *My.*
Turi. *Sindh.*

Seed.—Seeds black, irregularly pitted, 2-lobed at the base.

Oil.—Presumably similar to that of other Cucurbitaceous plants. No specimen to be found in the Museum collection.

Luffa pentandra, *Roxb.*

Roxb. Fl. Ind. iii. 712.

Leaves cordate, downy, 5–7 lobed, mucronately denticulate, middle lobe longest; female pedicles 1-flowered, solitary.

Hab.—Rungpore, &c., and cultivated.

Native synonyms :—

Deondool. *B.*
Nuni-Beerd. *Tel.*

Seed.—Fruit linear, marked with 10 straight lines like ridges; seed with elevated dots and sharp waved margins.

Oil.—Not described, and there is no specimen in the Museum collection.

Uses.—The seeds are reported to be emetic and cathartic, but the properties and uses of the oil are not stated.

Seeds in the Museum collection from Mysore.

Mallotus Philippinensis, *Müll.*

DC. Prod. xv.; *Bedd. Fl. Syl.* t. 289; *Brandis, For. Fl.* 444.

Rottlera tinctoria, *Roxb. Cor. Fl.* t. 168; *Fl. Ind.* iii. 827.

Large shrub or small tree, branchlets, inflorescence, and under side of leaves hoary; leaves alternate, ovate or ovate-lanceolate, entire, glabrous above, hoary and with minute red glands beneath, blade 4–9 in. petiole 2–3 in. long, 2 depressed glands at base of leaf, 3 basal nerves, midrib penniveined, the nerves joined by numerous parallel veins at right angles to the midrib; flowers white and yellow, dioicous, sub-sessile in axillary and terminal paniculate bracteate spikes; ovary tomentose, 3 celled, styles 3, $\frac{3}{4}$ in. long, thickly papillose. (*Brandis.*)

Native synonyms :—

Camul. *H.*
Toong, Poonnag, Poonnaga, Keshoor. *B.*
Capila-podee. *Tam.*
Vassuntagunda, Chendurapu, Veligarum, Kunkuma-puvoa. *Tel.*
Poonnagam, Corunga-munjenarum. *Tel.*
Ham-parandælia. *Cey.*
Shendree. *Bombay.*



Fig. 26. Fruit and seeds.

Seed.—Fruit a 3-lobed, 3-celled, 3-valved capsule, $\frac{1}{3}$ in. diam., dehiscing loculicidally, and densely covered with a bright red powder, consisting of minute stellate hairs, and fine grains of a red resinous substance soluble in alcohol and ether. (Fig. 26.)

Oil.—Clear, limpid oil of a pale brownish or sherry colour.

Uses.—Medicinally as a cathartic. Is said to possess valuable properties, for which reason it is desirable that further information be obtained and experiments made.

Seeds in the Museum from Bombay, and oil from Coorg.

Bibliography.—Balfour's Cyclopædia, iv. 146.

Mangifera Indica, *L.*

Roxb. Fl. Ind. i. 641; *Bedd. Fl. Syl.* t. 162; *Brandis, For. Fl.* p. 125.

Tree; leaves alternate, lanceolate, acuminated, glabrous; calyx 5-cleft; petals 5; panicles terminal, much branched, pubescent, erect; drupe obliquely oblong, or somewhat reniform; seed solitary; flowers small, greenish yellow.

Hab.—Common everywhere in India.

Native synonyms :—

Am. *H.*
Racha-mamidi, Tiyya-mamidi, Mamidi, Mamari, Mavi, Mamidi-chettu, Ela-mavi, Gujju-mamidi, Mamadi-chettoo, Makandamu. *Tel.*
Maa, Ma-maram, Ma-marum, Maah-marum, Amba-pooree. *Tam.*
Tha-yat, That-yat, Tha-rat, That-rat, Thayetben. *Burm.*
Am. *B.*
Mavena. *Can.*
Palam. *Jav.*
Mangga. *Sund.*
Kapalam. *Lampung.*
Ampalam, Mampalam. *My.*
Mava, Mangai, Mangoe. *Mal.*
Amra, Makandamu. *Sans.*
Ambo. *Uriya.*
Aetamba-gaha, Amba. *Cyn.*
Am, Aum. *Ass.*

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Seed.—Fruit from 2–6 in., compressed, generally yellow when ripe, with a more or less flattened fibrous seed, the kernels of which are eaten in times of scarcity.

Oil.—No description of this oil has come under our notice. The fat from seeds of a closely allied tree in W. Africa is as solid as Kokum, and this may be similar. Undoubtedly the seeds contain a large per-centage of oil.

Uses.—Uncertain.

Seeds in the Museum from Madras.

Melia azedarach, *L.*

W. & Arn. Prod. i. 117; *Wight Icon.* t. 160; *Brandis, For. Fl.* 68.

Leaves deciduous; leaflets about five together, obliquely ovate-lanceolate, serrated, finely acuminated; petals nearly glabrous; peduncles axillary, panicled above, many flowered; flowers smallish, white, externally lilac at the top; fragrant.

Hab.—Northern India. Deccan. Concans.

Native synonyms for the tree are—

Bakayan, Maha-ninb. *H.*
Gouri-nim, Gouli-nim. *Dec.*
Malai-vembu, Malai-veppam. *Tam.*
Konda-vepa, Turaka-vepa. *Tel.*
Bettada-bevina. *Can.*
Maha-nim. *B.*
Parvata-nimba-vrikshaha. *S.*
Dongra-cha-limba-cha-jhada. *Mah.*
Lunu-midella. *Cey.*
Maha-nimba. *Cey.*
Simbo-tama-bin, Simbo-thama-kha, Simbo-thamaga, Simbo-khamakha. *Bur.*

Seed.—Drupe ovoid or globose, yellow when ripe, $\frac{1}{2}$–$\frac{3}{4}$ in. diam.; rind rough; putamen thick, hard, 5-celled, 5-seeded, or with fewer cells and seeds by abortion.

Oil.—From the fruit a fixed oil is extracted, which Dr. Birdwood states is similar to that of the Neem. (*Melia Indica.*)

Uses.—Probablymedicinal.

No sample in the Museum.

Bibliography.—

Drury, Useful Plants, p. 289.
Birdwood, Bombay Products, p. 297.
Hawkes' Report on Oils of S. India, p. 32.

Melia Indica, *Brandis, For Flor.* p. 67.

Azadirachta Indica, *Juss., W. & Arn. Prod.* i. 118; *Roxb. Fl. Ind.* ii. 394; *Wi. Ic.* t. 1.

Melia azadirachta, *Linn., DCand. Prod.* i. 622.

Tree; leaves simply pinnated, leaflets unequal-sided, glabrous, serrated; panicles axillary; flowers small. white, fragrant.

Hab.—Peninsula. Hindostan. Assam.

The *native synonyms* are :—

Azad-darakhtehindi, Nib. *P.*
Ninb, Nimb. *H.*
Nim. *Duk.*
Bevina mara. *Can.*
Vembu, Veppam, Veppa marum. *Tam.*
Vepa chettu, Nimbamu. *Tel.*
Veppa, Ariya-veppa. *Mal.*
Limbo. *C.P.*
Nimura. *Sind.*
Nim, Nimgachh. *B.*
Nimba vrikshaha. *S.*
Limbacha-jhada. *Mah.*
Limbdanu jhada. *Guz.*
Kohumba, Nimba-gaha. *Guz.*
Tamabin, Thamakha, Thamaga, Kamakha, Khamakha. *Bur.*
Betain. (*Kumaon.*)

Seed.—Drupe ovoid-oblong, size of an olive, smooth, dark purple when ripe, 1-celled, 1-seeded; seed

Oil.—From the fruit, says Dr. Brandis, is extracted by boiling or pressure a fixed acrid bitter oil, deep yellow, with a strong disagreeable flavour. It is said to be expressed from the pulp, and not from the seed, and is exported from Madras chiefly to Ceylon.

The oil loses its fluidity at so low a temperature that it almost claims insertion with the solid fats. It is of a yellow colour with a strong odour, and during the winter

months in this climate is as solid as the fats of the species of *Bassia*. During summer it partially regains fluidity.

Uses.—It is used medicinally, in dyeing, as an antiseptic and anthelmintic, and is burnt in lamps.

Preparation.—This valuable and much used medicinal oil is obtained by either expression or boiling. It enters into the practice of native physicians, by whom it is administered internally as an anthelmintic, and externally as a liniment in rheumatism, headache, and as an application to ulcers. The oil is of a deep yellow colour, has a strong smell, and an unpleasant bitter taste. It is exported to Ceylon, its chief market, but the demand is not constant. It is frequently burnt in lamps, and is sold in the bazaar under the name of "bitter oil." (*Jury Reports*, 1857.)

Mr. Bingham, in writing of the resources of the Sasseram district, says that the Neem produces abundantly small yellow seeds which drop from the tree when ripe. These pulpy fruits contain a kernel, and are eagerly gathered by the poorer classes. The kernel yields about 25 per cent. of bitter impure oil, which smokes offensively in burning. The oil, however, is much valued in native pharmacy as a liniment. He did not know whether this quality was known or valued by European practitioners. The kernel would not bear exportation, but the oil might be found useful, and its production is only limited by the quantity of the trees planted, which are hardy, and grow in any soil. (*Agri.-Hort. Journ.*)

It should be determined satisfactorily whether the kernels of the seed or the pulp of the fruit furnishes the oil.

Seeds in Museum from Madras, Bombay, and Kurrachee; and oil from Madras, Mangalore, and Mysore.

Bibliography.—

Pharmacopœia of India, p. 54.
Birdwood, Bombay Products, p. 297.
Hawkes' Report on Oils of S. India, p. 32.
Drury's Useful Plants, p. 59.
Brandis, Forest Flora, p. 67.
Agri.-Hort. Journ. of India, xii. 334.
Madras Jury Reports, 1857.

Melia sempervirens, *Swartz.*

Bot. Reg. t. 643; *Grieseb. W. Ind. Fl.* 128; *Roxb. Fl. Ind.* ii. 305; *W. & A. Prod.* i. 117.

Leaves evergreen; leaflets ovate, sometimes cordate at the base, cut, or serrated, with taper entire apices, glabrous; petals nearly glabrous.

Hab.—Cultivated. Native of the West Indies.

Native synonyms :—

Bukarjun, Bukayun. *H.*
Maha-nimba. *B.*
Ban, Bam? *A.*
Bukayun, Bukain, Daracht-i-azad. *P.*
Bukaena? *Parb.*
Baksi? *New.*
Bakain, Darkona, Hab-ul-ban-Drek. *Panj.*

Seed.—Drupe and seed similar to *Melia azedarach.*

Oil.—Probably similar in its nature and uses to that of other species of *Melia*, but of this we have no definite information.

Uses.—Medicinal.

Dr. Brandis considers that the tree is specifically identical with *Melia azedarach.*

Mesua ferrea, *L.*

W. & Arn. Prod. i. 102; *Wi. Icon.* t. 117; *Roxb. Fl. Ind.* ii. 605.

Tree, 40 feet; sepals 4, unequal; petals 4, alternate with the sepals; leaves oblong, lanceolate, acuminated, glaucous beneath, upper side shining, midrib and margins coloured; flowers stalked, axillary, large, white, fragrant; fruit about the size of a small apple, 1 celled, 1–4 seeded.

Hab.—Courtallum.

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Native synonyms :—

Nag-keshur, Nagkushar. *B.*
Nagkesar. *H.*
Gangau *Burm.*
Na-gaha. *Cyn.*
Irul-maram, Irool-maram? *Tam.*
Chikati-manu? Naga-kesarachettu, Suvarnam. *Tel.*
Kesaramu-naga-sara, Kinjalkamu. *Sans.*
Nag-champa. *Mahr.*
Belutta-champagam. *Mal.*
Nahor. *Ass.*
Nagishvoro. *Uriya.*

Seed.—Fruit ovoid, conical pointed (fig. 27—1), size variable, often of a large chestnut base surrounded by the persistent sepals, 1–4 seeded; seeds dark brown, testa smooth, in form and colour resembling chestnuts (fig. 27—2).

Oil.—The sample in the Museum is a thick dark coloured oil, freely depositing stearine.

Uses.—It is used both as a lamp oil and as a healing application to sores. Dr. Ross states that in Canara it is employed as an embrocation in rheumatism.

It is procurable in Canara at the rate of Rs. 4, and the seed at Rs. 1.8.0. per maund.

Seeds in the Museum collection from Bengal, Chittagong, and Mangalore, and oil from Bengal.

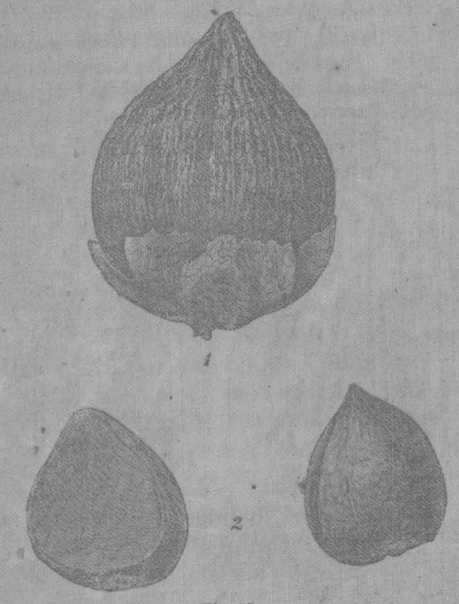


Fig. 27.

Bibliography.—

Hawkes' Report on Oils of S. India, p. 38.
Pharmacopœia of India, p. 32.
Drury's Useful Plants, p. 291.

Michelia champaca, *L.*

DC. Prod. i. 79; *Roxb. Fl. Ind.* ii. 656; *W. & A. Prod.* i. 6; *Wi. Illus.* i. 13; *Hook. Fl. Ind.* i. 42.

MICHELIA RUFINERVIS, *DC. Prod.* i. 79.
MICHELIA DOLDSOPA *Ham, DC. Prod.* i. 79; *Wall. Tent.* t. 3.
MICHELIA AURANTIACA, *Wall. Pl. As.* t. 147.
MICHELIA RHEEDII, *Wi. Ill.* i. 14, t. 5, f. 6.

A tall tree; leaves ovate lanceolate, tapering to a long point; flowers yellow; segments of perianth 15–20; ovaries pubescent. (*Hooker.*)

Hab.—Commonly cultivated; wild in Temperate Himalaya, &c.

Native synonyms :—

Sempagum. *Tam.*
Tsiapungum. *Mal.*

Seed.—Fruit 3–4 in.; carpels subsessile.

Oil.—Whether this be a fatty oil from the seeds or a volatile oil from the flowers remains to be determined. There is no sample of a fatty oil in the collection, and it seems doubtful whether such a product is known.

Mimusops elengi, *L.*

Roxb. Cor. Pl. t. 14; *Fl. Ind.* ii. 236; *Wi. Ic.* t. 1586; *Bedd. Fl. Sylv.* t. 40; *Brandis*, p. 293.

Large evergreen tree, glabrous; leaves coriaceous, shining, wholly glabrous when full grown; blade about 4 in. long, elliptic, short-acuminate on petiole $\frac{1}{2}$–$\frac{3}{4}$ in. long; flowers pure white, fragrant, nearly 1 in. across, in axillary fascicles of 2–6 flowers, drooping, on peduncles shorter than or as long as petiole; calyx segments 8, ovate lanceolate, acuminate; corolla of 2 circles of lobes, the inner of 8–10 obovate-oblong

segments, narrowed at base, alternating with twice their number of linear-oblong lobes of the outer circle, all lobes more or less dentate near the apex; stamens 8, opposite to the lobes of the inner circle, anthers long-acuminate, alternating with an equal number of lanceolate stammodes, which are shorter than stamens and densely hirsute on the back with long stiff hairs. (*Brandis.*)

Hab.—Circars. West Ghauts. Peninsula. Sylhet.

Native synonyms :—

Magadam, Magludam-maram, Mayugadi-maram, Maghidam. *Tam.*
Pogada, Pogada-manu, Pogada-mannoo, Paga-dupu. *Tel.*
Mugali, Mugali-mara, Minjulu ? Moogali mara. *Can.*
Mulsari, Bakula, Mulsari-ka-jhar. *H.*
Kya-ya. *Burm.*
Bakula. *B.*
Bacul, Bholsari, Mulsari, Taindu. *Dec.*
Bakul. *Mahr.*
Elengi. *Mal.*
Bakula. *Sans.*
Moone-malgass. *Cyn.*
Bokul. *Ass.*

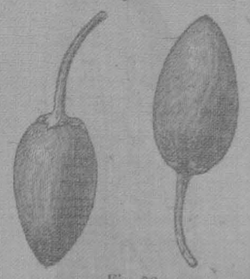


Fig. 28.

Seed.—Fruit a smooth, ovoid, 1-seeded berry, yellow when ripe, about 1 in. long.

Oil.—The oil expressed from the seeds is enumerated amongst the oils of the Madras Presidency.

Uses.—Medicinal. It is reputed also to be available as a painter's oil.

Obtainable in tolerably large quantities in some parts of the country, according to the Madras Jury Reports, and said to be known in England, but this latter is doubtless an error.

Seeds in the Museum from Calcutta.

Bibliography.—

Birdwood, Bombay Products, p. 304.
Drury's Useful Plants, p. 292.
Roxburgh's Flora Indica, ii. 236.

Mimusops Indica, *DC.*

DC. Prod. viii. 205; *Brandis, For. Fl.* 291; *Wi. Icon.* t. 1587.

M. KAUKI, *Wall. Cat.* 4149.

M. HEXANDRA, *Roxb. Cor. Pl.* t. 15? *Bedd. Fl. Sylv.* p. 441.

Large evergreen tree; leaves coriaceous, shining, wholly glabrous, sometimes approximate near ends of branches, blade 2–4 in. long, obovate-oblong, obtuse, or emarginate, petiole ½–1 in. long; flowers whitish, ¼ in. across, in axillary fascicles of 3–6 flowers, peduncles shorter than petioles; calyx segments 6, ovate, acute, shortly tomentose outside, edges hairy; corolla of 2 circles, the inner of 6–8 oblanceolate segments, narrowed into a short claw, alternating with 6–8 pairs of linear subcoriaceous acute segments of the same length forming the outer circle; stamens 6–8, exceeding half the length of corolla segments, opposite to the lobes of the inner circle, alternating with an equal number of flat bifid more or less denticulate staminodia, as long or a little shorter than the filaments. (*Brandis.*)

Hab.—Forests of S. India and Ceylon. Central India. Guzerat.

Native synonyms :—

Ksheerni. *B.*
Khir, Khirni, Kirni, Kheeri, Chirni. *H.*
Manilkara, Boasco. *Mal.*
Palla. *Tam. Tel.*

Seed.—Fruit a yellow berry, generally 1-seeded, size and shape of an olive.

Oil.—No sample in the Museum collection.

Bibliography.—

Drury's Useful Plants, p. 293.
Powell's Punjab Products.

Mimusops kauki, *R. Br.*

Brandis, For. Fl. p. 293.

MIMUSOPS BROWNIANA, *Benth.*

Leaves obovate, very obtuse, silvery beneath, scarcely three times as long as the petiole.

Hab.—Ind. Archipelago. Cultivated in Calcutta.

Native synonym :—

Buasow. *My.*

Fruit.—Fruit large, ovoid, 1–2 in. long.

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Moringa pterygosperma, *Gærtn.*

W. & Arn. Prod. i. 178; *Wi. Illus.* t. 77; *Bedd. Fl. Syl.* t. 80; *Brandis*, p. 129.

GUILANDINA MORINGA, *Linn.*

HYPERANTHERA MORINGA, *Vahl., Roxb. Fl. Ind.* ii. 368.

Tree 30–35 feet; leaves 2–3 pinnate, with an odd leaflet; calyx 5 cleft; petals 5, nearly equal, the upper one ascending; filaments hairy at the base; racemes panicled; 5 stamens without anthers; seeds numerous, 3 angled, the angles expanding into wings; flowers white. (*Drury.*)

Native synonyms :—

Sujna, Moongay. *H.*
Shajina, Sigroo, Sobhanjun. *B.*
Mooringay, Mooringhy, Moorungay. *Tam.*
Mooraga, Moorunga, Moonaga. *Tel.*
Moongay. *Dec.*
Mooringeh, Mooringay. *Mal.*
Nugga. *Can.*
Merikoolu, Ganmurunga. *Cey.*
Sainga, Saigut. *Bombay.*

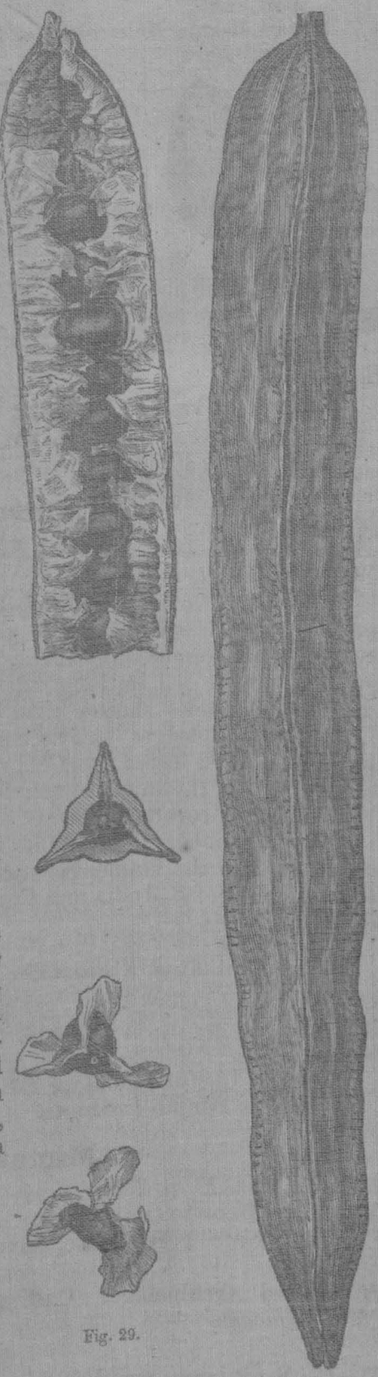


Fig. 29.

Seed.—Pods pendulous, 9–18 in. long, with nine rounded longitudinal ribs; seeds trigonous, winged at the angles, size of a large pea. (Fig. 29.)

Oil.—Clear, limpid, almost colourless oil, rather thick in this climate, is the character of the Museum sample of this oil.

Uses.—Medicinal.

Preparation.—This oil has been examined by Mr. Dugald Campbell, who states that it is the very opposite to a dry oil, being extremely rich in fatty substances, and of sp. grav. 915·60 at 60° F., water taken as 1·000. When it is kept cooled for a short time to 44° it becomes opaque from crystals of the fatty substances forming throughout it, and it is now very viscid and thick. In this state it may be heated up to 65° before it assumes its original brightness. It is nearly tasteless, and almost without odour. (*Ure's Dictionary.*)

O'Shaughnessy remarks that the delicate perfumes of flowers are often retained by the ben oil by pouring it over the flowers or strewing layers of the flower for about four hours over cotton soaked in the oil. It is thus that the jessamine and several other very volatile odours are obtained by the perfumers. (*Bengal Dispensatory.*)

In the West Indies it is stated that this oil is used as a salad oil, because it does not congeal or turn rancid, and that it has a reputation as an external application for pains in the limbs, gout, and rheumatism. Probably the oil derived from *Moringa aptera*, an allied species, has been confounded by authors with that of the present tree, from which Dr. Brandis says no oil is extracted in India, but Lieut. Hawkes writes that it is *seldom* made in India, and does not form an article of export.

Seeds and oil in the Museum from Madras.

Bibliography.—

Birdwood, Bombay Products, p. 300.
Journ. Soc. of Arts, Jan. 16, 1857.
Trans. Roy. Soc. Arts, Jamaica, iii. 9.
Hawkes' Report on Oils of S. India, p. 39.
Drury's Useful Plants, p. 298.
Simmonds' Commercial Products, p. 523.

Murraya Kœnigii, *Spr.*

Brandis, For. Fl. p. 48.

BERGERA KŒNIGII, *Linn., Roxb. Fl. Ind.* ii. 375.

Cor. Pl. t. 112; *W. & Arn. Prod.* 94.

Pubescent; leaflets 10–25, oblique at base, ovate lanceolate, short petioled, about 1 in. long; flowers white in terminal corymbose panicles; calyx persistent, segments short, triangular; petals oblong, dotted, 4–5 times longer than the calyx; anthers short, cordate; ovary 2-celled; style short, cylindrical; stigma capitate sulcate. (*Brandis.*)

Hab.—Outer Himalaya. Common in Bengal and S. India.

Native synonyms :—

Limbolee, Simbolee, Karay-paak, Bursunga. *H.*
Barsanga, Bursunga, Karia-phullee. *B.*
Caroova-pillay? Carroova-pillay, Karaway-pillay, Karipilli. *Tam.*
Kari-vepa. *Tel.*
Kari-bepon, Karreya-pela. *Mal.*
Gandla, Gandela, Gāndi, Gānt, Gani, Bowala. *N.W.P.*
Harra, Kat-nim. *Oudh.*
Watu-karapincha. *Cey.*
Karay-paak. *Vulg.*
Koodianeemb. *Bombay.*

Fruit.—Fruit ovoid, black when ripe, surface rugose; seeds embedded in mucilaginous fluid.

Oil.—Yellow, clear transparent oil procured from the seeds, and is known as Simbolee or Limbolee oil. All parts of the plant have a peculiar, powerful, rather disagreeable aromatic odour.

Bibliography.—Birdwood, Bombay Products, p. 296.

Myrtus communis, *L.*

Boiss. Fl. Orient. ii. 736; *Brandis, For. Fl.* 232.

Evergreen, wholly glabrous; leaves opposite, coriaceous, shortly petiolate, ovate-lanceolate, acuminate; flowers white; fruit a small blue-black berry, free part of calyx tube short, regularly 4–5 cleft.

Hab.—Cultivated.

Native synonyms :—

Vitāyati mehndi. *Murad.*
Hab-ul-ás. *Punj.*

Seed.—Berry globose, blue black.

Oil.—This is another of the substances concerning which information is required, whether any fatty oil is obtained from myrtle berries. Perhaps names have been confounded. We have no knowledge of such an oil.

Uses.—Said to be medicinal. Baden Powell remarks that it is reputed to be very strengthening and promotive of the growth of the hair.

Nicotiana tabacum, *L.*

DC. Prod. xiii. 557; *Woodv. Met. Bot.* i. t. 60.

Herbaceous, pubescent, glutinous, stem erect, tapering, branched above; leaves oblong-lanceolate, acuminate, sessile, lower ones decurrent, half stem-clasping; flowers pedicelled bracteate; segments of the oblong calyx lanceolate, acute, unequal; corolla outwardly downy, throat somewhat inflated, segments of the much spreading limb acute; capsule the length of the calyx or slightly longer.

Hab.—Cultivated, probably with other species.

Native synonyms :—

Tobacoo seed oil. *Eng.*
Tumak, Tumbaca, Bujjirbhang. *H.*
Tumak, Tumbaca, *B.*
Poghei. *Tam.*
Poghako. *Tel.*
Toombacco. *My.*
Doonkola. *Cey.*
Bujjirbhang. *A.*

Seed.—Seeds very small.

Oil.—Clear, limpid, colourless oil.

Uses.—For painting.

Seeds in the Museum from Bhopal; and oil from Sattara and Mysore.

Preparation.—The oil of tobacco seed appears to be known in Russia, and the seed is said to contain 15 per cent. of oil, which has peculiar desiccative properties, and may

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be employed with advantage in paints and varnishes. The process of extraction is simple and easy, requiring only a reduction of the seed to powder, which is kneaded into a stiff paste with a sufficient quantity of hot water, and submitted to the action of a strong press. The oil is exposed to a moderate heat, which precipitates all the impurities to the bottom of the vessel, leaving the oil in a perfectly clear and limpid state.

Bibliography.—Simmonds' Commercial Products, p. 518.

Nigella sativa, *L.*

Boiss. Fl. Or. i. 68; *DC. Prod.* i. 49.

Herbaceous, erect, rather hispid, rarely smooth; sepals oblong, attenuated into a short stem; petals shortly stipitate; anthers submuticis, carpels 5–7 verrucose, connate nearly to the apex in an ovate capsule; seeds trigonous, rough, tuberculate.

Hab.—Cultivated.

Native synonyms :—

Black cumin seed oil. *Eng.*
Kalajira. *H.*
Mugrela. *B.*
Carin-siragum. *Tam.*
Nulla-gilakara. *Tel.*
Koolunjun. *Dec.*
Kaloodooroo. *Cey.*
Shoonez. *A.*
Siah-daneh. *P.*

Seed.—Seeds black, irregularly triangular.

Oil.—A dark coloured fragrant oil, according to Lieut. Hawkes, but samples from Egypt exhibited in London in 1851 were clear, nearly colourless, and about the consistence of castor oil.

Seeds in Museum from Mysore and Calcutta, and oil from Sattara.

Bibliography.—

Birdwood's Bombay Products, p. 293.
Hawkes' Report on Oils of S. India, p. 40.

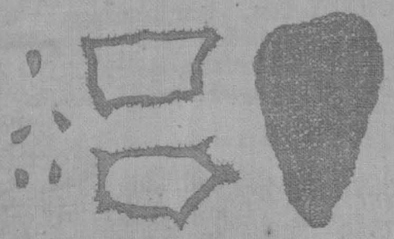


Fig. 30, seeds, natural size and magnified, with sections.

Olea ferruginea, *Royle.*

Royle, Illus. i. t. 65; *Brandis, For. Fl.* p. 576.

OLEA CUSPIDATA, *Wall., Brandis, For. Fl.* t. xxxviii.

Middle sized unarmed tree; branchlets, petioles, and enflorescence clothed with minute scales; leaves oblong lanceolate, cuspidate entire 2–4 in., shining above, thickly clothed beneath with minute ferruginous, orbicular scales; flowers whitish, bisexual in axillary subtrichotonous cymes, generally shorter than the leaf; bracts linear, caducous; lateral flowers sessile or sub-sessile, the terminal pedicellate; calyx short-campanulate, with 4 short teeth nearly truncate; corolla rotate, lobes ovate; anthers oval, filaments short; style short, stigma thickened, bifid.

Hab.—Afghanistan, Beluchistan, Hills of W. Sindh, Punjab salt range, and many parts of the outer ranges of the N.W. Himalaya to 6,000 feet.

Native synonyms :—

Khāu, Kahū. *Sindh.*
Kau, Khau, Ko, Kohu, Li, Khwan, Shwan, Shwawan. *Punj.*
Zaitun. *P.*

Seed.—Drupe ovoid, about ¼–⅓ in. long, black when ripe, supported by the remains of the calyx, pulp scanty, oily, putamen thick, hard, bony.

Oil.—In Afghanistan oil is extracted from the indigenous tree in a small way. In 1851 an experiment was made in Kohat to extract oil on a larger scale. The oil was excellent, but the quantity obtained was insufficient to repay an extension of the process.

Uses.—The same as ordinary olive oil.

Papaver somniferum, *L.*

W. & Arn. Prod. i. 17; *Roxb. Fl. Ind.* ii. 571.

Herbaceous, 2–3 feet; sepals 2, deciduous; petals 4; stem smooth, glaucous; leaves amplexicaul, repand, cut and toothed, teeth somewhat obtuse; capsules obovate or glabrous, peduncles drooping; seeds numerous; flowers red, white, or purplish.

Hab.—Cultivated in India.

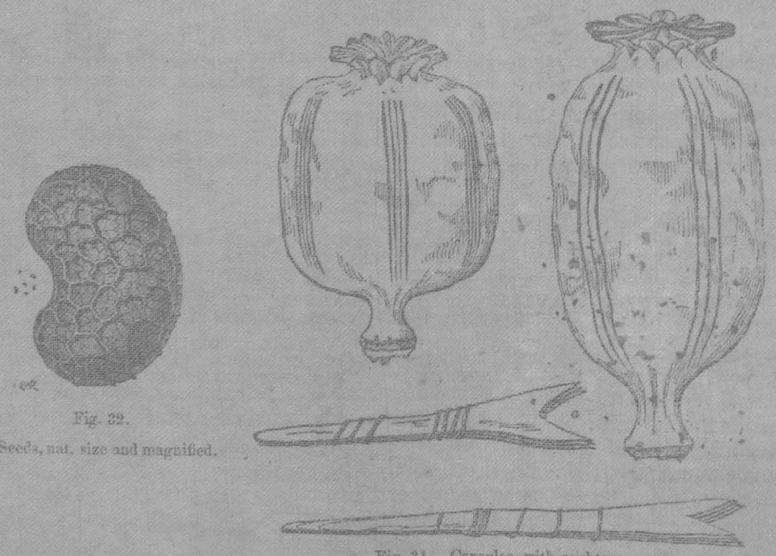


Fig. 32.
Seeds, nat. size and magnified.

Fig. 31. Capsules, with anshters.

Native synonyms :—

Posta-ka-tel. *H.*
Cassa-unnay. *Tel.*

Seed.—Seeds small, kidney shaped, reticulated, either yellowish, white, or grey.
Oil.—Clear, transparent, nearly colourless, limpid oil.
Uses.—Edible, and for burning, and in Europe for artists.
Preparation.—The poppy is largely cultivated throughout Malwa, and the opium districts, where the drying oil obtained from the seeds is more extensively used than any, both in lamps and as food. At Bhopaul the oil is procurable at the rate of Rs. 4. 8. per maund of 25 lbs., or about 40*l.* per ton. By simple exposure to the rays of the sun in shallow vessels, this oil is rendered perfectly colourless. (*Madras Jury Reports*, 1857.)

The poppy plant is largely cultivated in all parts of Shahabad and Behar, as also in the neighbouring district, for the sake of opium. The seed has no intoxicating qualities, but has a sweet taste, and is used parched by the lower classes of natives as food, it is also much used by the sweetmeat makers as an addition in their wares. This and the seed of the Til are the only oil seeds, with the exception of the cocoa-nut, which, as far as Mr. Bingham knows, are used for that purpose. It produces under the native method a clear limpid oil, which, however, has the disadvantage of burning very quickly. About 30 per cent. of oil is extracted, and the cake is then sold as a food to the poorer classes. The oil (in 1862) sold at about 5 seers per rupee. It has been suggested that if properly prepared this oil would, from its thin and limpid character, be admirably adapted to supersede many of the purposes, if not all, where the more expensive olive oils of Southern France and Italy are now used. (*Agri.-Hort. Journ.* xii. p. 344.)

Seeds in the Museum from Ahmedabad, Bhopal, Calcutta, Central India, Gyah, Goonah, Indore, Lucknow, Madras, Poona, Raepore, Sarun. Oil from Bengal, Calcutta, Ghazepore, Madras, Mysore, Patna, and Viziniagram.

Bibliography.—
Birdwood, Bombay Products, p. 293.
Hawkes' Report on Oils of S. India, p. 31.
Drury's Useful Plants, p. 397.
Simmonds' Commercial Products, p. 518.

Persea gratissima, *Gærtn.*

Wi. Icon. t. 1823; *Brandis, For. Fl.* p. 378; *Grieseb. W. Ind. Fl.* p. 280.

Tree; branchlets and panicles pubescent; leaves elliptical-oblong or elliptical, glabrate and pale beneath, primary veins 5–6 jugal, prominent beneath, pedicels shorter than the flower; calyx segments nearly equal; berry large, obovate.

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Hab.—Introduced from S. America.
Native names :—

Avocado pear, Alligator pear. *Eng.*

Seed.—Pear-shaped fruit, 4–6 in. long, with a large seed in a soft butyraceous pulp.
Oil.—Derived from the pulp of the fruit, of a dark greenish brown colour.
Uses.—For burning, soap-making, &c.

The avocado pear tree has been introduced into India, and as it promises to become naturalised deserves a record here. No oil in the Museum collection.

Bibliography.—
Trans. Jamaica Soc. of Arts, ii. p. 72.
Hawkes's Report on Oils of S. India, p. 46.

Pistacia Cabulica, *Stocks.*

Stocks in Hook. Journ. iv. 143; *Walpers' Ann.* iv. 446.

Tree 10–20 feet high, bark tuberculate, minutely pubescent; leaves 5–7–9 leaflets, petioles from the base to the apex inconspicuously subulate, leaflets subsessile, narrow lanceolate-oblong, pointed; fruit rounded, compressed.

Hab.—Beloochistan Hills and throughout Affghanistan.
Native synonyms :—

Kussoor. *Affgh.*
Pista. *H.*

Seed.—Fruit rounded, compressed.
Oil.—No sample in the Museum collection.
Uses.—Doubtful whether this oil is ever extracted in India, except as a curiosity or for experiment. The demand for the kernels would make it too costly.

Pistacio nuts in the Museum from Bombay are probably imported nuts of *Pistacia vera.*

Pithecolobium dulce, *Benth. in Hook. Journ.* ii. 423.

Bedd. Fl. Sylv. t. 188.
Inga dulcis, *Willd. W. & A. Prod.* i. 269.
Mimosa dulcis, *Roxb. Fl. Ind.* ii. 556.

Tree; extreme branches pendulous, armed with short straight stipulary thorns; leaves bipinnate, pinnæ and leaflets each one pair; leaflets oblong, very unequal sided, obtuse, with a gland between the pinnæ and between the pairs of leaflets, petiole shorter than the leaflets; flowers capitate, heads shortly pedunculate, racemose, the racemes panicled, legumes turgid, twisted; seeds glabrous and smooth, imbedded in a firm pulp. (*Beddome.*)

Hab.—Introduced from the Philippines.
Native synonym :—

Coorookoopilly.

Seed.—Legume torulose, circinating, valves red within, replete with an edible pulp; seeds black, shining, semi-immersed in an arillus.

Oil.—A light coloured oil, with about the consistence of castor oil.

Uses.—Its qualities and uses do not appear to have been determined. It was exhibited by Lieut. Hawkes at Madras in 1857.

Pongamia glabra, *Vent.*

W. & Arn. Prod. i. 262; *DCand. Prod.* ii. 416; *Wi. Ic.* t. 59; *Bedd. Fl. Syl.* t. 177; *Brandis, For. Fl.* 153.
Galedupa Indica, *Roxb. Fl. Ind.* iii. 239.
Dalbergia arborea, *Willd.*

Tree; leaflets 2–3 pair, ovate or obovate, acuminated, glabrous; vexillum, with two callosities at the base of the limb and decurrent along the claw; racemes axillary, many flowered, about half the length of the leaves; pedicels in pairs; legume oblong, nearly sessile, thick, with a short recurved beak, tumid along both sutures; flowers middle-sized, bright purple.

Hab.—Coromandel. Concans. Deccan. Patna. Assam.

The synonyms of the tree are—

Kurung, Caranj, Kungee, Karunje. *H.*
Kurunja. *B.*
Poongu-marum. *Tam.*
Kanoogoo, Kanoogamanoo. *Tel.*
Papar, Papri, Karanj, Kanji, Kunj.
Karanjaka. *Sans.*
Pongam. *Mal.*
Canaga. *Can.*
Mokul-karanda. *Cing.*

Native synonyms :—



Fig. 33.

Seed.—Legume thick, hard, semiovate, about 2 in. long, 1 in. broad, acute at both ends; seeds reniform.

Oil.—Rather thick red brown oil, with a tendency to deposit stearine in cool weather. This is the character of the oil in the Museum collection.

Uses.—This oil holds a high place in native materia medica as an application in scabies, herpes, and other cutaneous diseases. Dr. Gibson states that he knows no article of the vegetable kingdom possessed of more marked properties in such cases than the above. The oil is also much used as an embrocation in rheumatism. (*Pharm. India.*) In the Deccan Col. Sykes reported that it was employed as a lamp oil, and the Madras Jury Reports that it is chiefly used by the poorer classes as a lamp oil or for adulterating lamp oil.

Preparation.—In 1858, Mr. G. H. Grose made some observations on this oil in the Agri.-Hort. Journal from whence we gather the following particulars. The oil reported on was obtained at the village of Jeypore near Ampta at the rate of Rs. 11.8. per maund. A maund of seed will yield 8 seers of oil, and a large tree will produce 4 or 5 maunds of seed in a year, but if a tree produces 2 maunds of seed this will be 16 seers of oil for the tree, which is much less than is stated by the natives; allowing 40 trees to a Bengal beegah, 16 maunds of oil would be the produce of one beegah, which at Rs. 10 per maund is equal to Rs. 160, a result considered most satisfactory. In its boiled state this oil is thicker and resembles castor oil. The special examination of this oil made by Mr. C. B. Wood elicited some peculiar features, one of which is thus stated "This is the first time I have ever seen any oil become darker in passing through animal charcoal, which not only deprives most oils of colour, but in many instances destroys the strong and offensive smell. It appears to me to contain a very powerful acid which has worked on the perforated funnel containing the charcoal through which the oil percolated. It may be a good oil for the pharmacopœia, but I fear it would not take for burning, because of its offensive smell, and for machinery on account of the acid which I believe it contains." (*Agri.-Hort. Journ.* 1858, x. p. 223.)

Seeds in the Museum from Ahmedabad, Bhopal, Bombay, Madras, Mangalore, and Poona; and oil from Bombay, Chota Nagpore, Chittagong, Madras, Mysore, and Sattara.

Bibliography.—

Birdwood's Bombay Products, p. 299.
Hawkes's Report on Oils of S. India, p. 33.
Pharmacopœia of India, p. 79.
Journ. Agri.-Hort. Soc. of India (1858), vol. x. p. 223.
Drury's Useful Plants, p. 353.

Prinsepia utilis, *Royle.*

Royle Illust. t. 38, f. 1; *Brandis, For. Fl.* p. 196.

Nearly glabrous; youngest branchlets only pubescent; leaves coriaceous, axillary, spines often leaf-bearing; flowers white, in short axillary racemes, generally from the outside base of the spines; drupes purple; seeds oily. (*Brandis.*)

Native synonyms :—

Baïkar. *Punj.*
Gurinda, Chamba, Tatua, Phulwara, Rari, Jinti, Bekkli, Karngura, Behkul, Bhekkal, Bekhwa, Bekkar. *Punj.*

Seed.—Drupe oblique, oblong, cylindrical, purple, fleshy, with a coriaceous 1-seeded kernel.

Oil.—The oil expressed from the seeds.

Use.—For food and for burning.

No seed or oil in the Museum collection.

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Prunus Armeniaca, *Linn.*

Roxb. Fl. Ind. ii. 501; *Brandis, For. Fl.* p. 191.

ARMENIACA VULGARIS, *Pers., DC. Prod.* ii. 532; *Boiss. Fl. Orient.* ii. 652.

Low tree of rather crooked growth; leaves broad, roundish, cordate or ovate, glandularly serrated; flowers white, tinged with dusky red; fruit round, yellow within and without; seed smooth, compressed.

Hab.—Armenia. Cultivated in India.

Native synonyms :—

Himalayan apricot. *Eng.*
Badam-kohee. *N.W.I.*
Hari, Gardalu, Jaldaru, Shirau, Cheroli, Cherkush, Serkuji, Shari, Zardalu. *Punj.*
Jaldaru, Chui, Barzha, Hari, Chir, Sari. *N.W.P.*
Iser. *Cash.*

Seed.—Drupe downy or smooth, with a tender, succulent sapid pericarp, stone smooth, with a thickened sulcate margin.

Oil.—Clear, of a pale yellow colour, smelling strongly of hydrocyanic acid, of which it contains about 4 per cent. It is sold in the bazaars as Badam kohee. (*O'Shaughnessy.*)

Uses.—The oil extracted from the kernels is burnt, used in cooking, and for the hair.

No seed or oil in the Museum collection.

Bibliography.—

Brandis, Forest Flora, pp. 192.
O'Shaughnessy, Bengal Dispensatory, 323.

Putranjiva Roxburghii, *Wall.*

Wi. Ic. t. 1876; *Royle, Ill.* t. 83*a*; *Bedd. Fl. Sylv.* t. 275; *Brandis, For. Fl.* 451.

PUTRANJIVA AMBLYOCARPA, *Müll. Arg.*; *DC. Prod.* xv. 444.

NAGEIA PUTRANJIVA, *Roxb. Fl. Ind.* iii. 766.

Middle sized evergreen tree, dark green foliage, branchlets and petioles pubescent; leaves elliptic oblong, with unequal-sided base, serrulate, short petiolate, 3–5 in. long, upper side glabrous, shining, lateral nerves numerous, joined by reticulate veins; stipules subulate, deciduous; male flowers small, yellow, subsessile, numerous, collected in sessile irregularly globose axillary heads; calyx 3–5 cleft; stamens 3, filaments more or less connate; female flowers pedunculate, axillary, often in twos or threes; calyx 5–6 cleft, segments oblong, obtuse; ovary 3-celled, pubescent; styles 3, short, dilated into triangular lobed stigmas. (*Brandis.*)

Hab.—Sub-Himalayan tract. Bengal. Burma. S. India.

Native synonyms :—

Putranjiva. *Sans.*
Jivputrak. *H.*
Kudra-juree. *Tel.*
Pongolam. *Mal.*
Patji. *Oudh.*
Putajan. *Punj.*
Jia-puta, Joti, Juti, Putra-jiva. *N.W.P.*

Seed.—Fruit ovoid, smooth, white, $\frac{2}{3}$ in. long; nut pointed, very hard, rugose, 1-celled, 1-seeded.

Oil.—Olive brown, rather turbid, soon exhibiting a deposit of the more solid portion.

Uses.—Not stated, probably for burning.

Seeds in the Museum from Saharunpore, and oil from Chota Nagpore.

Bibliography.—

Birdwood, Bombay Products, p. 307.
Hawkes's Report on Oils of S. India, p. 38.

Raphanus sativus, *L.*

DC. Prod. i. 228; *Hook. Fl. Ind.* i. 166.

Root fleshy, variable in size and form; leaves roughly pilose, lower leaves lyrate; flowers variable, usually white or lilac with purple veins; pods terete, continuous, 1 in. to 2 ft.

Var *a. Caudatus* (Raphanus caudatus, L.), with whip-like pods as long as the entire plant.

Hab.—Cultivated.

Native synonyms :—

Radish. *Eng.*
Moollee. *H.*
Moue-lah. *Pegu.*
Moogae-beejah. *Can.*
Moolinga-verie. *Tam.*
Tukm-i-turb. *P.*

Seed.—The pods are cylindrical and continuous, reaching in one variety to nearly 2 feet; seeds oblong, smooth.

Oil.—Apparently very similar to the oils obtained from the seeds of other cruciferous plants. Sample of this oil was shown at the Madras Exhibition of 1857.

Uses.—Same as rape oil.

Seeds in the Museum from Ahmedabad, Bengal, and Bombay, and oil from Mysore and Madras.

Ricinus communis, *L.*

Roxb. Fl. Ind. iii. 689; *DCand. Prod.* xv. p. 1017.

Height 8–10 feet; root perennial; stem round, thick, pointed, channelled, glaucous, purplish-red colour upwards; leaves alternate, large, deeply divided into seven segments, on long tapering purplish stalks, spikes glaucous, springing from the divisions of the branches, males from the lower part of the spike, females from the upper; capsules prickly; seeds oval, shining, black dotted with grey.

Hab.—Cultivated.

Native synonyms :—

Arend, Arendi, Arendi-ka-tel. *H.*
Arendi, Bherenda. *B.*
Sittamunak, Sittāmoonakā-unnay. *Tam.*
Amadum, Sittamindi. *Tel.*
Avanak, Pandiavanak, Citavanakoo. *Mal.*
Erundie. *Dec.*
Haralu. *Can.*
Endaru. *Cey.*
Jarak, Miniak-jarak, Citavanaca. *Mu*
Kyet-hsoo, Kyet-tsootshee. *Burm.*
Jarak, Citavanaca. *Sumatra.*
Khiroa, Cherua, Tehscha, Zœjt, Djar, Duhnul-kherwa. *A.*
Beedinjeer, Rowgen, Bedanger. *P.*

Ricinus communis, minor, *L.*

a. Small seeded variety.—

Arend, Arendi, Arendi-ka-tel. *H.*
Arendi, Bherenda. *B.*
Sittamunak, Sittāmoonakā-unnay. *Tam.*
Amadum, Sittamindi. *Tel.*
Avanak, Pandiavanak, Citavanakoo. *Mal.*

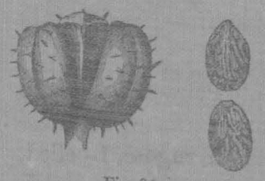


Fig. 34.

Seed.—Capsule prickly, tricoccous; seeds oval, flattened, blackish or purplish brown, mottled with grey, about ½ in. long or less.

Oil.—Pale straw-coloured, or almost colourless.

Uses.—For medicinal purposes.

Seeds in Museum from Cuttack, Singapore, Bimlipatam, Mangalore, Mysore, Poona, Madras, Assam. Oil from Calcutta, Dinapore, Madras, Mangalore, Mysore, Tanjore, Bombay, and Penang.

Of the two varieties of castor oil seed the small yields the best oil, which is employed for medicinal purposes, the large furnishes lamp oil. The two may therefore be treated of separately. The following observations on the production of oil from the small seed were furnished in the Madras Jury Report for 1857, by Lieut. Hawkes.

The fresh seeds after having been sifted and cleaned from dust, stones, and all extraneous matters are slightly crushed between two rollers, freed by hand from husks and coloured grains, and enclosed in clean gunny. They then receive a slight pressure in an oblong mould which gives a uniform shape and density to the packets of seed. The "Bricks" as they are technically called are then placed alternately with plates of sheet iron in the ordinary screw or hydraulic press. The oil thus procured is received in clean tin pans, and water in the proportion of a pint to a gallon of oil being added the whole is boiled until the water has evaporated; the mucilage will be found to have subsided and encrusted the bottom of the pan, whilst the albumen solidified by

heat forms a white layer between the oil and the water. Great care must be taken in removing the pans from the fire the instant the whole of the water has evaporated, which may be known by the bubbles having ceased, for if allowed to remain longer the oil, which has hitherto been of the temperature of boiling water or 212°, suddenly rises to that of oil or nearly 600°, thereby heightening the colour and communicating an empyreumatic taste and odour. The oil is then filtered through blanket flannel or American drill, and put into cans for exportation. It is usually of a light straw colour, sometimes approaching to a greenish tinge.

The cleaned seeds yield from 47 to 50 per cent. of oil, worth in England from 4*d.* to 6*d.* per lb.

The following is the result of experiments made at Madras and Calcutta to ascertain the per-centage of oil in Castor seed.

In Calcutta 1,400 lbs. of seed yielded as follows :—

	Kernels.	Oil.
1st sort - -	632 lbs.	324 lbs.
2nd sort - -	184 ,,	87½ ,,
3rd sort - -	164 ,,	76½ ,,
	980 ,,	488 ,,

Making a total of 980 lbs. of kernels and 488 lbs. of oil from 1,400 lbs. of seed.

In Madras 1,400 lbs. of seed yielded :—

	Oil.
1st sort - -	318 lbs.
2nd sort - -	88 ,,
3rd sort - -	74 ,,
Total -	480 ,, of oil from 1,400 lbs. of seed.

	Rs.	a.	p.
The cost of the Madras oil is stated as follows :—			
1,400 lbs. of seed at Rs. 3.3 per bag of 164 lbs. - -	27	3	4
Husking and selecting kernels and cooly hire - -	3	11	9
Crushing, moulding, pressing, and boiling - -	2	7	1
Filtering and sundries - - - -	2	8	0
Overseer's pay, godown rent, &c. - - -	1	6	2
300 empty quart bottles, corks, &c. - - -	34	4	8
Cleaning and packing charges - - -	4	8	0
	Rs. 76	1	0

Or an average of $4\frac{17}{360}$ annas per quart of first, second, and third sort oil, or 4*d.* per lb.

When manufactured in the ordinary native mill this oil is sometimes used by the richer classes in lamps.

Castor oil extracted hot differs from the preceding only in the mode of preparation. The seeds are boiled for two hours in water, dried for three days in the sun, freed from the shells, pounded, and then boiled in fresh water until the whole of the oil has risen to the surface. Five seers of the seeds or 3⅛ lbs. should by this process yield a quart of oil. This is the sort generally used in medicine by native practitioners; it is straw-coloured and free from any unpleasant taste or smell. (*Lieut. Hawkes.*)

Ricinus communis, major, *L.*

b. Large seeded variety.—

Seed.—Capsule prickly, tricoccous; seeds oval, flattened, purplish brown, marbled and variegated with grey, ¾ inch long.



Fig. 35.

Oil.—More or less discoloured or turbid.

Uses.—For burning in lamps.

Seeds in Museum from Calcutta, Gyah, Ahmednugger, Mysore, Madras, Ahmedabad, Moorshedabad, Sarun. Oil from Canara, Chota Nagpore, Madras, Sattara, and Tanjore.

In the Sasseram district Mr. Bingham states that the castor oil plant is largely cultivated, principally for home use, but a considerable quantity for the castor oil factories of Dinapore. The native process only succeeds in making a very impure oil, which is so offensive for its smoky qualities in burning that it is not sought after by them for that purpose; but only for anointing leathern well ropes, shoes, &c., and being a cheap oil is largely used for the latter purpose. It is thick and viscid, and, extracted under the native process, soon turns rancid; while by the European process it is next to the cocoa-nut oil one of the purest and best burning oils known. The plant scarcely requires any cultivation, and in South Shahabad is oftener sown in the borders of a valuable field as a hedge than for any other purpose. It loves, however, a sandy loam, and will not grow in the clays. Its yield under the native process is about 33 per cent. of the impure oil above described; and he believes a larger quantity and he knows that a purer oil is extracted by the European process. Newly cleared jungle lands grow the castor plant abundantly, and its extended cultivation is only bounded by the demands in the market, as long as the rates are remunerative; for although the sowing and tendence of the plant costs little trouble, yet the packing of the seed is a troublesome process, and it requires a much larger amount of room to come to perfection. The natives sow and uproot the plant yearly. He did not know why this should be, as it grows and yields abundantly the second and third years in hedges or other open places. When cultivated by itself the natives always sow the seed too close, and consequently the plant is comparatively small; for attaining its full perfection no place is better for it than a hedge or a bank. (*Agri.-Hort. Journ.* xii. p. 341.)

Lamp oil is obtained from the large castor oil seeds sometimes by the cold method, but more usually it is extracted by heat and forms the common "lamp oil" of the bazaars.

The mode of preparation is thus described by Lieut. Hawkes. The seeds having been partially roasted over a charcoal fire, both to coagulate the albumen and liquefy the oil, are then pounded, and boiled in water until the oil rises to the surface. The roasting process, however, gives it a deeper red colour and an empyreumatic odour. The price varies in different parts of the country from Rs. 1.10 to Rs. 3.13.6 per maund of 25 lbs. The average of 19 large stations in all parts of the Madras Presidency for the quarter ending 31st Oct. 1854 was Rs. 2.8.6 per maund. (*Jury Reports*, 1857.)

Bibliography.—

Birdwood, Bombay Products, p. 306.
Hanbury and Flückiger, Pharmacographia, p. 510.
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Canvane, Dissertation on Oleum Palmæ Christi (1764).
Pereira Materia Medica, ii. 416.
Guibourt, Hist. de Drogues.
Dispensatory of United States, p. 592.
Pharmacopœia of India, p. 201, 462.
Pharmaceutical Journal, 2 ser. ii. 419; vii. 229; viii. 250; iv. 282; vii. 534; i. 350.
Ainslie, Materia Medica, i. 256.
Hawkes' Report on Oils of S. India, pp. 16, 25.
Drury's Useful Plants, p. 365.
Simmonds' Commercial Products, p. 542.

Samadera Indica, *Gærtn.*

Gærtn. Frut. ii. t. 156; *Hook. Fl. Ind.* i. 519; *Wi. Ill.* t. 68; *W. & Arn. Prod.* 151; *Hook. Ic. Pl.* t. 7.

NIOTA PENTAPETALA, *Poir. in Lam. Dict.* iv. 490; *DC. Prod.* i. 592.

NIOTA TETRAPETALA, *Lam. Ill.* t. 299.

NIOTA LAMARCKIANA, *Blume, Bidj.* 251.

VITTMANNIA ELLIPTICA, *Vahl. Symb.* iii. t. 62.

MANUNGALA PENDULA, *Blanc. Flor. Filip.* p. 306.

Small tree, with stout branches; leaves elliptic-lanceolate, fleshy, umbels many flowered on very long peduncles equalling the leaves; fruit coriaceous, glabrous, smooth, or slightly reticulated. (*Hooker.*)

Hab.—Western Peninsula.

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Native synonym :—

Karinghota. *Mal.*

Seed.—Fruit oval, 1½ by 1 in.
Oil.—Not described, and no sample is to be found in the Museum.
Uses.—Medicinal, for rheumatism.
No seeds or oil in the Museum.
Bibliography.—Drury, Useful Plants, p. 380.

Santalum album, *L.*

Bedd. Fl. Sylv. t. 256; *Roxb. Fl. Ind.* i. 442; *Brandis*, p. 398.

SIRIUM MYRTIFOLIUM, *Roxb. Cor. Pl.* t. 2.

Small evergreen glabrous tree; leaves opposite, ovate or ovate lanceolate; blade about 2 in. long, narrowed into petiole ½ in. long; flowers deep brownish purple or blood red, inodorous, in axillary cymose panicles; perianth campanulate, limb of 4 valvate, triangular segments; stamens exserted, adnate to the perianth tube, and alternating with 4 rounded obtuse scales; style as long as perianth; berry black, alternating with 4 rounded obtuse scales; style as long as perianth; berry black, globose, one-seeded. (*Brandis.*)

Hab.—Indigenous in the drier parts of the peninsula. Cultivated in other places.

Native synonyms :—

Sandal wood, White Sandal wood, Yellow Sandal Wood. *Eng.*
Sandal, Chandanam, Chandanapuchettu, Sandanum, Tella-chandanam, Krishna-chandanam, Rakta-krishna. *Tel.*
Chandanam, Shandanam, Sandanum, Somendilla? *Tam.*
Chandana, Kat-chandan, Sandal, Sakar, Chunduna, Chundoie. *H.*
Chandana, Chunduna. *B.*
Chandana, Mala-yaja, Gandhasara, Bhadrasri, Ghundasaru. *Sans.*
Sandal-abiad, Sundul-abiyaz. *A.*
Ayasru. *Amboyna.*
Narti, Niat. *Annatom Island.*
Sanda-ku. *Burm.*
Gandaga-mara, Sri-ganda, Gandaga. *Can.*
Tan-heong, Tan-mùh. *Chin.*
Kaya yndhan. *Cochin Chin.*
Chunduna, Ghundasaru, Sandel, Sundel. *Dec.*
Jarse. *Fiji.*
Sandal-sakar, Sundul-sukur. *Guz.*
Chandan. *Mahr.*
Chandana, Jindana, Chunduna, Chandana-mara, Tsjandana-maruin, Somendilla? *Mal.*
Bua-alu. *Marquesas.*
Nassau. *New Hebrides.*
Turi-turi. *Oparto Islands.*
Sandal-safed, Sundel-safeid. *P.*
Hia-hi. *Sandwich Islands.*
Sandan, Rat-hihiri. *Cyn.*
Nebissi. *Tanna Islands.*
Aika-menil. *Timor.*
Eimeo, Ahi. *Tahiti.*

Seed.—Berry black, globose, one-seeded.
Oil.—The seeds of the sandal wood tree yield by expression a thick and viscid oil, which is burnt by the poorer classes in lamps. (*Madras Jury Reports*, 1857.)

Lieut. Hawkes observes that it does not give much promise of usefulness. Sandal wood oil is distilled from the wood.

Bibliography.—

Birdwood, Bombay Products, p. 306.
Madras Jury Reports, 1857.
Hawkes' Report on Oils of S. India, p. 38.

Sapindus trifoliatus, *Linn.*

Hook. Fl. Ind. i. 682.

SAPINDUS LAURIFOLIA, *Vahl. Symb.* iii. 54; *Roxb. Fl. Ind.* ii. 278; *W. & A. Prod.* i. iii.; *Brand. For. Fl.* 106.

SAPINDUS ACUTUS, *Wi. Icon.* t. 1965.

SAPINDUS EMARGINATUS, *Roxb. Fl. Ind.* ii. 279; *Bedd. Fl. Sylv.* t. 154; *Wi. Ill.* t. 51.

SAPINDUS ABSTERGENS, *Roxb.*

Tree; leaves (normally) abruptly pinnate, leaflets 6–4 elliptic or oblong acuminate or emarginate, glabrous, or especially beneath pubescent, with short curved or stellate hairs, base obtuse, enflorescence terminal, panicled, pubescent, scale of the petals membranous, pilose-ciliate; ovary 3-lobed, ferruginous, tomentose. (*Hooker.*)

Hab.—Common about villages in S. India. Cultivated in Bengal.

Native synonyms :—

Rethà, Riti-ka-jhar, Ritha. *H.*
Koomuttie-ghenzalo, Kankadu, Kunkudu-karra, Kunkudu, Kankadu-chettu, Koonkudu-karra, Konkoodoo. *Tel.*
Poovandie, Pounanga, Pucha-cotta-maram, Puvandi, Poochee-cottay, Horingi-maram, Manay-poongunka, Ponnan-kottai. *Tam.*
Buro-ritha, Ritha. *B.*
Thalay-marathu, Kukate-kayi. *Can.*
Findage hindi, Fandage-hindi, Bandage-hindi. *Ar.*
Urvanjik-kaya, Punnan-kotta. *Mdly.*
Miavmen-sue-khe-si, Me-av-me-sue-kha-ti. *Burm.*
Arishta phalam. *Sans.*
Areeta. *Mahr.*
Rarak. *My.*
Penela, Gas-penela. *Cyn.*
Ritha, Ritah, Retch. *Dec.*
Urista. *Sans.*
Mukta-maya. *Uriya.*
Ratah. *P.*

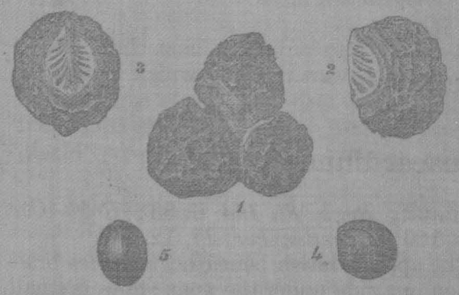


Fig. 86.
1–3, Capsules; 4, 5, Seeds.

Seed.—Drupes fleshy, 2 or 3 slightly nited, each the size of a cherry; seed sub-spheroid.

Oil.—Semi-solid oil, extracted from the kernel of the seed.

Uses.—Medicinal.

Seeds in the Museum are from Ahmedabad, Cuttack, and Madras, and oil from Madras.

Bibliography.—

Birdwood, Bombay Products, p. 297.
Hawkes' Report on Oils of S. India, p. 39.

Sarcostigma Kleinii, *W. & A.*

Hook. Ind. Fl. i. 594; *Miers, Contrib.* t. 18; *Wi. Ill.* t. 1854.

Climbing branched shrub, branches terete; leaves 4–10 by 2–4 in., coriaceous, pale on both surfaces, base rounded, nerves prominent beneath; petiole $\frac{4}{5}$ in., transversely wrinkled; rachis extra-axillary, angular, covered with brownish strigose hairs; flowers $\frac{1}{8}$ in. diam.; male flowers, calyx minute, pilosulous, cup-shaped, obscurely 4–5 lobed; petals $\frac{1}{12}$ in., glabrous, oblong, acute; stamens as long as the petals, filaments glabrous, flat, strap-shaped, anthers 2-celled; rudiment of pistil conical; female flowers, calyx and corolla as in the male; ovary obovoid, pilosulous, surrounded by five hypogynous abortive stamens, stigma subsessile, conical; ovules 2, collateral. (*Hooker.*)

Native synonyms :—

Poovana, Poovengah.
Adal, Odul (oil).

Seed.—Fruit 1–1½ in., olive shaped, somewhat compressed, bright orange red, rugose and strigose externally, smooth within.

Oil.—With a peculiar but not disagreeable odour.

Uses.—This plant yields a highly esteemed medicinal oil (Adal or Odul), much used on the western coast for rheumatism. Lieut. Hawkes remarks that it is burnt in lamps, and is only known in Tinnevelly, Travancore, and the western coast.

Bibiography.—

Birdwood, Bombay Products, p. 306.
Hawkes's Reports on Oils of S. India, p. 42.
Drury's Useful Plants, p. 386.

Schleichera trijuga, *Willd.*

Brandis, For. Fl. pl.xx. p. 105; *Bedd. Fl. Sylv.* t. 119; *Roxb. Fl. Ind.* ii. 277; *W. & A. Prod.* 114.

Large tree; young parts downy; leaves abruptly pinnate, coriaceous when old, leaflets 2–4 pair, opposite, sessile, oblong, entire, obtuse-acute or short acuminate, with 10–18 main lateral nerves on either side of the midrib and intermediate shorter nerves, the leaflets of the lowest pair 1–3 in., of the terminal pair 6–9 in. long; flowers yellow, on short pedicels, fascicled on interrupted, often branched racemes; racemes axillary, or below the leaves, often several on short branchlets; male and bisexual flowers generally on different trees. (*Brandis.*)

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Hab.—Common in the dry forests of S., Cent., and E. India, below 3,000 feet. In N. W. India in Oudh forests.

Native synonyms :—

Kosum, Kossum, Kussumb, Gausam, Kasam. *Cent. Ind.*
Poo-marum. *Tam.*
Sagdi-marra. *Can.*
May, Roatangha. *Tel.*
Gyoben. *Burm.*
Koosum. *Bombay.*
Kassuma, Koham, Kocham. *Panch Mehals.*

Seed.—Fruit the size of a nutmeg, pointed, often echinulate; seeds 1 or 2 with a smooth brown testa enclosed by a pulpy arillus which has a pleasant acid taste; cotyledons full of fat oil.

Oil.—Not described, and there is no sample in the Museum collection.

Uses.—As a lamp oil in Malabar.

Seeds in the Museum are from Mangalore.

Bibliography.—Drury's Useful Plants, p. 386.

Semecarpus anacardium, *L.*

Wi. & Arn. Prod. i. 108; *DCand. Prod.* ii. 62; *Roxb. Fl. Ind.* ii. 83; *Roxb. Cor. Pl.* t. 12; *Wi. Icon.* 558; *Bedd. Fl. Sylv.* t. 166; *Brandis, For. Fl.* 124.

Tree; leaves cuneate obovate, rounded at the apex, whitish beneath; panicles bracteolated; fruit sessile, cordate ovate, notched on one side under the apex; flowers small, green. (*Drury.*)

Hab.—Coromandel and most parts of India.

Native synonyms :—

Bhela, Bhela-taki, Bhelva, Bhola-taki. *B.*
Bhela, Belawina, Bhelawan, Bhilama. *H.*
Bhela, Bhola. (*Gualpara.*)
Shayng-cottay-maram, Shayrang-cottay. *Tam.*
Bhallataka, Bhallatamu, Nalla-jidi-chettu, Jidichettu, Nellajidi, Jiri, Jidighinzalu, Tummedamamidi, Jadi-chetto, Neelajeedie, Jeedi-ghenzaloo. *Tel.*
Biladur. *P.*
Habbul-fahm, Habbul-galb.
Shen-kotte. *Cing.*
Kiri-badulla. *Cyn.*
Chai-bin. *Burm.*
Ghera-mara, Gheru. *Can.*
Kampira. *Mal.*
Arushkara, Bhalataka, Bhallataka-bijam. *Sans.*
Bhalawan, Bhela, Bhilawa. *Dec.*
Bellawa, Bhilamu. *Guz.*
Beebwa, Bibooa, Biba. *Mahr.*
Bhalleah, Ballia. *Uriya.*
Ingarduja. *Ar.*
Khi-si. *Burm.*

Seed.—Drupe obliquely oval, or oblong, about 1 in. long, smooth, shining, purplish black when ripe, with a thick pericarp, its cells filled with an acrid resinous juice, surrounded at the base by a fleshy orange hypocarp formed of the thickened receptacle and base of calyx.

Oil.—The museum sample is a very dark, rather tenaceous, unpromising oil.

Uses.—The oil of the seeds, says Brandis, mixed with the milk of *Euphorbia* is made into birdlime by the wild tribes of the Satpara range in the central provinces.

According to the Madras Jury Reports (1857), the acrid and vesicating oil which is found between the two laminæ of the pericarp of the marking nut is collected and used as a preventive against the attacks of white ants and by native practitioners in rheumatic and leprous affections. By boiling the whole nut not divested of its pericarp an oil is also obtained which acts as a blister.

The qualities of the oil of the kernel of the nut require investigation.

The preparation or collection either of the oil or acrid juice is liable to cause much irritation and inflammation of the hands, face, &c. of those engaged in the work.

The acrid black substance found in the pericarp does not fall under the denomination of "oil;" the produce of the kernel alone is included here.

Specimens of seed in the Museum from Calcutta, Madras, and Travancore, and oil from Madras.

Bibliography.—

Birdwood, Bombay Products, p. 299.
Pharmacopœia of India, p. 60.
Bengal Dispensatory, p. 280.
Drury, Useful Plants, 383.

Sesamum Indicum, *L.*

Roxb. Fl. Ind. iii. 100.

Annual; 2–3 feet; leaves ovate, oblong, entire, calyx five-parted; corolla with a short tube and campanulate throat; flowers axillary, solitary, corolla dirty white or pale red; capsule oblong, tetragonal, 4-celled; seeds numerous.

Hab.—Cultivated.

Native synonyms:—

Gingelly oil, Sesame oil. *Eng.*
Meetha, Til, Krishna-til. *H.*
Til. *B.*
Nul-unnay, Yelloo-cheddie. *Tam.*
Noovvoloo. *Tel.*
Schit-eloo. *Mal.*
Barcek-til. *Dec.*
Tel-tala, Tun-pattala. *Cey.*
Hnan. *Burm.*
Djyl-djylan. *A.*
Kunjed. *P.*

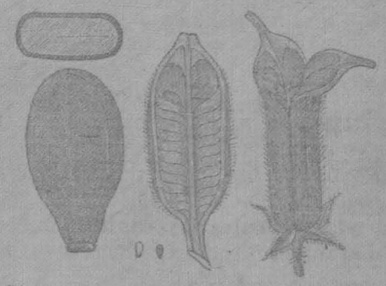


Fig. 37, capsule with seed nat. size and magnified.

Seed.—Capsule 4-celled, two-valved; seeds flattened, small, somewhat discoid, varying from dirty white to nearly black.

Oil.—A clear, limpid oil, varying in colour with that of the testa of the seed, sometimes very pale yellowish, at others dark amber, inodorous, of a bland sweetish taste, and not liable to become rancid.

Uses.—In India it is chiefly used in cookery, in anointing the person, for making soap, and for burning in lamps. In England for soap and for burning in lamps. It bears some resemblance to olive oil in its properties and may be used for similar purposes. Like olive oil it is laxative in large doses.

Preparation.—This oil is probably consumed to a greater extent than any other by the natives of India, and second only to cocoa-nut oil in importance as an article of commerce. The seed is extensively cultivated.

The mode of preparation sometimes adopted is that of throwing the fresh seeds, without any cleansing process, into the common mill and expressing in the usual way. The oil thus becomes mixed with a large portion of the colouring matter of the epidermis of the seed, and is neither pleasant to the eye nor so agreeable to the taste as that obtained by first repeatedly washing the seeds in cold water, or by boiling them for a short time until the whole of the reddish brown colouring matter is removed and the seeds have become perfectly white. They are then dried in the sun and the oil expressed as usual. This process yields 40 to 44 per cent. of a very pale straw-coloured sweet smelling oil, an excellent substitute for olive oil.

In different parts of the Madras Presidency the price of this oil varies from Rs. 1.5 to Rs. 6 per maund of 25 lbs. In S. Arcot it is procurable at Rs. 27.12.5 per candy. (*Jury Reports*, 1857.)

Two varieties of Sesame are cultivated for the sake of the oil. The gingelly seed par excellence is the produce of the plant which is sown in the month of March after the rice crop, and is irrigated twice, once at sowing and once afterwards. The seed, which is black and is called first sort gingelly, from the fact of its yielding the largest per-centage of oil, ripens in May, and sells at the rate of Rs. 60 per candy of 500 lbs. The oil obtained from both varieties sells at the same price, viz., Rs. 2.14.6 to 3 per maund of 25 lbs., according to quality.

Second sort gingelly is sown in June, and produces a red seed. The plant, although a little larger, resembles in most respects the former; it has, however, a somewhat longer leaf, and the flower differs a shade or two in colour. A candy of 500 lbs. of this seed sells at Rs. 57.8. The price of the oil is the same as that of Gingeley. (*Jury Reports.*)

Mr. R. W. Bingham, in reporting of the resources of the Sasseram district, observes that of this seed there are two kinds, and both are extensively sown in various parts. The first is sown in July, and is ready for reaping, say, in November, the seed is sown in August, but they are both ready nearly at the same time. These plants are also sown as auxiliaries, but with the high land rain crops, such as Ruhur, Motha, &c. The seed has about the same value as Sursoon in the bazaars, but the oil being thinner and purer, and almost tasteless, while burning with little smoke, is extensively used in Indian perfumery. It is extracted from the seed in the same manner as mustard seed. The residue or cake is eaten by the poorer classes as an article of food,

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and is greedily devoured by cattle. It grows in sandy loams. (*Agri.-Hort. Journ.* xii. 339.)

Test.—The authors of the Pharmacographia state that a peculiar substance is obtained in solution by repeatedly shaking five volumes of the oil with one of glacial acetic acid. If a cold mixture of equal weights of sulphuric and nitric acids is added in like volume the acetic solution acquires a greenish yellow hue. The same experiment being made with spirits of wine substituted for the acid, the mixture assumes a blue colour quickly changing to greenish yellow. The oil itself being gently shaken with sulphuric and nitric acids takes a fine green hue. It takes place even with the bleached and perfectly colourless oil. Sesame oil added to other oils, if to a larger extent than 10 per cent., may be recognised by this test.

Sesame seed in the Museum are from Assam, Cuttack, Ahmednugger, Burmah, Serokie, Madras, Indore, Lucknow, Sattara, Mangalore, Bimlipatam, Kurrachee, Jacobabad, Siam, Dharwar, Gyah, Goonah, Moulmein, Poona, Midnapore, Bhopal, Mysore. Oil from Calcutta, Chota-Nagpore, Goonah, Lucknow, Madras, Mangalore, Mulkapore, Mysore, Patna, Sattara, Tanjore, Tenasserim, and Vizagapatam.

Bibliography.—

Journ. Agri.-Hort. Soc. India, xii. 339.
Madras Jury Reports, 1857.
Hawkes' Report on the Oils of Southern India, p. 22.
United States Dispensatory, p. 776.
Pharmacopœia of India, p. 150.
Hanbury and Flückiger, Pharmacographia, p. 425.
O'Shaughnessy, Bengal Dispensatory, 479.
Buchanan's Journey through Mysore, i. 95, ii. 224.
Baden Powell's Punjab Products, p. 420.
Simmonds' Commercial Products, p. 533.
Birdwood, Bombay Products, p. 305.
Drury, Useful Plants, p. 389.

Shorea robusta, *Roxb.*

Gærtn. Fructl. iii. 48, t. 186; *Hook. Fl. Ind.* 306; *Roxb. Fl. Ind.* ii. 615; *Corom. Pl.* iii. 312; *Wall. Cat.* 965; *DCand. Prod.* xvi. 2, 628; *Bedd. Fl. Sylv.* t. 4; *Brandis*, p. 26.

Vatica robusta, *Steud. Nom.* ed. 2.

Leaves ovate-oblong, acuminate, base cordate, glabrous; lateral nerves about 12 pairs; panicles terminal or axillary lax; stamens 50.

A very large tree, but often occurring in a stunted form; leaves 6–10 by 4–6 in.; petiole ¾–1 in.; stipules ½ in., falcate, pubescent; panicles 5–9 in. long, clothed as well as the flowers with pale velvety pubescence, branches unilateral, racemose; flowers subsessile; petals about ½ in. long, pale yellow, tapering upwards, 12–13 nerved; anthers with a bearded appendage; ovary pubescent; stigma 3-denticulate; fruiting calyx with the segments, sometimes subequal, bases ½ in., ovate, pubescent; wings 2½ in. linear, obtuse, 10-nerved. (*Hooker.*)

Hab.—Tropical Himalaya and along its base from Assam to the Sutlej. Eastern Districts of Central India. Western Bengal Hills.

Native synonyms:—

Eing-gyeen. *Burm.*
Oanqahar, Qiqahar. *Arab.*
Laale-moaabbari. *B.*
Sal. *H.*
Sal, Saj. *B.*

Seed.—Fruit ovoid, acuminate, ½ in. long, hoary, coriaceous, indehiscent, enclosed by the base of the calyx segments; seed 1, ovoid, cotyledons fleshy.

Oil.—Character of the oil not described.

Uses.—Saul seed oil is enumerated in Madras Jury Reports as one of the products of that Presidency, but its uses are not stated.

Seeds in the Museum are from Saharunpore.

Spinacia oleracea, *W.*

DCand. Prod. XIII., ii. p. 118.

Stem 1 foot to 1½ feet, striate, smooth; leaves 2–4 in. long., 1–2 in. broad, acute mucronate, rather thick, soft, smooth, bright green, the upper deltoid or oblong, lower sagittate, medial nerve rather prominent beneath; stamens 5; fructiferous calyx 1½–2 in. long, sessile, rather compressed, apex scarcely mucronulate, smooth, becoming greenish, cusps 2–3 in. long, acute.

Hab.—Cultivated.
Native synonyms :—

Paluk, Sag-paluk. *H.*
Spinach seed oil. *Eng.*
Bij-palak. *Punj.*
Isfanaj, Ispanaj. *Ar. P.*
Vusayley-Keeray. *Tam.*

Seed.—Seeds brown, with the margins quite obtuse.
Oil.—Said to yield a fatty oil, but this requires confirmation, as the plant is very sparingly cultivated in India.
Seeds in the Museum are from Calcutta.

Swietenia, *sp.*

[The species not having been determined, no description can be inserted here.]
Native synonyms :—

Gayapa-noona. *Woond.*
Gayapa. *Bombay.*

The wound tree oil or Gayapanoona of Rajahmundry, locally known for some time was shown at the Madras Exhibition of 1857, and Gayapa oil is mentioned in his Report by Lieut. Hawkes.
Bibliography.—
Birdwood's Bombay Products, p. 297.
Hawkes' Report on Oils of S. India, p. 42.

Symplocos cratœgioides, *Don.*

Brandis, For. Fl. p. 299.
Symplocos paniculata, *Wall.*
Lodhra cratœgioides, *Decaisne, Jacq. Voy.* t. 110.
Large shrub or moderately sized tree, young shoots and leaves pilose; leaves membraneous, elliptic or ovate acuminate, 2–4 in. long, sharply serrate, on short petioles, turning yellow in drying; flowers fragrant, snow white, in cymose corymbs forming terminal panicles, pedicels slender, as long as flowers, bracts linear, caducous; calyx turbinate, tube glabrous, lobed rounded, ciliate; corolla 5 cleft nearly to the base; stamens numerous, filaments filiform, connate in 5 bundles; ovary 2 celled, stigma capitate, papillose. (*Brandis.*)
Hab.—Himalaya, 3,000–8,000 feet from near the Indus to Assam.
Native synonyms :—

Lodar, Lu, Laudar, Loj, Losh. *Punj.*
Lodh. *Kumaon.*

Seed.—Fruit ovoid or nearly globose, $\frac{1}{4}$–$\frac{1}{3}$ inch long, crowned with the remains of the calyx limb, 1 seeded.
Oil.—Dr. Stewart observes that an oil is said to be extracted from the seeds, but there is no sample in the Museum collection.
Bibliography.—Stewart's Punjab Plants, p. 138.

Tamarindus Indica, *L.*

Bedd. Fl. Sylv. t. 184.
Wi. & Arn. Prod. i. 285; *DCand. Prod.* ii. 488; *Roxb. Fl. Ind.* iii. 215; *Brandis,* 163.
Tree; leaves abruptly pinnated; leaflets numerous; flowers racemose, somewhat orange, sheathed with scarlet, slightly fragrant.
Hab.—Peninsula. Bengal. Assam.
Native synonyms :—

Umblie, Amli, Imlee, Nuli-ambli, Ambli. *H.*
Chinta, Chinta-chettu. *Tel.*
Poolí, Poolia-marum, Pulia-maram, Pollium, Polia-maram, Pulli-maram. *Tam.*
Karangee, Kranji, Kamal, Asam, Assam-jawa. *My.*
Seiambala, Sigembela, Maha-si-yambala. *Cyn.*
Tamr-i-hindi? Amblie, Tamar-hindee Umblie, Homar. *A.*
Tintori, Nuli, Ambli, Amlee, Tentool. *B.*
Umbli. *Dec.*
Ma-gyi, Magyiben. *Burm.*
Huli-shena, Oonara-mara, Hoonsay? Onara-mara. *Can.*
Cheetz, Chintz. *Mahr.*
Balam-puli, Balam-pollie. *Mal.*
Darakht-tamr-i-hindi, Temr-hindee. *P.*
Umlika, Tintiree, Tintili, Chukra, Chincha. *Sans.*
Tentooli, Koyan. *Uriya.*
Teteli. *Ass.*

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Seed.—Pod pendulous, 3–8 in. long, 1 in. broad, outer pericarp a thin crustaceous shell, inner layer an acid pulp traversed by fibres; seeds obovate or roundish, often angular, compressed with a brown very hard thick shining testa, and no albumen.
Oil.—Clear bright fluid oil with somewhat of the odour of linseed oil. It does not appear to be of common occurrence.
Uses.—For burning.

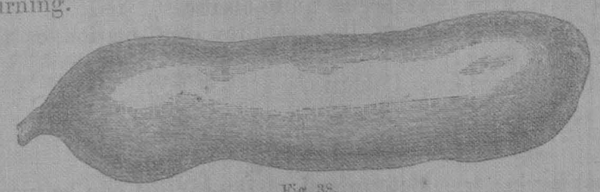


Fig. 38.

Preparation.—Baboo Ramgopaul Ghose writes of this oil that it is not only likely to be useful as a substitute for linseed oil, but would do well as a burning oil. A cotton wick wetted with this oil gave a very clear light, emitting scarcely any smoke or smell. Judging from the samples he estimates the value at Rs. 10 per maund. Captain Davis adds particulars of the method adopted by him for the preparation of the oil. Ten maunds of the seed of the tamarind were collected, put to steep in water, until the outer cuticle softened sufficiently to permit of its being peeled off, in other words, blanched as almonds are; then the white remaining substance was submitted to the process of extraction in a wooden mill, generally called "kooloo" by the "talees" or oil sellers. To prevent any adulteration one of my Government sepoys was detailed to watch the process. The smell of linseed attributed to this oil is attributable to the mill in which the seeds were expressed having been in general use for extraction of linseed oil, and the wood naturally imbibed the odour of the substance used in the mill. (*Agri.-Hort. Journ.*)
Seeds in the Museum collection are from Madras.
Bibliography.—Agri.-Hort. Journ. India (1857), ix. p. 366.

Tectona grandis, *Roxb.*

Roxb. Cor. Pl. i. t. 6; *Flor. Ind.* i. 600; *Brandis, For. Fl.* p. 354, t. 44.
Large deciduous tree; branchlets 4-sided and channelled; pith large, quadrangular; leaves oval or obovate; blade 1–2 ft. long, 6–12 in. broad; petiole 1–1½ in. long, upper side rough, under side clothed with dense stellate grey or tawny tomentum, main lateral nerves prominent, 8–10 pair, with two or three large branches near the edge of the leaf, joined by numerous parallel transverse veins; flowers white or short pedicles, in large erect terminal cross branched cymose panicles, 1–3 feet long, with short lanceolate bracts; fruit globose. (*Brandis.*)
Hab.—Indigenous to both peninsulas of India.
Native synonyms :—

Segoon. *B.*
Segoon. *H.*
Teka. *Tel.*
Thaikoo-marum, Thaikoo. *Tam.*
Theka, Tekka. *Mal.*
Jaadi. *Can.*
Tekka. *Cey.*
Jati. *My.*
Sagwan. *Bombay.*

Seed.—Fruit subglobose, more or less indistinctly 4-lobed, ½-in. diam., the thick spongy pericarp consisting of a dense felt of branched hairs; nut uneven, 1–3, rarely 4-celled, and a central cavity having the appearance of a fifth cell. The inflated calyx, enclosing the fruit like a bladder, is generally ovoid, sometimes depressed, reticulate, more or less crumpled, or irregularly plaited, 1–1½ in. diam.
Oil.—Teak seed oil has been enumerated amongst the products of India, but this may be intended to apply to teak wood oil, which is not a fatty oil.

Terminalia bellerica, *Roxb.*

Roxb. Fl. Ind. ii. 431; *Roxb. Cor.* 198; *W. & Arn.* 313; *Bedd. Fl. Syl.* t. 19; *Brandis,* 222.
Terminalia punctata, *DCand. Prod.* ii. 13.
Tree; leaves about the extremities of the branchlets, long-petioled, obovate, obtuse or shortly acuminated quite entire, glabrous; spikes axilary, solitary, almost the length of the leaves; bisexual flowers sessile; male shortly pedicellate, with a large

hairy glandular disc in the bottom of the calyx; drupe obovate, obscurely 5-angled, fleshy, covered with greyish silky down; flowers small, greyish green, offensively smelling. (*Drury.*)

Hab.—Peninsula. Goruckpore. Goalpara.

Native synonyms:—

Tani, Tondi-chettu, Tadi-chettu, Katthu-elupæ, Bahadha, Thanddee, Thandi, Bahadrha. *Tel.*
Tani, Tanikai, Tandi-maram, Tani-kaia-maram, Tonda-maram, Cattu-elupa, Vellai-murdoo, Tanikoi, Tandee-marum, Cattoo-eloopœ. *Tam.*
Bherda, Yehela, Taree-mara, Tahaka-mara. *Can.*
Titseim, Tissein, Phangah, Pan-gan, Ruheera, Pangah, Bankha, Paugah. *Burm.*
Bula-gaha, Booloo-gass, Booloo. *Cyn.*
Beleyluj. *A.*
Buhura, Boyra. *B.*
Bulla, Balra, Balda. *Dec.*
Beheyra? Bahera, Bhaira. *H.*
Berda, Yehela. *Mahr.*
Tani. *Mal.*
Beleyleh. *P.*
Bahirah. *Sans.*
Bhâra, Bahadha. *Uriya.*
Bauri. (*Gualpara.*)
Bulla, Beheyra, Buhura. *H.*
Tamkai. *Tam.*
Toandee, Tadi. *Tel.*
Bherda, Yehela, Bullah. *Dec.*

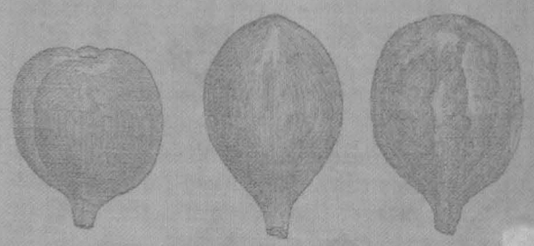


Fig. 39.

Seed.—Fruit ovoid, grey, velvety, with 5 or more indistinct furrows, ¾ to 1 in. long; nut thick and hard.

Oil.—It is remarked that the oil separates readily into two portions, the one fluid, of a pale green colour, and the other floccular, white, and of the consistence of ghee.

Uses.—

Sample of this oil was exhibited at Madras in 1857, and in the Museum from the same locality.

Seeds in the Museum from Calcutta, Madras, Punjab.

Bibliography.—Birdwood, Bombay Products, p. 301.

Terminalia catappa, *L.*

W. & Arn. Prod. 313.

Leaves about the extremities of the branchlets, short petioled, obovate, cuneate, and attenuated, but at the same time slightly cordate at the base, a little repand, with a large depressed gland beneath on each side of the midrib, near the base; racemes axillary, solitary, simple, shorter than the leaves; drupe oval, compressed, glabrous, with elevated navicular margins, convex on both sides.

Native synonyms:—

Jungle almond oil. *Eng.*
Badamie, Budam. *H.*
Badam, Budam. *B.*
Jungli-badam, Vadam, Natto-vadam-cottay, Vodamovettilla, Badamchettu. *Tel.*
Badama-hindee, Jungli-badam. *Dec.*
Adamarum. *Mal.*
Nattoo-vadamcottay. *Tam.*
Cotumba. *Cey.*
Catappa. *My.*

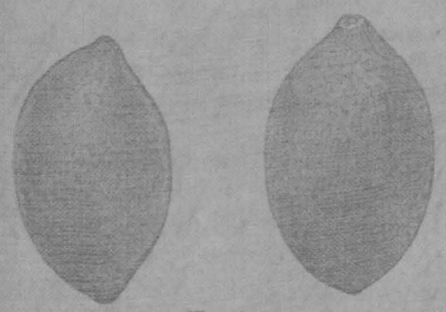


Fig. 40.

Seed.—Drupe oval, compressed, glabrous, with elevated navicular margins, convex on both sides.

Oil.—Pale sherry colour, limpid oil, resembling almond oil, but liable to deposit stearine.

Uses.—Similar to those of almond oil, for which it has been proposed as a substitute.

Oil prepared from these seeds, made experimentally at Jessore in 1843, was expressed in the common native mill (pestle and mortar fashion), and was the produce of some almonds gathered during a few mornings from under the trees in the neighbourhood. After a sufficient quantity was gathered and allowed to dry in the sun for a few days, which facilitates breaking the nut, I set four coolies to work with small hammers to clear the kernels from their shells, and in four days they broke a sufficient quantity for one mill, viz. six seers, and which in the course of three hours after it was put into the mill produced about three pucka seers of oil; the pressing of the oil therefore is of

no consideration, as the value of the oil cake to feed pigs, &c. is sufficient to cover that expense, but the breaking of the nuts is one of chief consideration, and would require particular attention, with a view to its reduction, if it be deemed profitable to manufacture the oil on an extensive scale. From the mill the oil was first received into a basin, and afterwards filtered through blotting paper. The colour of the oil is that of pale sherry, which is owing to the rind being allowed to remain with the kernels. It is necessary to mention this, as on comparing it with the real almond oil this circumstance might prejudice its value. Dr. Mouat reported on samples of the oil thus prepared that he had "compared it with a good muster of the ordinary Euro-
"pean almond oil, and found that in taste, smell, and specific gravity the former was
"very similar to the latter, but is deeper in colour, becomes turbid in keeping, and
"deposits a quantity of white stearic matter. In most ordinary purposes, medicinal
"and otherwise, the former might profitably be substituted for the latter in this
"country, and if expressed with greater care, and freed from every impurity, might
"become an article of commercial value and importance." (*Agri.-Hort. Journ.*)

Seeds in the Museum collection from Madras, and oil from Calcutta, Chota Nag-pore, and Madras.

Bibliography.—

Birdwood, Bombay Products, p. 301.
Hawkes's Report on Oils of S. India, p. 42.
Pharmacopœia of India, p. 89.
Journ. Agri.-Hort. Soc. of India, xii. p. 539 (1843).
Drury's Useful Plants, p. 118.

Terminalia chebula, *Retz.*

Brandis, For. Fl. t. 29, p. 223; *Bedd. Fl. Syl.* t. 27; *Roxb. Cor.* t. 197.

Large tree; young branchlets, leaf-buds, and youngest leaves with long soft shining, ovate or oblong ovate, acuminate, 3–8 in. long; main lateral nerves arcuate, prominent, 6–12 on either side of midrib; petiole shorter than ⅓ length of leaf, 2 or more glands on upper side of the petiole; flowers sessile, dull white or yellow, with a strong offensive smell; spikes 2–4 in. long, often panicled, at the end of this year's shoots terminal above the leaves, and in the axils of the leaves; bracts subulate or lanceolate, longer than flower buds, falling after the flowers open; free part of calyx cup-shaped, cleft half way into 5 acute triangular segments, woolly inside, with long brown hairs; filaments more than twice the length of calyx segments. (*Brandis.*)

Hab.—Siwalik tract, Outer Himalaya, E. Bengal, Behar, Centr. India, and S. India.

Native synonyms:—

Hara, Hor, Hur, Har-hara, Hulda, Umbedhur? *H.*
Haratukee, Haree-tukee, Huri-tukee. *B.*
Kadukai, Kadukai-marum. *Tam.*
Karakaia, Seingi-tige. *Tel.*
Huldah, Heerda. *Dec.*
Kodorka-marum, Kodorka. *Mal.*
Araloo. *Cey.*
Kayoo-bin. *Pegu.*
Heliluj-kabulee. *A.*
Helilehkeelan. *P.*
Arulay. *Mysore.*

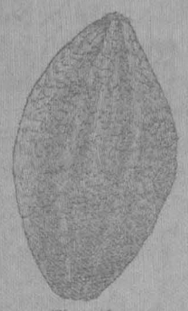


Fig. 41.

Seed.—Fruit obovoid from a cuneate base, sometimes ovoid, 1–1½ in. long, more or less distinctly 5-angled; nut thick and hard, with a rough surface, irregularly 5-grooved.

Oil.—Clear, transparent, almost colourless, fluid oil.

Uses.—Medicinal, procurable in very small quantities from the kernel of this nut.

Seeds in the Museum from various localities, and oil from Mulka-pore.

Bibliography.—Birdwood, Bombay Products, p. 301.

Tetranthera laurifolia, *Jacq.*

DC. Prod. xv. 178; *Brandis, For. Fl.* 379.

Tetranthera apetala, *Roxb. Cor. Pl.* t. 147.

Tetranthera Roxburghii, *Nees.*

Middle-sized evergreen tree, variable, branchlets, inflorescence, and leaves more or less pubescent, older leaves often glabrate; leaves alternate, ovate, or elliptic, pale beneath; flower heads yellowish, in pedunculate umbels or corymbs, generally as long as petiole,

or a little longer, partial peduncles shorter than common peduncle; flowers 8–12, rarely less, on slender pedicels, involucre of 4 rounded concave membranes, bracts ¼ in. long; perianth segments very irregular, generally wanting, filaments hairy.

Hab.—Oudh Forests, Kumaon, Gurhwal, Outer Himalayas, S. India, Bengal, Burma, &c.

Native synonyms :—

Maida, Meda lakri. *N.W.P.*
Gwa, Rian, Chandra *Punj.*
Menda. *C. Prov.*
Ungdungnet. *Burm.*

Seeds.—Berry subglobose, ½ in. diam., black, and almost dry when ripe.

Oil.—It has been stated that in Java an oil is obtained from the fruit of this tree. There is no account of any such product in India, although the tree is not uncommon in the North and East.

Uses.—Uncertain.

No seed or oil in the Museum collection.

Tetranthera monopetala, *Roxb.*

Roxb. Cor. t. 148; *Flor. Ind.* iii. 821; *Brandis, For. Fl.* t. 45, p. 380.

Evergreen tree; branchlets, under side of leaves, and inflorescence with slight, often rust coloured pubescence; leaves alternate, elliptic oblong, acute; flower heads whitish, pedunculate, in sessile or subsessile axillary clusters, peduncles shorter than petioles; flowers 5–6 on short hairy pedicels; involucre of 5 bracts; perianth 5–6 cleft, membraneous; stamens 9–13, filaments hairy; berry ovoid.

Hab.—Oudh Forests. Bengal. Burma. S. India.

Native synonyms :—

Baro-Kukar-chettu. *B.*
Undung. *Burm.*
Jungli-rai-am, Medi-lakri. *H.*
Nara-chettu, Nara-mamedi. *Tel.*
Singraf, Sangran, Marda, Kat-marra, Kakuri, Kerauli, Patoia. *N.W.P.*
Randkarri, Katmedh. *Oudh.*

Seed.—Berry ovoid, ¼ in. long, black when ripe, supported by the spreading somewhat enlarged base of the perianth.

Oil.—Undescribed.

Uses.—The oil is used for ointment as well as for candles.

Bibliography.—

Drury, Useful Plants, p. 421.
Powell, Punjab Products.

Thespesia populnea, *Cor.*

Wi. & Arn. Prod. i. 54; *Hook. Ind. Fl.* i. 345.
Hibiscus populneus, *Roxb. Fl. Ind.* iii. 190; *Wi. Icon.* 8.
Malvaviscus populneus, *Gaertn.*

Small tree; leaves 3 in. diam., cordate, roundish, acuminate, quite entire, 5–7 nerves, with a glandular pore beneath the nerves, petiole 2½ in.; peduncle axillary, shorter than the petiole; bracteoles obsolete or 5, oblong lanceolate, deciduous, as long as the cup-shaped 5-toothed calyx; corolla 2–3 in. diam.; staminal tube toothed at the top, filaments ascending; capsule 1½ in. oblong, depressed, scaly, ultimately glabrescent. (*Hooker.*)

Hab.—Tropical shores of Bengal, Ceylon, and both peninsulas.

Native synonyms :—

Paraspipal, Parspippu, Porush, Paris. *H.*
Porash, Porush. *B.*
Porsung, Pooarasoo, Purasha-maram. *Tam.*
Parasa-piplo. *Guz.*
Gangarenu-chettu, Ghengheravie. *Tel.*
Parish, Paras-pippal. *Dec.*
Sooriya-gaha, Gansuri-gaha. *Cey.*
Puvvarasha. *Mal.*
Parsacha-jhada. *Mahr.*

Seed.—Capsule 1½ in. long, oblong, depressed, scaly, ultimately becoming smooth; seeds pilose, or powdery on the surface.

Oil.—Deep red coloured and somewhat thick oil.

Uses.—It is as yet unknown to the natives, but would probably be of use in cutaneous affections. Its expense precludes its use other than medicinally.

Bibliography.—

Birdwood's Bombay Products, p. 294.
Hawkes' Report on Oils of S. India, 40.

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Trigonella fœnum-græcum, *Linn.*

Stem erect, simple; leaflets obovate, obsoletely toothed; stipules lanceolate, falcate, entire; calyx pilose, the teeth subulate, length of tube; legume falcate, twice the length of the beak, reticulated lengthwise, many-seeded.

Hab.—Cultivated.

Native synonyms :—

Methee, Moothee. *H.*
Methee-shak, Methika. *B.*
Vendium. *Tam.*
Menthuoo. *Tel.*
Mathee. *Dec.*
Mentia. *Can.*
Oolowa. *Cey.*
Helboh. *A.*

Seeds.—Sickle-shaped pod, 3–4 inches long, containing 10–12 hard brownish yellow seeds, having the smell and taste characteristic of peas and beans, with the addition of a melilot flavour.

Oil.—In the Pharmacographia it is stated that other extracts from the pulverized seeds 6 per cent. of a fœtid fatty oil having a bitter taste.

This is enumerated in the Madras Jury Reports (1857) as one of the oils produced in the Madras Presidency. Lieut. Hawkes states that the fresh seeds of this plant yield a small per-centage of oil.

Seeds in the Museum from Bombay, Calcutta, and Madras.

Bibliography.—Hawkes' Report on Oils of S. India, p. 41.

Vernonia anthelmintica, *Willd.*

Serratula anthelmintica, *Roxb. Fl. Ind.* iii. 406.
Conyza anthelmintica, *Linn; Rheede,* ii. t. 24.

Annual; stem erect, roundish, slightly tomentose; leaves alternate, serrate, narrowing at the base into the petioles; calyx ovate; corolla consisting of 20 or more hermaphrodite florets; flowers in panicles at the ends of the branches on long peduncles, thickening towards the flowers, a solitary peduncle terminates the stalk; flowers purplish.

Hab.—Peninsula. Bengal.

Native synonyms :—

Buckche, Kaliezeerie. *H.*
Somraj. *B.*
Neer-noochie, Caat-siragum. *Tam.*
Neela-vayalie, Adavie-zeela-kura. *Tel.*
Catta-seragam. *Mal.*
Kali-zeerie. *Dec.*
Sanni-nayan. *Cey.*

Seed.—Seeds about ⅛ in. long, of a dark brown colour, covered with whitish scattered hairs, cylindrical, tapering towards the base, marked with about ten paler longitudinal ridges, and crowned with a circle of brown scales.

Oil.—No sample in the collection.

Uses.—Lieut. Hawkes states that the seeds yield an oil which is never prepared for sale. Probably medicinal.

Seeds in the Museum from Bombay, Calcutta, Poona.

Bibliography.—

Hawkes's Report on Oils of S. India, p. 42.

Vitex trifolia, *L.*

Roxb. Fl. Ind. iii. 69.

Shrub; leaves ternate and quinate, often unifoliate, white, mealy beneath, leaflets shortly petiolate, generally sessile, always entire, pedicels dichotomous; flowers terminal, racemose, violet.

Hab.—Bengal. South India. Burma. Indian Archipelago.

Native synonyms :—

Nismdha, Seduari, Nishindha, Samalu, Sinbalu, Peni-ke-shum-bali. *H.*
Neer-noochie, Cara-noochie. *Tam.*
Neela-vayalie, Teliavavillie *Tel.*
Cara-noochie, Caranosi. *Mal.*
Panee-ki-shumbalie. *Dec.*
Meean-milila. *Cey.*
Lagondi. *My.*
Usslukeabie, Fil-fil-burree. *A.*

Seed.—Drupe round, smooth, when ripe black, size of a small pea, one celled; nut conform to the drupe, four celled, nearly all fertile.

Oil.—Drury states that a clear sweet oil of a greenish colour is extracted from the root. This would doubtless be a volatile oil. Constant recurrence of the name in catalogues amongst fatty oils would lead to the conclusion that such a product is obtained from the seeds.

Xylia dolabriformis, *Benth.*

Brandis, For. Fl. 171; *Bedd. Fl. Sylv.* t. 186.
INGA XYLOCARPA, *W. & A. Prod.* 269.
MIMOSA XYLOCARPA, *Roxb. Cor. Pl.* t. 100; *Fl. Ind.* ii. 543.

Large tree, unarmed; common petiole short, 1–2 in. long, bearing 1 pair of pinnæ with 2–6 pairs of oblong or ovate-oblong acuminate leaflets 3–9 in. long, the terminal leaflets largest; flowers pale yellow, in globose tomentose long pedunculate flower heads, 1 in. diam; petals linear, valvate, slightly cohering at the base; stamens 10, free; anthers basifixed with deciduous stipitate glands; pod thick, woody, flat, falcate, 4–6 in. long, 2–2½ in. broad at the broadest part. (*Brandis.*)

Hab.—Burma. S. India.

Native synonyms:—

Jamboo. *H.*
Eruvalu-maram. *Tam.*
Boja, Conda-tangheroo, Tangedu. *Tel.*
Erool. *Mal.*
Yerool? Jambay, Jamba-mara. *Can.*
Jamba. *Mahr.*
Pyangadeau? Pyn-kado, Pingadoo. *Burm.*

Seed.—Pod thick, woody, flat, falcate, 4–6 in. long, 2–2½ in. broad at the broadest part; seeds 8–10, oval, compressed, shining, ½ in. long.

Oil.—Undescribed.

Uses.—No sample of seeds or oil in the Museum collection.

The seeds of the following plants have also been enumerated as affording oil, but beyond this we have no information:—

Cochlospermum gossypium, *DC.*
Feronia elephantum, *Corr.*
Parkia biglandulosa, *Wi. & Arn.*
Hyoscyamus niger, *Linn.*

Fatty oils sent to the Museum, as oil of cubebs (*Piper cubeba*) and oil of *Cardamoms* (*Elettaria cardamomum*), appear to be only fatty oils flavoured with the volatile oil of those seeds.

INQUIRENDÆ.

The following oils require determination and further information:—

CYPRUS OIL,	Madras Jury Reports, 1857.
CONDAMUNNEE OIL,	do.
EUGENIA OIL,	do.
DAMMER TREE OIL,	do.
MOOROOGANA TALLOW,	do.
MANALOO OIL,	do.
GHIRGILLY OIL,	do.
SAHCOTTAY OIL,	do.
WILD CASTOR OIL,	do.
TUNTAPOO (*Cassia tora?*),	do.

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LONDON:
Printed by GEORGE E. EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty.
For Her Majesty's Stationery Office.

1917
47

Dec. 10 –

Rec'd
Ind. Off. No. 1947 27th Sept. 1878 –

India Office, London.
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My Lord Duke,

Herewith are forwarded for the use of your Excellency's government, twenty five copies of a Report, by Dr. M.C. Cooke, on the oil-seeds and oils in the India Museum, or produced in India, which has been prepared in this country at the request of the government of India.

I have the honor to be,
My Lord Duke,
Your Grace's most obedient
humble Servant,
Cranbrook

To/
His Excellency
The Most Noble
The Governor in Council
Fort Saint George.

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