The distillate, from which the oil had been removed, was strongly acid; it was neutralized with baryta. The barium salt thus obtained treated with dilute sulphuric acid, yielded after agitation with ether a yellow oily principle similar to that which had been separated from the distillate by ether. There appears to have been no plumbagin in this root; it had the usual appearance of the drug as met with in commerce, and when received was quite fresh and moist, and had to be dried before it could be powdered. Further operations upon large quantities of the fresh and dried root will be necessary before the nature of this substance can be determined, for at present the physical properties of the principle, the so-called plumbagin, are not sufficiently well known to enable one to positively assert whether it is odourless or not, while its chemical constitution has not been studied.

Toxicology.— Chevers (*Med. Jurisp.*, p. 252,) refers to two fatal cases of poisoning from the internal administration of the root; one of these was homicidal.

In Madras Plumbago was little used before 1882. In 1882 and 1883, it formed 12 per cent. of the cases in which poison was detected in Class A (Human Cases, Viscera examined); in 1888, two cases in 51 were detected; and in 1889, two in 101. In Class B (Suspected Attempts to Poison); in 1883, one in eight: in 1884, one in eight; in 1885, one in seven; and in 1887, one in two of the poisons detected was plumbago. The drug had variously been administered by sorcerers to persons accused of theft, or as an abortifacient, or as a love potion to women. The symptoms were nausea, vomiting, and burning pain in the throat and inability to pass urine. The affected persons were found to have sore mouths, feeble irregular pulses and cold skins. In Bombay, Dr. Lyon finds plumbago root chiefly used for the purpose of causing abortion. With this object it is sometimes given internally, but is usually employed as a local irritant application to the os uteri, a portion of the root or a twig of the plant being pushed into the vagina and sometimes into the uterus. In some cases the cotton-covered end of an abortion stick is smeared with a paste made from the powdered roots.

The following table shows the particulars of Plumbago poisoning in India :—

Presidency.	Year.	Human Viscera. Plumbagin.	Substances suspected to be or to contain poison.		Remarks.
			Plumbagin.	Plumbago root or Lalchitra.	
Bengal	1882	2	.....	1	"In two stomachs examined in connection with abortion cases, evidence was obtained of the presence of *Plumbagin*, the active principle of *Plumbago rosea* (Lalchitra). According to Norman Chever's Manual of Medical Jurisprudence for India in some ascertained cases *lalchitra* has been given internally as an abortive. As a rule, however, the root is applied either to the neck of the uterus or introduced into the vagina. Chevers also records two instances in which men were poisoned by the drug."
Do.	1884	.....	.....	2	"*Plumbago rosea* was found in connection with two cases of alleged criminal abortion, one of the cases occurring at Dacca and the other at Ghattal. This plant is extensively used in producing criminal abortion. A piece about 6 inches in length is introduced into the os uteri and there produces intense irritation and vesication which results in abortion when the woman is pregnant. In 1882-83, however, this drug was found in the stomachs of two women, who were alleged to have died from the effects of abortion."

Presidency.	Year.	Human Viscera. Plumbagin.	Substances suspected to be or to contain poison.		Remarks.
			Plumbagin.	Plumbago root or Lalchitra.	
Bengal	1885	.....	.....	1	
Do.	1886	.....	.....	1	
Do.	1887	.....	.....	2	
Do.	1888	.....	.....	2	
Do.	1889	.....	.....	1	
Madras	1881	.....	.....	1	
Do.	1882	1	.....	4	"As this poison has very seldom been detected in this Presidency, all of the cases of poisoning by Plumbago are briefly noticed." "In the first case a woman was suspected to have been drugged, in order to facilitate robbing her, by something given in rice flour. The poison was detected in the vomited matter, and also in a suspected powder. The woman seems to have suffered severely, but fortunately had the benefit of skilful treatment, from the Medical Officer, Satur, from whom a careful and intelligent record of the symptoms of the case was received." "In the second case an insane man was reported to have died suffering from vomiting and purging shortly after taking a red powder given him by a native doctor.

Do.	.....	...	.....	.....	.....	A small quantity of Plumbago was found to be present in a suspected powder received for examination. But the proportion of Plumbago to comparatively inert constituents was not so great as to prohibit the possibility of the powder having been a *bonâ fide* medicine. No traces of poison could be detected in two lots of sand believed to contain vomited matters, or on the soiled cloth worn by the deceased, or in the stomach."
						"In the third case a man was reported to have died shortly after taking some medicine. Symptoms were briefly described as purging and vomiting."
						"Plumbago was detected in the viscera and in a suspected medicine. The case seems very similar to the preceding one. In the fourth and fifth cases, which were simultaneously received from Cuddapah, it appeared that in each instance medicine had been taken from an old woman for the cure of venereal disease. In one of these cases, it was alleged that the old woman had been bribed by a rival bazaar man to give a fatal dose. In both these cases, poison was detected in the vomited matter and unexpended medicine. Whatever the true history of the cases may have been, there seems no doubt that the patients were very nearly killed."
Do	.....	1883	18	.....	.....	The report in 1883 reviews the work of 1882 and a part of 1883; after this it was changed from the official to the calendar year. In the report for 1884, when reviewing the work for 1883, it is mentioned that in examining the human viscera or evacuations for poisons, *Plumbago zeylanica* was detected in 18 instances and one in Class B.

Presidency.	Year.	Human Viscera. Plumbagin.	Substance suspected to be or to contain poison.		Remarks.
			Plumbagin.	Plumbago root or Lalchitra.	
Madras—*contd.* ...	1884	.....	.....	.....	"Plumbago (*Plumbago rosea* or *zeylanica*) was found in one case. It was believed to have been used as an abortifacient."
Do.	1886	.....	1	.....	A love potion given to a woman was found to contain this poison.
Do.	1887	2	.....	.....	One given as a purgative medicine.
Do.	1889	2	.....	.....	One given as an abortifacient.
Bombay	1875	.....	1	.....	"In another case of the same kind some pills were found to contain a vegetable principle, resembling in characters Plumbagin, the active principle of *Plumbago rosea* or Lalchitra."
Do.	1881	.....	3	.....	"1, A case from Bijapur, in which some pieces of root alleged to have been used for the purpose of procuring abortion were identified as pieces of the root of the *Plumbago zeylanica*; 2, a case from Sangamner, in which some pieces of stick stated to have been used for the purpose of procuring abortion, were found to be armed at the end with cotton covered with a paste in which, on chemical examination, Plumbagin, the characteristic principle of *Plumbago rosea* and *zeylanica*, was detected; 3, a case from Nasik, in which again Plumbagin was detected in a red paste, and also in matters

Do.	1885	.....	1	.....	staining a piece of cloth found in the house of a woman accused of an attempt to procure abortion."
Do.	1888	.....	1	.....	"In a case from Satara of death after abortion, Plumbagin, the characteristic principle of *Plumbago rosea* and *zeylanica*, was detected in a lump of paste found lying in the vagina of the deceased. In this case arsenic was also detected in minute quantity in the liver." "A case from Pandharpur (Sholapore District), in which some drugs found on searching the house of a reputed sorcerer were forwarded for examination. The man was accused of administering a narcotic drug to a woman, in order, it was said, that while under its influence, she might give a clue to the offender in a case of theft. From the symptoms, the drug administered was probably datura. The drugs forwarded were some roots and powders. Of these the roots were found to be Plumbago roots, and a number of the powders were found to contain Plumbagin and a mercurial compound."
N. W. P.	No case recorded.				
Punjab	No case recorded.*				

* The following case of the use of Plumbago is recorded in Dr. Brown's book on "Punjab Poisons" Case.—*Transactions of the Medical and Physical Society*, Bombay, paper read by Dr. J. Mill :—

On December 16th, 1861, a man poured over the face of a sleeping native, with whom he had quarrelled, a liquid, said to have been prepared from the roots of *Plumbago rosea* and *Semecarpus Anacardium*, but this also contained some blistering flies and sulphate of copper. Six days afterwards he was seen by Dr. Mill, who described the whole of the face, neck and left side of the chest as being covered by a deep black slough, the pain was very great: the next day the slough separated and the man appeared better, but 35 days after the injury, he died from exhaustion."

Commerce.—The root is sold at Rs. 4 to 5 per maund of 37½ lbs. The Bombay market is supplied from Kattiavar and Guzerat, where the shrub grows to a much larger size than it does in the Concan.

PRIMULACEÆ.

DIONYSIA DIAPENSIÆFOLIA, *Boiss.*

Fig.—*Clusius Exot. i. p.* 199.

Hab.—Persia. The plant.

Vernacular.—Hamáma (*Arab., Ind. Bazars*).

History, Uses, &c.—The recent discovery by Mr. E. M. Holmes of the botanical source of Hamáma (*Pharm. Journ.*, 1887,) enables us better to understand the description by Dioscorides of the *amomon* of the Greeks. His chapter περὶ ἄμωμου has always puzzled the commentators; it has an hiatus in the middle; there are several doubtful readings in the text, and a paragraph which appears to have got into it by mistake. In the edition of 1529 we read φύλλα δὲ βρυονια (*sic.*) ὅμοια and in the same edition, where bryony is treated of, the word is printed βρωνία in the usual manner. This creates a suspicion that the true text may have had moss, and not bryony; we can then read the description of the first kind of amomon as follows—"Amomon is a small shrubby plant (θαμνίσκος) like a bunch of intertwining woody stems; it has a small flower like the wallflower (λευκόιον); the leaves are like those of moss; the best is the Armenian, of a golden tinge, with reddish yellow stems, sufficiently fragrant. This would agree very well with the characters of the genus Dionysia. Dioscorides then proceeds to describe the kind found in Media, differing somewhat from the first, and smelling like *peganon*. So far the Arabian version is much the same as the Greek text, but it omits the next paragraph from τον δε πόντικον το ὑπερυθρον, where the hiatus occurs, and begins the description of the third kind thus—"A third kind is the Coptic," &c., evidently quite a different drug from the first two.

Throughout the remainder of the chapter the Greek and the Arabian versions agree, with the exception that the latter omits all mention of *Amomis*.

The conclusion of the chapter in Dioscorides is noteworthy; he says—"In the selection of these articles it is important to avoid broken pieces, and to choose such specimens as have entire branches springing from a single root;" this is applicable to hamáma, but not to cardamoms.

Theophrastus (9, 7, 1) merely mentions cardamomon and amomon as coming from Media. Celsus (*lib.* V.) mentions amomum and cardamomum as ingredients in a "Malagma adjecur dolens." Pliny (13, 1,) speaks of amomum as an Assyrian shrub with a white flower, from which a costly perfume was made. In short there is no medical description of the drug except by Dioscorides.

The non-medical classical writers mention amomum, but they allude to it in a vague way, or as a precious perfume.

In Virgil's third *Eclogue*, Damœtas says :—

> "Qui te, Pollio, amat, veniat, quo te quoque gaudet:
> Mella fluant illi, ferat et rubus asper amomum."

Among the Arabians Ibn Sina (Avicenna) only notices one kind of Hamámá, "Shajrat kánkood min khashab mushabbak" (a plant with latticed woody branches, the first kind of Dioscorides); but he remarks that it affords a sticky exudation. Sheik Dawood of Antioch, who wrote A. D. 1656, says: "Hamámá, is in Greek amomiya, and its flowers are called leukáin, it is not *bruwaniya*, which is a name for *fashara*. The plant consists of sticks latticed together in a bunch of a reddish-golden colour, acrid, hot, perfumed; it springs from a single root, hard, perfumed; it grows in Armenia and Tarsus, and a kind of it in Syria is greenish and small, or yellowish and fragile, both spurious; and it grows in the month of Nisan (April); it has reddish flowers, like those of the Wallflower or Sádaj."

The Persian writers give similar descriptions, but that of Haji Zein el Attar (A. D. 1368) is more original. He says:—"Hámámá, amámún or amúman in Persian *Mahilú*, hot and

dry in the second and some say in the third degree. It is of two kinds, one is well-known, and is called in Shiraz mahilu, and there is another kind like *Persiawashán* (maiden-hair), and like it, of a reddish yellow colour; the leaves are green and small, and the flowers yellow and small, and the plant is about a span high, or in my experience less. It grows on stones. The best is of a golden colour from Armenia, and has a sweet smell."

Mr. E. M. Holmes has found in the Herbarium of the British Museum a specimen of *Dionysia diapensiæfolia*, Boiss, bearing an inscription in the handwriting of Kotschy, which states that the plant grows on stones, as stated by Haji Zein. He has also ascertained that the Persian drug is aromatic; possibly Armenia may furnish a more perfumed plant belonging to the same genus. We see nothing in the description of Dioscorides to connect Amomon with Cardamomon. On the other hand, his description of Cardamomon is very short, and such as he would naturally give of an article so well known as this must have been from its every-day employment by Asiatics as a masticatory and spice. In addition to this, he notices a use of cardamoms peculiar to India, namely, as a lithontriptic in nephritis and dysuria. The description of Dioscorides is as follows:—"Cardamomon is brought from Commagene (the northern province of Syria, now Camosh), Armenia, and the Bosphorus, but it is produced also in India and Arabia. Choose that which is tough, well-filled, closed; if not in this state, it is too old and has lost its aroma. The taste is pungent and somewhat bitter.

We think there can be no doubt that the Greeks were well acquainted with Cardamons through their intercourse with Eastern nations long before the time of Dioscorides, although they had no exact information as to their source. As suggested by Mr. Holmes, the *Amomis* of Dioscorides was probably a plant having the same characters as his true amomum.

The Pontic and Coptic kinds were probably entirely different plants used as substitutes. We must also bear in mind that

plants having no very remarkable properties were used by the ancients, and are still used in the East, as ingredients in perfumes, &c., from some superstitious fancy in connection with them.

The Hamama now in use in the East was known in Europe as Amomum in the 14th and 15th centuries, and is figured by Clusius (*Exot. Lib.* I., p. 199). He calls it *Amomum spurium*. The same drug was found in use in Egypt by Prosper Alpinus, 1580-83. Dr. Leonhart Rauwolff, who travelled in the East (1573-76) for the purpose of studying the drugs of Dioscorides, says of Amomum: "Lastly amongst the rest I did also enquire after the amomum and thought, because they were near unto the confines of Armenia (*i. e.*, the bazars of Aleppo), that therefore they might easily have it by the caravans which come daily from those parts, yet I was forced to run a great while after it, till at length I got a little stock thereof in one shop. They call it by the name of Hamama. But of the other so-called by Dioscorides, which is like unto it, and therefore may easily be taken for the right one, they had a great deal. These two small shrubs, although they are very like to one another, yet for all that they may be distinguished by their stalks and different colours, wherefore Dioscorides bids us (if we will not be imposed upon) to pick out the bigger and smoother, with its noble seed, and to leave the small. This stalk which I found about the length of a finger, is almost of the colour of the bark of the cinnamon tree, and also in its acrimony and good odour (although it was old) still very strong. At the top had been several woody stalks close to one another, whereon I believe had been the flowers and seeds. But the twigs of the other sort, which are crooked and bended, are of a brown colour, which at the top divide themselves into other less ones like a tree, whereon grow several stalks, with little heads like unto the Masaron, or *Marum Syriacum* from Crete, wherein is no great strength nor odour." (*Ray's Collection of Curious Travels and Voyages*, 1693, *quoted by C. C. Bell in a letter to the Pharm. Journ., Jan. 28th*, 1888.)

Hamama is applied as a poultice to boils and scorpion stings, &c. Taken internally it is considered sedative and is thought to promote the action of the liver and spleen and to remove obstructions in those organs. It is also prescribed in gout and in uterine obstructions, both internally and externally. The dose is 2 dirhems.

Description.—The following is Boissier's description of the plant (*Diag. Ser.* 17, *p.* 65) :—Densissime et late cæspitosa, ramis ob folia vetusta dense imbricata columnaribus ; foliis minute hirto-glandulosis, planis, sub-flabellatim reticulato-venosis, ovatis et oblongo-spathulatis, basi attenuatis obtusissimis, integris vel obtuse utrinque 1—2 crenatis ; pedunculis subnullis, rosulæ foliis occultatis vel paulo longioribus, breviter exsertis ; 1 rarius 2—3, floris, floribus involucro 3—5 bracteato suffultis ; bracteis lineari-spathulatis, obtusis, integris, calycem æquantibus ; calyces ad ¾-partiti, laciniis lineari-spathulatis obtusis, corollae luteæ glanduloso-hirtæ, tubo calyce quadruplo longiore, limbi ampli laciniis ovatis retusis. Cæpites lati, 3—4 pollices elati, folia 1½—2 lineas longa, calyx 2½ lineas, corolla 10—12 longa.

Pedunculis exsertis et involucro affinis *D. cæspitosæ*, sed in hac pedunculus longus, bracteæ majores incisæ, calycis laciniæ acutæ, corollæ limbus minor.

The seeds of Hamama are elliptic or subtriangular, concave on the outer side and bluntly keeled on the other; brown in colour, and rugulose with netted markings. The average length $\frac{5}{10}$th of an inch.

Chemical composition.—The plant contains a light brown resin, which becomes covered with a glaucous film on exposure to the air; it is soluble in sulphuric acid and in aqueous alkaline solutions with an orange colour. The taste is at first pungent and warming, afterwards acrid, with a sialogague action. A crystalline body is separated from the alcoholic extract, soluble in water, and responding to alkaloidal tests, but otherwise acting as a neutral substance. Some free fatty acids are also removed by alcohol from the plant. The seeds

examined separately yielded to ether 24 per cent. of brown fat, melting at 29° C. This fat on saponification yields some fragrant volatile fatty acid; a mixture of insoluble fatty acids melting at 41°, soluble in spirit and crystalline; and a neutral, brown, fluorescent resin.

No substance like cyclamin was found in the infusion of the whole herb. The seeds contained ammonia from the decomposition of the albuminoids. The herb afforded 16·9 per cent., and the seeds 11·1 per cent. of mineral matter.

ANAGALLIS ARVENSIS, *Linn.*

Fig.—*Eng. Bot. viii. t.* 529; *xxvi, t.* 1823. Scarlet Pimpernel (*Eng.*), Mouron rouge (*Fr.*).

Hab.— Many parts of India, Europe, Western Asia. The herb.

Vernacular.— Jonk-mári, Jainghani (*Hind.*).

History, Uses, &c.— Dioscorides describes two kinds of ἀναγαλλὶς, the male with red flowers, and the female with blue flowers. According to him the herb has lenitive properties, and is used to subdue inflammation, to assist in the extraction of thorns from the flesh, and in the cure of sores. The juice administered through the nostrils is said to remove pituitous matters from the head and relieve toothache; mixed with honey it removes films from the eyes and improves the sight. Given with wine, it was thought to be an antidote for the poison of the viper; it was also prescribed to relieve pain in the kidneys and liver, and to promote the dispersion of dropsical swellings.

The female plant was supposed to cure *prolapsus ani* and the male plant to incite that disease. Pliny (25, 92) speaks of the plant to the same effect. The Arabian and Persian physicians repeat the words of Dioscorides with slight additions or variations, but remark that large doses have an injurious effect upon the stomach; they call the plant Anághális, but in modern Arabic it is known as Marijáneh. The old European physicians recommended the use of Anagallis in mania and melan-

cholv, and Quercitanus made it a speciality in his treatment of mania. Ravenstein and Gwelin record cases in which persons bitten by rabid animals were cured by the use of this herb; it was administered internally and also applied to the bitten part.

Most of these physicians considered it to be an efficacious remedy in gout, dropsy, and pulmonary complaints. Orfila places Anagallis among the narcotico-acrids, and gives the following account of its effects upon animals:—"At eight in the morning three drachms of the extract of pimpernel, prepared by evaporating in a water-bath the juice of the fresh plant, were introduced into the stomach of a robust dog. At six in the evening he was dejected, and at eleven sensibility appeared diminished. The next morning, at six, he was lying down, apparently dead, and might be displaced like a mass of inert matter. He expired half an hour after. The mucous membrane of the stomach was slightly inflamed; the interior of the rectum was of a bright red colour; the ventricles of the heart were distended by black coagulated blood; the lungs presented several livid spots, and their texture was preternaturally dense. Two drachms of the same extract, applied to the cellular tissue of a dog's thigh, caused death in twelve hours with the same symptoms as the preceding. M. Gronier gave to horses some tolerably strong doses of the decoction of this plant, and he observed almost constantly a trembling of the muscles of the posterior extremities as well as those of the throat, and a copious flow of urine. After death the mucous membrane of the stomach was found inflamed."

In India, Anagallis is used as a fish-poison, and also to kill leeches, which sometimes get lodged in the nostrils of those who frequent the jungles in the rainy season. Both the blue and the red flowered varieties are found in Western India; the blue being the common one eastward.

Description.—Root small, stem branched from the lower part, often dotted with purple, more or less procumbent, square. Leaves sessile, ovate, many-ribbed, dotted with purple at the back. Peduncles angular, longer than the leaves,

twisted and recurved after flowering. Corolla bright scarlet, with a violet coloured mouth; its edges finely crenate, or minutely fringed with glands. Fruit pale and transparent, the size of a pea. Seeds roughish. The plant has a somewhat bitter and acrid taste.

Chemical composition.—D. Malapert (1857) has shown that the poisonous properties of the plant are due to the presence of a substance similar to, if not identical with, *Saponin*. J. A. Heintzelman obtained a small quantity of volatile oil from the dry herb, and found it of a strong peculiar odour and a pungent and acid taste. A few drops produced headache and nausea lasting for several hours.

CYCLAMEN PERSICUM, *Miller.*

Fig.—*Bot. Mag.*, *t.* 44. Sow-bread (*Eng.*), Arthanite, Pain de pourceau (*Fr.*)

Hab.—Persia. Levant. The tubers.

Vernacular.—Bakhúr-i-Miryam (*Ind. Bazars*).

History, Uses, &c.—Under the name of κυκλάμινος, a species of Cyclamen is mentioned by Greek medical writers, which Fée considers to have been *C. hederæfolium*, Ait., and Littré *C. græcum*, Lam.: it was also called ἰχθυόθηρον, "fish-taker," from its being used to kill fish, and according to Theophrastus was used as a love charm. It is described as having emetic, purgative and hydrogogue properties, and was considered to be useful as an emmenagogue, as an antidote to the poison of snakes, and when locally applied, as a resolvent of tumours. The juice was blown into the nose to purge the brain; mixed with wine it is said to have intoxicating properties. The plant was supposed to cause pregnant women to abort if they walked over it, and the dried root was worn by men as an amulet to protect them against spells. Pliny (25, 67) calls it Cyclaminos, and states that it is known in Italy as *Tuber terræ*; he repeats much of what Dioscorides says about its medicinal properties. The Arabian physicians under the

names of Artanitha and Bakhúr Miryam reproduce what Dioscorides has written concerning Cyclamen. Persian writers describe the Persian plant under the names of Azarbu and Chubak-ushnán, and state that it is a kind of Artanitha. The Indian Mahometan writers follow the Arabs and Persians. The different species of Cyclamen were formerly used in Europe on account of their emetic, purgative, and diuretic properties, and an ointment prepared from the root was applied to the abdomen of adults to produce vomiting or purging, and over the bladder to induce diuresis; it was also applied to the navel of children suffering from intestinal worms, and to scrofulous tumours. Bulliard states that it is still used in the north of France as a purgative and often produces emesis, cold sweats, giddiness and convulsive movements. Pigs are said to eat the root with impunity, but fish are easily poisoned by it, and frogs sicken and die after a few days. Schroff, who has experimented with cyclamin, comes to the following conclusions:—1, Cyclamin does not act upon the sound skin; 2, in the mouth it produces a very unpleasant sensation and taste, and excites salivation; 3, in the stomach it causes burning, oppression, nausea, and vomiting, and in this organ, as in the intestine, it occasions inflamination; 4, in the connective tissue it excites inflammation, which may be followed by gangrene: 5, it does not affect the brain, spinal marrow, or nerves; 6, it salivates men when not taken by the mouth, but by the veins; 7, its action is analogous to that of saponin. (*Stillé and Maisch.*)

Description.—These plants have a roundish, tuberous, or fleshy root stock, from the upper side of which spring the leaves and flowers, sometimes directly from the top, sometimes from a short neck-like stem. The leaves are roundish or ovate with a deep basal sinus, sometimes angular at the margins and often marbled with greyish white. The flowers have the segments of the corolla turned back. The capsule is five-valved, and after flowering the scape in most of the species coils up spirally with the seed vessel in the centre, bending itself at the same time towards the ground. Porta considers

that the root "suo circinato bulbo muliebrem uterum affabre demonstrat effigiatum."

Chemical composition.—The activity of the plant depends upon a principle similar to, if not identical with, saponin. Saladin (1830) named it cyclamin. It has a bitter acrid taste, forms a soapy mixture with water, and when boiled with acids is converted into glucose and a resinous substance which has been named cyclamiretin. Fish poisoned by it die asphyxiated through imperfect respiration. (*Gmelin.* 15, 343; 16, 200.)

MYRSINEÆ.

EMBELIA RIBES, *Burm.*

Fig.—*Burm. Fl. Ind., t.* 23; *Lam. Ill., t.* 133.

Hab.—Throughout India. The berries.

Vernacular.—Viranga, Váyvirang, Bábirang (*Hind.*), Biranga (*Beng.*), Vávadinga (*Mar.*), Váyvirang (*Guz.*), Váyu-vilangam (*Tam., Tel.*), Vâyubilaga (*Can.*).

History, Uses, &c.—The Sanskrit name is Vidanga; it has many synonyms, such as Vrisha-násana, "destroyer of the enemy" (worm); Suchitra-vija and Chitra-tandula, "having variegated seeds." Susruta describes the fruit as anthelmintic, alterative and tonic, and recommends its use along with liquorice root for the purpose of strengthening the body and preventing the effects of age. In the Nighantas it is described as bitter, pungent, hot, astringent, appetizing and light; useful for the removal of abdominal pains, worms, wind and skin diseases. The berries enter into the composition of several applications for ringworm and other skin diseases.

Under the names of Birang-i-Kabulí and Biranj-i-Kabulí notices of the drug will be found in Mahometan works. The hakíms consider it to be attenuant and a purgative of phlegmatic humours; also a valuable anthelmintic, especially against tapeworms. Ibn Sina describes it as a strong anthel-

mintic. Mír Muhammad Husain notices that it turns the urine red. He fixes the dose at three dirhems of the powder, and directs it to be given with fresh milk. Rheede figures a plant which appears to be *Embelia robusta*, and states that the seeds kill worms. Ainslie has the following short notice of it:—"Babreng is the Hindooie name of a vermifuge seed, common, I have been given to understand, in the higher provinces of Bengal, the Sanskrit name of which is Chitratandoola. What the plant is I know not." Roxburgh gives a full botanical description of the plant, and remarks that the berries are used to adulterate pepper. Royle notices their aperient properties. Váyvirang is in high repute as an anthelmintic among the country people, especially in cases of tapeworm, a disorder common among the Native Christians of the Coast. The dose is a teaspoonful of the powder twice a day for a child, and a dessertspoonful for an adult; it can hardly be called purgative; the taste is rather pleasant, slightly astringent, and faintly aromatic. The worm is expelled dead. A purgative should be given to prepare the patient for the drug. It is a common practice to put a few berries of this plant in the milk that is given to young children; they are supposed to prevent flatulence.

Recently Dr. Harris (*Lancet, July* 23*rd*, 1887) has directed attention to the value of this drug as a remedy for tapeworm. He states that he has administered it for several years with good results to natives of India and Europeans; he gives one to four drachms with milk and curds early in the morning.

Description.—The fruit is globular, of a dull red, and grows in large bunches; it is rather smaller than a peppercorn. The dried fruit has the five partite calyx and stalk often attached; the outer shell is striated from the base to the apex, where there is a small beak; its colour is reddish brown, marked with dark spots; inside the outer shell is the seed, enveloped in a delicate membrane, on removing which a cup-like hollow is seen opposite the insertion of the stalk. The seed is horny, of a reddish colour, and its external surface

appears to be covered with spots of white mildew: this appearance however, with the aid of a lens, is seen to be due to a delicate crystalline efflorescence. If kept for any time the outer shell of the fruit becomes much darker. From the rapidity with which this change takes place, we would suppose the quality of the drug to be not affected by it.

Chemical composition.—Warden (*Pharm. Journ., Jan.* 1888) separated from the fruit a substance in the form of brilliant golden spangles having the properties of an acid, which, with caustic soda, potash and ammonia, gave wine-red solutions.

He obtained crystalline compounds of this acid with soda, potash and ammonia, and provisionally named it *Embelic acid.* In a further communication to the same Journal (*Oct. 20th,* 1888), he says:—"The embelic acid used for ultimate analysis was repeatedly crystallized from absolute alcohol, and the soft crystalline mass thus obtained strongly pressed between layers of cloth to remove mother-liquor. The resulting cake was freed from alcohol by exposure to air, reduced to powder, and finally dried at 100° C. in the water oven for some hours.

On combustion with cupric oxide in a current of oxygen in an open tube, the following results were obtained:—

A—·2696 gram gave ·6920 gram CO^2 and ·2308 gram H^2O.
B—·2534 „ ·6506 „ „ ·2106 „ H^2O.

From these figures the following percentage composition is deduced:—

	Carbon.	Hydrogen.	Oxygen.
A	70·000	9·495	20·405
B	70·019	9·234	20·747
Mean	70·009	9·364	20·627

These percentages lead to the formula $C^9H^{14}O^2$, as is seen by the following comparison:—

		Theory.		Found.
9	equiv. of carbon	108	70·129	70·009
14	„ hydrogen	14	9·090	9·364
9	„ oxygen	32	20·781	20·627
		154	100·000	100·000

In order to determine the molecular formula, compounds of silver and lead with embelic acid were examined. In preparing the metallic salts of embelic acid, as the acid is insoluble in water, alcoholic solutions neutralized with ammonia—any excess of ammonia being driven off by prolonged boiling—were mixed with hot alcoholic solutions of silver and lead. The resulting precipitates were allowed to subside, washed with water by decantation, thrown on a filter and washed with alcohol, then with ether, thirdly with water, and finally again with alcohol and ether. The precipitates were very difficult to wash, owing to caking, and during the operation a certain amount of decomposition appeared to occur. Thus, in preparing the lead and silver salts, after mixing the solution of embelic acid with an excess of the metallic solution, the supernatant liquid, when the precipitate had subsided, was colourless; but on washing the precipitate with alcohol and ether, the filtrate was coloured yellow, and after prolonged washing with water, the filtrates afforded evidence of the presence of silver or lead, and then when alcohol and ether were used for the final rinsings the filtrates were again coloured yellow.

Ignition of the silver salt, after having been dried at 100° C., indicated that it contained 40·653 per cent. of the metal, which gives 264·9 as the molecular weight of the salt, and 158 as the molecular weight of the acid, the acid being represented by the formula $HC^9H^{15}O^2$. The silver salt would have the formula $AgC^9H^{15}O^2$, which requires the following theoretical percentage:—

Carbon	41·432
Hydrogen	4·987
Silver	41·302
Oxygen	12·279

The composition of the salt as determined by analysis afforded the following percentages:—

Carbon	41·544
Hydrogen	5·557
Silver	40·653
Oxygen	12·246

Two analyses of the lead salt afforded 37·781 and 37·810 per cent. of lead, respectively, which gives a mean percentage of 37·795 as the lead content of the salt. Taking the lead salt to be represented by the formula $(C^9H^{13}O^2)^2Pb''$, its theoretical percentage composition would be—

Carbon	42·154
Hydrogen	5·074
Lead	40·282
Oxygen	12·490

while the actual percentage as determined by analysis gave the following figures :—

Carbon	43·545
Hydrogen	5·824
Lead	37·795
Oxygen	12·836

A comparison of the theoretical and found percentages for the silver and lead salts indicates differences which can only be accounted for by assuming that the salts were partially decomposed during preparation.

Embelic acid was found to have a melting point of 139·5° C. to 140° C. (uncorrected), when it forms a deep ruby liquid. At about 155° C. it commences to decompose; indications of a portion having sublimed were noted.

The following colour reactions were obtained by adding the respective re-agents to dilute alcoholic solutions of the acid :—

Ferric chloride, a dirty brownish-red colour.

Ferrous sulphate, brownish colour.

Chloride of zinc, violet colour.

Phosphomolybdic acid, light green precipitate.

Plumbic acetate, dirty green precipitate.

Nitrate of silver, dirty reddish-brown precipitate.

Embelic acid is insoluble in water, and is not decomposed by being boiled with dilute sulphuric or hydrochloric acid.

Salts of embelic acid with soda, potash and ammonia were prepared. The ammonia salt was the one most readily obtained crystalline. When an alcoholic solution of embelic acid was mixed with strong ammonia in excess, and the deep red resulting liquid allowed to evaporate spontaneously, the salt crystallized in large needle-shaped crystals of a foxy red hue.

The ammonium salt was found to be effective as an anthelmintic for tænia in doses of 3 grains for children and 6 grains or more for adults. It would appear to act in cases in which the ordinary tæniacides fail. The best method of administration is to give the salt with a little honey or simple syrup, the drug being preceded and followed by castor oil. The ammonium salt of embelic acid possesses one very important advantage over the liquid extract of male fern—it is tasteless—and may thus prove a useful addition to our materia medica.

Lascelles Scott has found in the fruit a minute quantity of volatile oil with a spicy flavour, a fixed oil, colouring matters, a resinoid body, an alkaloid of a yellowish white colour, which he has named *Ohristembine*, and a tannin. The dried fruit as sold in the Calcutta bazars is generally mixed with pepper corns, and the volatile oil mentioned by Scott may be due to this admixture.

Commerce.—The fruit of *E. robusta* is collected and sold under the same name as that of *E. Ribes*. Moodeen Sheriff has observed two varieties of the drug offered for sale in Madras. The drug has lately been exported to Germany to some extent. Value, Rs. 2½ per maund of 37½ lbs.

SAPOTACEÆ.

BASSIA LATIFOLIA, *Roxb.*

Fig.—*Roxb. Cor. Pl., t.* 19; *Bedd. Fl. Sylv., t.* 41.

Hab.—Central India, W. Bengal to Western Ghâts, Kumaon, Terai.

BASSIA LONGIFOLIA, *Linn.*

Fig.—*Wight Ill., t.* 147; *Bedd. Fl. Sylv., t.* 42.

Hab.—Malabar Coast, Ceylon. The flowers and oil of the seeds.

Vernacular.—Moha (*Hind., Mar.*), Maua (*Beng.*), Mahudo (*Guz*), Illupai (*Tam.*), Ippa-chettu (*Tel.*), Ippa-gida (*Can.*). *B. latifolia* is sometimes distinguished by the addition of the adjective "wild" or "forest."

BASSIA BUTYRACEA, *Roxb.*

Fig.—*Roxb. in Asiatic Researches*, viii. *p.* 499—502. Indian butter tree (*Eng.*).

Hab.—Sub-tropical Himalaya. The oil of the seeds.

Vernacular.—Phúlwára, Chiára, Cheuli, Cheuri (*Hind.*), Yelpot (*Lepcha.*).

History, Uses, &c.—These trees are called in Sanskrit Madhuka, Madhudruma, "honey tree," Madhupushpa, "honey flower," Madhusakha, Madhusravas, Gudapushpa "sugar flower," and Kolaphala, or "the fruit of the Kols," a wild tribe inhabiting the hills and forests of Central India, who subsist, to a great extent, upon the fleshy flowers which they collect and dry. The milky juice of the bark, Madhuka-sára, is described as a remedy for phlegm and rheumatism, astringent and a promoter of suppuration; the flowers as sweet, strengthening and cooling; the fruit as cold, sweet and strengthening; it is thought to be antibilious and anti-rheumatic, and useful in leprosy and skin diseases. The spirituous liquor prepared from the flowers is called Madhu-mádhavi or Madhvásava, and is described by Susruta as heating, astringent, tonic and appetizing. The flowers, seeds and oil obtained from them, are more or less used as food all over India, and in many districts form a very important addition to the dietary of the agricultural classes. For further information upon this subject we

would refer our readers to "The Dictionary of Economic Products of India," by Watt (Vol. I., p. 405—416). Ibn Batuta, who visited India A.D. 1332, mentions مهوه (Mahwa), and remarks that the flowers, when dried in the sun, taste like figs. The Persians have named these trees *Darakht-i-gul-chakán* on account of their deciduous flowers. In Guzerat the Mahometans manufacture a coarse soap from the oil of the seeds with soda and lime; this soap varies in price according to the amount of oil it contains. Medicinally, Bassia oil is used as an emollient application to the skin, and the cake as a detergent for washing the hair, and also as an emetic. The oil of *B. butyracea*, known as *Phúlwa butter*, may be used in the preparation of *Ung. Hydrarg. Nitratis* in the same manner as Kokam butter (See *Garcinia indica*). The bark of the Bassias is used in decoction as an astringent. From the flowers a coarse kind of molasses may be prepared. Bassia spirit when rectified loses its offensive odour, and may be used for pharmaceutical purposes. The ordinary native distilled spirit is very rich in fusel oil: one of us found as much as ·4 per cent. in a sample of Mahwa spirit. In the Bengal districts in which the spirit is made, the fermentation is conducted in earthen vessels containing 10 to 20 gallons of fluid, 10 to 20 seers of the flowers being a charge. The jar is then filled up with spirit wash and water, and the process of fermentation occupies from 3 to 7 days, depending on the temperature. The stills are of the rudest description. Molasses and other materials are sometimes added to the contents of the vats. The amount of spirit obtained varies with the quality of the flowers: Warden's experiments would indicate that on an average one maund will yield about 2·12 gallons of London proof spirit when treated in the manner usual among native distillers. In some districts a composition called *bakha* or *muli* is added to the contents of the fermenting vats; it is stated to be composed of herbs and roots, which are dried, ground, and made up into balls with flour. About half a seer (1 lb.) is added to one maund (80 lbs.) of raw material. In certain cases dhatura, nux vomica seeds and other poisonous substances are added to these balls.

The use of bakha has been prohibited in Government distilleries in Calcutta and its suburbs. For further information on Mahwa spirit, we would refer the reader to the report of the Commission of 1883-84 on the excise of country spirit in Bengal. A kind of gutta-percha has been prepared from the milky juice of *B. latifolia*, which has the consistence of ordinary gutta, but is more adhesive and hardens much more rapidly. Used alone it cannot replace the gutta of commerce, but mixed with an equal proportion of that article, it may be used to make the moulds required in galvanoplastic operations; the mixture is as easily manipulated in hot water as ordinary gutta. (*Heckel and Schlagdenhauffen.*)

Description.—Bassia bark is thick and red coloured, with a rough brown surface and astringent taste. The trees produce cream-coloured flowers in March and April, and in August a reddish-yellow fruit from 1 to 2 inches long, which contains from 1 to 4 seeds; these are light brown, about 1½ inch long and ¾ of an inch broad, irregularly ovoid in shape, with a large scar on one side and a ridge on the other, terminating in two slight prominences; the shell is thin and brittle, and the seed consists of two large oily cotyledons, easily separated, white when fresh, but soon turning brown when kept. They yield a greenish-yellow oil, which becomes a soft white mass in the cold weather; that of *B. butyracea* solid at 35° C., whereas the oils of *B. latifolia* and *B. tomentosa* melt at 25·3° C.

The dried flowers at a little distance have the appearance of raisins, on closer inspection they are seen to be fleshy, sticky, compressed, hollow bodies, about $\frac{6}{10}$ of an inch long, and nearly as broad, with an aperture at both ends, the upper being much the larger and serrated. Upon being soaked in water they assume an almost globular form, and the numerous anthers are seen attached by very short filaments to the inside of the corolla. The taste is acid and sweet. The fleshy substance of the corrolla, which is about $\frac{1}{10}$ of an inch in thickness and translucent, consists of a parenchyma which may be divided

into two portions: an outer or cortical, consisting of smaller cells, and an inner consisting of large cells; it is traversed by numerous bundles of spiral vessels; some of the cells contain crystalline masses of sugar; all of them granular matter; there is no starch.

The seeds are from 1 to 2 inches long, and enclosed in a chestnut coloured thin shell; they have a peculiar odour and bitter aromatic taste. The latex of these trees is a milky liquid, sticky to the touch, when kept it developes a rancid sour odour; it contains, besides the gutta-percha, some starch and about 88 per cent. of water.

Chemical composition.—Bassia flowers have been examined by Church (1886), who found them to have the following composition:—

Cane sugar	3·2
Inverted sugar	52·6
Other matters sol. in water	7·2
Cellulose	2·4
Albuminous substances	2·2
Ash	4·8
Water at 100° C.	15·0
Undetermined matter	12·6

MM. A. Riche and A. Rémont (*Journ. de Pharm. et de Chim.*, 1880,) found in the flowers of *B. longifolia* 60 per cent. of fermentable sugars and 8·50 per cent. of crystallizable sugar.

In a paper read before the Society of Chemical Industry, 1887, Mr. H. S. Elsworthy gave the composition of trade samples of the flowers of *B. latifolia*:—

	Saccharose.	Invert sugar.	Dextro-glucose.	Total Sugar.
1. Hyderabad	17·1	40·0	...	57·1
2. Jubbulpore	4·6	41·4	...	46·0
3. Guzerat	9·6	45·3	...	54·9
4. Mirzapore	6·7	...	43·6	50·3

The seeds of *B. longifolia* have been examined by E. Valenta (*Dingl. Polyt. Journ.* ccli., 461). One hundred parts dried at 100° C. gave—

Fat (light petroleum extract)	51·14
Matters soluble in absolute alcohol	78·3
Tannin	2·12
Bitter principle sol. in water	0·60
Starch	0·07
Vegetable mucilage	1·65
Albuminous substances soluble in water	3·60
Extractive substances soluble in water	15·59
Insoluble proteids	4·40
Total ash	2·71
Fibre and loss	10·29
	100·00

Ash in the soluble portion 0·95 per cent.

Total proteids ..... 8·00 ,,

For the extraction of the fat, light petroleum boiling at 40°—45° was used. The fat has a yellow colour and greasy consistency; but on exposure to the air and light the colour disappears and the fat soon becomes rancid. It has a specific gravity of 0·9175 at 15°, melts at 25°·3, solidifies at 17°·5—18°·5. It contains considerable quantities of free fatty acids, but only a small amount of glycerol. One gram of the fat requires 192·3 mgrms. of KHO for the complete saponification of the fatty acids. It is partly soluble in alcohol, and perfectly soluble in ether, carbon bisulphide, benzene, &c. The fatty acids obtained by saponifying the fat with potash-ley, and decomposing the resulting soap by means of a ten per cent. solution of hydrochloric acid, have a white colour, and pleasant odour and taste. They melt at 39°·5, solidify at 38°, and dissolve readily in alcohol. According to Schädler the butter consists of 80 per cent. of stearin and 20 per cent. of olein; the author, however, found that it contained palmitin and olein.

The ash of the seeds is yellowish-white, and dissolves almost completely in water. It gives by analysis—

Silicic acid and portion insoluble in nitric acid	10·67
Phosphoric acid	15·47
Sulphuric acid	6·81
Carbonic anhydride	7·46
Ferric oxide and alumina	2·01
Lime	0·64
Potash with traces of soda	56·68
Moisture and loss	0·26

—(*Year-Book of Pharmacy*, 1886, p. 174.)

According to MM. E. Heckel and F. Schlagdenhauffen (*Journ. de Pharm. et de Chim.*, 1889,) the latex of *B. latifolia* has the following composition :—

Water		87·40
Acid formic (trace) and acid acetic		0·50
Insol. in water 1·666	organic matter	1·405
	ash	0·261
Sol. in water 0·172	tannin and gum	0·125
	ash	0·047
Sol. in alcohol	resin α	2·043
Sol. in acetone	resin β	2·824
Gutta-percha		1·803
Ash		3·792
		100·000

The gutta-percha is flesh-coloured, tolerably hard at ordinary temperatures, but softens when worked with the hand and becomes sticky; dried at 105° C. it loses about 60 per cent. of water; strongly pressed and dried on a water-bath, it becomes light brown, gradually hardens, and becomes covered with a white efflorescence, which dissolves at once in chloroform and bisulphide of carbon, and less easily in cold alcohol. Boiling alcohol and acetone dissolve $\frac{1}{4}$ of its weight; the solution filtered whilst hot deposits a grumous mass, without any trace of

crystals. The alcohol and acetone solutions when concentrated afford a syrupy, colourless, transparent fluid, which, when completely dry, presents the appearance of gum, and is easily powdered. Concentrated sulphuric acid colours this substance yellow and afterwards brown; the addition of chloroform does not change the colour. On the addition of a trace of ferric chloride to this mixture and allowing it to stand, a rose-coloured upper layer forms, which gradually becomes blue. This reaction much resembles that of cholesterine, but is not due to the presence of that substance. Heated with fuming nitric acid, picric acid is not formed; concentrated hydrochloric acid, caustic potash and fused potash have no action on it. Warmed in a test tube it decomposes slowly and does not yield any crystalline product on cooling. Its formula is $C^{8}H^{12}O$. The portion insoluble in alcohol and acetone has the consistence of ordinary gutta-percha, but is more adhesive, and hardens much more readily than that substance. On combustion it leaves a white ash consisting of sulphate of lime with a trace of chloride and phosphate of sodium. (*Heckel and Schlagdenhauffen.*)

We find the bark of *B. longifolia* to contain 3 per cent. of caoutchouc, extracted by benzol; 17 per cent. of tannin, extracted by water; and some oxidized tannin removed subsequently by spirit or alkali. The bark contains starch and rhomboid crystals of calcium oxalate, and leaves 9·42 per cent. of ash when burnt.

The bitter principle contained in the seeds is probably saponin.

Commerce.—No definite information concerning the internal trade in the flowers is obtainable, but its value has been estimated at not less than 35 lakhs of rupees. For several years large quantities were exported from Bombay to France. In 1881-82, the exports were 57,000 cwts.; in 1882-83, 68,829 cwts., valued at Rs. 1,61,317; and in 1883-84, 227,114 cwts., valued at Rs. 5,70,879. In 1885 their import into France was prohibited by the French Government, as it was found to materially interfere with French interests.

The oil and seeds are exported to some extent for candle making. The value of the oil in Europe has been estimated at about £35 per ton.

MIMUSOPS ELENGI, *Linn.*

Fig.—*Wight Ic., t.* 1586; *Bedd. Fl.Sylv., t.* 40.

Hab.—Deccan Peninsula. Cultivated elsewhere. The bark, flowers, fruit, and oil of the seeds.

Vernacular.—Maulsiri (*Hind.*), Ovali (*Mar.*), Bakul (*Beng.*), Bolsiri (*Guz.*), Mogadam (*Tam.*), Pogada-mánu (*Tel.*), Halmadhu (*Can.*), Taindu (*Central Prov.*).

History, Uses, &c.—This highly ornamental tree, with dark green, oblong, alternate leaves and small white fragrant flowers, which turn to a tawny yellow colour before they fall, is very common in gardens in India. It is the Vakula, Kesara and Sinha-kesara, "lion's mane" of Sanskrit writers. Chakradatta mentions the astringent properties of the unripe fruit, and recommends it to be chewed for the purpose of fixing loose teeth. He also mentions a decoction of the astringent bark as a useful gargle in diseases of the gums and teeth. In the Concan a similar use is made of the unripe fruit, and the fruit and flowers along with other astringents are used to prepare a lotion for sores and wounds. Mír Muhammad Husain notices the practice of planting this tree on account of its handsome appearance. He says that the unripe fruit and seeds have powerful astringent properties, and that the decoction of the bark is useful as an astringent in discharges from the mucous membrane of the bladder and urethra, and also as a gargle in relaxation of the gums, &c. He mentions the use of a snuff made from the dried and powdered flowers in a disease called Ahwa, common in Bengal. The symptoms of this disease are strong fever, headache and pain in the neck, shoulders and other parts of the body. The powdered flowers induce a copious defluxion from the nose and relieve the pain in the head. The flowers are much used by the natives on account of

their perfume, which they retain when dry; pillows are sometimes stuffed with them, and they afford a distilled water. The juice of the bark and unripe fruit is used by silk dyers to fix colours. Rumphius states that the pounded leaves are applied to cure headache, that a decoction of the root is given in angina, whilst a plaster made from them is applied externally. The ripe fruit pounded and mixed with water is given to promote delivery in childbirth. (*Hort. Amb.* III., 17.) Horsfield (*Asiat. Journ.* VII. p. 262) describes the bark as an astringent tonic, and Dr. Bholanauth Bose states that a decoction of it forms a good gargle in salivation. (*Pharm. of India*, p. 131.)

Description.—The substance of the bark is red, it is covered externally by a very thick grey suber on the older branches, which separates in irregular scales, leaving isolated attached portions which consist of five or more distinct suberous layers; the inner surface is red and presents a coarsely striated surface; fracture short, disclosing white specks and stains in the substance of the bark caused by the drying up of the milky juice which it contained when fresh. The taste is bitter, astringent and mucilaginous.

The flowers are white and fragrant; calyx inferior, eight-leaved, in a double series; leaflets lanceolate, the four exterior ones leathery, larger and permanent; corolla one-petalled, tube very short, fleshy, border composed of a double series of segments; the exterior one consists of sixteen, spreading; the interior one of eight, generally contorted, and converging, all are lanceolate, a little torn at their extremities; nectary eight-leaved, conical, ragged, hairy near the base, inserted alternately with the filaments into the mouth of the tube, converging filaments eight, short, hairy; anthers linear, sharp-pointed below, two parted, converging. The berry is oval, smooth, when ripe yellow, and edible, one or more celled, according to the number of seeds that ripen; seed solitary, oblong, compressed, attached to the bottom of the cell, covered with a smooth, hard, thick integument, lined with a veined membrane; perisperm conform to the seed, two-lobed, pointed at the base, the

lobes uniting round the radicle; above the radicle they are often entirely divided by the large cotyledons, which extend to, or rather through its margins; embryo erect; cotyledons large, oval; plumule minute; radicle inferior, linear oblong. (*Roxburgh.*)

Chemical composition.—A decoction of the bark afforded 20·3 per cent. of extract containing 6·8 per cent. of tannin. Some caoutchouc, wax, colouring matter (probably oxidized tannin), starch, and 9·4 per cent. of ash were also obtained from the bark.

Mimusops hexandra, *Roxb., Cor. Pl. i., t.* 15; *Wight Ic., t.* 1587; a native of the Deccan Peninsula and Ceylon, cultivated in Northern India, has much the same properties as *M. Elengi.* The vernacular names are Kshiri (*Hind.*), Khirkhejur (*Beng.*), Rájana, Kerni (*Mar.*), Ráyan (*Guz.*), Palla *Tam.*).

The Sanskrit name is Rájádani. The dried fruit is known as *Kàkadia* in Guzerat, and the fresh fruit is sold in the streets in Bombay under the name of *Ahmadábádi-mewa.*

It is a handsome tree, with rigid branches and broad wedge-shaped leaves, and is often found planted in groves near Mahometan towns and buildings. The wood is tough, and is much used for making sugar mill beams, well-frames, &c. The ripe fruit is eaten both fresh and dried, and the bark which much resembles that of *M. Elengi* is used medicinally on account of its astringent properties. In the Concan the white milky juice, which exudes when the tree is wounded, is made into a paste with the leaves of *Cassia Fistula* and seeds of *Calophyllum inophyllum,* and applied as a maturant to boils. The seeds yield an oil which, according to Dr. Mootooswamy, is used as a demulcent, emollient, tonic and alterative in South India.

Chemical composition.—The tannin in this bark was identical with that found in the bark of *M. Elengi.* The bark examined was younger and afforded 10·3 per cent. of tannin,

giving a greenish precipitate with ferric salts, and 30 per cent. of oxide on the ignition of its lead compound. It contained also a resin, wax, caoutchouc, colouring matter, starch, and 7·5 per cent. of mineral residue.

The fixed oil from the seeds is of a light yellow colour, tasteless and odourless, and solidifies at a temperature a little above 15° C. At 17° it has a specific gravity of ·9186. The saponification equivalent is 266·3, as the oil requires 21·1 per cent. of caustic potash to form a complete combination with it. The oil yields 94·5 per cent. of insoluble fatty acids melting at 37°, and containing some stearic acid.

The fruit juice evaporated by heat leaves a blackish extract or paste having a pleasant flavour and sweetness. The extract contains 70 per cent. of sugar, which answers to levulose or fruit sugar. It also contains a yellow resin soluble in ether, alcohol, and benzol, and some caoutchouc. Pectin, colouring matter and a small quantity of tannin occur in the soluble portion of the juice.

ACHRAS SAPOTA, *Linn.*

Fig.—*Bot. Mag.*, *tt.* 3111—3112; *Gärt. Fruct.* 2, *t.* 104. Sapodilla plum, Bully tree (*Eng.*), Sapotillier (*Fr.*).

Hab.—West Indies. Cultivated in India. The bark, fruit and seeds.

Vernacular.—Chiku (*Mar.*).

History, Uses, &c.—This tree has become completely established as a fruit tree on the Western Coast, and in Bengal, and its fruit is regularly offered for sale in the markets. In other parts of India it appears to be less common. In the West Indies and South America the bark is used as a tonic and febrifuge, and the seeds are used as a diuretic in six grain doses; larger doses are said to be dangerous, and a case of poisoning by them has been recorded by Leprieur. In India the fruit is much esteemed by the natives, who consider that, if soaked in melted butter all night and eaten in the morning, it

prevents bilious and febrile attacks. We have not seen the bark or seeds used, nor do the natives appear to have noticed their medicinal properties. The tree yields a kind of gutta-percha similar to that of other sapotaceous plants.

Description.—The bark is red with a grey suberous outer coat; it has a bitter and strongly astringent taste. The fruit is ovoid externally rusty brown and rough, internally yellowish white, soft and pulpy; when quite ripe it has a medlar-like flavour. The seeds are black, shining, ovoid and elongated.

Chemical composition.—Bernou (*L'Union Pharmaceutique*, 1882,) separated from the bark two resins, one of which is soluble in ether, 11·8 per cent. of tannin, and the alkaloid *sapotine*, which is soluble in alcohol, ether, and chloroform, and is precipitated from its salts by ammonia.

EBENACEÆ.

DIOSPYROS EMBRYOPTERIS, *Pers.*

Fig.—*Bot. Reg., t.* 499; *Bedd. Fl. Sylv., t.* 69; *Roxb. Cor. Pl. i., t.* 70; *Rheede Hort. Mal. iii., t.* 41. Indian Persimmon (*Eng.*), Plaqueminier Glutinifère (*Fr.*).

Hab.—Throughout India. The fruit.

Vernacular.—Taindu (*Hind.*), Gáb (*Beng.*), Tumbilik-kay (*Tam.*), Tumiki, Tinduki (*Tel.*), Panich-chi (*Mal.*), Timburni, Temar (*Mar.*), Temru (*Guz.*).

History, Uses, &c.—*D. Embryopteris* is the Tinduka of Sanskrit writers; its bark is described in the Nighantas as a good application to boils and tumours, and the juice of the fresh bark as useful in bilious fever. The fruit when unripe is said to be cold, light, and astringent, and when ripe beneficial in blood diseases, gonorrhœa and leprosy. A kind of

Tinduka called Visha-tinduka, "poisonous tinduka," is said to have similar properties; as well as a plant called Kanki or Kinkini. Mir Muhammad Husain, speaking of Ebony, mentions *Gàb* as a kind of Indian ebony, but is silent as to its medicinal uses. Rheede (*Hort. Mal iii.*, p. 46), speaking of *D. Embryopteris*, says—"Arboris cortex in pulverem redactus ac cum oryzæ infuso, et expresso e matura nuce Indica lacteo succo mixtus, atque febricitantibus exhibitus æstum potenter extinquit; ex seminibus oleum exprimitur." The circumstance that the unripe fruit abounds in an astringent viscid juice, which is used by the natives of India for daubing the bottoms of boats, was communicated by Sir William Jones to Roxburgh in 1791. The introduction of the fruit into European medical practice in India is due to O'Shaughnessy. In 1868 it was made official in the *Pharmacopœia of India*. The fruit is eaten by the poorer classes. The seeds are preserved by the country people and given as an astringent in diarrhœa. The testa is the astringent part, the albumen being almost tasteless. Although the ripe fruit is very sweet, insects will not touch it.

Description.—Fruit subglobose, 1 to 2 inches in diameter, sometimes larger; glandular or rusty, yellow when ripe, and covered with a rust-coloured farina consisting of clubbed hairs. Seeds 8 in the perfect fruit, often less by abortion, arranged vertically round the central core, reniform, immersed in glutinous pulp. Fruiting calyx much accrescent, lobes ¾ inch, ovate, auriculate, base cordate, nearly glabrous.

Diospyros fruit is very astringent until quite ripe, when it becomes mawkish and sweet. This is noticed in the *Pharmacographia*, but not in the *Indian Pharmacopœia*, where unripe fruit should have been ordered.

Chemical composition.—The tannic acid of these fruits has the following reactions. A blue-black colour with ferric chloride; violet-black colour and precipitate with ferrous sulphate; pinkish precipitate with gelatine; curdy precipitate with iodine in potassium iodide; orange sediment with bromine

water; brown precipitate with cupric acetate; yellowish brown precipitate with potassium dichromate; aqueous alkalies afforded precipitates which changed in colour and became soluble by oxidation; grey precipitate with limewater, turning red by exposure to the air; it reduced the copper when boiled with Fehling's solution. The lead compound of the tannic acid contained 48·78 per cent. of oxide, whether prepared from the aqueous or alcoholic extract of the fruit. Boiled for two hours with dilute hydrochloric acid, the astringent principle was decomposed with the formation of two colouring matters and a body answering to glucose. The inspissated juice was not redissolved entirely even in boiling water, about thirty per cent. of pure soluble tannin was obtained from it, the remainder was an insoluble gum swelling up like tragacanth. The amount of astringent acid obtainable from the fruits examined by us was 12·8 per cent., and we consider it to be closely related to gallotannic acid.

Several species of Diospyros have fruit with the astringent properties of *D. Embryopteris* when unripe. The root of **D. Tupru** is used by the Marathás to make the Akshata mark (the sectarial circlet on the forehead), under the name of Akshaté ché khor, "akshata wood." The leaves are an article of commerce, being largely used for folding *viri*, "native cigarettes." The fruits contain 5·7 per cent. of tannic acid.

D. Ebenum affords Ebony, the 'Abnus' of the Mahometan Materia Medica. It is described as astringent, attenuant, and lithontriptic, and was used by the ancients. (*Cf. Dios. i.*, 114; *Pliny* 12, 8.)

The fruits of **D. montana** contain a very interesting colouring matter, which seems to be the chief ingredient besides sugar and malic acid but no tannic acid. The colouring matter is soluble in spirit and partly so in water. It is insoluble in ether, and gives an intense purple with alkalies. Subjected to hydrolosis it breaks up into a body soluble in ether, also pigmental, and a sugar. The fruits are used by the hill-men of Travancore for poisoning fish.

D. Kaki, a tree of China and Japan, cultivated in some parts of India, has an edible fruit which is known as the Chinese Persimmon. The fruit is green, globular, from two to three inches in diameter, and when ripe has an agreeable sweetness and flavour. The dried and powdered fruit contained 54·2 per cent. of sugar reducing Fehling's solution, an organic acid, no tannin, and a colouring matter soluble in ether similar to that of the fruits of *D. montana*.

The following shows the proximate analyses of the dried and powdered fruits freed from the seeds of four species of Diospyros :—

	Embryopteris.	Tupru.	montana.	Kaki.
Ether extract.....	1·2	2·1	10·0	1·5
Spirit extract	12·4	6·3	6·8	66·1
Water extract	7·5	4·4	6·3	11·5
Albuminous matter, &c...	12·1	16·4	12·5	3·0
Organic residue.....	61·9	65·1	58·6	14·1
Ash.....	4·9	5·7	5·8	3·8
	100·0	100·0	100·0	100·0

STYRACEÆ.

STYRAX BENZOIN, *Dryander.*

Fig.—*Bentl. and Trim., t.* 169. Gum Benjamin tree (*Eng.*), Aliboufier de Benjoin (*Fr.*).

Hab.—Sumatra, Java, Siam. Gum Benzoin.

Vernacular.—Lubán, Ud (*Ind. Bazars*).

History, Uses, &c.—Benzoin or Gum Benjamin does not appear to have been known to the ancient Hindus, nor is there any evidence that the Greeks and Romans, or even

the earlier Arabian physicians, were acquainted with it. There is however no doubt that in the original and legitimate Storax they were acquainted with a fragrant resin in separate or more or less agglutinated tears, somewhat resembling Benzoin, and produced by the *Styrax officinalis* of Linnæus. Specimens of this amygdaloid storax are still to be found in old Materia Medica collections. (*Hanbury's Science Papers*, p. 129.) Benzoin is first mentioned by the Arabian traveller Ibn Batuta, who visited Sumatra between A. D. 1325 and 1349. He calls it Lubán Jáví or Java Lubán, Java being a general name among the Arabs and Persians for the Eastern Archipelago. It is not mentioned by the Persian druggist Háji Zein, A. D. 1368. In more recent Arabic and Persian works, Benzoin is called Hasi-lubán-el-Javi, which may be translated 'pebbly or amygdaloid frankincense from Java,' and seems to imply the existence of another kind of pebbly frankincense. The author of the *Makhzan-el-Adiwya* states that Hasi-lubán-el-Javi is the same as Darv or Zarv (لوبان). On turning to this article, we find the following synonyms given: Fúzúkas* (*Greek*), Zarwa (*Syrian*), Fashashísh (*Turkish*), Dur-i-haskhak Arísa, Kalangúra, and Kamkám (*Persian*). This tree is said to grow in the Hejaz, Yaman, India and other countries, and to resemble the oak, the leaves being soft and reddish at the edges, and the fruit a cone like the fir, but with larger seeds; its bracts and spines turn red when ripe. The exudation is at first like a grain of wheat, but gradually increases until it reaches the size of a melon; from it a dark pitch-like substance may be separated. A decoction of the leaves is mentioned, and an oil which is obtained from the seeds. This description might do for *Liquidambar orientale*, but cannot apply to *Styrax Benzoin*. As regards the drug benzoin, Mir Muhammad Husain must have been well acquainted with it, as it was in common use in India before his time. He probably regarded it as a kind of amygdaloid storax. Ainslie mentions its use in Southern India by Tamool physicians as a remedy in phthisis and asthma.

* Probably a corruption of ξυρός, a name applied to the Storax tree by the modern Greeks.

The Mahometans use it for the same purpose, and direct the fumes to be inhaled. As an incense it is much used by all classes, the imports into Bombay alone averaging 6,000 cwts. per annum. For the early history of this drug in Europe, the *Pharmacographia* may be consulted. In that work will also be found a summary of what is known regarding the method of collecting it in Sumatra and Siam.

Description.—The following excellent description, together with a summary of its chemical composition, is extracted from the *Pharmacographia* :—

"Siam Benzoin.—The most esteemed sort is that which consists entirely of flattened tears or drops, an inch or two long, of an opaque, milk-like white resin, loosely agglutinated into a mass. More frequently the mass is quite compact, consisting of a certain proportion of white tears of the size of an almond downwards, imbedded in a deep, rich amber-brown, translucent resin. Occasionally the translucent resin preponderates, and the white tears are almost wanting. In some packages the tears of white resin are very small, and the whole mass has the aspect of a reddish-brown granite. There is always a certain admixture of wood, bark and other accidental impurities.

"The white tears, when broken, display a stratified structure with layers of greater or less translucency. By keeping, the white milky resin becomes brown and transparent on the surface, but from some experiments made by one of us (F.) it does not appear that opacity is due to water, but rather to a peculiar molecular (semi-crystalline ?) state of the resin. Siam benzoin is very brittle, the opaque tears showing a slightly waxy, the transparent a glassy, fracture. It easily softens in the mouth, and may be kneaded with the teeth like mastich. It has a delicate balsamic, vanilla-like fragrance, but very little taste. When heated it evolves a more powerful fragrance together with the irritating fumes of benzoic acid; its fusing point is 75° C. The presence of benzoic acid may be shown by

the microscopical examination of splinters of the resin under oil of turpentine.

"Siam benzoin is imported in cubic blocks, which take their form from the wooden cases in which they are packed while the resin is still soft."

"SUMATRA BENZOIN.—Prior to the renewal of direct commercial intercourse with Siam in 1853, this was the sort of benzoin most commonly found in commerce.

"It is imported in cubic blocks exactly like the preceding, from which it differs in its general greyer tint. The mass, however, when the drug is of good quality, contains numerous opaque tears, set in a translucent, greyish-brown resin, mixed with bits of wood and bark. When less good, the white tears are wanting, and the proportion of impurities is greater. We have even seen samples consisting almost wholly of bark. In odour, Sumatra benzoin is both weaker and less agreeable than the Siam drug, and generally falls short of it in purity and handsome appearance, and hence commands a much lower price. The greyish brown portion melts at 95°, the tears at 85° C."

Chemical composition.—Benzoin consists mainly of amorphous resins perfectly soluble in alcohol and in potash, having slightly acid properties, and differing in their behaviour to solvents. If two parts of the drug are boiled with one part of caustic lime and twenty parts of water, benzoic acid is removed. From the residue the excess of lime is dissolved by hydrochloric acid, and the remaining resins washed and dried. About one-third of them will be found readily soluble in ether, the prevailing portion dissolves in alcohol, and a small amount remains undissolved. Subjected to dry distillation, benzoin affords as chief product *Benzoic acid*, $C^7H^6O^2$, together with empyreumatic products. Benzoic acid exists ready formed in the drug to the extent of from 14 to 18 per cent., its extraction is easily accomplished by the aid of an alkali, most advantageously by milk of lime, which does not combine with the amorphous resins. Most pharmacopœias require not the inodorous acid obtained by a wet process, but that afforded by sublimation, which contains a small amount of fragrant empy-

reumatic products. The resin when repeatedly subjected to sublimation affords as much as 14 per cent. of benzoic acid.

Kolbe and Lautemann in 1860 discovered in Siam and Pennang benzoin together with benzoic acid, an acid of different constitution, which in 1861 they recognised as *Cinnamic Acid*, $C^9H^9O^2$. Aschoff (1861) found in a sample of Sumatra benzoin, cinnamic acid only, of which he got 11 per cent.; and in amygdaloid Siam and Penang benzoin only benzoic acid. In some samples of the latter, one of us (F.) has likewise met with cinnamic acid. (*Op cit.*, 2nd Ed., p. 407.)

Commerce.—The imports of Benzoin into Bombay in the year 1871-72 were 5,975 cwts., and the exports 1,043 cwts.; no later statistics are available, but there is probably little difference in the quantity imported. Average value in Bombay, first quality, Rs. 30 to Rs. 35 per maund of 37½ lbs. An artificial benzoin is manufactured in the bazar, in which pieces of silicate of magnesia are embedded in common American resin. It is largely retailed to the poor, who purchase small quantities for religious uses.

SYMPLOCOS RACEMOSA, *Roxb.*

Hab.—North-East India, Burma. The bark.

Vernacular—Lodh, Tilak (*Hind.*), Lodh (*Beng.*), Lodhra (*Mar.*), Lodhar (*Guz.*), Jálàriyaméd (*Can.*).

History, Uses, &c.—This tree, in Sanskrit Lodhra or Rodhra, Srimata, "propitious," and Tilaka, "because it is used in making the Tilaka mark on the forehead," is described in the Nighantas as hot, alterative, and useful in phlegmatic diseases and leprosy. In the Bhávaprakása it is said to be absorbent, stomachic, refrigerent, astringent, expectorant and hæmostatic, and to be useful in eye diseases, liver, fevers, dysentery and dropsy. A decoction of the bark is used as a gargle when the gums are spongy and bleeding. (*Susruta.*) It enters into the composition of various pastes which are applied

to inflamed parts; it is supposed to promote the maturation and resolution of stagnant humours. In fevers, dysentery and liver complaints, compound decoctions and infusions are used, and in dysentery a compound powder containing liquorice root, *Myrica sapida* bark, and pomegranate rind in equal proportions to the Lodhra bark. (*Sarangadhara, Chakradatta.*)

Roxburgh remarks that the bark is in request among the dyers of red in Calcutta, and seems to be used as a mordant only. He gives the following receipt:—"For three yards of cloth take Lodh bark, Chebulic myrobalans of each 2 ozs., rub them down with water, then add more water, steep the cloth and dry it. Next take 2 ozs. of alum, dissolve it in water and boil the cloth in the solution for an hour, then wash and dry it. Lastly, take the bark of *Morinda tinctoria* and flowers of *Woodfordia floribunda* of each 2 ozs., Madder root 1 lb., mix them with lukewarm water and let it boil, then put in the cloth and keep it in the boiling liquid for forty minutes." In this receipt the Lodh appears to be used as a dye to modify the colour afterwards produced by the Morinda and Madder. The middle layers of Lodh bark contain much red colouring matter.

In Europe it was formerly looked upon as a cinchona bark, and has been known at various times as "*Ecorce de lautour,*" "*China nova,*" "*China Calafornica,*" "*China Brasilensis,*" and "*China Paraquatan.*" It is now known as "Lotur bark." Drs. Charles and Kanny Loll Dey recommend the bark in 20 gr. doses mixed with sugar as a remedial agent in menorrhagia due to relaxation of the uterine tissue; it should be given two to three times a day for three or four days. Dr. K. L. Dey considers that the drug has a specific action upon relaxed mucous membranes. (*Phar. Journ, Sept.* 24, 1881.)

Description.—The bark is very soft and friable, of a light fawn colour; the external surface corky and much fissured transversely; the internal of a lighter colour and fibrous texture. On making a transverse section a middle layer of a red colour is seen between the corky and fibrous portions.

Microscopic examination shows that the coloured layer is chiefly composed of oblong cells containing red colouring matter; the inner layer of the bark consists almost entirely of woody fibre. The taste is faintly balsamic and astringent.

Chemical composition.—Dr. Hesse reports (*Ber. d. deutsch ch. Gesellsch*, X., 1,) that he has obtained from this bark three alkaloids, which he has named "*Loturine*," "*Colloturine*," and "*Loturidine*," and between which he thinks probably there is the same relation as exists between cusconine, aricine, and cusconidine. Loturine is present in largest quantity (0·24 per cent.); it is crystalline, and forms crystalline salts. Colloturine is also crystalline but loturidine is amorphous. All three alkaloids in dilute acid solutions show an intense blue-violet fluorescence. Winckler obtained from this bark an alkaloidal substance which he named "*Californine*," but Hesse believes this to have been a mixture of the acetates of the three alkaloids. Pelletier, Caventou and Winckler have separated *Kinovin* (Quinovin) from the bark of *China nova*. Kinovin forms an amorphous, nearly transparent resin, triturable to a light, white powder, inodorous, or faintly balsamic when warmed. Tasteless at first, but afterwards very persistently and disagreeably bitter and acrid; neutral; electric when rubbed. (*Winckler, Hlasiwetz.*) In alcoholic solution it exerts a dextro-rotatory action on polarised light; $(\alpha)\ j = 52{\cdot}4$ (De Vrij). Kinovin may be obtained in the anhydrous state by keeping it in a vacuum for a month, but cannot be dehydrated at once, even at a temperature of 190°: kinovin dried at 100° to 140° contains from 1 to 2 atoms of water, which is given off at 160° to 180°. (*Hlasiwetz.*) According to Hlasiwetz, kinovin corresponds with the formula $C^{60}H^{48}O^{16}$; according to Petersen the formula is $C^{15}H^{12}O^{4}$; according to Schneederman $C^{58}H^{30}O^{10}$. (*Gmelin, Handbook* xviii., p. 26.) The bark contains no tannin according to Hummel. The ash amounts to 7·4 per cent. containing 18 per cent. of carbonate of soda.

Commerce.—The bark is obtainable in all the Indian markets. Value, Rs. 3 to 3½ per Surat maund of 37½ lbs.

OLEACEÆ.

NYCTANTHES ARBOR-TRISTIS, *Linn.*

Fig.—*Bot. Reg.*, *t.* 399; *Bedd. Fl. Syl.*, *t.* 240; *Gärtn. Fruct.* ii., *t.* 138. Weeping Nyctanthes, Night Jasmine (*Eng.*), Nictanthe Arbre-triste (*Fr.*), Arvore da notte (*Port.*).

Hab. Central India. Cultivated throughout India. The leaves, fruit and bark.

Vernacular.—Harsinghár, Hár, Siháru (*Hind.*), Sephalika (*Beng.*), Párijata, Khurasli (*Mar.*), Manja-pu (*Tam.*), Harsing (*Can.*), Poghada (*Tel.*), Pakúra (*Punj.*).

History, Uses, &c.—Royle in his Himalayan Botany states that this tree is extremely common along the foot of the mountains which skirt the Dehra Dhoon, and may be seen for several hundred feet above Rajpore in the ascent to Mussoorie. Dr. Wallich found it in a wild state near the banks of the Irrawaddy, on the hills near Prome. In all parts of India it is one of the commonest cultivated shrubs, its flowers open at sunset, and fall before morning; they have a very strong perfume. The Sanskrit names for the tree are Sephálika; Párijátaka; Rajanihása, "night-smiling"; and Atyúhá, "very pensive." According to the Indian legend, a certain Nága (prince) called Párijáta had a daughter of whom the Sun became enamoured, but he soon deserted her for another sweetheart; whereupon the damsel pined away and died of grief. Upon the spot where she died sprang up the tree Párijataka, whose flowers have such a dread of the Sun that they fall from the tree in the early morning before he rises.

Chakradatta mentions the use of the leaves in fever and rheumatism; a decoction of the leaves prepared over a gentle fire is recommended by several writers as a specific for obstinate sciatica. In the Concan about 5 grains of the bark are eaten with Betel-nut and leaf to promote the expectoration of thick phlegm.

The author of the *Makhzan* gives a minute description of all parts of the tree, and states that the Indians use the white portion of the flowers as a purple dye, which they call Gulkámah, and the orange part as a yellow dye. The seeds and leaves are considered by them to have medicinal properties. Six or seven of the young leaves are rubbed up with water and a little fresh ginger, and administered in obstinate fevers of the intermittent type, at the same time a purely vegetable diet is enforced. The powdered seeds are used to cure scurfy affections of the scalp. Directions for the preparations of Gulkámah will be found in the *Karabádin-i-kabir*.*

Description.—Tree, 15 to 20 feet, young shoots 4-sided, leaves opposite, short-petioled, cordate or oblong, pointed, entire, or coarsely serrate, scabrous; panicles terminal, composed of small six-flowered terminal umbellets, calyx campanulate, slightly 5-notched, downy; corolla tube cylindric, as long as the calyx, segments 5 to 7; involucel of four inverse-cordate, opposite, sessile leaflets; flowers numerous, tube orange-coloured, border white, fragrant. The fruit is a dry, flat, oblong, mucronate capsule, prominently veined, $\frac{3}{4}$ inch long by $\frac{1}{2}$ inch broad; it is of a brown colour when ripe, and is divided into two cells, each of which contains a flat foliaceous seed of a light brown colour; the testa of the seed is thin, the kernel white, bitter and very astringent. The leaves have similar properties, and stain the saliva when chewed.

Chemical composition.—The fresh leaves were digested with 80 per cent. alcohol, and most of the alcohol recovered by distillation. The concentrated tincture deposited a large amount of resin and colouring matter on spontaneous evaporation. When the liquid had ceased to smell of alcohol, it was acidulated with dilute sulphuric acid, which caused the precipitation of a dark resin. After filtration the clear filtrate was neutralized with ammonia and agitated with ether. The ethereal solution was evaporated to dryness, mixed with dilute sulphuric acid and again agitated with ether: finally the aqueous acid

* A well-known Persian Pharmacopœia.

solution was again neutralized and agitated with ether. Operating in this manner, an alkaloidal principle was isolated, which we provisionally call *Nyctanthine*. Nyctanthine gives a marked precipitate with alkaloidal reagents, but no special colour reactions. In addition to an alkaloid, the presence of a trace of an oily principle was detected, which had a taste somewhat similar to that of oil of peppermint. An astringent principle, giving a greenish coloration with ferric chloride, with resins, and a sugar readily reducing an alkaline copper solution on boiling, were also present.

Jasminum grandiflorum, *Linn.*, Spanish Jasmine or *Chambeli*, is cultivated almost everywhere in India. The Sanskrit name is Játi; from the flowers a perfumed oil is prepared which is a favourite perfume amongst the Hindus. Their physicians prescribe the leaves as a remedy in skin diseases, ulcers of the mouth, otorrhœa, &c. Chakradatta mentions the use of the fresh juice of the leaves as an application to soft corns, and of an oil prepared with it in otorrhœa. In the Bhavaprakása the leaves are recommended to be chewed by those who suffer from ulceration of the mucous membrane of the mouth.

Mahometan writers consider the plant to have deobstruent, anthelmintic, diuretic and emmenagogue properties. Mír Muhammad Husain mentions the use of the flowers applied in the form of plaster to the loins and pubes as an aphrodisiac. He classes *J. grandiflorum* along with several other kinds of Jasmine under the name of Yasmín.

Chemical composition.—The air-dried leaves were exhausted with 80 per cent. alcohol, and the alcoholic extract mixed with water and agitated with benzole. The benzole extract contained much colouring matter and some resin. During agitation with benzole, a soft black resin separated. This resin was easily soluble in alkalies and reprecipitated by acids. The clear aqueous fluid after agitation with benzole was acidulated with dilute sulphuric acid, which caused a turbidity. After filtration, the liquid was agitated with ether, the extract contained astringent matter, and salicylic acid. The aqueous

solution was then rendered alkaline and reagitated with ether, the ethereal extract contained an alkaloid, for which we propose the name *Jasminine*, and which afforded no special colour reactions.

The *Mogra*, J. Sambac, is considered to have the the same properties as *J. grandiflorum*. In the *Pharmacopœia of India* the flowers, upon the authority of Mr. J. Wood, are said to have considerable power as a lactifuge; he speaks of them as effectual in arresting the secretion of milk in the puerperal state, in cases of threatened abscess. For this purpose about two or three handfuls of the flowers are bruised and applied to the breasts and renewed once or twice a day. The secretion is sometimes arrested in twenty-four hours, though generally a longer time is required. Mr. Wood speaks of this practice as being well known in Madras.

The wild single variety, called *Vikhmogra* or *Vishmogra*, (*Rheede vi.*, 56,) is used as an emmenagogue.

The juice of the leaves of J. arborescens, *Roxb.*, is used with pepper, garlic and other stimulants as an emetic in obstruction of the bronchial tubes by viscid phlegm. Seven leaves will furnish sufficient juice for a dose. For young children the juice of half a leaf and of four leaves of Agásta (*Sesbania grandiflora*) may be mixed with two grains of black pepper and two grains of dried borax and given in honey.

The bark and leaves of the following plants, belonging to this Order, are used by the hill villagers in the Madura District, in the preparation of Sago-toddy.

They are believed to assist and regulate the process of fermentation, but do not directly impart any intoxicating properties to the liquor.

Olea glandulifera, *Wall. Wight. Ic., t.* 1238; *Bedd. Fl. Sylv. t.* 238. Kadaly (*Tam.*).

The bark, which is externally greyish with whitish specks, internally brown and about $\frac{1}{8}$ of an inch in thickness, breaking with a close granular facture, contains a bitter glucoside and quercetin. The water extract amounts to 14·5, spirit extract 12·9, and ash 8·2 per cent.

Jasminum flexile, *Vahl., Wight Ic. t.* 1253; *Burm. Zeyl. t.* 58, *f.* 1. Mullu-gundu (*Tam.*).

A woody climber, stems about one inch in diameter, very woody and knotted, covered with a light yellowish brown, papery bark, exfoliating on the surface, contains a bitter glucoside and colouring matter. The water extract amounts to 9·6, spirit extract 6·6, and ash 7·9 per cent.

Ligustrum Roxburghii, *Clarke, Wight Ic.* 1242. Pungala (*Tam.*).

The bark is of a russet brown colour, and ¼ of an inch thick; fracture close, showing thick white fibres running through the brown inner and middle layers. The leaves are ovate or ovate lanceolate; dark green, smooth, entire, lighter on the under surface. Its chemical composition is similar to that of *J. flexile*.

SALVADORACEÆ.

SALVADORA PERSICA, *Garcin.*

Fig.—*Roxb. Cor. Pl. i., t.* 26; *Bedd. Fl. Sylv., t.* 247; *Wight Ill. ii., t.* 181.

SALVADORA OLEOIDES, *Dene.*

Fig.—*Jacq. Voy. Bot., t.* 144; *Brand. For. Fl., t.* 39; *Wight Ic., t.* 1621.

Hab.—The drier parts of India. The leaves, fruit, bark and oil.

Vernacular.—Pilu, Jhál (*Hind.*), Pilu (*Beng., Guz.*), Kakhan (*Mar.*), Kalarva, Kárkol, Ughai-puttai (*Tam.*), Varagogu (*Tel.*).

History, Uses, &c.—The two species of Salvadora grow upon the sea coast of Arabia, Persia and Western India, as well as in the arid districts of the interior. They are the Pilu of Sanskrit writers, and in the Nighantas bear the synonyms of Sahasrá, Karambha-priya, Tatphala, etc. The

Hindus consider the fruit to be hot, digestive, lithontriptic, fattening and light; and to be beneficial in enlarged spleen, rheumatism, tumours and lithiasis; it is also thought to have alchemic or alterative properties. In Marwar and other parts of Northern India the berries of *S. oleoides* and *S. persica* are largely collected and dried in the sun as an article of diet. When dry they resemble grape currants both in appearance and taste. From the seeds an oil is expressed, which is used as a stimulating application in painful rheumatic affections and after childbirth. The leaves of these trees heated and tied up in a cloth with those of *Vitex trifolia* are a favorite domestic remedy for rheumatic pains.

The Arabs call the Salvadoras Arák and the Persians Darakht-i-miswák, "tooth-brush tree," short pieces of the root, about the size of goosequill, being used to clean the teeth. On the coast of Persia bordering the Persian Gulf these shrubs are called Chúch, and are depastured by camels and buffaloes. They are said to render the milk very rich and thick. This property of the plant as a fodder is also known in India. The author of the *Makhzan-el-Adwiya* describes the fruit as deobstruent, carminative and diuretic, and remarks that a poultice of the leaves, which have similar properties, is used to relieve the pain caused by tumours, piles, etc.

Forskahl (*Ægypt–Arab.*, p. 32) has the following notice of Salvadora:—"In magno est pretio; fructus (*Kabath*) maturus edulis; folia contusa imponuntur tumoribus naram (نرم) dictis et bubonibus; sed vis antitoxica adeo famosa, ut carmine quoque celebretur." Kabáth is the Arabic name for the ripe fruit, when unripe it is called بَرِير (barir).

Ainslie gives *Ooghai-puttai* as the Tamil name of *S. persica*, and says, "the bark, which is a little warm and somewhat acrid, is recommended by the Hindu doctors, in decoction, in cases of low fever, and as a tonic and stimulant in amenorrhœa. The bark of the root when fresh acts as a vesicatory." (*Mat. Ind.* ii., p. 266). In the *Pharmacopœia of India*, we are told that Dr. Irvine employed the root-bark successfully as a vesi-

cant. In Dr. Imlach's Report on Snake-bites in Sind (*Bomb. Med. and. Phys. Trans. New Ser.*, iii., p. 80,) several cases are mentioned in the tabular record, in which Pilu seeds were administered internally, with good effect. They are also said to be a favorite purgative.

Royle considers *S. persica* to be the mustard tree of the New Testament, and says that the Syrian Arabs call it Khardal, *i. e.* "mustard."

Description.—*S. persica* and *S. oleoides* are small trees or shrubs with a crooked trunk, seldom more than one foot in diameter; bark scabrous and cracked, whitish; branches numerous, spreading; their extremities pendulous, like those of the weeping willow; leaves opposite, petioled, oval or oblong, veinless, shining on both sides, fleshy, from 1 to 2 inches long, and one inch broad; flowers minute, greenish yellow, in terminal panicles from the exterior axils; berry in *S. persica* small, smooth, red, juicy; in *S. oleoides* it is larger and yellow. The solitary seeds have a strong aromatic smell, and taste like garden cress. The oil of *S. oleoides* is of the consistence of butter, of a bright green colour, and pungent odour. That sold in the shops is usually adulterated, and is of a greenish yellow colour, and of greater consistency than the genuine article.

The root-bark when fresh is of a light brown colour and nearly smooth, studded pretty thickly with scabrous corky warts, either single or arranged in transversely extended patches. The substance and inner surface of the bark is white and soft; fracture short; odour like cress; taste warm and pungent.

Microscopic structure.—The epidermis is formed of several rows of brick-shaped cells containing brown and green colouring matter; within this the cells of the parenchyma are brick-shaped and arranged in rows for some distance inward, afterwards the arrangement becomes more irregular, and the cells are loaded with starch, a few oil globules, and raphides; towards the inner part of the bark are a few large yellow stone cells. The wood is porous; the vascular system composed of large, very

fine dotted vessels. The medullary rays are remarkable for the number of large raphides contained in their cells.

Chemical composition.—The air-dried root bark of *S. Persica* was reduced to powder and extracted with 80 per cent. alcohol, the greater part of the alcohol recovered by distillation, and the last traces removed by spontaneous evaporation. The resulting extract was mixed with water, acidulated with sulphuric acid and agitated with ether. The ether extract contained some resin and colouring matter. During agitation with ether, brown flocks separated, which were subsequently collected by filtration. These flocks were partly soluble in alkalies, the alkaline solution giving a precipitate on the addition of acids: the alcoholic solution was neutral, and gave no reaction with ferric salts.

The original acid aqueous solution was rendered alkaline and reagitated with ether, and the ether driven off by a current of cold air. During evaporation there was a marked odour of *trimethylamine*. The ethereal extract consisted of a soft yellow resin-like substance, and a small amount of clear watery fluid. The reaction was strongly alkaline; a few drops applied to the skin caused a painless redness in about 10 minutes; no vesication ensued. A glass plate was moistened with dilute sulphuric acid and placed over the capsule containing the extract. After some time an odourless, crystalline deposit was observed, which, on the addition of an alkali, afforded the odour of trimethylamine. The remainder of the ethereal extract was heated for some hours in the water bath to 100° C. The residue was partly soluble in acids, and afforded all the reactions of an alkaloid. This residue was without any action when applied locally to the skin. After agitation with ether, the still alkaline original liquid was agitated with chloroform, which separated a further quantity of trimethylamine, and traces of an alkaloid. We propose calling the alkaloid *Salvadorine*.

The air-dried root-bark lost 13·76 per cent. when heated to 100° C., the ash amounted to 27·06 per cent., and was

remarkable for the large amount of chlorine present. No manganese was detected. The juice of the fresh bark and leaves had an acid reaction.

It appears to us highly probable that the stimulating effects of the fresh bark, when applied locally, are due to the presence of trimethylamine, a part of which no doubt exists in it in a free state, and the remainder as a salt, most likely as the chloride. The rapid and painless manner in which the dilute aqueous solution of trimethylamine produces redness of the skin, might perhaps be utilized, if the extremely offensive odour of the drug were not a bar. Trimethylamine is stated to act in a similar manner to aqueous ammonia locally, but it appears to us that trimethylamine is more active.

The fleshy portion of the dried fruit of *S. oleoides* has a taste similar to that of grape currants, and contains a large amount of sugar, which reduces an alkaline copper solution on boiling. The seeds contain a white fat with a melting point of 39 to 40° C (uncorr.). The alcoholic solution was neutral to litmus paper. We also isolated an alkaloid, soluble in ether and amylic alcohol, and giving very marked precipitates with alkaloidal reagents, but no special colour reactions. It also afforded marked precipitates with chromate and bichromate of potassium from its solution in H^2So^4. The taste was somewhat bitter and harsh. We are not in a position to state whether this principle differs or not from the one we detected in the root bark. A yellow colouring principle is also present in the seeds, which gives a deep bright yellow coloration with alkalies.

AZIMA TETRACANTHA, *Lam.*

Fig.—*Wight Ill. ii., t.* 152; *Gärtn. Fruct. t.* 225.

Hab.—Deccan Peninsula and Ceylon. The leaves, root, and juice.

Vernacular.—Kanta-gûrkamai (*Hind.*), Trikant a-jati (*Beng.*), Sukkapât (*Mar.*), Sungam-cheddi (*Tam.*), Tella-upi (*Tel.*),

History, Uses, &c.—The leaves, root, and milky juice are bitter, and are used medicinally by the Hindus. Dr. P. S. Mootooswamy (*Ind. Med. Gazette*, October, 1889,) states that the leaves are considered stimulant, and are given to puerperal women immediately after confinement. They are administered in the following manner by the villagers:—The leaves with an equal quantity of Neem leaves, and a little powdered brick, are finely ground and given twice a day for the first two days, no food being allowed. For the next six days the woman gets a little boiled rice and pepper water once a day, and is allowed to drink a little warm water after the meal; she is not allowed to sleep after her food during the day, and if thirsty must quench her thirst by eating betel leaves and areca nut. From the seventh day she gets her ordinary food. It is also the practise among the rural classes to give 2 to 4 ounces of Neem oil soon after delivery, with a little roasted asafœtida, and the woman is made to take daily for a month from the morning of the third or fourth day a bolus of a stimulating confection, called *Nadaycayam* in Tamil, which is supposed to keep off cold from the system. (This practice is general amongst the country people in most parts of India.)

The leaves are also administered with food as a remedy for rheumatism, and their juice to relieve cough.

The root is considered to have the same properties as the leaves, and to be also diuretic; it is given in dropsy along with other drugs. Dr. Mootooswamy gives the following formula as much used by native doctors:—Take of the root bark ʒx, *Tribulus terrestris* fruit, root of *Trianthema monogyna* and *Cephalandra indica* ā ʒi, Beleric and chebulic myrobalans ā ʒss, Iron dross ʒx, Goat's urine ʒviii, Water four sers. Make a decoction and keep it for several days in the oven. Dose 2 to 3 ounces twice a day in as much water.

A decoction of the root, leaves and bark with an equal quantity of *Acorus Calamus*, ginger, ajowan seeds and salt is recommended as a remedy for chronic diarrhœa, and 1 to 1½ ounces of the juice obtained from the root bark, with

three ounces of goat's milk, twice a day as a diuretic in dropsy.

Description.—Stem scarcely any, but branches innumerable, opposite, spreading in all directions, forming a close impenetrable bush, something like the Furze; young branches four-sided. Thorns axillary, four-fold, spreading, very sharp, from 1 to 2 inches long. Leaves opposite, short-petioled, reflexed, oval, acute. Male flowers axillary, numerous, female axillary, solitary, sessile, between the two thorns. Berry globular, of the size of a pea, when ripe white, succulent, edible. Seeds two. The plant is in flower and fruit the greater part of the year.

APOCYNACEÆ.

ALSTONIA SCHOLARIS, *Br.*

Fig.—*Wight Ic., t.* 422; *Bedd. For., Fl., t.* 242; *Rheede Hort. Mal. i., t.* 45; *Bentl. and Trim. t.* 173.

Hab.—Drier forests of India. The bark and leaves.

Vernacular.—Chhatián, Dátyúni (*Hind.*), Chhátin (*Beng.*), Sátvin (*Mar.*), Ezhilaip-pálai (*Tam.*), Edakula-pala, Palagaruda (*Tel.*), Janthalla (*Can.*).

History, Uses, &c.—The tree is called in Sanskrit Saptaparna, Sapta-chhada, Guchha-pushpa, Vrihat-tvak and Vishala-tvak, "having large or thick bark." Hindu physicians describe it as tonic, alterative, and useful in fever, skin diseases, and dyspepsia. Susruta gives the following formula for use in catarrhal dyspepsia:—"Take of the bark of *Alstonia*, stems of *Tinospora cordifolia*, bark of *Azadirachta indica*, and the bark of *Betula Bhojpatra*, equal parts, in all two tolas (320 grains), and prepare a decoction in the usual way." It also enters into the composition of several prescriptions for boils and other diseases of the skin. The specific name *scholaris* has been given to this tree from the fact of its planks, covered

with a layer of sand, being used as school-boards on which children trace their letters as in the Lancastrian system. The natives of Western India have a superstitious fear of it, and say that it assembles all the trees of the forest once a year to pay homage. (*Graham.*)

Rheede in 1678 and Rumphius in 1741 described and figured the tree and noticed the medicinal use of the bark by the natives along with salt and pepper in febrile dyspepsia, and as a local application to ulcers and rheumatic joints. Rumphius's experience is, that the bark is useful in catarrhal dyspepsia and in the febrile state consequent upon that affection, and also for enlarged spleen. He says: "Of its value in catarrhal dyspepsia I can speak from experience; the dose should be 15 grains taken at bedtime in powder or decoction." Nimmo in 1839 called attention to the bark as a powerful tonic, and suggested its use as an antiperiodic. Dr. Gibson in 1853 contributed a short, but interesting, account of the drug to the *Pharmaceutical Journal* (xii., p. 422). Alstonia bark is official in the *Pharmacopœia of India*, and is described as an astringent tonic, anthelmintic, and antiperiodic. In the Concan the juice of the fresh bark with milk is administered in leprosy, and is also prescribed for dyspepsia and as an anthelmintic; and the juice of the leaves with that of fresh ginger root or zedoary is administered to women after confinement. One of us has found the tincture of the bark to act in certain cases as a very powerful galactagogue: in one case the use of the drug was purposely discontinued at intervals, and on each occasion the flow of milk was found to fail.

In 1874 Gruppe, an apothecary of Manilla, obtained from the bark a substance which he named *ditain*. In the report on the Centennial Exhibition presented to the American Pharmaceutical Association (Transactions 1877), the following account of this substance and of the use of the drug in Manilla is given:—"*Echites scholaris* (*Alstonia scholaris*, Brown,) grows wild abundantly in the central provinces of the island of Luzon, where it has long been known and esteemed by the natives under the name of 'Dita,' as a most efficient tonic and febri-

fuge. The people having been in the habit of using it from time immemorial in decoction against malignant, intermittent, and remittent fevers with the happiest result, the attention of our leading physicians was excited, and the active principle ditain has now become a staple article, and ranks equal in therapeutical efficiency with the best imported sulphate of quinine. Numberless instances of private and hospital practice, carried out by our best physicians, have demonstrated this fact. Equal doses of ditain and of standard quinine sulphate have had the same medicinal effects; besides leaving none of the disagreeable secondary symptoms, such as deafness, sleeplessness, and feverish excitement, which are the usual concomitants of large quinine doses, ditain attains its effects swiftly, surely, and infallibly.

We use ditain generally internally in quantities of half a drachm daily for children, and double the dose for adults, due allowance being made, of course, for age, sex, temperament, &c. We derive very beneficial effects from its use, too, under the form of poultices. Powdered dita bark, cornflour, each half a pound; hot water sufficient to make a paste. Spread on linen and apply under the armpits, and on the wrists and ankles, taking care to renew when nearly dry, and provided the desired effects should not have been obtained. The results arrived at by ditain in our Manilla hospitals and private practice are simply marvellous. In our military hospital and penitentiary practice, ditain has perfectly superseded quinine, and it is now being employed with most satisfactory results in the Island of Mindanao, where malignant fevers are prevalent."

Description.—The drug consists of irregular fragments of bark, ⅛ to ½ an inch thick, easily breaking with a short coarse fracture. The external layer is very uneven and much fissured, dark grey or brownish, sometimes with black spots, it readily separates when handled. The interior substance and inner surface (liber) is of a bright buff. A transverse section shows the liber to be finely marked by numerous small medullary rays. The bark has no particular odour; when chewed it

communicates gradually to the palate a slightly bitter but not disagreeable taste.

Microscopic structure.—The cortical tissue is covered with a thin suberous coat, the middle layer of the bark is built up of a thin-walled parenchyme, through which enormous, hard, thick-walled cells are scattered in great numbers, and are visible to the naked eye, as they form large irregular groups of a bright yellow colour. Towards the inner part these stone-cells disappear, the tissue being traversed by undulated medullary rays, loaded with very small starch grains; many of the other parenchymatous cells of the liber contain crystals of calcium oxalate. The longitudinal section of the liber exhibits large but not very numerous laticiferous vessels, as elongated simple cells with perforated tranverse walls (sieve-cells) containing a brownish mass, the concrete milk-juice with which all parts of the tree abound.

Chemical composition.—In 1875, Jobst and Hesse exhausted the powdered bark with petroleum ether, and then extracted, by boiling alcohol, the salt of an alkaloid, which they called *Ditamine*. After the evaporation of the alcohol, it is precipitated by carbonate of sodium and dissolved by ether, from which it is removed by shaking it with acetic acid. Ditamine as again isolated from the acetate forms an amorphous and somewhat crystalline, bitterish powder of decidedly alkaline character; the bark yields about 0·02 per cent.

From the substances extracted by means of petroleum ether, as above stated, Jobst and Hesse further isolated (1) Echicaoutchin, $C^{25}H^{40}O^{2}$, an amorphous yellow mass; (2) Echicerin, $C^{30}H^{48}O^{2}$, forming acicular crystals, melting at 157° C.; (3) Echitin, $C^{32}H^{52}O^{2}$, crystallized scales, melting at 170°; (4) Echitein, $C^{42}H^{70}O^{2}$, which forms rhombic prisms, melting at 195°; (5) Echiretin, $C^{35}H^{56}O^{2}$, an amorphous substance, melting at 52° C.

Echicaoutchin may be written thus: $(C^{5}H^{8})^{5}O^{2}$, echicerin $(C^{5}H^{8})^{6}O^{2}$, echiretin $(C^{5}H^{8})^{7}O^{2}$; these formulæ at once indicate how nearly the three substances are allied. They are

probably constituents of the milky juice of the tree. (*Pharmacographia*, 2nd *Ed.*, *p.* 422.)

Hesse has since separated from Dita bark two other bases, *Echitamine* and *Echitenine*. He now reports that *Ditamine* exists in the bark in the proportion of 0·04 per cent. It is readily soluble in dilute acids, and differs from the alkaloids associated with it in being precipitated from its acid solution, by ammonia. Its formula deduced from the analysis of its platinochloride, is $C^{16}H^{19}NO^2$.

Echitamine is obtained from the liquor from which the ditamine has been extracted. On neutralizing this liquor, concentrating it by evaporation, and then adding hydrochloric acid and sodium chloride, impure echitamine hydrochloride is precipitated. The base isolated from this precipitate, and then purified, crystallizes in thick vitreous prisms, answering to the formula $C^{22}H^{28}N^2O^4+4H^2O$. When dried in vacuo these part with three molecules of water, leaving a strong base of the formula $C^{22}H^{28}N^2O^4+H^2O$, or $C^{22}H^{30}N^2O^5$, which the author calls echitamine hydrate, or echit-ammonium hydroxide. If in drying the heat be raised to and maintained at 150° C., another molecule of water is given off; but the anhydrous echitamine thus left is a much weaker base, and is reconverted into the original alkaloid by dissolving it in hydrochloric acid, and decomposing the hydrochloride. In consequence of the decided loss of basic properties accompanying the elimination of the last molecule of water, the author prefers to regard the monohydrated base as the normal form. The latter is a powerful alkaloid; it neutralizes acids perfectly, and yields well-defined crystallizable salts.

Echitenine.—This base is prepared from the mother liquors of echitamine hydrochloride, by precipitating with mercuric chloride, decomposing the precipitate with sulphuretted hydrogen, and then shaking with chloroform. It exists in the bark to the extent of only 0·01 per cent. Its composition corresponds to the formula $C^{20}H^{27}NO^4$. It is markedly bitter, of a brownish colour, and fuses above 120° C. With

strong sulphuric acid it forms a reddish violet, and with nitric acid a purple solution, the latter of which changes to green and ultimately to yellow. Its salts are amorphous. In the author's opinion all these alkaloids belong to one series:—

Ditamine	$C^{16}H^{19}NO^{2}$
?	$C^{18}H^{23}NO^{3}$
Echitenine	$C^{20}H^{27}NO^{4}$
Echitamine Hydrate (Echit-ammonium Hydroxide)	$C^{22}H^{30}N^{2}O^{5}$

(*Liebig's Annalen*, cciii., 144) *in Year-Book of Pharmacy for* 1881.)

Commerce.—The bark is not an article of commerce in India.

Rhazya stricta, *Decaisne. in Jacq. Voy. Bot., t.* 111.

Vernacular.—Sewar (*Sind*).

This plant is widely distributed through Western Asia, from Yemen in Arabia, to the North-West Provinces of India. Its leaves, which are very bitter, are sold in the bazars in Sind, the natives using them in the preparation of cooling bitter infusions. *R. stricta* is a stiff-growing plant with erect stems 2 to 3 feet high, and upright thickish smooth leaves placed rather close together on the stem. Dr. Stocks describes the infusion as a good and peculiar bitter tonic, and recommends it for trial.

HOLARRHENA ANTIDYSENTERICA, *Wall.*

Fig.—*Brand. For. Fl., t.* 40; *Wight Ic., t.* 1297; *Rheede Hort. Mal. i., t.* 47. Conessi or Tellicherry Bark (*Eng.*), Écorce de Codagapala (*Fr.*).

Hab.—Throughout the drier forests of India. The bark.

Vernacular Kura, Kaureya (*Hind.*), Kurchi (*Beng.*). Kuda, Pándhara-kuda (*Mar.*), Kuda, Doula-kuda (*Guz.*), Kulap-pálai (*Tam.*), Amkudu (*Tel.*), Kodamuraka, Kodasiga (*Can.*).

The seeds: Karwa-indarjau (*Hind.*), Tita-indarjau (*Beng.*), Kulappalai-virai (*Tam.*), Amkudu-vittulu (*Tel.*), Kadu-indarjau (*Mar.*), Kadvo indarjau (*Guz.*), Kodu-murakan-bija (*Can.*).

History, Uses, &c.—The Sanskrit names for this useful tree are very numerous, the best known are Kutaja and Kalinga, amongst others we may mention Girimallika, Vatsaka "cow tree," Sakra sakhin "Indra's tree," and Sakrásana "Indra's food." The tree is fabled to have sprung from the drops of amrita which fell on the ground from the bodies of Rama's monkeys, which were restored to life by Indra. The seeds are called in Sanskrit Indrayava, Bhadrayava, Vatsakavija, or Sakravija, "Indra's seed." The bark is one of the most important articles in the Hindu Materia Medica, and is described in the Nighantás as bitter, astringent, cold and digestive; a remedy for piles, dysentery, bile, leprosy and phlegmatic humours. Susruta says it is expectorant, an antidote to poisons, cures dysuria, urinary and skin diseases, checks nausea and vomiting, removes pruritus, improves the condition of bad ulcers, relieves pains of the stomach, and checks the derangement of the three humours, *viz.*, phlegm, air and bile. The seeds are considered to be astringent, febrifuge and anthelmintic. Both bark and seeds are usually combined by Hindu physicians with a number of other medicines which are principally astringents, bitters and aromatics. As examples of such preparations we may mention the *Kutajaleha* or confection, and the *Pathádya churna* or compound powder of Chakradatta. In the *Pradaráni lauha* the drug is combined with iron, but perhaps the most popular preparation is the *Kutajárishta* or Kutaja wine of Sarangadhara, which is made in the following manner:—Take of fresh root bark, 12½ seers, raisins, 6¼ seers, flowers of *Bassia latifolia* and bark of *Gmelina arborea* of each 80 tolas; boil them together in 256 seers of water, till reduced to 64 seers, and strain. Then add flowers of *Woodfordia floribunda* 2½ seers; treacle 12½ seers, and let the mixture ferment for a month in a cool place (it is usually buried under the ground). Draw off and bottle. This preparation has an agreeable flavour, is not bitter, and is an excellent

remedy in chronic dysentery and diarrhœa. Plasters and oils, containing Conessi bark combined with astringents and aromatics, are also used by the Hindus. They are applied over the part of the abdomen which is most painful.

Arabic and Persian writers describe the seeds under the name of Lisán-el-asafír-el-murr, and Zabán-i-gungishk-i-talk (bitter sparrow's tongue); they consider them to be carminative and astringent, and prescribe them in chronic chest affections, such as asthma, also in colic and diuresis; besides this they attribute lithontriptic, tonic and aphrodisiac properties to them, and combined with honey and saffron make them into pessaries which are supposed to favour conception. We may mention incidentally that the use of medicated pessaries for this purpose is a common practice in India.* They are also used after delivery. According to the Makhzan, the bark is the Tiwaj (tvac?) of Persian writers, which the author of the *Tuhfat* identifies with Talisfar, by some supposed to be the Indian bark used in dysentery by the Greek physicians under the name of *μάκερ*.

The Portuguese physicians, Garcia and Christopher a Costa, describe the drug under the names of Coru, Curo, Cura and Corte de pala. Rheede, who calls the tree Codaga-pala, states that the bark is applied as a *lép* (plaster) in rheumatism, and that a hot decoction of it is used in toothache, and in the cure of bowel affections. Ainslie mentions the bark as having been lately admitted into the British Materia Medica, under the name of Conessi bark.

Conessi bark, also known as Codaga pala, Corte de pala, and Tellicherry bark, enjoyed for a time considerable repute in Europe. It has however fallen into disrepute, principally, according to Sir Walter Elliot, who regards it as one of the most valuable medicinal products of India, from the comparatively inert bark of *W. tinctoria* having been confounded with it. Favourable reports of its use as a remedy in dysentery will be found in the *Pharmacopœia of India*. For ad-

* Similar pessaries were used by the Greeks and Romans.

ministration Mr. O. C. Dutt prefers a watery extract of the root bark, of which the average dose is about three grains in combination with half a grain or more of opium.

Other European physicians have preferred the powdered bark, or a decoction made with 2 oz. of the bark to 2 pints of water, to be boiled down to one pint. The impure alkaloid (wrightine) is bitter, and has been used with some success as an antiperiodic, and in the treatment of dysentery occurring in aged persons and infants. It is sold by druggists in Calcutta.

For an exhaustive analysis of the botanical confusion which has arisen in connection with this plant and the various species of Wrightia, we would refer our readers to an article by M. R. Blondel (*Nouveaux Remèdes*, Sept. 24, 1887,) in which the botanical history and structure of *Holarrhena antidysenterica* is fully discussed and illustrated.

Description.—Three Apocynaceous plants are frequently called *Kura, Koda* or *Kuda* in the Indian vernaculars; *Holarrhena antidysenterica*, *Wrightia tomentosa*, and *Wrightia tinctoria*. They may be distinguished most readily by an examination of the follicles and seeds. *H. antidysenterica* has the pair of follicles separate, *W. tomentosa* has them connate, separating when quite ripe, and *W. tinctoria* has follicles connected at the apex only. In Holarrhena the seeds have a tuft of hairs on the end most remote from the foot-stalk, whilst in the Wrightias the tuft is on the end next the foot-stalk.

The young bark of Holarrhena is grey and nearly smooth; on the older branches it is externally of a brown colour, and scarred from the exfoliation of portions of the suber; internally it is of a cinnamon colour, and the cambium layer when present smooth and nearly white. The root bark resembles that of the older stems, but is of a deeper and more rusty brown colour.

The seeds resemble oats, are very bitter, and are contained in long follicles about the thickness of a quill. They are of a

yellowish brown colour, about 2 centimetres long and 2 to 3 millimetres thick; at one end of the seeds is a kind of shallow neck, to the sides of which was attached the tuft of hairs. One side of the seed is grooved, and in this groove may be seen the raphé. The outer envelope of the seed is thin and papery, and within it is a thin white layer of albumen. The embryo consists of a conical radicle and two foliaceous convoluted cotyledons.

Microscopic structure.—A section of the bark from the larger branches is remarkable for several layers of rhytidoma, the inner of which is in contact with the cambium; this structure gives rise to exfoliations of portions of the outer layer of the bark. Simple and branched laticiferous vessels are to be seen, and a few groups of stony cells. The cells of the parenchyma are filled with starch granules and contain red colouring matter. Externally there is a thin layer of suber. In the young bark the rhytidoma is not developed, consequently there is no exfoliation.

Chemical composition.—The bark and seeds contain a basic substance (*Wrightine*), to prepare which the pulverised seeds are treated with carbon bisulphide in a displacement apparatus to remove a fat oil, then dried and exhausted with hot alcohol; the extract freed from alcohol by distillation, is digested with a small quantity of dilute hydrochloric acid, and the evaporated filtrate is mixed with ammonia or sodic carbonate, which throws down a copious flocculent precipitate, consisting of the impure base.

Wrightine after washing with cold water forms an amorphous powder, insoluble in ether and in carbonic disulphide, soluble in water and alcohol, and especially in dilute acids, with which it forms uncrystallisable salts having like the base itself a persistent bitter taste. The acetic acid solution is precipitated by tannic acid; the hydrochloric acid solution gives flocculent precipitates with platinic, auric, and mercuric chlorides. (*Stenhouse, Phar. Jour.* (2), V., 493.) R. Haines (*Ibid.*, VI., 432) states that he obtained the same base from Conessi

bark in 1858, and gave a short description of it in the *Transactions of the Medical and Physical Society of Bombay* (New Series, IV., 38). He proposed to call it *Conessine*, and calculated, from the analysis of the free base, and of the platinum salt, the formula $C^{25}H^{42}NO$. The seeds have recently been again investigated by Herr Warnecke (*Berichte*, XIX., 60), who has obtained from them a crystalline alkaloid by exhausting them with ether containing a little hydrochloric acid, digesting the extract with water and precipitating with ammonia, washing the yellow flocculent precipitate with water, and then after drying it over sulphuric acid dissolving it in petroleum spirit and evaporating. The pure alkaloid is described as occurring in delicate colourless anhydrous needles, having a bitter taste, becoming yellow at 60° to 70° C., and melting at 122° C. The alkaloid readily forms salts with acids, the hydrochlorate being crystalline. It is difficultly soluble in water, but freely soluble in alcohol, ether, chloroform, petroleum spirit, benzol, amyl alcohol, and carbon bisulphide. An analysis gave figures corresponding with the formula $C^{11}H^{18}N$. Herr Warnecke therefore claims that this base, for which he prefers the name "Wrightine" is the first discovered solid non-exygenated alkaloid occurring in nature; in this, however, he is hardly correct, since the formula $C^{16}H^{20}N^4$ was attributed in 1861 to a base isolated by Rieth from the bark of *Arariba rubra* (*Annalen*, CXX., 247), which was also obtained crystalline.

Rather curiously, but simultaneously with the publication of the above-mentioned communication, another appeared by Messrs. Polstorff and Schirmer (*Berichte*, XIX., 78), which described the results of the chemical examination of a bark forwarded from Tropical Africa by German missionaries as a remedy against dysentery, and referred to *Holarrhena africana*, DC. They report that they have isolated from this bark minute proportions (one-tenth per cent.) of an alkaloid that they consider to be identical with that separated by Professor Haines from East Indian conessi bark; and they attribute to it characters closely resembling those described by Herr Warnecke as

pertaining to the alkaloid obtained by him from *Wrightia antidysenterica* seeds. Like that alkaloid also, though crystallizable, it contains no oxygen, the formula by which it is represented being $C^{12}H^{20}N$ or differing by CH^2 from the formula given by Herr Warnecke for his alkaloid; but Messrs. Polstorff and Schirmer think their formula $C^{12}H^{20}N$ is fairly comparable with that of Professor Haines for conessine from East India Conessi bark, $C^{25}H^{42}NO$ (old notation), since the free base has the peculiarity (also shared by Aribine) of crystallizing with a molecule of water; and they think that his combustion was probably made with imperfectly dried alkaloid. It will be observed that Professor Haines and Messrs. Polstorff and Schirmer operated upon the bark of the respective plants, whilst Herr Warnecke used the seeds. So that at present there is some doubt whether both barks yield an identical alkaloid, differing in composition from that from conessi seeds by CH^2, or whether it is the alkaloid from the East Indian and African plants that differ, but are homologous. Messrs. Polstorff and Schirmer have prepared and described several salts of their alkaloid. It may be added that there is a remark in the Appendix to the Indian Pharmacopœia to the effect that probably *Holarrhena* (*Wrightia*) *antidysenterica*, *H. Codaga*, *H. pubescens* and *H. malaccensis*, are only varieties of one species, and are endowed with similar, if not identical, medicinal properties. It appears desirable, therefore, that the investigation should be extended to the bark and seeds of those plants. (*Pharm. Journ.*, *Feb.* 27, 1886.)

Commerce.—The bark and seeds are both articles of local commerce. Value, bark, Rs. 1½ per maund of 37½ lbs.; seeds, Rs. 25 per maund.

Wrightia tinctoria, *Br.*, *Wight Ic.*, t. 444; *Bot. Reg.* t. 933, a native of Central India, the Western Peninsula and Burma, which has already been mentioned in connection with the last article as a kind of *Kura*, affords a bitter bark which is frequently substituted for true Conessi bark; its seeds also are an article of commerce under the name of *sweet indarjau*.

This shrub is often cultivated in gardens on account of its fragrant, white, jasmine-like flowers, which are offered in the Hindu temples. It would appear to have been confounded by Garcia d'Orta with Holarrhena, as he states (*Coll.* 27) that the flowers of Coru smell like Honeysuckle, whereas those of Holarrhena are odourless. The leaves of this plant, which turn black when dry, afford a kind of indigo called in Mysore *Pala Indigo*. An account of the preparation of this dye appears in Buchanan's "Journey through Mysore, &c.," 1, 473. The coagulated milky juice forms a kind of caoutchouc; the wood is valued by turners, who call it Dudhi, "milk wood."

The bark may be distinguished from true Conessi bark by its darker colour, and by its not exfoliating in patches (absence of rhytidoma); the seeds by their want of bitterness. The bark is used as a tonic and the seeds as an aphrodisiac; both are articles of commerce, the former being more frequently met with in the shops than true Conessi bark. The seeds are sold at about Rs. 4 per maund of 37½ lbs.

NERIUM ODORUM, *Soland.*

Fig.—*Bot. Mag.*, 1799, 2032; *Bot. Reg.*, *t.* 74; *Rheede Hort. Mal. iv.*, *t.* 1, 2. Oleander (*Eng.*), Laurier Rose (*Fr.*).

Hab.—W. Himalaya, Central India, Sind. Cultivated all over India. The root.

Vernacular.—Kaner (*Hind.*, *Guz.*, *Mar.*), Karabi, Kaner (*Beng.*), Alari (*Tam.*, *Mal.*), Gannèru (*Tel.*), Kanigila (*Can.*).

History, Uses, &c.—In Sanskrit medical works two varieties of Karavira are mentioned, namely, Svetapushpa, "white-flowered"; and Raktapushpa, "red-flowered." Other well known Sanskrit names for the Oleander are Asvamáraka "horse-killer," and Pratihasa "laughing." In the Nighantas both kinds are described as hot and poisonous; they are said to be of use as an external application to swellings, leprosy and skin diseases such as itch. The flowers of the red and white Oleander are much used by the Hindus in religious ceremonies.

De Gubernatis states that the *N. Oleander* is called in Italy *Ammazza cavallo* or *Ammazza l'asino*, and remarks that this accounts for the dread of its presence shown by the ass of Lucian and Apuleius. (*Myth. des Plant.* ii., 259.)

For external application the Hindus make a strong decoction of the root and boil it down with oil and cow's urine until the water has been driven off, other drugs are usually added, such as Plumbago root, Embelia seeds, &c.

The root of Oleander beaten into a paste with water is recommended by Sarangadhara to be applied to chancres and ulcers on the penis. According to Chakradatta the fresh juice of the young leaves is dropped into the eyes in ophthalmia with copious lachrymation. In Arabic and Persian works the plant will generally be found described under the name of Difli; other names are Sum-el-Himár and Kharzahrah, which both signify Asses'-bane; it is identified with the Nerium of the Greeks.* The Mahometan physicians describe it as a most powerful resolvent and attenuant, only to be used externally; taken internally it acts as a poison upon men and animals. A decoction of the leaves is recommended to reduce swellings, and an oil prepared from the root bark in skin diseases of a scaly nature and in leprosy. Mír Muhammad Husain says that the Oleander is poisonous to insects, and that it cures itch. He also states that the leaves though poisonous to all four-footed animals are a counter-poison against serpents. The latter statement appears to be copied from Pliny. (*Hist. Nat.* 24, 2.) Ainslie informs us that the bark of the root and leaves are considered by the Vytians as powerful repellants, applied externally. The active principles of *N. odorum* are powerful heart poisons. 0·0016 grams of *Neriodorein* injected hypodermically into a large healthy frog caused in 14 minutes diminution of the heart beats from 70 to 12 per minute, followed by a temporary rise to 60; after the lapse of five minutes longer the heart ceased to beat. This cessation of the heart's action was

* Nerium Oleander, hardly different from the Indian plant. Conf. Dios. περὶ νηρίου iv., 80. It was also called by the Greeks and Romans Rhododaphne and Rhodadendron.

closely followed by cessation of the respiration. According to Fraser (*Trans. Royal Soc. Ed.* xxiv.) oleander like digitalis, &c., produces at first irregularity and acceleration of the heart's action, then a diminished frequency caused by protraction of the ventricular systole, and, finally, stoppage of the contractions by cessation of the dilation of the ventricles, which remain contracted, white and perfectly empty.

Description.—Roots crooked, bark thick, soft, external surface grey, corky, on young roots the corky layer is very thin, and the interior yellow colour of the bark is seen through it, inner surface yellow. The bark when cut or wounded exudes a pale yellow latex, which is resinous and very sticky. Odour somewhat acrid. Taste acrid and bitter.

Microscopic structure.—In the bark of the roots the medullary rays are very numerous; their being loaded with yellow resinous juice makes them very conspicuous. The laticiferous vessels are numerous and generally in groups of two, three, or more. The wood is very porous, and abounds in large dotted vessels. Both bark and wood abound in starch.

Chemical composition.—Mr. H. G. Greenish has extracted from the bark of *N. odorum* two bitter principles, one soluble in chloroform and little soluble in water, to which he has given the name *Neriodorin*, and another very soluble in water and insoluble in chloroform, which he has named *Neriodorein*. Both of these substances are powerful heart-poisons. Neriodorein is an amorphous powder of a pale yellow colour, and very bitter taste, insoluble in petroleum spirit, ether, benzol, chloroform, sulphide of carbon, amylic alcohol, and acetic ether, but readily soluble in water and alcohol. It contains no nitrogen; a watery solution is neutral to test paper. Chloroform partly separates it from its watery solution in the form of an oily liquid. Chloroform and ether precipitate it from an alcoholic solution in a flocculent condition. It is soluble in glacial acetic acid, the evaporation of the solvent leaves a yellow amorphous varnish-like mass. Although the aqueous solution passes through the dialyser it has not yet been crys-

tallised. Concentrated sulphuric acid colours it of a brownish-red with a violet tinge round the edge of the mixture, gradually the mixture becomes yellow, passing to brown and green. In the presence of sugar strong sulphuric acid produces a brownish red colour passing to violet. Heated in a closed tube with 2 per cent. of hydrochloric acid for two hours, neriodorein is decomposed into a yellow resinous substance, it appears to be a glucoside. Neriodorin is a transparent yellow, varnish-like substance which cannot be pulverized even after drying over sulphuric acid under the air pump; it is very soluble in chloroform, scarcely soluble in cold water, but much more so in hot water; its watery solution is bitter. It is insoluble in petroleum spirit, benzol and bisulphide of carbon; ether only dissolves a trace. It is very soluble in alcohol, contains no nitrogen, and is uncrystallisable. In other respects it closely resembles Neriodorein. (*Phar. Jour.*, *April* 23*rd*, 1881.)

Toxicology.—The leaves of *Nerium Oleander* were examined by Leukowsky (*N. J. Pharm.* 46, 397), who announced the presence in them of two alkaloids, *Oleandrine* and *Pseudocurarine*. Schmiedeberg (1883), who considers oleandrine to be a glucoside, found in the leaves two other glucosides, *Neriine* and *Neriantine*: he considers neriine to be identical with digitaleine. M. E. Pieszczek (*Archiv. d. Pharm.* (3), xxviii., 352, 1890,) obtained from the bark a glucoside having the composition 62·324 per cent. Carbon, 8·066 per cent. Hydrogen, and 29·610 per cent. Oxygen, which he found to be very poisonous, having an action similar to that of strychnine: 4 cgr. proved fatal to a rabbit in three-quarters of an hour. He has named this glucoside *Rosaginine* from *Cortex Rosaginis*, the German name for oleander bark. M. Pieszczek also obtained from the bark the neriine of Schmiedeberg, the composition of which he found to be 54·252 per cent. Carbon, 7·570 per cent. Hydrogen, and 38·178 per cent. Oxygen. If a portion of neriine is dissolved in strong sulphuric acid, and the vapour of bromine is made to pass over the mixture, a splendid violet-purple colour is produced. The bark was also found to contain

an essential oil of disagreeable odour, and a crystalline body, the aqueous solution of which has a fine blue fluorescence, especially after the addition of an alkali. This latter substance was only found in old bark.

Toxicology.—Chevers (*Med. Juris. for India*) refers to the toxicology of the drug at length, and states on the authority of Honigberger that the root of the hill plant is more toxic than that grown in gardens; he remarks that it is proverbial among females of the hills, when quarrelling, to bid each other go and eat the root of the *Kaner*. Ainslie also refers to its use by Hindu women when tormented by jealousy, and Broughton says that it is well known and extensively used in the Bombay Presidency as a poison, the juice from the red variety being considered the strongest and most fatal. It is also stated to be much used as a poison in the Umballa district, the root sometimes being given in coffee. Dr. Cleghorn (1868) records the history of two male adults who were found dead in the house of a prostitute. The woman confessed that she had given them the powdered root of *Kurrubee* in milk as a cure for gonorrhœa, from which they were suffering, the root being a popular remedy for venereal and skin diseases. Soon after taking the mixture, the men became sick, vomited, and complained of pain in the abdomen, writhed about the floor, and latterly became sleepy. On *post-mortem* examination the following points were noted:—

Brain.—In one case engorgement of venous sinuses: puncta sanguinea abundant: otherwise apparently normal. In the other case the brain is reported as apparently healthy.

Heart.—In one case vessels on exterior surface congested, right ventricle distended with dark fluid blood; valves, &c., healthy. In the other case, two ounces of serum were found in the pericardium, and both ventricles were filled with fluid blood.

Lungs.—In one case no information recorded: in the other returned as healthy.

Stomach.—In one case congestion of vessels on posterior surface of great curvature: a well defined spot of congestion

on posterior surface of cardiac end: a similar patch near pyloric orifice: contents grumous, fluid. In the other case, well marked spots of congestion on the anterior and posterior surfaces of peritoneal coat, covering cardiac end: mucous surfaces corresponding to these being covered with specks of stellate congestion: contents grumous, fluid.

Liver.—In one case large vessels congested, otherwise normal. In the other case, enlarged: large veins filled with blood.

Spleen.—In both cases enlarged: probably by malarious fever.

Intestines.—In one case mucous coat of small gut throughout of a dark colour: large veins distinct. Large patch of congestion on upper part of mucous surface of duodenum, surface velvetty: spots of congestion scattered through jejunum and ileum: villi well marked in upper part of jejunum: large spots of congestion in inguinal flexure. In the other case, the bowels were reported as normal, except that in parts the vessels were congested.

Kidneys.—Intensely congested in one case, healthy in the other.

Œsophagus.—In one case covered with dark-coloured mucus; in the other the upper part of fauces covered with blood.

No chemical examination of the viscera was made. In 1843, a case of fatal poisoning by the root was sent to the Chemical Examiner, Bengal, by Dr. Greig, in which the bark had been taken from the roots of a plant in the doctor's own garden, beaten to a powder, and then administered mixed with oil. It was judged that at least two or three ounces of the bark had been taken. About 1½ hour after the poison had been taken, the patient was apparently senseless and unable to answer questions: the pulse was preternaturally slow and soft but regular, with an inclination to stop: a considerable amount of the mixture was stated to have been vomited soon after it had been taken. Warm water and an emetic was administered, which induced free vomiting, and the patient was ordered to be moved about. Under this treatment he revived consider-

ably, but relapsed into insensibility some hours afterwards. The patient appears to have recovered from all urgent symptoms, but to have died suddenly on the following day after making some exertion. On *post-mortem* examination 5 hours after death, the cavities of the heart were filled with black fluid blood. The lungs were natural. The stomach contained a quantity of dark yellowish fluid, and on its internal surface, near the cardiac and pyloric orifices posteriorly were found small patches studded with red points, and one or two slight abrasions of the mucous membrane. The liver appeared somewhat distended, and the intestines and spleen are reported natural.

Mr. Broughton (*Trans. By. Med. & Phys. Soc.* for 1857-58, p. 4,) reports a case in which a slight and delicate male drank a little more than an ounce of the expressed juice, walked five yards and fell senseless. When seen in the morning, the face and eyes were flushed, head hot and perspiring, with stertorous breathing and foaming at the mouth, accompanied by violent spasmodic contractions of the muscles of the entire body: more remarkable in the upper than lower extremities, and on the left than right side. During intervals of spasm, the patient lay evenly upon his back, when an attack occurred, the superior contractions of the left side threw him over on his right, in which position he remained during the paroxysm. Insensibility continued, and the spasms returned at intervals of an hour, and were induced by attempts to rouse or move the patient: the bowels were moved involuntarily. Towards evening the spasms decreased, the face became pale, the pulse a thread, the eyes shrunk and the extremities cold: stimulants restored the circulation, but insensibility continued, and the bowels were moved involuntarily. In the evening reaction set in, the skin became hot, the pulse frequent: there was no spasms but insensibility was still complete. On the morning of the following day the patient was restored to speech and reason.

The following case was treated in the Medical College Hospital, Calcutta, and reported in the *Ind. Med. Gazette*,

September, 1866. A male adult was brought to hospital in an apparently unconscious state, the trunk and limbs being rigid, and the jaw spasmodically closed, the pulse very feeble, and exceedingly slow, about 30. The history was to the effect that 5 hours previously more than ½ tola (45 grains) of the fresh root bark of *Sheth Kurrubee* (white oleander) rubbed up with black pepper had been taken. Within half an hour the patient began to feel giddy and very heavy, and was obliged to lie down: this was shortly followed by a general uneasy sensation and considerable restlessness. Soon afterwards fits occurred, in which the trunk and limbs were rigid and contracted, the hands clenched and thumbs flexed inwards on the palms. Profuse perspiration and a sensation of constriction round the chest also accompanied each paroxysm. In hospital the patient had no regular paroxysm, but constant muscular twitchings were observed all over the body, and continued for four or five hours after admission. The rigidity of the muscles gradually wore off, and on the morning after admission the patient declared himself quite easy save for a slight heaviness about the head. The patient stated that he had never lost consciousness, and that his mind had been quite clear. Babu K. H. Acharjee (*Ind. Med. Gaz.*, 1866,) reports the case of a boy, to whom the powdered root had been administered for intermittent fever. In three or four hours he was attacked with tetanus, and was found free from fever, quite sensible, the jaws spasmodically closed, and the muscles of the body rigid and contracted. The patient recovered. Babu D. Mookerjia draws attention to the tetanic symptoms which may occur in oleander poisoning, as evidence that the action of the poison resembles that of strychnia, and he remarks, in the case last mentioned, that all the urgent symptoms (as in strychnia poisoning) were developed suddenly, and the muscles of the jaw were likewise the last to be affected: when the symptoms began to subside, they did so rapidly. He also adds—the marked difference between the effects of oleander and nux-vomica poisoning consists in the condition of the pulse. In nux-vomica poisoning it is generally

unaffected, becoming slightly quickened only during a fit; but in oleander poisoning its preternatural slowness is a marked feature.

In Madras oleander pounded with gingelly oil is a favourite poison with suicides. The Madras Chemical Examiner's Report for 1882-83, mentions three cases; for 1883, two cases; for 1885, one case. They were all suicides, the root was detected by its physical characters in the vomited matters.

In the whole of India, during the fifteen years ending 1888, the reports of the Chemical Examiners record 29 detections of oleander,—namely, Bengal, 2; N.-W. Provinces, 2; Madras, 11; Bombay, 14. Two of the detections in Bombay were in connection with cattle poisoning.

THEVETIA NERIIFOLIA, *Juss.*

Fig.—*Bot. Mag.* 2309; *Lyon, Med. Juris. for India*, p. 298. Exile or Yellow Oleander (*Eng.*).

Hab.—West Indies. Cultivated in India. The bark.

Vernacular.—Pila-kanér (*Hind., Guz.*), Kolkaphul (*Beng.*), Pachchai alari, Tiruvachchippu (*Tam.*), Pachcha-gannéru (*Tel.*), Pachcha-arali (*Mal.*), Pivala-kanér (*Mar.*).

History, Uses, &c.—This plant is commonly cultivated in India as an ornamental garden shrub.

Descourtilz, in his *Flora of the Antilles*, speaks of *T. neriifolia* as an acrid poison, of the bark as a drastic purgative, of the fruit as emetic, and of an extract of the plant as a remedy for intermittent fever. He describes the case of a young negro who had eaten of the green fruit, and who was affected with chills, delirium, and other nervous symptoms, nausea, and a thready pulse; he had irregular spasms, followed by extreme agitation, with singing, laughing, and weeping, and then by a fixed blank look. He seemed tending to coma, but was relieved by an emetic.

The antiperiodic properties of the bark have been confirmed by Dr. G. Bidie (*Madras Quart. Med. Journ.* v., p. 178), and Dr. J. Shortt (*Ibid.*, viii., p. 294).

Their trials with it in various forms of remittent fever proved highly satisfactory, and leave little doubt that it is a remedy of considerable power. It was employed in the form of tincture (one ounce of the freshly-dried bark macerated for eight days in 5 ounces of rectified spirit) in doses of from 10 to 15 drops thrice daily. In larger doses (30 to 60 drops), it acts as an acrid purgative and emetic, and carried to a greater extent is evidently powerfully poisonous. The kernels are extremely bitter, and when chewed produce a slight feeling of numbness and heat in the tongue; by expression they yield a clear, pale amber-coloured, slightly viscid, acrid oil, which is sometimes recommended as a cathartic by the natives, but, according to Dr. Shortt, it produces violent vomiting and hypercatharsis. (*Pharm. of India*, p. 138.) This, however, is contrary to our experience; the oil *when pure* is as inert as olive oil.

Dr. A. J. Amadeo of Porto Rico states that two grains of the extract of the bark, given in the apyrexia of intermittent fever, prevent the access of the paroxysm, and that the natives employ the bark in infusion for the cure of ague. (*Pharm. Journ.*, *April*, 1888.)

The active principles of the plant *Thevetin* and *Theveresin* have been thoroughly tested in experiments on animals by Blas and by T. Husemann (*Archiv für exp. Pathol. u. Phar.*, v. 228). The former has upon frogs the same effects as digitalin, and its lethal dose is also nearly the same (gm. 0·001—0·003). It first hurries the respiration and renders it irregular, and kills by producing a tonic contraction of the ventricle of the heart, with a corresponding engorgement of the auricle and of the general circulation. Voluntary motion is not destroyed, although motility is impaired in the hind legs. The same effects, essentially, were produced by theveresin in the dose of gm. 0·05. Experiments upon dogs and rabbits led these observers to recognize a strong analogy between the effects of these glucosides and the effects of digitalin, helleborin, and other analogous products. They produce repeated attacks of vomiting (in dogs), and sometimes watery diarrhœa

and profuse salivation, with extreme prostration, so that the animal lies still and will not change his posture except during the efforts at vomiting. The cerebral functions seem to be impaired, at least at the beginning of the attack; later, when exhaustion has become complete, the animal remains motionless, as if narcotized. The breathing is laboured, but the pupils are unchanged, and muscular tremor is constant, although spasms are either absent or only occur just before death. As above stated, in animals killed by these poisons the ventricle is contracted, yet in exceptional cases it is found dilated with dark blood. The vomiting produced by thevetin is doubtless due in part to its irritant qualities, for when it is injected hypodermically the punctures are apt to produce abscesses. The venous congestion of the stomach, which gives the interior of the organ a blue colour, is partly due to the cardiac obstruction and partly to the repeated efforts at vomiting. According to Prof. Carpio (*Phila. Med. Times*, ix. 396), the thevetin of *Thevetia Yccotli* produces symptoms almost identical with those above described, and kills by arresting the heart either in diastole or in systole. The experiments of Cerna (*Ibid.*, p. 426,) led him to the following among other conclusions: Thevetin produces death by asphyxia and by cardiac paralysis; applied to the skin, it irritates, with a sensation of burning; it produces convulsions of cerebral and paralysis of spinal origin; increases intestinal paralysis; lowers the temperature; locally applied, it contracts the pupil; and it increases salivation. Warden has confirmed the statement as to the production of convulsions. (*Amer. Jour. Phar.*, liv. 301.)

Description.—The fresh bark of the young wood, of from ½ to 1 inch in diameter, is green, smooth, and covered by a thin grey epidermis, through which the green colour is apparent; it turns black when dry. The bark from the larger stems has a brown suberous coating; the wood is white and soft, with a large central pith. All parts of the plant yield an abundance of acrid milky juice. The fruit is globular, slightly fleshy, green, 1½ to 2 inches in diameter, and contains a hard

nut, light brown in colour, and triangular, with a deep groove along the edge corresponding to the base of the triangle; each nut contains two pale yellow, slightly winged seeds. The seeds and the inner layer of the bark give, when boiled with hydrochloric acid, a deep blue or bluish-green colour.

Chemical composition.—De Vrij has obtained from the kernels of the seeds from 35·5 to 41 per cent. by expression and 57 per cent. with benzol of a limpid almost colourless oil. The oil had an agreeable mild taste like that of fresh almond oil; its density at 25° C. was 0·9148, and at that temperature it was perfectly liquid and transparent, at 15° C. it became pasty, and at 13° C. entirely solid. Oudemans found it to consist of 63 per cent. triolein and 27 per cent. tripalmitin and tristearin. After expression of the oil De Vrij obtained from the cake about 4 per cent. of a beautiful crystallised white glucoside, to which he gave the name of *Thevetin*. A solution of 1·14 gram. of thevetin in glacial acetic acid to a volume of 10 cubic centimetres yielded in the polarimeter a levogyre rotation of 9·75°. With concentrated sulphuric acid thevetin yields a clear, dark yellow liquid, which by exposure to the air assumes after a few minutes a beautiful purple colour. This colour disappears after some time under separation of a flocculent matter. Nitric acid yields no reaction with thevetin at the ordinary temperature. De Vrij has also found thevetin in the bark of the shrub. (For a further account of thevetin and theveresin, see a paper by Dr. Blas in the *Transactions of the Académie des Sciences de Belgique* (3) 2, No. 9—.) Warden has described a principle contained in the seeds which he called *pseudo-indican*, and which affords a blue coloration with hydrochloric acid: he points out that this reaction might be utilized in toxicological investigations. (*Pharm. Journ.*, Nov. 1881.) In another communication to the same journal, he refers to the presence of a second toxic principle in the seeds, which he considers to possess greater toxic powers than thevetin. (*Pharm. Journ. xiii.*, 182-183.)

Toxicology.—Dr. Kanny Lal Dé has drawn attention to the use of the seeds as a poison in Bengal, but erroneously

ascribes their toxic properties to the bland oil. Dr. Dumontier has published an account of the death of a child three years of age after eating one seed. An interesting case of poisoning by one of the seeds is recorded by Dr. J. Balfour (*Madras Journ. of Lit. and Science, iii., N. Ser.*, p. 140). Recovery ensued. Dr. Lyon (*Med. Juris.*, p. 299) mentions a case in which eight to ten seeds proved fatal to an adult female: he remarks that cases of poisoning in the human subject are seldom met with in India, but of late years the seeds have come into somewhat extensive use in the Bombay Presidency as a cattle poison, nine cases of this kind having been reported in the Bombay Chemical Analyser's Office during the year 1886. In Bengal four other cases are on record, but the particulars of one only are given, in which a woman attempted to commit suicide.

CERBERA ODOLLAM, *Gärtn.*

Fig.—*Wight Ic.*, t. 441; Lyon's *Med. Juris. for India*, p. 300.

Hab.—Swamps and creeks on the coasts of India and Ceylon; Sunderbuns. The seeds.

Vernacular.—Odallam (*Mal.*), Katarali (*Tam.*), Honde (*Can.*), Sukanu (*Mar.*), Dabúr, Dhakur (*Beng.*).

History, Uses, &c.—This is a handsome tree, very plentiful along the backwaters of the western coast. Emetic and purgative properties are assigned to the milky juice, bark and leaves, and the action is very similar to that of *Thevetia neriifolia*. The kernel of the seeds is frequently resorted to in criminal poisoning in the Madras Presidency, and in the native states of Travancore and Cochin. The fruit combined with datura is a part of the remedy given by native physicians for hydrophobia. The bark affords a fibre. The seeds yield 55·5 per cent. of a bland fixed oil, of a pale yellow colour, which is used for burning and for anointing the head; it contains no poisonous property if obtained by expression or by means of petroleum ether.

Description.—The ripe carpel is ovoid, 2 to 4 inches long, somewhat resembling a green mango, fibrous and woody within, and contains a single broad, compressed, white seed, consisting of two irregularly attached oily cotyledons.

Chemical composition.—Dr. de Vrij has separated from the kernels a crystalline poisonous glucoside, probably the same as thevetin, and an alcoholic extract of the seeds when treated with hydrochloric acid gives a blue or bluish-green colour as exhibited by Thevetia.

Professor Plugge, of Groningen, has made an investigation of the seeds with the following preliminary results. 25 grams of the powder, partially separated from oil by expression, were entirely freed from oil by extraction with benzol, and the remaining powder afterwards extracted with alcohol. From this alcoholic solution it was impossible to obtain any crystalline body, although the solution contained a very poisonous principle. The alcohol was evaporated, and the resulting syrup was dissolved in a few c. c. of water. With this solution subcutaneous injections were made on frogs, and it was found that 0·5, 0·2, 0·1, and even 0·05 c. c. caused death in from five minutes to one hour. The symptoms are chiefly—(1) stoppage of the respiration, or in smaller doses, irregularity of the respiration; (2) violent and repeated vomiting; (3) general paralysis; and (4) finally stopping of the heart in contraction (systole). It seems that the poisonous principle of Cerbera seeds is not only a strong poison of the heart, that, like digitalin, stops the heart in systole, but also has a very marked action on the respiration. The watery solution of *Cerberin* (?) was not precipitated by alkaloid-reagents, with the exception of phosphomolybdic acid. The principle can be best separated from the watery solution of the alcoholic extract, by first shaking it with petroleum ether, and then removing the cerberin with chloroform.

The oil of the kernels has a specific gravity of 9194 at 15·5° C.; at a few degrees below this temperature it deposits solid fats. The saponification equivalent is 259·4, and after decom-

position of the soap, there is left 95·5 per cent. of insoluble fatty acids melting at 34°. The elaïdin reaction resulted in the solidification of the oil in one hour, and after 24 hours it became so firm as to hardly yield to the pressure of the finger. The ash of the seeds amounts to 3·3 per cent.

Toxicology.—Cases of poisoning with the seeds of Odallam are brought to the notice of the medical officer at Trevandrum every year; they act as an irritant poison by producing vomiting and purging, soon followed by collapse and death. In 1885, out of four cases, one was fatal; in 1886, seven cases were reported. The nut is occasionally eaten by children in mistake, but it is mostly used intentionally by women who wish to commit suicide when they get into trouble. The Madras Chemical Examiner in 1888 reported the case of a boy who, after eating the kernel, "suffered from vomiting and tingling of the skin and throat, deep sleep, and twitching of the muscles, and died in 16 hours." A part of the fruit sent with the viscera was identified.

Pao Pereira.—Under this name the Portuguese in India use the intensely bitter bark of *Geissospermum lævе*, which they obtain from Brazil, as a febrifuge and tonic.

Santos (1838) separated from it an alkaloid, *pereirine*, which in its impure state, as a brown-yellow amorphous powder, is employed in Brazil. Bochefontaine and De Freitas (1877) proposed to call it *geissospermine*, and Hesse (1877) adopted this name for the alkaloid, which is nearly insoluble in ether and water and readily soluble in alcohol and dilute acids; it crystallizes in small white prisms, dissolves in strong nitric acid with a purple-red colour, becoming orange-yellow on heating, and in concentrated sulphuric acid at first colourless, rapidly changing to blue, and gradually to a pale colour; its composition is $C^{19}H^{24}N^2O^2H^2O$. A second alkaloid, *pereirine*, is easily soluble in ether, forms a greyish-white amorphous powder, and is coloured blood-red by nitric and violet-red by sulphuric acid; it appears to be present in larger proportion than the preceding one. (*Stillé and Maisch.*)

TABERNÆMONTANA CORONARIA, *Br.*

Fig.—*Wight Ic. t.* 477; *Bot. Mag.* 1861; *Rheede Hort. Mal. ii.*, 54, 55. Ceylon Jasmine (*Eng.*), Arbre-vache (*Fr.*).

Hab.—Uncertain. Cultivated in India. The milky juice and root.

Vernacular.—Tagar (*Hind., Mar., Guz.*), Nandia-vatai, Nanthia-vatai (*Tam., Tel.*), Nandi-battal (*Can.*), Karáta-pála (*Mal.*).

History, Uses, &c.—This shrub is often confounded with the Tagara of the Nighantas (see *Valeriana Wallichii*). Rheede says that the milky juice of *T. coronaria* mixed with oil is rubbed into the head to cure pain in the eyes; the root chewed relieves toothache; rubbed with water it kills intestinal worms; with limejuice it removes opacities of the cornea. It is the *Fula de S. Antonio* of the Portuguese. Ainslie (ii., 257) states that the Sanskrit name given to it in Southern India is Nandivriksha, and that it is very cooling in ophthalmia. In Western India the milk has the reputation of being very cooling, and is applied to wounds to prevent inflammation. Two wild species, *T. dichotoma* and *T. Heyneana*, are considered to have similar properties, and are known by the same vernacular names. In Pudukota the flowers are used in inflammation of the cornea. The milk of plants belonging to this genus contains caoutchouc and resins, but is generally free from acridity. *T. utilis* is the Hya-Hya or Cow-tree of British Guiana, which yields a copious supply of thick sweet milk when tapped.

Description.—A shrub 6—8 ft., much dichotomously branched, bark pale; leaves 4—6 inches by 1—1½ inch, glossy, rather coriaceous, green when dry, pale beneath, margin waved, petiole ¼—½ in., axils of petioles glandular. Peduncles 1—2 in., pedicels slender, bracts minute. Flowers pure white, often double, fragrant. Follicles 1—3 in., spreading and recurved, sessile or contracted into a sort of stalk at the base, turgidly oblong, beaked or not, 3-ribbed; seeds 3 to 6, oblong,

striated, aril red, fleshy. (*Fl. Br. Ind.*) All parts of the plant abound in a milky juice, which has a bitter taste.

Chemical composition.—The fresh roots were extracted with 80 per cent. alcohol. From the alcoholic extract, in addition to resins and extractives, a large amount of an alkaloidal principle was isolated, soluble in ether, and giving marked precipitates with alkalies, chromate of potash, and alkaloidal reagents, but no special colour reactions were noted. The taste was bitter, and the principle as deposited by spontaneous evaporation of an ethereal solution, was in the form of a yellowish brittle varnish.

RAUWOLFIA SERPENTINA, *Benth.*

Fig.—*Wight Ic. t.* 849; *Bot. Mag. t.* 784; *Burm. Fl. Zeyl., t.* 64. Syn.—*Ophioxylon serpentinum.*

Hab.—Throughout India. The root.

Vernacular.—Chota-chand (*Hind.*), Chandra (*Beng.*), Harkai (*Mar.*), Pátala-gandhi (*Tel.*), Chuvanna-avilpori (*Mal.*), Covan-namilpori (*Tam.*), Sutranabhi (*Can.*).

History, Uses, &c.—This shrub is mentioned in Sanskrit works under the names of Sarpagandhá and Chandrika. The Hindus use the root as a febrifuge, and as an antidote to the bites of poisonous reptiles, also in dysentery and other painful affections of the intestinal canal. By some it is supposed to cause uterine contraction and promote the expulsion of the fœtus. Ainslie gives the following account of it:—*Tsjovanna amelpodi* is the name given, on the Malabar Coast (*Rheede, Mal.* vi. 81, t. 47), to a plant, the bitter root of which is supposed to have sovereign virtues in cases of snake-bites and scorpion-stings; it is ordered in decoction, to the extent of a pint in twenty-four hours, and the powder is applied, externally, to the injured part. The plant is the *Radix mustela* of Rumphius. (*Amb.* vii. 29, t. 16.) The Javanese class it among their anthelmintics, and give it the name of *pulipandak*.

It may be found noticed both by Burman in his *Thesaur. Zeylan.* (t. 64) and Garcia ab Horto; the latter recommends it as stomachic; Rumphius speaks of it as an antidote to poisons; and Bontius, in his *Hist. Mat. Med. Ind.*, tell us that it cures fever." (*Mat. Ind.* II. 441.) It will be seen that Ainslie confounds it with the *Radix mustela* or ichneumon root (*Ophiorrhiza Mungos*), and the natives of some other parts of India appear to make the same mistake. Sir W. Jones (*Asiat. Research.* iv., p. 308,) thinks it possible that this plant may perhaps be the true ichneumon plant. In the *Pharmacopœia of India* its use in labours to increase uterine contractions is noticed upon the authority of Dr. Pulney Andy, but we have no other evidence of its efficacy in such cases. In Bombay most of the labourers who come from the Concan keep a small supply of the root, which they value as a remedy in painful affections of the bowels. In the Concan the root with *Aristolochia indica* (Sápsan) is given in cholera; in colic 1 part of the root with 2 parts of *Holarrhena* root and 3 parts of *Jatropha Curcas* root is given in milk; in fever the root with *Andrographis paniculata*, ginger and black salt is used. The dose of the combined drugs in each case is from 3 to 4 tolás.

Description.—Root crooked, tapering, from ½ an inch in diameter downwards; bark soft, corky, marked by longitudinal fissures, light brown; wood brittle, showing rings and medullary rays visible to the naked eye; taste very bitter; odour of the fresh root acrid. The suber upon transverse section presents when magnified the appearance of a piece of honeycomb, *viz.*, alternate rows of long tubular cells and compressed cells; the inner portion of the bark consists of a delicate parenchyma, loaded with starch, and traversed by indistinct medullary rays. The wood is remarkably starchy.

Chemical composition.—The roots examined by us reduced to fine powder lost 7·18 per cent. when dried at 100° C. The ash amounted to 7·89 per cent., and was of a light chocolate colour, containing a marked amount of iron and

a trace of manganese. On analysis the following results were obtained:—

Petroleum ether extract,	·64	per cent.
Ether "	·346	" "
Alcoholic "	3·936	" "
Aqueous "	11·38	" "

The petroleum ether extract was oily, yellow, and possessed an odour like that of a mixture of cedar and musk. On standing arborescent crystals separated; in alcohol the extract was partly soluble with acid reaction; the insoluble residue was oily and contained a trace of a wax. The extract afforded marked indications of the presence of an alkaloidal principle.

The ether extract was hard and had the same odour as the petroleum ether extract, but in a less marked degree. Treated with water a sightly bitter solution was obtained, which gave no reaction with ferric salts: by the action of dilute sulphuric acid an intensely bitter solution was obtained which contained an alkaloid. A yellow resin was also present.

The alcoholic extract was brittle, yellowish brown and intensely bitter. A solution in alcohol exhibited a very marked greenish fluorescence. In cold water the extract was partly soluble, with slight fluorescence, and very bitter: ferric salts gave no colour reaction. The alcoholic extract was treated with dilute sulphuric acid and the turbid acid solution agitated with chloroform: after separation of the chloroform, the liquid was rendered alkaline with ammonia, and agitated first with chloroform ether, and finally with amylic alcohol. The three extracts exhibited fluorescence when dissolved in alcohol, but the appearance was most marked in that obtained by chloroform acting on the acid solution. The chloroform extract deposited a yellowish granular mass on standing, which was non-crystalline: in taste the extract was extremely bitter: it afforded marked indications of the presence of an alkaloid, but was not wholly soluble in diluted sulphuric acid. The ether-chloroform extract was non-crystalline, it was also

bitter, but the bitter taste was associated with some astringency; it was wholly soluble in dilute sulphuric acid, and afforded marked indications of the presence of an alkaloid.

The amylic alcohol extract was of a dark colour, and wholly soluble in dilute sulphuric acid, and very bitter: it also gave marked alkaloidal reactions. With sulphuric acid, none of the extracts afforded crystalline salts.

The aqueous extract had a bitter taste; it reduced an alkaline copper solution on boiling: with ferrocyanide of potassium and acetic acid a faint turbidity was produced. The residue insoluble in water contained a large amount of starch.

At present we do not offer any opinion as to whether the alkaloidal principles we have referred to in the various extracts are identical or not: we are also at present unable to state whether these alkaloids are new or merely principles which have already been described as occurring in other plants of the same natural order. An analysis of the root of *Ophioxylon serpentinum* by W. Bettink has been published in Haaxman's *Tijdschrift* (Jan. 1888), where no alkaloid is reported to have been found, but a crystalline body related to juglone. We feel convinced that the drug examined by Bettink was not authenticated. Prof. Eykman has recorded the discovery of an alkaloid in an Indian species of *Ophioxylon*, and later still (1890), M. Greshoff has found an alkaloid giving a veratrine reaction with Frohde's reagent, thus substantiating our analysis. It is probable that as the root resembles Plumbago root, Prof. Bettink's ophioxylin was only plumbagin.

ALLAMANDA CATHARTICA, *Linn.*

Fig.—*Bot. Mag.*, *t.* 338. *Syn.*—*A. Aubletii*, Rohl.

Hab.—America. Cultivated in India and has run wild in the tidal backwaters of the Western Coast and at Goa.

Vernacular.—Jahari-Sontakka (*Mar.*), Arasina (*Can.*).

History, Uses, &c.—This beautiful climbing shrub is very common in gardens, and is said to have been introduced

into India from Brazil by the Portuguese. The flowers are offered by the Hindus in their temples, and they appear to be aware of the poisonous nature of the plant, as the Marathi name signifies "poisonous Sontakka." Sontakka is the name for *Hedychium flavum*, the flowers of which have some resemblance to those of Allamanda. We have not heard of the plant being used medicinally in this country, but Ainslie (*Mat. Ind.* ii. 9,) has a short notice of it, and mentions its use at Surinam by the Dutch as a cathartic. Poupée Desportes of St. Domingo recommends the extract of the bark, in doses of 1 to 2 grains, as an excellent hydrogogue cathartic. The leaves are also said to have been used in the cure of painters' colic. In large doses all parts of the plant are violently emetic and cathartic.

Description.—*A. cathartica* has elliptic lanceolate leaves arranged in fours round the stem on very short petioles. The flowers are large, yellow, and funnel-shaped, and are borne at the ends of the branches. The fruit is globular, the size of a small walnut, and thickly set with long soft spines; it contains several flat seeds with a membranous margin. All parts of the plant abound in a thick milky juice.

Chemical composition.—The fresh leaves were pulped and digested with 80 per cent. alcohol. The green tincture was concentrated and when free from alcohol, the extract was agitated with benzole, which removed colouring matters, &c. The aqueous solution was then acidulated with sulphuric acid and agitated with ether. The extract was indistinctly crystalline, and partly soluble in water, affording a dark brownish-green coloration with ferric chloride, and precipitating an alkaline copper solution on boiling. The portion insoluble in water was dissolved by alkalies with bright yellow coloration, and reprecipitated in yellowish-brown flocks by acids. The original aqueous solution was now rendered alkaline and agitated with ether; the extract did not exceed a trace, was indistinctly crystalline, and afforded marked indications of the presence of an alkaloid. The dark brown alkaline solution was now acidulated with sulphuric acid and agitated with amylic alcohol.