COMPOSITE.

The vernacular names applied to this plant are properly those of Artemisia.

ERIGERON CANADENSIS, Linn.

Fig.-Reich. Ic. Fl. Germ. wvi, t. 917; Bentl. and Trim. t. 149. Canada Fleabane (Eng.), Vergerette de Canada (Fr.).

Hab.--Western Himalaya, Punjab, Rohilkund, Europe, North America.

Vernacular -?

History, Uses, &c.—This genus derives its name from the Greek $\eta_{Pl}\gamma'\epsilon\rho\omega\nu$ ($\epsilon\eta_{Pl}\gamma'\epsilon\rho\omega\nu$, 'aged' or.' hoary in spring'), a term used by Theophrastus for a plant which he describes (H. P. viii.) as $\kappa_{L}c\rho_{L}\omega\delta\eta_{S}$ or like Succory. Dioscorides (iv. 92) describes the same plant as having leaves like $\epsilon_{\nu}\omega\mu\nu\nu$ (Eruca sativa) but smaller, yellow flowers, and a white pappus. Pliny (25, 106) calls it Senecio. It is uncertain what this plant was, but it is generally supposed to have been a species of Senecio.

E. canadensis is common in all warm countries, but is supposed to be of American origin, and to have spread over the remainder of the globe since its importation from that continent. Parkinson, in 1640, seems to be the first author who mentions the plant, but he describes it as an American species only. It first became known to French botanists in 1653, and a few years afterwards it had become a weed about Paris; it is supposed to have been imported accidentally from Canada along with bales of skins. Shortly after this, it made its appearance in England, and is now common about London. How and by what means it reached Northern India is not known; it may possibly be a native of that region, especially as it has not made its appearance near the great commercial ports of India as we might expect from the history of its introduction into Europe.

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Several species of Erigeron are used officially as diaretics in the United States of America, and the oil of E, canadensis is official in the U. S. Pharmacopœia.

E. canadensis is a stimulant which owes its virtnes to a volatile oil. It is popularly supposed in America to have a special action on the uterus, whence its name "Squaw-weed." Stillé states that "almost all of the testimony which has been published respecting the remedial virtnes of fleabane, agree in attributing to the Canadian species, astringent and hæmostatic virtnes." It has been found a useful remedy in the treatment of diarrhœa, dysentery, &c. The oil was first brought to notice by the celectic physicians, recent trials seem to indicate that it is a remedy of special value in uterine hæmorrhæge. The oil has been observed by R. Barthelow (*Physic. and Surg.*, *April*, 1887,) to check the waste of albumen, to lessen the irritability of the bladder in cystitis, and to afford considerable relief in bronchial catarrh and similar affections. The dose given was five drops, three or four times a day.

The medicinal properties of E. canadensis do not appear to be known to the natives of India, nor have we heard of any vernacular name for it.

Description.—Stem 6 inches to 3 feet, simple, erect, slender, striate, with scattered hairs; branches numerous, ascending; radical leaves spathulate, or narrowly obovate, dentate, stem leaves linear-lanceolate, acute; heads very namerous, about $\frac{1}{4}$ inch long, involuce bracts acuminate, ligules pale rosy or purplish, scarcely exceeding the pappus, disk flowers yellow; achenes $\frac{1}{16}$ of an inch, narrow, flat, nearly glabrous, pappus $\frac{1}{3}$ of an inch. The plant has a mint-like odour, and an astringent somewhat bitter taste.

Chemical composition.—The plant contains a volatile oil which is a limpid, pale yellow liquid of a peculiar aroma and persistent odour, somewhat terebinthinate and of an aromatic, not very pungent taste. According to A. M. Todd (Amer. Journ. Fharm., June, 1887.) the specific gravity of the natural oil is not above '865, nor below '855; it should not boil vigorously

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below 342° F., nor above 347° F. until five per cent. has been volatilized; when redistilled it is colourless, and a resinous product of a deep reddish brown colour is left in the retort. The pure oil in the natural state should not polarize nearer the zero point than -26, nor further than -60; the rectified oil, freed from resin, may polarize somewhat nearer the zero point than the limit given, and the first fractions should be dextrogyre. The oil dissolves iodine without explosion, is gradually coloured reddish by potash, and is slowly acted upon in the cold by fuming nitric acid. It dissolves freely in ether and absolute alcohol, but is only moderately soluble in 80 per cent. spirit. The oil consists mainly of a terpene, $C^{10}H^{16}$, specific gravity '8464, boiling at 176° C., and yielding a crystalline dihydrochloride which fuses at 47°-48° C. (Beilstein and Wiegand, Ber. der Deutch. Chem. Ges. zv., 2854.)

Erigeron asteroides, *Boxb.*, Maredi (*Hind.*, *Guz.*), Sonsali (*Mar.*), is used in India as a stimulating diuretic in febrile affections. It is an annual, flowering during the cold season, and a native of dry cultivated lands.

Stem erect, from 6 to 12 inches high, ramous near the ground, round, hairy; branches ascending, longer than the stem; leaves alternate, the inferior ones short petioled, oval or obovate, grossly toothed, the superior ones sessile, oblong, sub-lyrate, all are covered with soft down and are somewhat glutinous; flowers few, terminal, pedancled, large; flat; hermaphrodite florets of the disc yellow, the female ones ligulate, those of the border blue, generally entire or only emarginate. (*Roxb.*)

BLUMEA BALSAMIFERA, DC.

Fig.-Rumph. Amb. vi. t. 24, f. 1. Oostindische ofte wilde Salie (Dutch).

Hab.—Tropical Himalaya, Burma, Eastern Peninsula. The camphor.



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BLUMEA DENSIFLORA, DC.

Fig.-Seem. Fl. Vit. 141, t. 27.

Hab.—Tropical Himalaya, Malay and Fiji Islands. The camphor.

Vernacular.--Ngai (Chin.), Kai-dai-bi (Coch.-Chin.), Sombong, Bangachappa (Malay), Pung-ma-theing (Burm.), Kukronda (*Hind.*), Kuksungh (Beng.). The Hindi and Bengali names are also applied to other strong smelling Blumeas.

History, Uses, &c .- The camphoraceous Blumeas are called by Sanskrit writers Kukundara and Kukkura-dru, . "dog-bush" because their pungent odour is attractive to those animals; the vernacular names are derived from the Sanskrit. In addition to the two plants placed at the head of this article, B. aromatica, DC., and B. lacera, DC., are considered by the Hindus to be deobstruent and resolvent, and particularly useful in the disease of the nose called Ahwah, said to be peculiar to Bengal, which is accompanied by strong fever, heaviness in the head, pains in the body, especially in the neck, shoulders and loins; the powdered leaves are given internally in two drachm doses mixed with butter, and also used as a snuff. The juice of the leaves is placed in the eye to cure chronic purulent discharges; it is also used as an anthelmintic, and as an astringent in dysentery, chronic discharge from the uterus, &c. A preparation (márana) is made by oxidizing steel filings in the juice of these plants, which is highly esteemed as a remedy for renal dropsy. Dr. Anderson of Bijnor has found the fresh juice of B. lacera useful as an anthelmintic, especially for thread worms, and Dr Bolly Chand Sen of Calcutta speaks of it as invaluable in Tinea tarsi. Mir Muhammad Husain in the Makhzan describes Kukronda as a plant two cubits in height, much branched, having long crenated leaves not unlike endive leaves, but larger and softly downy, of a dark green colour, pungent odour, and astringent taste ; flowers small, yellow ; fruit like the anemony (downy) ; seeds small, black, pubescent. (B. densiflora?)

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The Conyza ederata of Rumphius is considered by Roxburgh to be B. balsamifera; the Baccharis salma of Loureiro is probably the same plant, and also the Planta Bantamica of Clusius (iv. 23), which was discovered by Colins in Batavia prior to the year 1619. Clusius states that it is used as a condiment and as a remedy for colic, and in paralysis as a stimulant fomentation or bath; given in decoction with the leaves of Vitex Negundo, Careya arborea and Citrus acida it produces copious perspiration. It is also used as a vermifuge and as an astringent in menorrhagia. Dr. Mason (Burmah, its People and Natural Productions, Lond., 1852,) mentions the manufacture of a camphor by the Tavoyers from B. densiflora, one of the most abundant weeds throughout the Tenasserim Provinces. Subsequently a Mr O'Riley of Amherst manufactured and purified more than 100 pounds of this camphor which was sent to Calcutta for trial, and prononneed to have the same medicinal properties as ordinary camphor. In 1874, Hanbury (N. Repert. f. Pharm. xxiii., 321,) pointed out that this was the Ngai camphor mentioned by Rondot (Etude Pratique du Commerce d'Exportation de la Chine, Paris, 1848,) which was worth 250 dollars the picul (1331 lbs.) in China. Mr. Hanbury also obtained from Mr. F. H. Ewer of Canton a sample of Ngai camphor, and of the plant from which it was manufactured in China (B. balsamifera); he also ascertained that the camphor was used in medicine by the Chinese and largely for the purpose of perfuming inks at the ink factories of Wei-chan and other places.

Description.—B. balsamifera is a large shrubby plant with an erect ligneous trunk, and branches covered with ashcoloured bark. Leaves alternate, short-petioled, lanceolate, irregularly serrate, and generally more or less pinnatifid at the base, downy, particularly underneath, where they are sericious and beautifully reticulated with numerous veins, from 6 to 12 inches long ; petioles short, often with 1 to 4 small leaflets ; corymbs terminal, numerous, bearing many sub-cylindric bright yellow flowers. (*Roxburgh.*) The plant smells strongly of worm wood and camphor.

COMPOSITZE.



B. densifiera very closely resembles B. balsamifera, and is united with it by some botanists. B, lacera has an erect branching stem, the principle leaves of which are petioled and lyred, the superior ones simply oval and much smaller, all are sharp toothed, downy, and various in size. Umbellets terminal, and from the exterior axils, peduncled. Flowers a dull yellow. The plant has a strong odour of wormwood and camphor.

Chemical composition.—B. balsamifera and densifiora contain a volatile oil having the odour of wormwood, and a camphor which has been examined by Sydney Plowman, 1874, who found its composition to be Carbon 77.56, Hydrogen 11.6, Oxygen 10.84, whilst Borneo camphor examined at the same time yieldsd C 77.66, H 11.68, O 10.66 and Laurel camphor C 78.2, H 10.44, O 11.36. Ngai camphor has the same physical properties as Borneo camphor, but the two substances differ in optical properties, an alcoholic solution of the former being *levogyre*. By boiling nitric acid, Borneo camphor is transformed into common (*destrogyre*) camphor, whereas Ngai camphor affords a similar yet *levogyre* camphor, in all probability identical with the stearopten of *Chrysanthemum Parthenium*, Pers. (*Hanbury Science Papers*, p. 393; *Pharmacographia*.)

Commerce.— This camphor has of late years been fraudulently sold as Borneo camphor in India. The value of Ngai camphor in China is about 250 dollars a picul, whereas Borneo camphor costs about 2,000 dollars for the first quality and 1,000 dollars for the second.

Blumca criantha, DC., a native of Western India, is called Nimurdi in Marathi, and is used by the country people to drive away fleas. It is very common in the Concan, and is remarkable for the clusters of globose, woolly buds crowded together at the crown of the root, and for the strong odour of caraways which it possesses. The habit of the plant is variable, in cultivated ground it is erect, but in pasture land prostrate or decumbent. The flowers are yellow. Medicinally the juice



of the plant is administered as a carminative, and the herb used along with the leaves of *Vitex Negundo* and *Careya arbo*rea for fomentations. A warm infusion is given as a sudorific in catarrhal affections, cold it is considered to be diaretic and emmenagogue. Under the names of Bhámburdi (*Mar.*), Kalára and Chánchari-mari, "flea-killer" (*Guz.*) several kinds of Blumea are used indiscriminately by the natives of Western India. The plants generally supplied by the herbalists being *Blumea lacera, Laggera aurita* and *Blumea eriantha*.

In Southern India, under the names of Jangli or Divarimuli (Dec.), Nárak-karandai, Káttu-mallángi (Tam.), Káru-pogáku, Adavi-mullangi (Tel.), Laggera aurita, Schultz-Bip (Blumea aurita, DC.) is according to Dr. Moodin Sheriff, chieffy used. When young the foliage resembles that of a radish, the flowers are white or pinkish. Some Mahometan physicians use this plant as a substitute for Kamáfitus, the $\chi a \mu a \mu a \pi i r v$ of the Greeks, which was A juga Chamæpitys, Schreber, a labiate plant.

Chemical composition.-The entire plant of B. eriantha in flower, without roots, was air-dried and reduced to fine powder.

On heating to 100° C., 8.76 per cent. was lost, due to moisture and volatile oil. The ash amounted to 8.31 per cent., it was of a light brown colour, and contained marked traces of manganese and iron.

On distillation with water a colourless oil was obtained, lighter than water, and which possessed in a marked degree the odour of the drug. The oil had a sp. gr. of 9144 at 80° F., and was strongly levogyre. The plant yielded to petroleum ether 3.02 per cent. of extract, to ether 1.55 per cent., and to alcohol 3.40 per cent.

The various extracts contained chlorophyll, a dark acid resin, a trace of tannin, malic acid, volatile oil, and a wax, and in addition, from the ether extract a crystalline principle was obtained. This principle after repeated crystallization from alcohol was of a light lemon yellow colour, in tufts of needles, or by slow crystallization in very large rhombic prisms. It was without odour, gritty between the teeth, and without any

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decided taste. In water, cold or boiling, it was practically insoluble, it was slightly soluble in cold ether and alcohol, but was not easily soluble even in boiling alcohol. The ethereal solution left the principle, on spontaneous evaporation, as a dull adherent deposit on the sides of the vessel. The crystalline principle had a melting point of 156° C. (uncorrected); it did not contain nitrogen. With reagents it gave the following reactions:--

Concentrated sulphuric acid dissolved it, the solution being of a bright yellow colour; on the addition of water the acid became milky from separation of white flocks. Concentrated nitric acid gave an orange-red coloration; hydrochloric acid produced no change either in the cold or on heating. Fröhde's reagent gave a yellow colour, changing to yellowish-green on heating. Sulphuric acid and potassium bichromate no special reaction. An alcoholic solution 'gave with ferric chloride a dirty greenish brown coloration; with ferrous salts, a dirty reddish coloration, which disappeared on heating, leaving the solution of a pale yellow tint. The addition of alkalies to an alcoholic solution produced a bright yellow colour; in hot or cold aqueous alkaline solutions the principle was insoluble.

This principle would appear to be allied to the quereitrin group, but does not appear to be identical with any of those hitherto described; we reserve, however, a definite expression of opinion for the present.

PLUCHEA LANCEOLATA, Oliv.

Fig. - Deless. Ic. Sel. iv., t. 21. Syn. Berthelotia lanceolata.

Hab .- Upper Bengal, Oude, Punjab, Sind.

Vernacular .- Ra-sana (Punj.), Koura-sana (Sind.)

Description.—An annual, with spreading branches, and opposite, petioled, oval or oblong leaves covered with stomata on both sides, edges vertical; florets tubular, with silky pappus. It forms thickets up to four and five feet high. The leaves are

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said to be aperient, and used as a substitute for senna. We have not had an opportunity of examining them.

SPHÆRANTHUS INDICUS, Linn.

Fig.-Wight Ic. t. 1094 ; Rheede Hort. Mal. x. t. 43.

Hab.-Tropical Himalaya, and southwards to Ceylon. The herb.

Vernacular — Mundi, Gorakh-mundi (Hind., Mar., Guz.), Murmuria (Beng.), Kottak-karandai (Tam.), Boda-tarapu (Tel.), Mundikasa (Can.).

History, Uses, &c .- This plant, which is very common in rice fields, is called in Sanskrit Munditika or Mundi, Bhikshu, Pari-vráji (mendicant) and Tapo-dhaná (rich in religious penance). It is described in the Nighantas as pungent, bitter, and stomachic; sweet, light and stimulant, a remedy for glandular swellings in the neck, urethral discharges and jaundice. The dose of the powdered herb is about a scruple or a scruple and a half twice daily, but more may be given. Rheede, who speaks of the plant under the name of Adacamanjen, tells us that the powder of the root is considered stomachic, and that the bark ground and mixed with whey is a valuable remedy for piles. The plant with camin is stomachic : with honey it is given for cough; and ground with oil, it is used to cure itch. Burmann calls it Spheranthus purpurea. Forskahl speaks of it under the name of polycephalos, and Dr. Horsfield, in his account of Javanese medicinal plants, informs us that the inhabitants of Java consider it as a useful diuretic. (Ainslie, Mat. Ind. II., p. 167.) By some Indian Mahometan physicians this plant has been supposed to be the Kamázariyús* of Arabic writers, but the author of the Makhzan-el-Adwing says that this is a mistake, and describes Mundi in a separate He speaks of it as a powerful tonic, deobstruent and article.

* χαράιδρος Teucrium Chamzedrys, Linz. Petit Chéne, (Fr.) Ground Oak or Germander, considered to be tonic, diurctic and sudorific, one of the ingredients of the celebrated Portland Powder, Conf. Dios. pi, 103.

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alterative, and observes that the odour of the plant may be perceived in the urine and perspiration of those who are taking it. The administration of the drug is recommended in bilious affections, and for the dispersion of various kinds of tumours. The distilled water is mentioned as one of the best preparations; it is directed to be made in the same manner as rose water. Mir Muhammad Husain also states that the Hindus ase the bark, and make a kind of confection of the young plant by rubbing it up with clarified butter, flour and sugar; a portion of this taken daily is said to be a good tenic, and to prevent the hair turning white or falling off. Several other somewhat similar preparations of different parts of the plant are mentioned by him, and are described as preservatives of the animal powers. An oil prepared from the root, by steeping it in water, and then boiling in oil of Sesamum until all the water is expelled, taken fasting every morning for 41 days in doses of 2 dirhems, is said to be a powerful aphrodisiac انقورت باہ ایحد ے اخشد کر is said to be a powerful aphrodisiac Experiments with the distilled water show that it is not diuretic; in the case of a cachectic native suffering from frequent micturition caused by chronic prostatitis it afforded much relief. A European suffering from boils derived decided benefit from taking a wineglassful three times a-day.

Description.—Plant generally about 8 inches high, winged; leaves thick, sessile, decurrent, obovate, bristle-serrate, covered with down, consisting of long white hairs; flower heads solitary, mostly terminal, sub-globular, the size of a small marble, purple when fresh, but lose their colour when dried; roots fibrous. The drug generally consists of the whole plant, but the capitula are sometimes sold separately. The taste is somewhat bitter, the odour of the capitula terebinthinate.

Chemical composition.-150 lbs. of the fresh herb distilled with water in the usual manner yielded a vory deep sherrycoloured, viscid essential oil, very soluble in water, and chinging to the side of the vessel, so that only half an ounce could be collected. The oil does not appear to have any



rotatory power, but it is difficult to examine on account of its opacity.

The most important principle detected in the leaves, stems and flowers of the plant was a bitter alkaloid soluble in ether, affording reactions with the ordinary alkaloidal reagents, but giving no special colour reactions. We have provisionally called this alkaloid Sphæranthine.

Commerce.---The dried herb, and also the dried flower heads, are sold in the bazars.

INULA HELENIUM, Linn.

Fig. - Woodville Med. Bot., t. 26; Bentl. and Trim. 150. Elecampane (Eng.), Année (Fr.).

Hab.-Central Asia, Central and Southern Europe. The root.

History, Uses, &c .- All the Indian Mahometan writers on Materia Medica mention this drug under the names of Rásan, Kust-i-shámi, or Zanjabil-i-shámi, i.e. Syrian Costus or Syrian ginger. Rásan is a Persian name for the plant which has been adopted by the Arabs. From the Barhan-i-Katia we learn that the plant is also known in Persia as Pil-gush (elephant's ear), and Gharsa, and is useful for eruptions and all kinds of pains, especially those arising from chill, bites of animals, &c. Elecampane is the Elever of the Greeks, and is described by Hippocrates as a stimulant of the brain, stomach, kidneys and uterus; it is the Inula of the Romans and the Enula campana of mediæval writers, and was formerly much used in pectoral affections, such as cough and asthma, and in acid dyspepsia, rheamatism, &c. ; an ointment made with it was used to cure itch. It is still a domestic remedy in France and Germany, and to a less extent in England, and the root holds a place in the Pharmacopœias of Germany, France and the United States of America. The root is preserved as a pectoral candy on the continent of Europe, and is used in France in the preparation of absinthe. Of late years the active



principle, helenin, has been introduced into medical use, and is said to possess remarkable antiseptic properties; it is recommended as a gargle in ozæna and internally in diseases of the respiratory organs for reducing inflammation. It is said to speedily relieve chronic bronchitis, and has also been employed in anthrax and acid dyspepsia. Korab claims for helenin a power of destroying bacilli (*Bull. de Therap. ciii. 271*). The dose of this principle is from $\frac{1}{6}$ to $\frac{1}{3}$ of a grain.

It is imposible to determine whether Elecampane was known to the ancient Hindus, but the old Persian name Rásan leads its to suspect that it was possibly the original Rásna of the Hindu Materia Medica, although entirely different roots are now in use under that name. It is significant that Gandhamula, *i.e.* "aromatic root," is a synonym for the rásna of the Nighantas, whilst the roots actually in use are not aromatic; the properties also attributed to these roots in the same books are those of Elecampane and not of the inert roots now in use in the plains of India.

Inula racemosa, Hook. f., a native of the Western Himalayas and Cashmere, is used in veterinary medicine in those parts, as a tonic and stomachic; its roots closely resemble in properties those of *I. Helenium*.

Aitchison informs us that I. Royleana, DC., a native of the same districts, is largely used to adulterate Costus.

Pulicaria crispa, Benth. (Inula quadrifida, Ham.), a native of the Punjab and Upper Gangetic plain, is called Phatmer or Phatmel in Hindi (फर, a rent, and केल, union), and according to Stewart is used as a vulnerary.

Description.—The root of *I. Helenium* is about 6 inches long and 1 or 2 inches thick, divided below into branches 6 to 12 inches long and $\frac{1}{2}$ to 1 inch thick, very fleshy, in commerce always sliced either longitudinally or transversely.

The longitudinal slices have the bark overlapping; the transverse slices are concave, somewhat radially striate; externally irregularly wrinkled and brownish, internally white



when fresh, greyish after drying, of a peculiar aromatic odour and an aromatic, bitterish, and pungent taste. The root is hygroscopic and flexible in damp weather, but when dry breaks with a short fracture. The bark is $\frac{1}{2}$ inch or more thick, the inner portion radiates near the cambium line; the meditullium has small fibro-vascular bundles and broad medullary rays, and all parts of the root are dotted with shining yellowish-brown resin-cells.

Chemical composition .- Elecampane contains a little volatile oil, some acrid resin, a bitter principle not known as yet in the isolated state, waxy matter, inulin, etc. On investigating the body formerly known as helenin and elecampane camphor, which crystallizes from the concentrated tincture mixed with water, Kallen (1873) isolated helenin, CeHO, which is insipid, almost insoluble in water, crystallizes in needles, fuses at 110° C., and is by nitric acid converted into oxalic acid and a resinous body. On distilling the root with steam, Kallen (1876) obtained inula camphor or alant camphor, C10H16O. and inuloi or alantol, C15H20O2. The first of these forms colourless needles of a faint camphoraceous odour and taste, melts at 66° C., and is sublimable and very slightly soluble in water. Alantol is a yellowish liquid having the odour of peppermint and an aromatic taste, boiling near 200° C., and yielding ervstallizable alantic or inulic acid, C15H22O3. Inulin, C12 H²⁰O¹⁰, is contained in the subterraneous parts of Compositæ, and is obtained by forcibly expressing the grated juicy roots. when a portion will deposit on standing, and the remainder may be precipitated by alcohol. Kiliani (1881) recommends boiling the roots with water containing sodium carbonate; the liquid is cooled by a freezing mixture, and the precipitate repeatedly dissolved in hot water and reprecipitated by cooling. The autumn roots contain the largest percentage (elecampane 44 per cent.) of inulin, which by the following spring is to a considerable extent changed into mucilage, sugar, and levalia, and in some cases to glucosides. Inulin is a fine white powder, tasteless and inodorous, insoluble in alcohol, slightly soluble in cold water, more so in hot water, and then partly



XANTHIUM STRUMARIUM, Linn.

Fig.-Eng. Bot. 36, t. 2544; Matth. Valg. 2, 545, f. Broad-leaved Burweed (Eng.), Lampourde (Fr.).

Hab.-Hotter parts of India and Ceylon. Europe. The herb.

Vernacular.—Gokhru-kallán (Punj., Sind.), Ban-okra (Beng.), Marlumatta (Tam.), Veritel-nep (Tel.), Shankeshvar (Mar.), Shankhahuli (Hind.), Kadvalamara (Can.).

History, Uses, &c.—The $\xi_{dv}\theta_{uv}$ of Dioscorides (IV. 133,) appears to be this plant; he tells us how it should be used to dye the hair, and also notices its use in dispelling tumours. The generic name has been given it on account of its containing a yellow-colouring matter, and the specific name is an allusion to its use in scrofula. It is the *Xanthium seu Lappa* minor of Ray, Bauhin and Matthiolus. In some parts of Germany, where it is called Spitzklette, it has a popular reputation as a remedy for ague, and in Russia it is considered to be a prophylactic in hydrophobia. In the Punjab and Sind it is called Goldru kallán, or ' great Gokhru, ' and is given in small-pox on the doctrino of signatures (Stewart); its hairs and prickles are employed in medicine in China. (Smith.) It appears to be the Hasak of the Eastern Arabian physicians, and the Hamaz-el-amir of the Westeru, it is the



Khár-i-khasak of Persia, and Háji Zein informs us that it is called Khár-i-súhúk at Shiraz, and Harada at Ispahan; the last name is an allusion to its vellow colour. Harad is the old Persian for turmeric. Hasak is described by Mahometan writers on Materia Medica as useful for dispelling tumours and curing ophthalmia, also in renal and urinary complaints as a diuretic, and in colic; it is said to be aphrodisiac. The Hindus consider the whole plant to be diaphoretic and sedative, and very efficacious in long-standing cases of malarious fever; it is generally administered in the form of decoction, and is said to be the Shánkhini or Shankhapushpi of Sanskrit writers. Loureirc states that the seeds are attenuant and resolvent of inflammatory swellings. In America and Australia this plant has been observed to prove fatal to cattle and pigs which have pastured upon it. Modern experiments with the drug seem to indicate that like Jaborandi it is sudorific, sialogogue and slightly diurctic. The dose given has been 10 grains of the dry leaves.

Description.--Stem erect, scabrous, clouded with darkcoloured spots; leaves alternate, petioled, cordate or kidneyshaped, notched, waved, 3-nerved, scabrous, about 4 inches in diameter, petioles round, scabrous, as long as the leaves; flowers terminal and from the superior axils, male aggregate above the female, short peduneled; fomale, subsessile, solitary; germ superior, oblong, armed with uncinate bristles, 2-celled, each cell containing one ovule enveloped in an interior tunic.

Chemical composition.-Zander (1881) obtained from 100 parts of the fruit 5.2 ash, 38.6 fat, 36.6 albuminoids, 1.3 xanthostrumarin and organic acids, besides sugar, resin, &c. Xanthostrumarin seems to be a glucoside, is yellow, amorphous, soluble in water, alcohol, ether, benzol and chloroform, and yields precipitates with group reagents for alkaloids, and with ferric chloride, lead acetate, and salts of other metals, but is not precipitated by tannin or gelatin. Xanthostrumarin is related to datiscin, which is coloured yellow by alkalies, gives a green precipitate with ferric chloride, and a yellow one with



acctate of lead. M. V. Cheatham (1884) obtained only 14.5 per cent. of fixed oil, and a principle which was precipitated by tannin. (*Amer. Journ. Pharm.*, 1881, 271, and 1884, 134.)

SIEGESBECKIA ORIENTALIS, Linn.

Fig.-Wight Ic., t. 1103; Schk. Han. 3, t. 256. Herbeguérit-vite (Fr.).

Hab.—Throughout India. Cosmopolitan in warm climates. Vernacular.—He-kien, Kau-kau (Chin.), Katampam, Katampu (Tam.).

History, Uses, &c .- This plant is named after Dr. George Siegesbeck, a German physician, fomorly director of the gardens at Petersburgh. It appears to have been long known in China as a remedy for ague, rheumatism, and renal colic: but as far as we know, its medicinal properties are not known to the natives of India. The properties of the plant have been studied by Vinson and Louvet, who state that in the island of Réunion it has a considerable local reputation as a sialagogue, vulnerary, tonic, aperient and depurative; it is an ingredient in Périchon's Sirop depuratif végétal, which is used as a remedy in venereal and scrofulous affections. The juice of the fresh herb is used as a dressing for wounds, over which, as it dries, it leaves a varnish-like coating. A decoction of the leaves and young shoots is used as a lotion for ulcers and parasitic skin diseases. Other preparations of the plant are a wine and a watery extract. Auffrey of the Mauritius separated a bitter principle from the drug which he named darutyne, in honour of Dr. C. Daruty, the author of a work upon the medicinal plants of that Island.* J. Hutchinson (Brit Med. Journ., June 25, 1887,) has recommended a tincture of Siegesbeckia as a local application in certain skin diseases; he remarks that most of the medicaments now in use inconvenience the patient on account of their greasy nature, and, if

* Plantes médicinales de Pile Maurice et des pays intertropicaux. Maurice : 1886. Christy, New Commercial Plants, No. 9, pp. 49-52.



not greasy, they do not afford relief to the dryness and tension of the slin. The affected parts are rubbed night and morning with a mixture of equal parts of the tincture and glycerine, which appears to act as a stimulant and parasiticide, the pain is soon relieved, and the cruptions disappear.

Description. — A much branched, erect herb, 1 to 3 feet high with opposite, broadly triangular or ovate, coarsely toothed more or less scabrous leaves. Flowers yellow, the ray-Abrets are strap-shaped and pistil bearing, those of the disk tubular and perfect. The exterior scales of the involucre are twice the length of the inner. The achenes are without pappus, and are half inclosed by the chaffy scales of the receptacle.

Chemical composition .- The bitter principle of this plant was discovered in 1885 by M. L. Anffray and named Darutyne, and a specimen of the white crystalline scales was shown in the Indian and Colonial Exhibition, London, 1886. Darutyne is prepared by treating a strong decoction of the fresh leaves with subacetate of lead to precipitate the colouring matter, the lead being removed by diluted sulphuric acid, and the filtered liquid evaporated to an extract, triturated with onequarter of its weight of lime and dried at 144° F. It is then treated with alcohol, part of the alcohol distilled off, and the residue mixed with five or six times its volume of water, slightly acidulated. The precipitated substance after filtration is treated with alcohol, and mixed with two or three times its volume of water, when the darutyne crystallizes out, the yield being 0.15 per cent. The crystals are soluble in alcohol and ether, but insoluble in cold water, dilute acids, alkalies and chloroform and are neutral to test paper. M. Auffray finds that it does not give the reactions for glucosides, alkaloids, acids, or resin. Concentrated sulphuric acid dissolves the crystals with a brownish colour, and strong hydrochloric acid without colour in the cold, but when allowed to boil the liquid becomes of a greenish tint, depositing a green resincus substance.



We found the crystals obtained from a desection of the plant to give off the odour of salicylol when heated with sulphuric acid and potassium dichromate, and we obtained some crystals in the ether extract of the plant, which also acted as a derivative of salicylic acid.

Enhydra fluctans, Lour., Hilamochika or Hilamochi, (Sans.), Hingcha (Beng.), Harkuch (Hind.), a glabrows or public public the second state of the

This plant is unknown in Western and Southern India.

ECLIPTA ALBA, Hassk.

Fig .- Lam. Ill., t. 687; Rheede, Hort. Mal. a., 41.

Hab .- Throughout India. The herb.

Vernacular.--Bhangra (Hind.), Bhengra (Guz.), Máka (Mar.), Kesuria (Beng.), Garaga, Kádige-garaga (Can.), Karesha-lánganni, Kaikeshi, Kaivishi-ilai (Tam.), Gunta-galijeru, Galagara-chettu, Gunta-kalagara (Tel.), Cajenneam (Mal.).

History, Uses, &c.—This is a very common weed in the rainy season, and may be found in irrigated fields and gardens at all times of the year; it is used by the Hindus at the Shraddh ceremony, being placed under and on the Pinda. It is called in Sanskrit Kesaraja, Bhringarája and Markava, names which include Wedelia calendulacea, which is regarded by the natives of India as a variety of Eclipta alba. In the Nighantas it is described as bitter, pungent, hot, and dry, removing phlegm and wind, increasing the appetite, and curing diseases of the skin, eye and head. In practice it is principally used as a tonic and deobstruent in hepatic and splenic enlargements, and in various chronic skin diseases; in



the latter class of cases it is applied externally and given internally. The juice of the plant is used in tatooing to communicate a blue colour to the punctures, and it is stated in native works that when taken internally and applied externally it will dye the hair black. Mahometan writers follow the Hindus in their description of the medicinal properties of this herb, and give Kadim-el-bint as the Arabic name. Rheede states that a decoction is used for headache and toothache, and that the juice with melted butter is given in rheumatism. Pills made by pounding the plant with oil are supposed to relieve vertige, and remove phlegmatic humors from the brain; whilst the leaves powdered and mixed with salt, pepper and limejuice, stimulate the appetite. He describes Wedelia calendulacea (x., 42,) as having similar properties. According to Dutt, the last-named plant is the Kesarája mostly used in Bengal. Ainslie also mentions it under the name of Peela Bhangra, and describes it in the following terms :---

"It has an herbaceous stem, a foot high, and nearly erect; leaves quite entire, opposite, lanceolate, bluntish, with yellow flowers, terminating, solitary, and on a very long peduncle. The leaves, seeds, yellow flowers, in a word the whole of this low-growing plant, which is pleasant and somewhat aromatic to the taste, is used in medicine; it is considered as deobstruent, and is prescribed in decoction, in the quantity of half a teacupful twice daily."

Mr. J. J. Wood suggested that *Eclipta alba* would be found eventually of greater service than taraxacum in hepatic derangements. The expressed juice is recommended as the best form for administration in the *Pharmacopacia of India*, and in Bombay the natives use the juice in combination with aromatics, such as ajowan seeds, as a tonic and deobstruent, and give two drops of it with eight drops of heney to new-born children seffering from catarrh. The plant is used in-Madras to allay the irritation caused by scorpion sting. The leaves are rubbed from above the inflamed part down to the wound, and a paste is then made of the leaves and applied as a poultice.



The following prescription is used in the Concan for tetanus: —Máka juice I tolá, juice of Leucas seylanica (Tamba) $\frac{1}{4}$ tolá, Ginger juice 2 tolás, juice of Vitex trifolia I tolá, leaf juice of Sesbania grandiflora 3 tolás; to be boiled with foar times the quantity of cocoanat juice and a little rice and treacle to form a Khir, to be given twice a day.

Description.—*E. alba* is a small prostrate or ascending plant, stem reddish; leaves linear or oblong-lanceolate, attennated at the base, with waved edges, 1 to 4 inches long. The whole plant is rough to the touch from the presence of numerous adpressed white hairs; the structure of these is pecaliar, the base is red and turned upwards, and upon it is attached a conical, white, glandular hair. The flower heads are in pairs, axillary or terminal, $\frac{1}{2}$ to $\frac{1}{2}$ of an inch in diameter, white or rarely yellow, one having a peduncle twice as long as the other; the receptacle is flat, and furnished with bristlelike scales between the florets, ray-florets fertile or sterile; disc-florets fertile, tubular; achenes of the ray-florets triquetrons, these of the disc compressed; pappus toothed or 2-aristate.

Wedelia calendulacea has a procumbent, glabrons or scabrid stem, 6 to 18 inches in length, rooting at the lower nodes ; leaves 1 to 3 inches long, variable in breadth, sub-sessile, linear-oblong or oblanceolate, acute or obtuse, entire or subcrenate, hairs on both sides scattered, adpressed, rigid, white. Heads solitary, yellow, on long slender axillary pedancles, 1 to 14 inches in diameter, outer involuce bracts large, oblongobtuse, herbaceous, much longer than the disc-florets; outer florets ligulate, central tabular; achenes of the ray triquetrous, those of the disc compressed, pappus of toothed or hairy scales.

Chemical composition.—In addition to a large amount of resin, an alkaloidal principle was detected in *E. alba*, which we failed to obtain in a crystalline form. It añorded no special colour reactions. The sulphate was slightly soluble in ether. We provisionally call this alkaloid *Ecliptine*.



GUIZOTIA ABYSSYNICA, Cass.

Fig.-Wight Ill., t. 182; Bot. Mag., t. 1017. Niger seed (Eng.).

Hab .--- Africa, cultivated in India. The seed and oil.

Vernaeular.-Rámtil, Kálátil (Hind., Beng., Mar., Guz.), Ulisi, Valesalu (Tel.), Uchellu (Tam.), Hutchu-ellu (Can.)

History, Uses, &c .- This plant is the Núk of the Abyssinians, and was first brought to the notice of Europeans by Bruce. (Travels, 1768-75.) It appears to have been introduced into India by the early Arabian traders, and was first brought to the notice of the English in India in 1800, when the seeds were sent to the Botanical Garden at Calcutta from the British Resident at the Court of the Berar Raja, and from Mr. Heyne at Bangalore, as those of a plant largely cultivated for the sake of the sweet oil obtained from the seeds. (Rozb. Fl. Ind., iii, 441.) In the same year Huts' Ellu, or the foolish oil plant, was observed by Dr. Buchanan in Mysore. About the middle of August, after a heavy rain, the seed is sown broadcast, and ploughed in. It requires neither manure nor weeding, and is very exhaustive to the soil. It ripens in three months, when it is cut near the root and stacked for eight days. Then, having been for two or three days exposed to the sun, the seed is beaten out with a stick, and separated from fragments of the plant by a fan. Part of it is parched and made into sweetmeats with jaggery, but the greater part is sold to the oil-makers for expression. This oil is much esteemed for culinary purposes, and is also used as a lamp oil, but is reckoned by the natives inferior to that of Sesamum. About the same time it was noticed by Ainslie, who testified to its extensive cultivation on the coast. (Mat. Ind., ii. 256.) Heyne notices its cultivation in Bengal and calls it Werinnua. (Tracts on India, p. 49.) The plant is cultivated on many parts of the table-land of India as a cold weather crop, and was first shipped to London from India in 1851. Allen (Commercial Analysis) classifies it in the cotton seed



group of fixed oils, and states that its applications are to adulterate rape oil and to act as a substitute for linseed oil. We have not found it to be siccative enough for the latter purpose, and, in fact, from its sweetness and low congealing point, we should consider it of greater value than that usually attributed to it.

Description.—This is an annual, herbaceous, erect plant; leaves opposite, long, lanceolate, coarsely serrated, peduncles elongated, subcorymbose; flowers large, bright yellow.

The achenes are of a greyish-black colour, about $\frac{2}{10}$ of an inch long, somewhat angular from lateral compression, tapering towards the base, quite smooth, taste oily and nutty.

Chemical composition .- The seeds have been examined by Anderson who found them to contain water 7.02, oil 43.22, albuminous substances 1937, sugar, gam, &c., 1337, cellulose 14:33, ash 3:48 per cent. The nitrogen amounted to 3:10 per cent. (Highland Agr. Soc. Journ., New Ser., No. 69, p. 376.) The oil is light yellowish brown having a specific gravity of 921 at 20° and 924 at 15:5°. It solidifies at a temperature below zero. A few drops mixed with strong sulphuric acid form greenish brown clots. After the application of Massie's test the oil became light brown; heated with the acid, and after the action had censed, the oil became dark reddish brown. It required 19 per cent. of KHO for saponification, and the fatty acids resulting from the decomposition amounted to 94.9 per cent. of the oil and melted at about 21° C. The fatty acids remaining at a temperature a little above their melting-point, separated into a solid white crystalline acid melting at 50° and some liquid oleic acid. By decomposing the lead soap of the fatty acids insoluble in ether, a white lustrous body was obtained melting at 54° and solidifying at 51°, and soluble in alcohol with a slight acid reaction, probably myristic acid. The oil has slight drving properties. About one and-a-half gram of oil was heated to a temperature of 92° in a shallow capsule for a few hours



each day and weighed carefully each morning before being heated. The greatest increase was observed on the second day, but the weight augmented daily in diminishing amounts until the fifteenth day, when it was found to have gained altogether 7.2 per cent. The oil was still unctuous and transparent and flowed from the vessel when inverted. The oil was heated to over 250° on three occasions, but this did not appear to affect its limpid character.

Glossocardia linearifolia, Cass., Wight Ic., t. 1110.

Syn.-G. Bosvallea, a plant of Central India and the Deccan, is known in Marathi by the name of *Phatar-suva*, which means *Rock anethum*. In the Poona and Sholapore districts it is called *Pitta-pápada*, a name also given to *Fumaria* as well as to several Acanthaceous plants. It is not sold in the Bombay shops, but is the Pitta-pápada of the Poona druggists, and according to Dalzell and Gibson is much used in female complaints, the nature of which they do not specify. *G. linearifolia* is a small annual, with many stems, diffuse; leaves alternate, much divided, linear at the base; heads of flowers solitary, yellow, on short naked pedancles. It has a bitter taste, and an odour of fennol, and is used as an emmenagogue.

ACHILLEA MILLEFOLIUM, Linn.

Fig. — Woodville, t. 15; Reich. Ic. Fl. Germ., avi. t. 1026; Bentl. and Trim, 153. Yarrow, Nose-bleed (Eng.), Herbe aux Charpentiers, Millefenille (Fr.).

Hab.-Western Himalaya. Cultivated in gardens.

Vernacular .- Biranjásif (Ind. Bazars).

History, Uses, &c. — Different species of Achillea have been used medicinally from a very early date, Dioscorides (iv., 34) mentions $d_{\chi}(\lambda)_{\ell_1(CP)}$ as a plant which was used as an astringent and emmenagogue. According to Pliny the generic name was given to these plants because Achilles was the first to use them as a vulnerary, he says: — "Invenit et achilleon Achilles discipulus Chironis, qua vulneribus mederetur, que ob id



Achilleos vocatur. Hac sanasse Telephum dicitur. Alii primum æruginem invenisse, utilissimam emplastris, ideoque depingitur ex cuspide decutiens eam gladio in valnus Telephi. Alii utroque usum medicamento volunt. Aliqui et hanc panacon beracleon, alii sideriten. Hanc apud nos millefolium vocant, cubitali scapo, ramosam, minutioribusque quam fceniculi foliis vestitam ab imo. A hi fatentur quidem illam valneribus atilem, sed veram achilleon esse scapo cœruleo pedali, sine ramis." (25,19). A species of Achillea is the Kaisum of the Arabians, Ibn. Sina says of it: لرة جاليدوس زهوه را بلغ من الافسنقين-: Sina says of it to Galen its flowers are more conspicuous than those of wormwood). The same plant is the Biranjásib or Biranjásif of the Persians, which has been identified by Stocks with A. saniolina, Linn.; the description of biranjasif in the Tuhfat-el-muminin is unmistakably that of an Achillea; another Persian name for the plant is Bu-i-maderán; it is in common use as a tonic in Persia and Sind. In Egypt a species of Achillea is used medicinally under the name of Barbara (!, e). In Europe and in the East the plants belonging to this genus have long been considered to have stimulant, tonic, emmenagogue and antihæmorrhoidal properties. A. Moschata (Génepi blanc) is an Alpine plant with a musky odour, having sudorific and healing properties. At Engadine, in Switzerland, a volatile oil is extracted from it called Esprit d'Iva. For administration 1 oz. of A. millefolium may be infused in a pint of water and reduced to 6 oz., of this 1 oz. may be given every hour. This plant has of late years been reintroduced into medical use in America; it is spoken of as a general stimulant and tonic, with peculiar relations to the pelvic organs. Like other stimulant tonics, it has been found capable of curing certain cases of intermittent fever, and is apt to promote the appetite and digestion in atonic gastric disorders. Its special local action is illustrated by the virtues ascribed to it in piles and amenorrhosa, for the cure of which it was celebrated even in ancient times. The form of the first of these diseases, in which it appears to be most efficient, is that in which, along with relaxation of the sphincter ani, there is a discharge of mucus, more or less

bloody, during defecation. A similar condition of atony in the reproductive organs of the female is attended sometimes with menorrhagia, and sometimes with imperfect and painful menstruation. A tonic and stimulant regimen is essential to its successful treatment, and as a portion thereof, milfoil may sometimes be employed with advantage. By this mode of action, doubtless, milfoil has proved beneficial in lencorrhœa and flatalent colic; and it may assist in curing relaxed and otherwise inert conditions of the throat, when its infusion is used as a gargle, or in cases of sore nipples, when it is applied as a lotion. The volatile oil may be given in doses of 20 drops.

Achillein, in doses of from 8 to 20 grains, is reported to have occasioned a sense of epigastric oppression and some irregularity of pulse, but to have increased the appetite. (*Stilla* and Maisch.)

Description .- A perennial herb with a slender creeping root-stock, giving off numerous filiform roots, and several long subterranean, reddish stolons with a blunt succulent scale at each node. Leaves alternate, the radical ones often 6 inches long, stalked, with a wide petiole, lanceolate-oblong in outline, the cauline ones much smaller, sessile and oblong, all very deeply bi- or tri-pinnatisect with closely placed, overlapping segments, which are again cut into linear, very acute lobes, more or less hairy, mucronate, and having small oilglands on the lower side. The flowers grow in level-topped corymbs; heads numerous, with the involucre cblong; scales imbricate, keeled ; receptacle flat, chaffy ; ray-florets pistillate, 4 or 5, short ligulate, white or rose-coloured; disk-florets several, perfect, tubular, with the margin whitish and the tube greenish; achenes flattened, oblong, without pappus. It has a feeble aromatic somewhat chamomile-like odour, and a bitterish, rather saline taste.

Chemical composition.---Yarrow yields by distillation with water-about $\frac{1}{10}$ per cent. of a blue or dark-green volatile oil, that of the flowers having a spec. grav. of 0.92, that of the leaves 85 to .92, the latter being butyraceous. The bitter principle

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achillein was obtained by Zanon (1846) as a reddish-brown extract-like mass, and was regarded by Von Planta (1870) as being identical with the alkaloid achilleine of *A. moschata*. Zanon's achilleic acid is aconitic acid (*Hlasiwetz*, 1857). Yarrow also contains a small quantity of resin, tannin, and gum, and various salts, consisting of malates, nitrates, phosphates, and chlorides of potassium and calcium; on incineration, from 13 to 17 per cent. of ash is obtained.

Von Planta-Reichenau (1870) obtained from A. moschata a bluish-green volatile oil, *ivaol*, of a refreshing odour and bitterish mint-like taste; *ivain*, $C^{2*}H^{42}O^5$, soft, yellow, insoluble in water, soluble in alcohol and bitter ; *achilleine*, $C^{20}H^{36}N^2O^{15}$, is readily soluble in water, with difficulty in absolute alcohol, insoluble in ether, and when boiled with dilute acids yields sugar, ammonia, an odorous body, and *achilletine*, $C^{11}H^{17}NO^4$, which is dark-brown, insoluble in water, and not bitter ; *moschatine*, $C^{21}H^{27}NO^7$, is insoluble in cold water, and has an aromatic bitter taste. (*Stillé and Maisch.*)

MATRICARIA CHAMOMILLA, Linn.

Fig.— Lamk. Ill. t. 678; Bentl. and Trim. t. 155. German Chamomile (Eng.), Camomille d'Allemagne (Fr.).

Hab .--- Northern India, Persia, Europe.

Vernacular. — Bábune-ke-phúl (*Hind.*), Shimai-chámantippu (*Tam.*), Sima-chámanti-pushpamu (*Tel.*), Shima-jeventi-pushpam (*Mal.*), Shime-shyámantige (*Can.*), Bábuna-na-phúla (*Guz.*), Bábuna-cha-phúla (*Mar.*).

History, Uses, &c.—The arbenis of Dioscorides is referred by Sibthorp to Anthemis chia, Linn., but it is probable that several species were used under this name, including Matricaria Chamomilla. Theophrastes describes the flowers of anthemon as TO dév KUKAO arbos ACUROV, TO dév MEGO XPUGOS (H. P. vii., 13), his plant was therefore a single-flowered onc. Formerly the chamomile flowers met with in the bazars were all obtained from Northern India and Percia, and were the flowers of M. Cha-

momilla, but now the double flowers of Authemis nobiliss imported from Europe, are found in most of the large towns. The drug does not appear to be mentioned by the old Sanskrit writers, and was probably first used in India by the Mahov metan invaders. The notices of Babunah in Persian works on Materia Medica must be understood as applying to M. Chamomilla; we gather from them that this plant is named after the village of Bábunah in Irák-arabi, where it is particularly abundant. The Arabs call it Tuffah-el-ard and Shajratel-káfúr (camphor plant). It is considered to be stimulant, attenuant, and discutient. There is a popular opinion among the Persians that the odour of the flowers induces sleep and drives away noxious insects; they also say that bathing the genitals with chamomile tea has a powerful aphrodisiac effect.

Description .- The flower-heads are 1 to 1 of an inch broad, and have a flattish involucre, with two or three rows of small oblong-linear, obtuse scales having the margin mem-. branous. The receptacle is at first convex, but becomes strongly conical and hollow, and is free from chaff. The ray-florets are about fifteen in number, soon reflexed, white, ligulate-oblong, with two notches at the apex and enclosing the bifid style, but no stamens. The numerous yellow disk-florets are tubular, five-toothed, somewhat glandular, hermaphrodite, and have the anthers united into a tube through which the bifid style projects. The achenes are small, curved, finely five-ribbed on the inner surface, brownish, without pappus, but with a slightly elevated margin at the apex. German chamomile-flowers have a peculiar aromatic odour and a bitterish aromatic taste. They are easily distinguished from allied composite plants by their smooth, conical, and hollow disks, which shrink very considerably on drying.

Chemical composition.--German chamomile-flowers contain about $\frac{1}{2}$ per cent. of volatile oil, some bitter extractive, malates, tannates, and a little tannin, besides the principles common to vegetables. Pattone's anthemic acid, isolated (1859) from Anthemis arvensis, Linn., was obtained by Werner (1867) from

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the officinal flowers by exhausting them with hot water acidulated with acetic acid, concentrating, precipitating with alcohol, evaporating the filtrate, and treating with chloroform. It is described as colourless silky needles having an agreeable odour of chamomile, a strongly bitter taste, and dissolving in water, alcohol, ether and chloroform. The precipitate obtained with alcohol is stated to contain a tasteless crystalline principle, *anthemidin*, which is insoluble in alcohol, ether, and chloroform, but soluble in acetic acid.

The volatile oil is a dark blue, in thin layers transparent thickish liquid, which gradually turns green and brown-when exposed to light and air, and more rapidly if obtained from dried flowers; it has a strong odour of the flowers and a warm aromatic taste; dissolves in about 8 parts of 80 per cent alcohol, has the specific gravity 0.93, and seems to consist of a terpene, $C^{10}H^{16}$, associated with $C^{10}H^{18}O$. The volatile oil becomes dark-brown, or green with strong or diluted nitric acid, and deep red-brown with sulphuric acid. The blue colour is due to the presence of a volatile principle which was named *azulene* by Piesse and *carulein* by Gladstone (1863), and which according to both investigators, is present in all other volatile oils having a blue or green colour—in the latter associated with a vellow principle. (Stillé and Maisch.)

Chrysanthemum coronarium, Linn., Lam., Ill. t. 678, f. 6, a native of the Mediterranean region, is commonly cultivated in Indian gardens, and is a favourite flower with both Hindus and Mahometans. It blossoms in the cold season, and there are two distinct varieties, one with large flowers, and another with small. The flowers are of various colours, and when dried impress a peculiar pricking sensation on the tongue like pyrethrum. Dalzell and Gibson (Bombay Flora ii., 48,) state that they are a tolerable substitute for chamomile. According to Dr. Walker (Bombay Med. and Phys. Trans., 1840, p 71,) the people of the Deccan administer the plant in conjunction with black pepper as a remedy for gonorrhea. The sernacular names are, Gul-dáúdi (Hind., Beng., Guz.) Shaman-

tippu (Tam.), Chemanti (Tel.), Jevanti-puva (Mal.), Shyavantigehuvu (Can.), Shevanti-cha-phula (Mar.).

Centipeda orbicularis, Lour., Wight Ic. 1610, a native of the plains of India and Ceylon, is used as a mechanical sternutatory by the natives; it is administered to relieve headache and colds in the head like Artemisia Ptarmica, Linn., the successwort of the English. In Sanskrit it is called Chikkana or Chhikika, which is equivalent to sneezewort, and the vernacular names have a similar meaning. According to Roxburgh this plant appears during the latter part of the cold season, on cultivated land. The whole plant does not cover a space more than about 6 to 8 inches in diameter. The root is simple, the stems several, branchy, pressing on the earth ; all are somewhat woolly; leaves numerous, sessile, wedgeshaped, deeply dentate, villous; flowers axillary or in the divisions of the branches, solitary, sessile, sub-globular, hermaphrodite, florets from 10 to 12 in the centre with the border 4-toothed, coloured and expanding; the female ones very numerous in the circumference, most minute, with the border seemingly 3-toothed, and the toothlets incurved. Receptacle naked.

ANACYCLUS PYRETHRUM, DO.

Fig.—Woodville, t. 20; Reich. Ic. Fl. Germ. t. 999; Bentt. and Trim. t. 151. Spanish Pellitory (Eng.), Salivaire d'Espagne (Fr.).

Hab .- North Africa. The root.

Vernacular.—Ákarkara, Akalkara (Hind, Beng., Mar.), Akkirakaram (Tam.), Ákala-karra (Tel.), Akkikaruka (Mal.), Ákalakari (Can.), Akarkaro (Guz.).

History, Uses, &c.—Pellitory root, in Sanskrit Akarákarabha, is only mentioned by the later writers, such as Sarangadhara and the author of the *Bhavaprakasa*, who have doubtless derived their knowledge of its properties from the Mahometaus, who in their turn closely follow the Greeks



The only difficulty is that #voetpop is described by Dioscorides as an umbelliferous plant; but with the properties of pellitory; here the author of the Makhzan comes to our aid and tells us that the pyrethrum of Dioscorides resembling anethum is a drug which the Arabs call Ud-el-karih-jibbali, very common in Syria; it is found at the upper part of Wady Pardah, and, he says, I have seen its fruit; it has a root about a span in length, as thick as the finger, and has many of the properties of pyrethrum. He also quotes Antaki* as mentioning two kinds of pyrethrum, viz., Western, or the kind described by Ibn Baitar, and Syrian called Ud-el-karih, which is the root of the mountain Tarkhún and the kind described by Dioscorides (Smyrnium cordifolium, Boiss.). We also learn from the Makhzan that det is an Arabic form of ithe name of a plant common in Persia, especially in Fars and about Shiraz; it is eaten like cress and other herbs with bread and cheese. There are two kinds, wild and cultivated; it is propagated by seed and by cuttings, and has a hot, astringent and sweetish taste ; if taken fasting it benumbs the tongue; on this account it is chewed to cover the taste of nauseous medicines. The taste is likened to that of the leaves of the Woodapple (Feronia elephantum). The root of the wild plant is called Akarkarha. Ainslie, speaking of Pellitory root, says :- " This root is to be found in most of the Indian bazars ; though I cannot learn that the plant grows in any part of India. It is a native of Arabia, Syria, Calabria, Crete, and Bohemia,+ and it is, no doubt, from the firstmentioned of these countries that it is brought to Hindustan, an export from Mocha. I am much inclined to think that it is the root we find noticed by Forskahl in his Materica Medica Khairina under the name of Ud-el-karih. With regard to its Asiatic names, there is this peculiarity, that its Arabic, Persian

* Sheik Dawood of Antioch, his work is in Arabic, and has been printed at Beyrout.

t The plant alluded to by Ainslie as growing in these localities must be Anacyclus afficinarum, Hayne, or German Pellitory. It is certainly not the Pellitory imported into India, being much smaller.



and Dakhanie appellations are nearly the same. The pungency of the pellitory root is not perceived till it has been chewed for a few seconds, when it occasions at first a glowing beat in the mouth soon followed by pricking sensation in the tongue and lips. The Vytians prescribe an infusion of it, in conjunction with the lesser galangal and ginger, as a cordial and stimulant in lethargic cases, in palsy, and in certain stages of typhus fever; they also order it to be chewed, as a masticatory, for the toothache. It ' certainly possesses powerful stimulant properties, but is scarcely ever employed in Europe as an internal remedy ; though it has been found useful as a sialagogue, and as such, Dr. Thomson says, has been given with success in some kinds of headache, apoplexy, chronic ophthalmia, and rheumatic affections of the face." (Mat. Ind. I., 300.) Mahometan writers consider pellitory to be discutient and attenuant; they prescribe it, chiefly in paralytic affections, which they suppose to be caused by phlegmatic humours. The Arabic name Akarkarha* is said to be derived from Akar and takrih, and to mean 'causing a sore.' Celsus mentions its use for opening the mouths of wounds. (Lib. v., cap. iv.) The Arabian physicians in the days of Avicenna prescribed pellitory in rigors. In India it is often given to parrots to make them talk.

Description.—The root as found in the shops is simple, 3 to 4 inches long by § to § of an inch thick, cylindrical or tapering, sometimes terminated at the top by the bristly remains of leaves, and having only a few hair-like rootlets. It has a brown, rough, shrivelled-surface, is compact and brittle, the fractured surface being radiate and destitute of pith. The bark, at most 1-25th of an inch thick, adheres closely to the wood, a narrow zone of cambium intervening The woody column is traversed by large medullary rays in which, as in the barks, numerous dark resin-ducts are scattered. The root has a slight aromatic smell, and a persistent, pungent taste, excit-

* It is also said by some to be a Coptic word, and by others supposed to be of Indian origin.

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ing a singular tingling sensation, and a remarkable flow of saliva. The drug is very liable to the attacks of insects.

Microscopic structure.—The cortical part of this root is remarkable on account of its suberous layer, which is partly made up of selerenchyme (thick-walled cells). Balsam-ducts (oil cells) occur as well in the middle cortical layer as in the medullary rays. Most of the parenchymatons cells are loaded with inulin; pellitory, in fact, is one of those roots most abounding in that substance.

Chemical composition .- Pellitory was first analysed by Parisel, who gave the name Pyrethrin to a soft resin soluble in alcohol and ether. Koene subsequently found in the root a resin, brown acrid oil, vellow oil, inulin, gum, salts and a trace of tannin. The two oils and resin together were said to constitute the pyrethrin of Parisel, and the active principle has consequently been regarded as a mixed substance. C. J. S. Thompson (Pharm. Journ. [3], xvii. 567,) finds the active principle to be an acrid resinous substance, residing mostly in the cortical portion, and occurring to the extent of 5 per cent in good samples of root. A very minute quantity placed on the tongue causes a strong burning sensation, which shortly increases, and remains for a considerable time, inducing a copious flow of saliva. A strong solution painted on the skin causes a sharp prickling sensation, and reddens the part where it has been applied. If the part is kept covered a blister will be produced. Besides being soluble in alcohol and ether, it dissolves in oils and acetic acid. It is composed of an acrid, brown resinous substance soluble in alcohol, but insoluble in water and strong alkaline solutions; and a dark yellow oil which is soluble in alkalies. The acridity of the oil is probably due to a small quantity of resin mixed with it.

R. Buchheim has recently claimed to have found the active principle to be a crystalline alkaloid, *Pyrethrine*, which he obtained by evaporating to dryness an alcoholic extract and exhausting the residue with ether. Pyrethrine melts at the heat of the body, and is resolved by alcoholic potash into piperidine and pyrethric acid. (*Arch. f. Experim. Path. 5.*, p. 458.)

Commerce.—The root is collected chiefly in Algeria, and is exported from Oran, and to a smaller extent from Algiers. But from information obtained by Flückiger and Hanbury from Colonel Playfair, British Consul-General for Algeria, and from Mr. Wood, British Consul at Tunis, it appears that the greater part is shipped from Tanis to Leghorn and Egypt. Mr. Wood was informed that the drug is imported from the frontier town of Tebessa in Algeria into the regency of Tanis, to the extent of 500 cantars (50,000 lbs.) per annum. Bombay imported in the year 1371-72, 740 cwts. of this drug, of which more than half was re-shipped to other ports of India. (*Pharmacographia.*) Pellitory root is valued in Bombay at about Rs. 24 per maund of $37\frac{1}{2}$ lbs. The quantity imported hardly varies from year to year.

TANACETUM UMBELLIFERUM, Boiss.

Syn.—Pyrethrum umbelliferum, Boiss. Fl. Or. i., p. 352. Hab.—Eastern Persia. The root. Vernacular.—Mitha-akarkara, Bozidán (Indian Bazars).

History, Uses, &c.—This plant was found by Aitchison in the Badghis and Harirud valley. The roots are collected and sold in India as "Mitha-akarkara," "Sweet Pellitory," and are used by the Mahometan physicians as Bozidán. The latter name, as we have already mentioned (Vol. ñ., p. 137), is of Persian origin, and is applied like Shakákul to several stimulating and nutritions roots mostly used by women for improving their embonpoint. The hakims consider it to be aphrodisiac, tonic, deobstruent, useful in rheumatism and gout, and in enlargement of the liver and spleen. They also state that it has abortifacient and anthelmintic properties.

Description.--Root 6 to 10 inches long, closely resembling that of pellitory in appearance, tapering, somewhat twisted. It has a brown, rough, shrivelled surface, is compact, and breaks with a short fracture, showing a radiate surface and small central pith. The bark adheres closely to the wood.

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The drug has the faint aromatic odour of pellitory, but is almost free from pungency.

Chemical composition .- A proximate analysis of the powdered root separated, ether extract 1-0, alcoholic extract 8.6, water extract 25.1, crude fibre 56.9, and ash 6.8 parts in one hundred. The ether extract, having a distinct odour of chaulmoogra oil, was evaporated to dryness and digested in rectified spirit for several months; this separated a whitish insoluble granular fatty substance, and a light reddisk brown liquid. The insoluble portion examined under a microscope was seen to consist of radiating crystalline tufts of wax, tasteless, and neutral in reaction, dissolving to some extent in boiling alcohol and solidifying in the cold; soluble in petroleum ether; it softened a little above 70°; at the temperature of boiling water it melted to a brown liquid, and with a sufficient heat, it burnt away on platinum foil with a smoky flame. The soluble portion of the ether extract was evaporated, and the fatty residue was acid in reaction, and produced a numbing sensation on the tongue and at the same time caused a flow of saliva. Petroleum ether removed a fatty acid from this residue and left a soft brown resin. This resin had the characters of pyrethrin. Besides its action on the tougue, it was soluble in ether, proof spirit, chloroform and bisulphide of carbon and insoluble in caustic and carbonated alkalies. Nitric acid decomposed it with evolution of gas. Sulphuric acid dissolved it with a red-brown colour and the mixture developed an odour of butyric acid.

The alcoholic extract of the root contained an organic acid, some saccharine matter reducing Fehling's test, but no alkaloid. The acid was deepened in colour with ferric chloride, gave an orange precipitate with plumbic acetate, but produced no deposit in solution of gelatine.

The water extract contained 15 per cent. of a carbohydrate forming a pulverulent precipitate with three volumes of alcohol.

Sweet Pellitory thus contains very little pyrethrin compared with the amount found in the Pellitory of Spain, and less inulin.



It is more woody, and its name probably refers not so much to the amount of sugar it contains as to the small quantity of acrid and pungent principle.

SPILANTHES ACMELLA, Dinn.

Fig.-Wight Ic., t. 1109. Para Cress (Eng.), Cresson der Para (Fr.).

Hab.-Throughout India. The flower heads.

Vernacular.—Pipulka (Mar.), Vana mugali (Can.). It bears the same names as Pyrethri Radix in the vernaculars.

History, Uses, &c .- Four forms of this plant are noticed in the Flora of British India,-S. proper, S. calva, S. oleracea, and S. paniculata. Of these S. oleracea, Jacq. Hort. Vind ii., t. 135, is a cultivated form common in Indian gardens. and S. paniculata is also, in the opinion of Sir J. D. Hooker, a form produced by cultivation. The cultivated forms are chiefly remarkable for their more robust and succulent habit, and in S. oleracea for larger and more highly-coloured flower heads : the latter plant is the true Cresson de Para, and is supposed to have been introduced into India from Brazil by the Portuguese. The flower heads of these plants are by far the most pungent part, and are chewed by the natives to relieve toothache, which they do by producing redness of the gums and salivation. Dr. W. Farquhar has used and recommended a tincture of the flower heads for toothache in place of tincture of pyrethrum. He says it is a specific for inflammation of the periosteum of the jaws. A bit of lint dipped in the tincture and laid on the gums repeated 3 or 4 times a day has a speedy effect in reducing the pain and swelling. Graham, on the authority of Dr Lush, states that S. oleracea is cultivated in the Deccan as a pot-herb, and the same fact was observed by Dr. Mason in Burma. S. Acmella proper has been sent to us from the Western Ghauts under the Marathi name of Pipulka as a fish poison in general use on those hills.

DORI



Description.—Small annual plants with round, smooth, aucculent, branching stems; leaves opposite, petioled, subcordiform, subdentate. The flower heads are solitary at the end of pedicels longer than the leaves, of a conical form, and in *S. oleracea* as large as an acorn; they are entirely composed of yellow or brownish yellow hermaphrodite tubular flowers. The achenes are compressed with ciliated margins, and are surmounted, except in *S. calva*, by two naked awns. The whole plant is pungent to the taste, but the flower heads are especially so, having a hot burning taste which causes profuse salivation.

Chemical composition .- Gerrard has analysed this plant with the result that the active principle is an oleo-resin with powerfully sialagogue properties. (Pharm. Journ. March 8, 1884, p. 717.) R. Buchheim has found in the herb the crystalline alkaloid obtained by him in Pellitory root (see article Anacylus Purethrum). We have made a full examination of the flower heads of Spilanthes calva, which are used as a substitute for pellitory in some parts of India, and we find them to contain the following constituents : a resin, fixed oil, yellow colouring matter, astringent organic acid, glucose, extractive with the odour and taste of malt and 7.6 per cent of mineral matter. The resin had the reactions possessed by pyrethrin in being soluble in ether, alcohol and proof spirit, insoluble in alkalies and destroyed by oxidizing agents. In these respects it resembles the pungent principle of plants found in the Zinziberacea. We were unable to obtain it in a crystalline condition.' The flower heads distilled with water afforded a distillate free from pungency, and the contents of the retort after boiling were likewise inert. The active principle is unstable in constitution and decomposed by heat.

ARTEMISIA. VULGARIS, Linn. var. indica.

Fig.-Wight Ic., t. 1112; Rheede Hort. Mal. c., t. 45. Wormwood (Eng.), Armoise, Herbe de Saint-Jean (Fr.).

Hab.— Throughout the mountainous districts of India. The herb.


Vernacular.—Nágdoun, Mastáru (Hind.), Nágdoni (Beng.), Surband, vulg. Surpan (Mar.), Máchipatri (Tel.), Máchipattiri (Tam.), Tiru-nitripacheha (Mal.), Uruvaln, Urigattige (Can.), Nágadavano (Guz.).

History, Uses, &c .- There appears to be a difference of opinion as to the Sanskrit name of this plant. In Northern India and Bengal it is identified with the Nágadamani of the Nighantas, a plant which is described as a tonic and counteracting the poison of spiders and snakes. In the Deccan and Western India the Sanskrit name is said to be Indhana, although the local version of the Raja-nighanta gives Nagdavana as the Marathi equivalent of Nágadamani, a name generally applied in that language to Crinum asiatisum. According to Moodin Sheriff, the Sanskrit name in Southern India is Granthiparni. These names are not synonymous, and as the plant is common in all parts of the country, this discrepancy would seem to indicate that its mention by the older Sanskrit writers is very doubtful. The modern Hindus consider wormwood to be a valuable stomachic, deobstruent and antispasmodic, and prescribe it in infusion and electuary in cases of obstructed menses and hysteria. A. vulgaris is generally considered to be the Artemisia of the Greeks, a name generally derived from the lunar goddess Artemis, who is supposed to have been the discoverer of its virtnes, but Pliny says :---"Sunt qui Artemisiam ab Artemide Ilithya cognominatam putent, quoniam privatim medeatur fæminarum malis."

Macer Floridus in his treatise, De viribus herbarum, calls wormwood herbarum matrem, and attributes to it emmenagogue, antilithic and alexipharmic properties; he also says that it assists parturition and prevents abortion. Apuleius De virtutibus herbarum states that a person carrying wormwood will be preserved from fatigue, hidden demons and the evil eye. "Tres artemisias," says he again, "Diana dicitur invenisse et virtutes earum et medicinam Chironi centauro tradidisse, qui primus de his herbis medicinam instituit." There is a popular superstition at Bologna that wormwood will indicate the ter-



mination of a disease; a bunch of the leaves is surreptitionsly placed under the sick person's pillow, if, after this he sleeps, he will soon get well; if not, he will die. (*Ds Gubernatis.*)

A. vulgaris is probably one of the kinds of Afsantin $(a\psi_{i\nu\theta_i\alpha\nu})$ described by Mahometan physicians, but owing to the want of a sufficient description of these drugs, it is impossible to identify it. Dr. Wight (Ill. *ii*, 92,) notices its use in nervous and spasmodic affections, and Dr. J. L. Stewart speaks of an infusion as a good mild stomachic tonic.

Artemisia Sieversiana, Willd., is one of the kinds of Afsantin sold in Indian bazars. It is imported from Persia, and has for many years been cultivated at Bandora, in the neighbourhood of Bombay, for the sake of the fresh herb, which is always obtainable in the market, and is much valued by the natives. The cultivation appears to have been in the hands of a few Christian families for several generations; they also cultivate Sweet Marjoram. The two plants are called Azarona and Mazarona by the native Christians, and were no doubt introduced into the country by the Portuguese. Medicinally it is esteemed as a tonic, deobstruent, febrifuge, and anthelmintic, and it is applied externally as a discutient and antiseptic. The hakims prescribe it in hypochondriasis, jaundice, dropsy, gout, scurvy, &c. ; also as an emmenagogue, and in hysterical affections.

Description.—A vulgaris is erect, suffruticose; leaves ashy and tomentose beneath, lower pinnatifid, upper trifid, uppermost undivided or with lanceolate lobes; lobes of the lower leaves toothed or, out; heads of flowers racemose-panicled, ovate; panicle leafy, spreading, partial racemes pendulous before flowering, young involucre a little tomentose, at length glabrous; exterior scales foliaceous, acute, interior membranaceous, obtuse; corol naked. (Roxb. Fl. Ind. iii., 419.)

A. Sieversiana is annual or biennial, hoary-pubescent, stem erect, angled and ribbed, simple or paniculately branched above; leaves mostly petioled, broadly ovate, 2-pinnatisect, segments obtuse and obscurely lobed, hoary on both surfaces, heads ‡ to

nearly $\frac{1}{2}$ inch in diameter, broadly hemispheric, pedicelled, secund, nodding, distant, in lax, long racemes terminating the branches, outer involucre bracts green heavy, inner broadly scarious, receptacular hairs long, straight. (Fl. Br. Ind.)

Chemical composition. - The Wormwoods contain absinthate of potash, a bitter substance, and a green volatile oil having a camphoraceous odour. Absinthin (C16H22O5), the bitter principle is prepared, according to Luck, by exhausting the leaves with alcohol, evaporating to the consistence of a syrap, and agitating with ether. This ethereal solution is evaporated to dryness, and the residue treated with water containing a little ammonia, which dissolves the resin, and leaves the absinthin nearly pure. To complete the purification it is digested with weak hydrochloric acid, washed with water, dissolved in alcohol, and treated with acetate of lead, as long as a precipitate is formed. After the removal of this precipitate by filtration, the excess of lead is precipitated by sulphuretted hydrogen, and the solution is evaporated. The absinthin then remains as a hard confusedly crystalline mass, possessing an extremely bitter taste. It is but slightly soluble in water, very soluble in alcohol, and less so in other. It possesses distinctly acid characters, and is dissolved by potash and ammonia. The Sal Absinthicum of the old Pharmacopicias was nothing more than carbonate of potash obtained by incineration of the plant. Absinthol, C10H16O, isomeric with ordinary camphor, is the essential constituent of Wormwood oil, in which it is associated with a terpene, boiling below 160°, and a deep blue oil which boils between 270° and 300°, and agrees in its properties with the blue chamomile oil examined by Kachler. Absinthol boils at 195° (Beilstein and Kupffer); at 200-205° (Alder Wright); 217° (Gladstone). It differs essentially from camphor in its chamical reactions, not being converted into camphoric acid by oxidation with nitric acid, or into camphocarboxylic acid by the action of sodium and carbonic anhydride, and vielding when fused with potash, a large quantity of resin, but no acid. Heated with phosphorus pentasulphide, it yields a considerable quantity of cymene, C10H14, identical with ordinary cymene

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from camphor or from cumin oil in density and the properties of the sulphonic acid derived from it. (Alder Wright.) Cymene is also formed, though in smaller quantity, by treating absinthol with zinc chloride.

Commerce.—Afsantin is imported from Persia; the entire plant is found in the bales, and owing to its toughness, is seldom much broken.

Value.--Rs. 5 to Rs. 7 per Surat maund of 37½ lbs. Artemisia vulgaris is not an article of commerce.

ARTEMISIA MARITIMA, Linn.

Fig — Bentl. and Trim., t. 157. Wormseed (Eng.), Semencine, Barbotine (Fr.).

Hab .- Northern Asia. The flower heads.

Vernacular.--Kirmáni-ajamo (Guz.), Kirmáni-ova (Mar.), Shih (Arab.), Kirmálá (Hind.).

History, Uses, &c .- The Sanskrit name of this plant is said by some to be Gadadhara, but it appears in the Nighantas under the name of Javániya "Grecian," with the Hindi synonym Kirmálá, evidently a corruption of Kirmán, the name of the province in Persia from which it is imported into India; it is described as a vermicide. A. maritima is the σερίφον and avivelov Callargiar of Dioscorides, and was used by the Greeks and Romans to expel intestinal worms. It was probably first known in Egypt, as Pliny states that those initiated in the mysteries of Isis used to carry a branch of it in their hands. Arabian and Persian physicians describe wormseed under the name of Shih, givign as synonyms, Sarifún and Afsantin-el-bahr; it is prescribed in doses of 2 to 3 dirhems as an anthelmintic, and also as a deobstruent and stomachic tonic. In the form of a poultice they use it to relieve the pain caused by the bites of scorpions and other venomous reptiles. The Persian name is Darmanah. The wormseed of the Indian market has been examined by Hanbury, who considers that it does not materially differ from the Russian drug, but is slightly shaggy and mixed with



tomentose stalks. He states that a specimen of Artemisia, No. 3201, Herb. Griffith, Afghanistan, in the Kew Herbarium, has capitules precisely agreeing with the Bombay drug.

Santonin is now well known to the natives of India, and is largely imported from Germany. It is generally considered to act as a poison upon ascarides, but according to Dr. von Schreder (Arch. f. exp. Path., xix., 290) this is not the case. He states that the santonin does not kill these worms, but its presence being distasteful to them, causes them to leave their resting place and wander into the large intestine, from which they can then be removed by a purgative. This should determine the time for giving a purgative, and Dr. von Schreeder thinks it should either be given with the santonin, or else some hours after. We have obtained very good results by giving half the dose at bed-time, and the remaining half next morning with a dose of castor-oil.

Description .- The drug consists almost exclusively of unopened flower heads or capitules, which are so minute that it requires about 90 to make up the weight of one grain. In inferior samples, there is an admixture of stalks, and portions of a small pinnate leaf. The flower heads are of an elliptic or oblong form, about 1-10th of an inch long, greenish yellow when new, brown if long kept; they grow singly, less frequently in pairs, on short stalks, and are formed of about 18 oblong, obtuse, concave scales, closely imbricated. This involucre is much narrowed at the base in consequence of the lowermost scales being considerably shorter than the rest. The capitule is sometimes associated with a few of the upper leaves of the stem, which are short, narrow, and simple. Notwithstanding its compactness, the capitule is somewhat ridged and angular from the involucral scales having a strong central nerve or keel. The middle portion of each scale is covered with minute vellow, sessile glands, which are wanting on the transparent scarious edge. The latter is marked with extremely fine strize, and is quite glabrous: in the young state and in the Bombay variety of the drug, the keel bears a few woolly colourless



1 Sala

hairs. The florets number from 3 to 5; they have in the bud an ovoid corolla, glandular in its lower portion, a little longer than the ovary, which is destitute of pappus. Mahometan writers name several varieties of wormseed, but do not describe them with any minuteness. It would seem then that we must be prepared to meet with slight differences in packages of the commercial article, but in any case the drug should have a powerful and agreeable odonr resembling cajuput oil and camphor, and a bitter aromatic taste.

Chemical composition.—Wormseed yields from 1 to 2 per cent. of essential oil, having its, characteristic smell and taste. The oil is slightly levogyrate, and chiefly consists of the liquid $C^{10}H^{16}O$, accompanied by a small amount of hydrocarbon. The former has the odour of the drug, yet rather more agreeable; sp. gr. 0.913 at 20° C. It boils without decomposition at 173° to 174°, but in presence of P²O⁵ or P²S⁵ abundantly yields cymol. The latter had already been observed by Völckel (1854) under the name of cynene or cinene, yet he assigned to it the formula $C^{12}H^9$; Hirzel (1854) called it cinæbene. The water which distils over carries with it volatile acids of the fatty series, also angelic acid.

The substance to which the remarkable action of wormseed on the human body is due, is Santouin, $C^{15}H^{13}O^3$. It was discovered in 1330 by Kahler, an apothecary of Düsseldorf, who gave a very brief notice of it in the Archiv. der Pharmacie (xxxiv., 318). Immediately afterwards, Augustus Alms, a druggist's assistant at Penzlin, in the Grand Duchy of Mecktenburg-Schwerin; knowing nothing of Kahler's discovery, obtained the same substance, and named it Santonin. Alms recommended it to the medical professon, pointing out that it is the anthelmintic principle of wormseed. Santonin constitutes from 1½ to 2 per cent. of the drug, but appears to diminish in quantity very considerably as the flowers open. It is easily extracted by milk of time, for though not an acid, and but sparingly soluble in water even at a boiling heat, it is capable of combining with bases. With lime it forms santoninate of



calcium, which is readily soluble in water. On addition of hydrochloric acid, santoninic acid, C¹³H²⁰O⁴, separates, but parts with OH², Santonin being thus immediately reproduced.

Santonin forms crystals of the orthorhombic system melting at 170°, which are inodorous, but have a bitter taste, especially when dissolved in chloroform or alcohol. They are colourless, but when exposed to daylight, or to the blue or violet rays, but not to the other colours of the spectrum, they assume a vellow hue, and split into irregular fragments. This change, which takes place even under water, alcohol or either, is not accompanied by any chemical alteration. This behaviour of Santonin, when exposed to light, resembles that of erythrocentaurin, C²⁷H²³O⁸. The latter has been obtained by means of ether, from the alcoholic extract of Erythraa Centaurium, and of some other plants of the Gentianacea. Mehuhas shown that the colourless crystals of that substance, when exposed to sunlight, assume a brilliant red colour, without undergoing any chemical alteration. The colourless solutions of this body in chloroform or alcohol yield the original substance. Yet as to Santonin, Sestini and Cannizzaro (1876) have shown that its dilute alcoholic solution, on long exposure to sunlight, affords a compound ether of photo-santonic acid, namely, C¹⁵H¹³O⁴ (C2H5)2.

Wormseed contains in addition to the two bodies just described, resin, sugar, waxy fat, salts of calcium and potassium, and malic acid; when carefully selected and dried, it yielded us 65 per cent. of ash, rich in silica. (*Pharmacographia*, 2nd *Ed.*, p 389.) Wormseed oil has been investigated (1884) by Messrs. Hell, Sturcke and Ritter, and Messrs. Wallach and Brass. The latter authors confirm the statements of previous observers that the principal constituent of *oleum cince* is a compound having the composition C¹⁰H¹⁸O, which, as being an isomer of Borneol, they propose to call '*Cyneol*'; and that this is accompanied by a certain quantity of hydrocarbons with a similar boiling point. But they have also met with another compound richer in oxygen, and having a higher boiling point. Pure cyneol is a liquid having a characteristic but not dis-

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agreeable camphor-like odour boiling at 176° to 177° C., and having a specific gravity of 0.92297 at 16° C. It is optically inactive, though the rectified oil from which it is obtained has been found to have a rotation to the left of 2°.9, due to other constituents boiling at higher temperatures. Oxidised by boiling with nitric acid, cyneol yielded besides the lower fatty acids essentially oxalic acid, but no acid of the aromatic series; while the hydrocarbons (C¹⁰H¹⁶ and C¹⁰H¹⁴) accompanying it in the oil yielded upon oxidation always more or less tolaylic or terephthalic acid. Cyneol by treatment with gaseous hydrochloric acid is converted into a hydrocarbon (C¹⁰H¹⁶), to which the name 'Cynen' has been given.

Commerce.—Wormseed is brought to India from Afghanistan and Persia in considerable quantities. Value, Rs. $2\frac{1}{2}$ to Rs. 3 per Surat maund of $37\frac{1}{2}$ lbs. Santonin is now largely imported into India; much of that sold in the bazar is adulterated to the extent of three-fourths of its weight with various substances, amongst which gam and boracic acid have been noticed. An easy test is to expose it to sunlight, which turns the santonin yellow.

DORONICUM PARDALIANCHES, Linn.

Fig.-Jacq. Austr., t. 350, Leopard'a bane (Eng.), Doronic (Fr.).

Hab .- Europe, Syria. The rhizome.

Vernacular .--- Darúnaj-i-akrabi (Pers., Ind. bazars).

History, Uses, &c.—D. pardalianches, according to Sibthorp, is called $\sigma coperide$ in modern Greek. He identifies it with the accorder of Dioscorides (iv., 75), which that writer describes as having a root like the tail of a scorpion and white like alabaster. Theophrastus (vi. 3. ix. 14) calls it $\theta \eta \lambda \dot{\phi} \phi \sigma v \sigma$ and $\sigma coperios$ and Pliny (25; 75) Thelyphonon and Scorpio. The author of the Makhzan-el-Adwaya states that Daránaj is a scorpioid knotted root with a greyish exterior and white interior, that it is hard, faintly bitter and aromatic. He de-



seribes the plant as having fleshy yellowish leaves of the shape of those of the almond, which lie flat upon the ground. The flower stem he says is hollow; it rises from the midst of the leaves to a height of two spans, and bears from 5 to 7 scattered leaves, thinner and longer than the lower leaves. The flower is yellow and hollow. The plant grows in Andalusia and the mountainous parts of Syria, especially about Mount Yabrúrat, where it goes by the name of Akrabi. There are two varieties of the drug, Persian and Turkish; the latter is most esteemed. With regard to its medicinal properties, he says that it is a resolvent of phlegm, adust bile, and flatulencies, cardiacal and tonic, useful in nervous depression, melancholy, and impaired digestion, also in pain of the womb, and flatulent dyspepsia.

Besides this it is prescribed for persons who have been bitten by scorpions and other venomous reptiles, and is hung up in houses to keep away the plague; pregnant women wear it round the waist suspended by a silken thread which must be made by the wearer; it is supposed to act as a charm, protecting the foctus and procuring a painless delivery. Hung up over the bed it prevents night terrors and ensures pleasant dreams. There would appear to be a demand for it in India, as it is kept by all Mahometan druggists.

Description.—Rhizomes scorpioid, occasionally branched, flat, jointed, of a white colour, 3 to 4 inches long, $\frac{1}{2}$ to $\frac{3}{4}$ inch broad, and about 2-10th of an inch thick. Upper surface scaly, under surface marked by scars of numerous rootlets, a few of which sometimes remain attached; substance brittle and horny, yellowish white, central portion somewhat spongy, odourless. Taste at first insipid, but after a few minutes a sensation of warmth and pricking is felt upon the tongue.

Microscopic structure.—Sections show that the bulk of the rhizome consists of a parenchyme, each cell of which is occupied by a mass having a granular appearance inactive in polarized light; towards. the circumference, the cells become gradually smaller, and upon the surface become scaly, forming a greyish epidermis. The cells are coloured black with



fodine with purplish centres, such as starch and dextrin would exhibit. After immersion in glycerine and alcohol, the section showed no sphæroidal crystals of inulin, but ceased to give the purplish-black colour. The vascular bundles are of a bright yellow colour, and consist of spiral vessels; they form one irregular ring round the rhizome about midway between the circumference and centre.

Chemical composition .- A decoction of the powdered rhizome gave a blue or violet black colour with iodine, but was not affected by iron salts. Water extracted 15.6 per cent. of soluble substances, consisting of 6.2 per cent. of glucose, estimated by standard potassio-cupric tartrate, and a quantity of mucilage. The mare was then boiled for two hours with hydrochloric acid (1 per cent.), an operation which rendered soluble over 60 per cent, of the drug, while 25 parts of this was glucese. Some fresh powder yielded to rectified spirit 6.75 of extract, which, with the exception of a little fatty matter, was soluble in water. This solution was sweet to the taste, abundantly reduced Fehling's solution, and was negative towards alkaloidal tests. Evaporated to dryness it was amorphons, and when heated, gave off the odour of burnt sugar. The ash was 3.3 per cent. The analysis of the drug shows it to be nutritive rather than medicinally active.

TUSSILAGO FARFARA, Linn.

Fig.—Eng. Bot. vi. i. 429; Woodville t. 13. Colt's foot (Eng.), Pas d'ane, Taconnet, Herbe de Saint Quirin (Fr.).

Hab.--Western Himalaya; Persia; Europe. - The herb. Vernacular.--Fanjiun (Arab., Ind. Bazars); Wátpán (Hind.).

History, Uses, &c. —This plant is the Bhx100 of the Greeks and the Tussilago and Farfarus of the Romans. From the earliest times it has been esteemed useful in coughs and other pectoral affections. Hippocrates recommends the root with honey in ulcerations of the lungs. Dioscorides, Pliny, and Galen • relate that the smoke of the leaves, received into the mouth



through a funnel or reed, is efficacious in coughs and dyspepsia. The Greek and Linnean names are derived respectively from she and tussis which both signify "cough." Most of the Arabian and Persian medical writers describe the herb under the name of Fanjiun, or Afanjiun, an Arab corruption of anoyéov, a word which, as far as we know, was never applied by the Greeks to any plant. All these writers closely follow Dioscorides in their accounts of its appearance and properties. The Hindus consider that the leaves have the power of expelling vata or wind, which is supposed to be the cause of various disorders, especially rheumatism; whence the name Vátapána or Watpan (windleaf); they also use the cotton-like down of the leaf as a styptic. In Europe, colt's-foot is still officinal in France and Germany, and has a reputation in pectoral affections as a domestic remedy in England. It is smoked like tobacco and also administered internally in the form of a decoction or infusion. The flowers are one of the quatre fleurs of French pharmacy.

Description.—Root mucilaginous, bitterish, creeping horizontally, with many fibres. Flowers coming before the leaves (whence the old name *Filius ante patrem*), drooping in the bud, bright yellow, about an inch broad; their rays spreading, copious, very narrow; each flower on a simple, round, woolly, radical stalk, scaly with numerous reddish, smooth, scattered bracts, crowded under the flower, like an exterior calyx. Leaves erect, on furrowed, channelled foot stalks, heart-shaped, slightly lobed, copiously and sharply toothed; very smooth, and of a slightly glaucous green above, white and densely cottony, with prominent veins beneath; when young they are revolute, and thickly enveloped in cottony down. (*Smith.*)

Chemical composition.—An analysis of the leaves of this plant has been made by C. S. Bondurant. A petroleum spirit extract contained caoutchone, resin and wax. Ether removed a bitter, colourless glucoside, and a reddish brown resin. Absolute alcohol separated 2.42 per cent. of tannic matter, and probably a little gallic acid; the extract was free from alkaloids. Water dissolved from the residue 3.42 per cent. of



gum, and 6.23 per cent. of dextrin and allied carbohydrates, and the alcoholic filtrate from these yielded saponin. Albuminous matter, oxalate of calcium, lignin and cellulose were determined, and the total ash was 17 I per cent. (*Phar. Jour.* [3] xviii. 77.)

SAUSSUREA LAPPA, Clarke.

Fig.-Dene. in Jacq. Voy. Bot., t. 104. Arabian Costus.

Hab.-Cashmere. The root.

Vernacular.-Kut (Hind.), Páchak (Beng.), Upalét (Guz.), Kushta (Mar.), Koshta (Can.), Goshtam (Tam.), Goshtamu (Tel.).

History, Uses, &c .- Sanskrit writers on Materia Medica mention a fabulous root under the name of Pushkaramula, "Lotus root," and ascribe to it properties similar to those of Costus. Among many other synonyms it bears the name Kashmira, "coming from Cashmere." We think there can be little doubt that this root, which is not now obtainable, and is described in the Nighantas as hot, bitter and pungent, and useful in cough, asthma, fever, dyspepsia and skin diseases, must have been Orris root. Kushta or Costus is now used instead of it, and orris root, although much used ia India by the Mahometans, has not been identified by the modern Hindus with Pushkaramula. Kóoros* is mentioned by Theophrastus (H. P., ix. 7), Dioscorides (i. 15), and is among the offerings made, B.C. 243, by Seleucus II., King of Syria, and his brother, Antiochus Hierax, to the temple of Apollo at Miletus. Costus, like many other Indian drugs and spices, was formerly carried to Europe by the Arabs, and, being supposed to be a production of Arabia, was known to the ancients as Arabian Costus. Dioscorides says :-- " The best is that which . is fresh, light coloured, compact and of firm texture, dry, not worm-eaten, devoid of an acrid smell, and which tastes hot and biting." He also mentions an inferior kind, light like Ferala,

* The Greek name is derived from the Sanskrit 53 through the Arabic



which he calls Iodian Costus. The Syrian Costus of the same writer is Elecampane root. The Arabs appear to have had, like the Hindus, a fabricus kind of Costus, which they speak of as the carrot of the sea (جزرالبعر) or Costus of the sea (تسطالبعر), which is mentioned in a tradition as one of the best of remedies.

This myth probably led the Greeks to describe Arabian as distinct from Indian Costus. Arabian writers describe Costus as a wood brought from India, a well known drug, of sweet odour, with which women and infants are fumigated : it is diaretic, beneficial to the liver in a high degree, and for the colic, and for worms, and the quartan fever, as a beverage; and for rheum, and defluxions, and pestilence, when the patient is fumigated therewith; and for the leprous-like disorder called ir, and the discoloration of the face termed is, when applied as a liniment; and it confines the bowels, expels wind, strengthens the stomach and heart, occasions pleasurable sensation, is an ingredient in many sorts of perfume, and is the best of perfumes in odour when one fumigates therewith (El. Leyth, " Eyn"; Kámus; Taj-el-Arús). Persian physicians copy all that the Greeks and Arabs have written, although they evidently know there is only one kind of Costus, and that brought from Cashmere. For an account of the history of this drug in mediæval Europe, Cooke (Phar. Jour., July 21st, 1877,) and Flückiger (Phar. Jour., Aug. 18th, 1877,) may be consulted. Amongst European writers upon the Materia Medica of India, Ainslie, although he describes Kust as the root of Costus arabicus, expresses his doubts in the following words : "Judging from the root, the plant would appear to differ from that described in the 11th Vol. of the Asiatic Researches, p. 349," The credit of first suggesting the botanical source of the drug is due to Guibourt; his conjectures were afterwards confirmed by Falconer, who, when on a visit to Cashmere, discovered that an Aplotaxis growing there produced the commercial Kust. The plant itself had been previously described by Jacquemont in 1831. Falconer's description may be found in the Transactions of the Linnean Society (1845, Vol. XIX., p. 23). There is also a full account of the drug and plant, with woodcuts, in

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Guibourt's History of Drngs (Vol III., 1869, p. 32, et seq.). Dr. Falconer maintained that the Aplotaxis was the Costus of the ancients; after giving his reasons for holding this opinion, he remarks :---

"It is collected in large quantities and exported to the Panjab, whence the larger portion goes down to Bombay, where it is shipped for the Red Sea, the Persian Gulf, and China; a portion of it finds its way across the Sutlej and Jumna into Hindustan Proper, whence it is taken to Calcutta, and bought up there with avidity, under the designation of Patchak, for the China market."

Royle, who wrote before Falconer's discovery of the source of Kust, appears to have met with two kinds of Costus, Kusti-talkh and Kust-i-shírín; from his observations on the latter article it would seem to have been the Kust of commerce. (Illustrations, p. 360.) Dr. Royle's original specimen of Kust-i-talkh has also been examined and found to be the root of Aplotaxis. At the present day we meet with only one kind of Costus in commerce. Cocke suggests that Kust-i-shírín is probably the young and Kust-i-talkh the old root, but no distinction of the kind is known in Bombay, and Haji Zein-el-Attar, the author of the Ikhtiárát (A.D. 1363) states that Kust-i-talkh is a Persian name for Indian Costus. Kust-i-shírín is the Kust-el-hala of the Arabs and our Orris root.

With regard to the uses of Costus, Dr. Irving states that formerly, when opium was not produced in Rajwarra, this root was extensively smoked as a stimulant. He adds that it is said to be narcotic when thus used, and that formerly great quantities went to China for smoking purposes. At the present time it is chiefly used as a perfume, and to protect bales of cloth from insects. In the Panjab it is applied in powder to ulcers, for worms in wounds, &c., and for toothache; it is also given in rheumatism. A summary of the uses of this drug is given by Baden Powell in his *Punjab Products* in the following terms:—

"1st-Dried and powdered as the principal ingredient in an astringent stimulant ointment, applied to severe ulcerations.



2nd-Dried and powdered as a hair wash.

3rd—As a stimulant in cholera; an infusion is made of Cardamoms 1 dr.; fresh 'Kut' 3 drs.; Water 4 ozs. One ounce every half hour. It is doubtless a powerful aromatic stimulant, and would be serviceable in any spasmodic disease.

4th --It is universally employed by the shawl merchants as a protector of Cashmere fabrics from the attacks of moth and other vermin.

5th-The dried root is an agreeable fumigatory, and yields excellent pastilles, which burn fairly.

6th—It is exported in enormous quantities to China, where it is used as an incense. In every Hong it is found; no mandarin will give an audience until the 'patchak' incense smokes before him; in every Joss-house it smoulders before the Tri-budh deity; in every floating junk in the Chinese rivers, the only house of countless hordes, Budh's image is found, and the smoke of the Patchak religiously wends its way heavenward. As to its uses in China, Dr. Porter Smith says that it is used in making incense in the South, or to preserve clothes from the attacks of moths and other insects. It is said to have the power of turning grey hair black. Carminative, stimulant, antiseptic, prophylactic, astringent, sedative, and insecticidal properties are referred to this remedy. The Chinese apply it with musk, which it resembles in odour and properties, to aching teeth."

Description. —Costus occurs in crooked twisted pieces about 3 inches long, and from $\frac{1}{2}$ to $1\frac{1}{2}$ inch in diameter, almost always split. Externally it is brown, marked by longitudinal ridges, and has a rough and somewhat reticulated surface. Its substance is compact and brittle, the fractured surface having a resinous appearance and dirty white colour. The central portion is generally absent, and appears to have been removed by decay before the root was collected. The taste is bitter, pungent and camphoraceous; the odour resembles that of fresh violets or orris root.

Microscopic structure.—Flückiger in his pamphlet, "Die Frankfurter Liste," Halle, 1873, p. 25, has shown that the root aboands in innlin, and shows, especially in the bark of the branches of the root, large balsam ducts. In both these respects Costus root agrees well with Elecampane and other aromatic roots of the Composite. A microscopic examination shows that the root consists of two parts, viz., a thick cortical layer of close texture, pervaded by a few laticiferous ducts and an inner radiating portion, the paranchyma of which is not so dense. This is also provided with laticiferons ducts, and a very abundant scalariform vascular system, which appears to be loaded with resincus matter. We have not been able to detact any staroh, nor does the iodine test indicate its presence.

Adulteration .- The natives of Cashmere say that this drug is apt to be adultorated with five or six other kinds of roots. A sample of false Costus in the Indian Museum, under the name of Kut mitha, examined by Cooke, was found to consist of pieces of a cylindrical root from 1 to 3 inches in length and from 1 to 11 inch in thickness; externally it was nearly smooth, or longitudinally striate with transverse paler scars. It was much lighter and less compact than Costus, friable and farinaceous internally, very much subject to attacks from insects, with little or no apparent odour or taste, and containing a large quantity of starch, the grannles of which were variable in size, and attached to each other in twos and threes. In 1859, a communication was made to the Agri-Horicultural Society of India of two roots, one called Kút and the other Thúth. They were from the hills of that part of the Kangra district which borders on Chumba. The "Kút" was identified as the " Costus," and the other was believed by Dr. Thompson to be the root of Salvia lanata, which was said to be common also in Cashmere, where it is used to adulterate "Kút." Subsequently Mr. H. Cope of Umritsar contributed some remarks to the same Society on the adulterations of this drug. " This adulteration," he says, "is now (1860) carried to such a pitch with the assistance not only of the tut (which so closely resem bles the genuine article in every respect but its qualities, that



it is difficult to distinguish the one from the other after admixture, which imparts to the false the odour of the true drug), but with other foreign substances of which cowdung is one, that I have ascertained as a fact that the more unscrupulous dealers use some 20 seers of the Kút to flayour 100 seers of trash. When tut was first found useful as an admixture, it was sold at Re. 11 per maund ; being now the main ingredient of the Patchak of commerce, it has risen to Rs. 41. I am told that two other substances, resembling the genuine article in exterior appearance, have been ascertained to serve as ingredients in the mixture sent to Calcutta and Bombay for exportation to China under the name of Patchak. They are, a root called Chog, brought from the hills, which is generally reported to be a deleterious drug, and Nirbisf, the root of a species of Aconitum, probably a virulent poison." (Cooke in Phar. Jour., July 21st, 1877.) With regard to Mr. Cope's remarks, we may mention that there is no difficulty in obtaining genuine parcels of Costus in Bombay. Perhaps the adulterated article may be specially prepared for the China market.

Chemical composition.—The air-dried roots reduced to powder, after heating for 26 hours to 100°C., lost 13.70 per cent. in weight, and were practically free from odour. The ash amounted to 3.46 per cent., and contained manganese in marked amount.

The odorous principle of the drug appears to consist of two liquid resins, both soluble in ether, alcohol, and benzene. One is neutral in reaction, and possesses in a very marked degree the odour* of the drug: the taste is somewhat camphoraceous : it is liquid at ordinary temperatures, amber-coloured, and after standing for some time gives an indistinctly crystalline deposit. It is apparently unaltered by agitation with dilute caustie alkaline solutions; and may be distilled without any alteration in odour. With concentrated sulphuric acid it first affords a deep brownish yellow coloration, changing to rich carmine on standing. The other resin is also liquid, amber-coloured, and possesses a musty odour, and gives an indistinctly crystalline

* A mixture of musk and orris root.



deposit on standing: the taste is pungent. It is also easily soluble in ether, alcohol, and benzene, and the alcoholic solution is strongly acid in reaction; with alkalies it combines, and on the addition of acids is precipitated as a milky white deposit. With concentrated sulphuric acid it affords a similar reaction to that of the first described resin.

In addition to these resins, evidence of an alkaloid was also obtained, together with traces of an ethereal salt of valeric acid, and an astringent principle giving a dark brownish coloration with ferric salts: and a dark solid resin soluble in amylic alcohol, but insoluble in ether or benzene.

Commerce .--- The roots are dug up in the months of September and October, when the plant begins to be torpid ; they are chopped up into pieces from 2 to 6 inches long, and exported without further preparation. The quantity collected is very large, amounting, as far as Dr. Falconer could learn, to 10,000 or 12,000 khurwars (load of 192 lbs.). The commodity is laden on bullocks, and exported to the Punjab, whence it finds its way to Bombay, and a portion to Calcutta through India. In Dr. Falconer's time the cost of collection and transport was about half a crown per cwt, Cleghorn states that it is also exported from Pangi on the Upper Chenab to the plains. The loads of it when passing, scent the air to some distance. Davies' "Trade Report" gives 29 maunds as exported to Afghanistan via the Bolan. Royle mentions that in one year (1837.38) 6,697 maunds of this root, valued at Rs. 99,000, were exported from Calcutta to China, and in 1867-68 nearly 10,000 mannds. In Cashmere the Maharaja is said to take it over from the collectors at half the price at which it sells again. In 1864, his income from this source was put down on good authority (according to Dr. Stewart) at 300,000 chilki, equal to nearly 1,90,000 rupees ; but this, he adds, is scarcely credible.* Kut is imported into Leh in small quantities from Cashmere for exportation to Lhassa, where it is called, as well as by the

* In the last official Reports, the export of Chob-i-koot to the Punjab are valued at Rs. 16,000 only, but under the head of drugs, &c., there are exports valued at Rs. 1,00,000, part of which may possibly be Costas.

Bhotes, Rusta, and is used for incense. In 1871, 33 maunds were imported into Leh from Cashmere, valued at Rs. 692. According to Dr. Falconer, at the time he wrote, the cost of collection and transport to a depôt at Cashmere was 2s. 4d. per cwt.: on entering India its value was enhanced to from 16s. 9d. to 23s. 9d. per cwt., whilst the commercial value at Canton was 47s. 5d. per cwt. From the Consular reports, it appears that in the year 1875 the imports of Costns into two Chinese ports only were for Hankow 1,270 piculs, valued at £5,224 6s. 3d, and Cheefoo 277 piculs, valued at £1,197, so that it is clearly no insignificant article of Chinese commerce. (Cooke in Phar. Jour., July 21st, 1877.) The value of Costna in Bombay averages Rs. 10 per manud of $37\frac{1}{2}$ lbs.

CENTAUREA BEHEN, Linn.

Hab.— Persia, Syria, Armenia. The root. Vernacular.—Sufed Bahman (Pers., Indian Bazars).

History, Uses, &c.—This root is the White Behen and white Rhapontic of European writers on Materia Medica and the Bahman abiad of the Arabians.

White and red Bahman were drugs of the ancient Persians, through whom the Arabs became acquainted with them, and introduced them into the West. From the Burhán-i-Kátia we learn that the word Bahman is equivalent to Brahman, and means the supreme intelligence; it is also the name of one of the Persian months, of the second day of each month, and of a plant which flowers in the month Bahman (January). Of this plant there are two varieties, red and white, the roots of which are fattening, expel flatulence, and are aphrodisiacal.

On the second day of the month Bahman, when the name of the day and month are the same, the Persians used to celebrate a feast, and cook all kinds of corn and meat, and sprinkle the flowers of the red and white Bahman upon the food; they also made a flour of the two roots and ate it with sugar, and the white Bahman they powdered and drank with milk to strengthen the memory. This day, which was called the Bahmanjana, was

considered to be a propitions day for collecting medicinal herbs, commencing any undertaking, putting on new clothes, paring the nails, cutting the hair, &c.

Bahman-i-sufed is much used by Mahometan physicians, who consider it to be hot and dry in the second degree and a powerful aphrodisiae and resolvent of phlegmatic humours; they also prescribe it in calculus affections and jaundice. Ainslie (Mat. Ind. ii., 14) confounds it with Asgandh, the root of Withania somnifera. The dose is one dirhem. Red Bahman or Bed Rhapontic, although a root of an entirely different structure, is always associated with white rhapontic in the East; its source is uncertain. The author of the Makhzan el-Adwiya states that it is the root of a plant called by source Kaf-i-Adam.

Description. ---White Bahman.--The dry root is of a whitish-brown externally, much shrivelled and twisted; near the erown it is marked by numerous circular lines. It may be either simple and tapering, or more or less branched; sometimes a portion of purplish stem remains attached; the average length is about 2½ inches, diameter ½ of an inch; the interior is white and spongy; when soaked in water it swells and becomes mucilaginous. The taste is mucilaginous and slightly bitter. Microscopic examination shows a mass of regular parenchyma surrounded on the outside by the brown oblong cells of the cortex. The centre of each of the parenchymatous cells is occupied by a substance giving a transient blue-black colour with iodine. There are numerous bundles of spiral vessels.

Red Bahman is a tuberous root, consisting of a central portion about 2 inches in diameter, from which spring 5 or 6 tapering tubers from $1\frac{1}{2}$ to 2 inches long, and from $\frac{1}{2}$ to 1 inch in diameter at the base. At the top of the central tuber is a scaly crown about 1 inch in diameter. The external surface of the root is of a reddish-brown coloar, scabrous and marked by numerous circular and longitudinal wrinkles; internally there is a dull red woody central portion, surrounded by a thick, yellowish-white horny layer, which near the crown becomes spongy. In the commercial article the root is sliced and the



central woody part removed. A section of the lateral tubers shows a red woody core, from which radiate rows of red spots as far as the inner bark. The spots when magnified are seen to consist of bundles of scalariform vessels, surrounded by a collection of pigment cells; the medullary rays connect these bundles, and are composed of single rows of oblong cells filled with finely granular red pigment. The bulk of the tuber consists of transparent cells which contain no starch. The bark is composed of an outer layer of epidermal scales, a middle layer of tangentially extended cells loaded with red pigment, and an inner layer of closely-packed columns of cells containing finely granular matter, and sometimes red pigment. The root has a mucilaginous and somewhat astringent taste. In general appearance and minute structure it closely resembles that of the Paony, and it is worthy of note that an edible Pæony (P. albiflora, Pall.,) is known to grow in Central Asia.*

Chemical composition.—The different nature of these two drugs is substantiated by comparing the results of their proximate analysis, and by their affording entirely different constituents.

White Beken.	Red Behen.
1.6	0.6
4.6	9.9
13.9	35.3
57.5	34.9
16-2	12.1
4.6	5-9
1.6	1.3
100.0	100:0
	White Behen. 1°6 4°6 13°9 57°5 16°2 1°6 1°6 1°6

White Behen yields to ether a yellow oily liquid, imparting a persistent greasy stain to bibulous paper, soluble in rectified spirit with an acid reaction, crystalline on standing, and

* In the report from H. M.'s Consulate at Newchwang for 1884, it is stated by Dr. Morrison that in that year 13,733 lbs of the root of this plant were exported from Manchuria for use as an astringent in hlenorrhagia and the diseases of women.

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melting below 20°. It consists of free fatty acids. The alcoholic extract contains a sweet tasting, uncrystallizable sugar, not reducing Fehling's solution; the aqueous solution of this extract is not affected by ferric salts, tannin or alkaloidal reagents. After exhausting with alcohol, the residue, on being treated with water, swells up to a white mass like tragacanth, and mucilage and saccharine matter enter into solution. The mucilage is gelatinized by natural plumbic acetate.

Red Behen contains a small amount of white fat soluble in ether and benzol. Alcohol dissolves out a tannic acid, related to cinchotannic acid, and an alkaloid. The alkaloid is bitter, soluble in ether with an opal-blue fluorescence, and forms feathery crystals when evaporated from this solvent. It dissolves in sulphuric acid with a violet-blue fluorescence, which is destroyed by dilution with water and restored by alkalies. We propose the name *Bahmanine* for this new alkaloid. The aqueous extract is mawkish and sweet, containing 6.2 per cent. of glucose. With two volumes of alcohol no mucilage is precipitated, but with four volumes a pulverulent deposit similar to inulin or inuloid is produced. This was collected on a filter, dissolved in boiling water and inverted. The resulting sugar reduced Fehling's solution, and was right-handed towards polarized light.

VOLUTARELLA DIVARICATA, Benth.

Fig.-Wight Ic. t. 1139; Bot. Mag. I. 81, t. 4.

Hab.--Central, Western and Southern India. The herb. Vernacular.--Bádáward (Pers., Ind. Bazars).

History, Uses, &c. -- This drug is described by Mahometan physicians as the Shaukat-el-baida of the Arabs, the Lúfiniki of the Turks, and the Sanakhúrd of the Syrians. Other Persian names given for it are Kangar-i-sufed and Asfari-bari. It is generally described as a thorny plant, about two



cubits high, with downy triangular stems as thick as the thumb or larger; heads of seed like those of a thistle, thorny and full of down; flowers purple, seeds like those of carthamus, but rounder. M. M. Husain says :—" Some have supposed this plant to be the same as the Shukai; this is not the case, but the two plants are nearly related. The true Bádáward has slender, white round stems, little more than a span high, slightly downy; flower heads white, surrounding them are three delicate soft spines like needles, so that all together they have much the appearance of a brooch, within is a quantity of white down, which, when the seeds are ripe, causes them to be carried about by the wind, hence the name Bád-áward. Medicinally the plant has tonic, aperient and deobstruent properties. It is said to drive away noxions reptiles when kept in the house." (Makhzan, article Bádáward.)

The Badaward sold in India agrees with the description of Mir Mahammad Husain. V. divaricata is found on sandy ground in Guzerat, and is thus described in the Bombay Flora : "Stem flexnose, short, ramous; branches diffuse, procumbent, angularly striated, sub-glabrous, leaves shortly pubescent or sub-glabrous, those of the stem lyrate, of the branches sinuately pinnatifid, the lobes spinously mucronate, involucre ovate, scales ovate at the base, araneose, terminating in a prickle-like appendage, flowers purple, appear in the cold weather, common in light soils in Guzerat." The drug has a bitter taste; it is imported from Persia.

Chemical composition.—The powdered drug contains a green essential oil having the odour of southernwood. An acid resin and some fatty matter was dissolved out by ether. The alcoholic extract contained an organic acid coloured green with ferric chloride, but unaffected by gelatine. The aqueous solution of this extract was crystalline when evaporated, and gave indications of an alkaloid. The aqueous extract was highly coloured and contained gum. The evaporated filtrate from the gum after standing a few days showed some white crystalline tufts of a gritty substance of an organic nature which was not examined.



Tricholepis glaberrima, DC., Done in Jacq. Voy. Bot. 98, t. 106, a plant of Central India, Marwar, the Concan and Deccan, Vern.—Bramhadandi, is believed by the natives to be a nervine tonic and aphrodisiac. It is a tall, erect, smooth plant, stem angled, leaves linear-lanceolate, acuminate, stem-clasping, distantly spotted with black specks, florets 7 lines long, heads of flowers small, terminal, purple.

CARTHAMUS TINCTORIUS, Linn.

Fig.—Reich. Ic. Fl. Germ. t. 746; Bot. Reg. t. 170; Rumph. Amb. V. 79. Safflower, Parrot seed (Eng.), Safran batard, Graine de perroquet (Fr.).

Hab.—Cultivated throughout India. (C. oxycantha, Bieb., is perhaps the wild form of this plant.) The flowers and seeds.

Vernacular.—Kar, Kusumba (Hind., Guz.), Kusum (Beng.), Kushumba (Tam., Tel.), Kusumbe (Can.), Kardi (Mar.).

History, Uses, &c.—This plant is the Kusumbha of Sanskrit writers, who describe the seeds as purgative, and mention a medicated oil which is prepared from the plant for external application in rheumatism and paralysis. It is the *writers* of the Greeks,* who used the leaves like rennet to curdle milk in making cheese. Pliny (21, 53,) calls it Cnecos. Mahometan writers enumerate a great many diseases in which the seeds may be used as a laxative; they consider them to have the power of removing phlegmatic and adast humours from the system.

The author of the Makhzan states that Kurtum, Hab-elasfar, and Bazr-el-ahris are the Arabic names for the seeds, and Khasakdanah and Tukm-i-kafshah the Persian. He also says that in Ghilan they are called Tukm-i-kajrah or Tukm-ikazirah, in Syria Káshni, and in Turkey Kantawiras, and that fine Greeks call them Atraktus (dipartoh(s), and Dioscorides Knikus (so(kos)). Ainslie has the following notice of the plant :---"A fixed oil is prepared from it which the Vytians use as an

^{*} Theophr. H. P. vi., 1; Arist. H. A. v., 19; Dios. iv., 182.



external application in rheumatic pains and paralytic affections also for bad ulcers; the small seeds are reckoned amongst their laxative medicines, for which purpose I see they are also used in Jamaica (the kernels beat into an emulsion with honeyed water). Barham tells us that a drachm of the dried flowers taken cures the jaundice." (Mat. Ind. ii., 364.)

The seeds are known in England as Parrot seed. Under the name of safflower the flowers form an important export article to Europe; they contain two colouring matters, yellow and red, the latter is the most valuable. In silk dyeing it affords various shades of pink, rose, crimson and scarlet. Rouge is also made from it. According to Calvert (Dying and Calico Printing, Ed. 1878,) though the safflower has lost much of its value as a dye since the discovery of the aniline colours, it is still used extensively in Lancashire for the production of peculiar shades of pink of the Eastern markets. It is also used for dyeing red tape, and there is no more striking instance of "red-tapeism," than the love which is shown for this particular colour by the users of that article. Much cheaper pinks can be produced from aniline, but notwithstanding the attempts which have many times been made to introduce them, they have failed in every instance, because the exact shade has not been obtained.

Description.—The Carthamus grows about two or three feet high, with a stiff upright whitish stem, branching near the top; and has oval, spiny, sharp-pointed leaves, their bases half clasping the stem; the flowers grow in heads at the end of the branches, and are surrounded by numerous leafy bracts (involucre) in numerous rows, the outermost row being broad and spreading out flat, with their edges spiny, the middle ones more upright, of an oval form, and surmounted by an egg-shaped appendage with spiny edges, and the innermost much narrower, quite upright, with their edges entire, but terminated by a sharp spiny point. Each flower is perfect, and has an orange or yellow corolla longer than the involuce, their lower part, being imbedded in a dense mass of fringed scales and hains



but the chief characteristic consists in the absence of the bristles, technically termed pappus. The fruits are about the size of barley corns, somewhat 4-sided, white and shining like little shells. (A. Smith, in Treasury of Botany.)

Chemical composition.—The flowers of Carthamus tinctorias contain two coloured principles, one yellow, soluble in water, and of no use in dyeing; the other red, soluble in alkalis, and precipitable by acids from its alkaline solutions; this is Carthamin. To prepare it, safflower is first washed repeatedly with water, to free it from the yellow substance, then treated with solution of carbonate of sodium; the liquid is saturated with acetic acid, and pieces of cotton are immersed in it, on which the carthamin is deposited. After twenty-four hours the cotton is removed and treated with solution of carbonate of sodium, which redissolves the colouring matter; the solution is mixed with citric acid, whereby the carthamin is precipitated in red flocks, and, lastly, these flocks are dissolved in alcohol. The solution evaporated in vacuo yields the carthamin in the form of a powder, having a deep red colour with greenish iridescence.

It is sparingly soluble in water, insoluble in ether, but easily soluble in alcohol, yielding a fine purple solution.

According to Schlieper, carthamin has the formula C¹⁴H¹⁶O⁷. M. Salvétat gives the following figures as representing the composition of safflower:—

Yellow colouring matter soluble in water	26.1	to	36.0
Carthamin	0.3	to	0.6
Extractive matters	3.6	to	5.6
Albumen	1.5	to	8.0
Wax	0.6	to	1.5
Cellulose	38.4	to	56.0
Silica	1.0	to	8.4
Alumina and oxide of iron	0.4	to	1.6
Manganese	0.1	to	0.2

A certain amount of pectic acid is also always stated to be present.



The yellow colouring matter of Carthamus is acid. It has a bitter taste and great colouring power. It combines readily with oxygen, and is converted into a brown substance. It unites with oxide of lead, forming the compound $(Pb^{2}O)^{5}C^{3}$ H¹⁰O⁵.

Commerce.—Kusumba is cultivated in most parts of India; it was formerly exported to the value of 6 to 7 lakhs of rupees yearly, but the present value of the exports is under one lakh.

The seed is of considerable importance as an oil seed in India. Value, Rs. 16 per candy of 8 pharrahs (about 5 cwts).

CICHORIUM INTYBUS, Linn.

Fig.-Eng. Bot. 539. Wild Succory, Chicory (Eng.), Barbe de Capucin, Chicorée (Fr.).

Hab.— Persia, Europe. Cultivated in India. The seeds. Vernacular.—Kàsni (Pers., Ind. Bazars).

History, Uses, &c. - This plant has been in use as a potherb from a very early period ; it was known to the ancient Egyptians, Greeks and Romans. Theophrastus (H. P. vii., 7, 8, 9,10, 11.) calls it «1xwpn and «1xwp10». Dioscorides mentions two kinds, -the wild, *1x00000, and the cultivated, ocpus ; he describes both as astringent, cooling and stomachic, and states that the plant is also applied externally on account of its cooling properties in inflammatory affections. The Romans called the plant Intubus or Intubum, and the plural of the latter word has furnished the Arabs with their name Hinduba. Pliny calls the wild plant Cichorium, Chreston (useful), Pancration (all powerful), and Ambubaia ; after enumerating its medicinal virtues, he says: "In addition to these qualities the Magi state that persons who rub themselves with the jnice of the entire plant, with mixed oil, are sure to find more favour with others, and to obtain with greater facility anything they may desire." Endive seeds were sold in Rome under the names of Erraticum and Ambubaia or Ambubeia, and were supposed to be a panacea and to have the property of fixing the affections. The Syrian dancing girls, whom Cneius Manlius first brought to Rome (Livy 9,1), were



also called Ambubaia (endive seed), on account of their attractive allurements, just as such persons are often addressed in India as Eláchi-dána (cardamom seeds) for the same reason. Ambubaia is a Syrian term, but the component parts of it Ambui (انبوى) odour, and Baia (بيا) full, occur in old Persian. It signifies full of odours, i.e., allurements. The wild endive is the Tarkashkun of the Persians and of Ibn Sina. Aitchison found it common every where in Khorasan, and also cultivated in gardens as a pot-herb under the name of Kásni. We have sown the seed sold in the Indian bazars, and have obtained a semicultivated form of the plant with upright leaves. The same form is cultivated by Mahometans at Hyderabad in the Deccan. The Germans call the wild Endive Wegewarte, "road guardian ;" Wegeleuchte "road light ;" Sonneuwende or Sonnenwirbel, "solstice;" Sonnenkraut, "sun herb ;" and Verfluchte jungfer, "unhappy young girl." According to the legend (Klytia, Berlin, 1875,) the plant is supposed to have been once a beautiful princess who, having been deserted by (or lost) her husband (or lover), was at her own request changed into this plant. A full account of the forms which this myth takes in Austrian Silicia. Bavaria and the Tyrol, quoted from Mannhardt, will be found in De Gubernatis (Muth. des Plant., ii, 87), where he compares these legends with those concerning the Basil and Indian Tulasi. Endive is much valued by the Indian hakims as a resolvent and cooling medicine, and is prescribed in bilious complaints much as Taraxacum is in Europe. The seeds are one of the four lesser cold seeds, and, as such, are still much used in the East.

Chicory root dried, roasted and reduced to powder, is very extensively used in Europe as a substitute for coffee and for adulterating that article. Stillé and Maisch state that from 3,500,000 to 4,000,000 lbs. are annually imported into the United States from Europe. The European consumption is probably not less than 20,000,000 lbs.

Description .- The achenes are about the same size as those of the lettuce, angled, of a pale, mottled grey colour.

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The root is fleshy and tapering, somewhat branched, longitudinally wrinkled, light brown externally and whitish internally. The bark is rather thin, radially striate from the dark coloured milk-vessels, and separated by a brown cambium-line from the finely porous yellow wood. The taste is bitter and mucilaginous.

Chemical composition.—Nietzki (Archiv. d. Pharm. (3) 8, 327) has separated from the flowers a crystalline colourless glucoside, $C^{5_2}H^{4_4}O^{19}$ $4\frac{1}{2}$ aq. insoluble in ether, freely soluble in hot water and sloohol, and dissolving with a yellow colour in alkalies. Boiling dilute acids split it up into glucose and $C^{s_0}H^{14}O^9$, which also occurs in the flowers. This forms needles very slightly soluble in boiling water, and coloured dark green by ferric chloride. According to Dragendorff the cultivated root contains 36 per cent. of inulin. The seeds contain a bland oil. According to König the following figures represent the composition of fresh and dried and burnt chicory :—

	Fresh.	Dry.
Water	75.69	12.16
Nitrogenous matter	1.01	6 09
Fat	.49	2.05
Sugar	3.44	15.87
Nitrogen free extractive.	17.62	46.71
Cellulose	·97	11.00
Ash	78	6.12

LACTUCA SCARIOLA, Linn. var. sativa.

Fig. — Reichb. Ic. Ft. Germ., t. 1421. Garden Lettuce (Eng.), Laitue cultivée (Fr.).

Hab.-Cultivated throughout Persia and India. The seeds.

Vernacular.-Kahn (Pers., Ind. Bazars.)

History, Uses, &c.—Lettuces have always been greatly estcemed on account of their cooling and refreshing properties.

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COMPOSITE.



In the wild state they produce to a certain extent narcotic and sedative effects, but these appear to be almost entirely removed by cultivation; still, even in the cultivated varieties, a milky and bitter juice exists in the flower stem. Lettuces $e_{\rho}/\partial a\xi^*$ appear to have been used for salads at a very early period. According to Herodotus, they were served at the tables of the Persian kings more than 400 years before the Christian era. The opium of Galen is supposed to have been Lettuce opium. The Greeks and Romans considered the lettuce unlucky, and used it only at funerals as a food.

Apuleius (De Vir. Herb.) speaks of it as a valuable medicinal herb-

"Herbæ lactucæ sylvaticæ succum cum vino optimo vetere et melle acapno quod sine fume collectum est, mixtum in ampullam vitream condito, et eo utaris, summam medicinam experieris." The seeds are one of the four lesser cold seeds of old writers, and as such still retain their position in the Materia Medica of the East. Mir Muhammad Hussain in his Makhzan mentions several kinds of lettuce, and also lettuce opium; but he acknowledges the superiority of the lettuces raised from English seed in India over those of Persia, and enlarges upon the cooling and purifying action of the herb upon the blood. The lettuce seed of the bazars is white: it is imported from Persia, and is sold for Re. ‡ per lb.

The Arabic name is Bazr-el-khas and the Persian Tukm-ikůhů. Both plant and seed are too well known to require description.

Chemical composition.— Lactucarium is a brown viscid substance obtained by evaporating the juice, which exudes when the stems of the wild lettuce are wounded. It has a peculiar opium odour and acts as a harcotic. German lactucarium contains, according to Ludwig, from 44.4 to 53.5 per cent. of *lactucone*; a soft resin; about 4 per cent. of an easily fusible waxy body; *lactucin*, the chief active principle of the substance;

*Also θρίδακίνη, Theoph. H. P. I., 16, 19, vii, 1 to 5. The wild lettuce,
* δρ. αγρια, vii., 6.



lactucic acid; about I per cent of oxalic acid; a non-volatile not bitter acid which reduces oxide of silver; and a volatile acid smelling like valerianic acid, both in small quantity only; about 7 per cent. of albumin ; at least 2 per cent. of mannite ; a small quantity of a neutral, not bitter, unfermentable substance, crystallising in rhomboid pyramids; and from 8 to 6 per cent. of ash, containing potash, soda, manganic oxide, ferric oxide, and a small quantity of lime. Lactucin is yellowish, fusible, bitter, soluble in 80 parts of cold water, moderately soluble in alcohol and in acetic acid, less soluble in ether which deposits it on evaporation in nacreous scales or rhombic tables. Formula according to Walz, C⁴⁰H⁴⁸O¹⁵. The leaves of the cultivated lettuce were found by Church to contain water 95:98 per cent.; albuminous matter 0.71; starch, sugar and gum 1.68; cellulose and lignose 0.52; chlorophyll and fat 0.22; ash 0.89. The ash was very rich in nitrates.

König gives the following as the mean composition of the garden lettuce;-

Water	.94.33
Nitrogenous matter	. 1.41
Fat	
Non-nitrogenous extractive	2.19
Cellulose	73
Ash	, 1.03

TARAXACUM OFFICINALE, Wigg.

Fig.-Reich. Ic. Fl. Germ. xix. tt. 1404-1406; Woodville, t. 16; Bentl. and Trim. t. 159. Dandelion (Eng.), Pissenlit (Fr.)

Hab.—Throughout the Himalaya and the Nilgiris. Cultivated in N.-W. Provinces. The root.

Vernacular .--- Dudhal, Baran, Kánphúl (Hind.).

History, Uses, &c.—The derivation of the mediæval name Taraxacum is uncertain, but it seems not improbable qhat it was a corruption of the Persian طرخشقورى (Tarkhashkún), the name of a kind of wild endive mentioned by Ibn



Sina, which he describes as useful in dropsy and obstructions of the liver. The same plant is noticed by other Arabian and Persian writers, all of whom describe it as the wild endive, and some of whom add that it has bluish flowers.

The Greeks and Romans speak of several varieties of endive, but there is nothing in their descriptions to lead us to suppose that they were acquainted with our Taraxacum. Fuchsius (1542) figured T. officinale (Ic. 391. f.), and named it Hedypaois, a name given by Pliny (20, 31) to one of his kinds of wild endive. Tragus (1552) figured it under the name of Hieracium majus. Matthiolus (1583) called it Dens leonis, and Linnæus (1762) Leontodon Taraxacum, on the supposition, apparently, that it was the Tarkhashkún of Ibn Sina. At the close of the last century dandelion began to be much used as a remedy for chronic obstructions of the liver and bowels, and as a diarctio in calculous affections. From experiments made by Rutherford and Vignal, it appears that taraxacum is but a feeble hepatic stimulant, but it has powerful diuretic properties. Taraxacum is very popular in India in cases of hepatic congestion due to, or associated with, atonic dyspepsia and constipation; indeed, it has become quite a domestic remedy in this country. It is cultivated as an annual crop at Saharanpur for the use of the Government sanitary establishments. The Madras Medical Stores are supplied with the root from the Nilgiris.

Description.— The perennial root is from 6 to 12 or 16 inches long, nearly cylindrical, $\frac{1}{2}$ to 1 inch thick, crowned with several short thickish heads above and furnished with few branches below. Fresh, it is light yellowish brown and fleshy; when dry, dark brown or blackish-brown, much wrinkled longitudinally; internally, it is white with a yellowish centre. It is inodorons and has a bitter taste. It is hygroscopic, and in damp weather rather flexible, but when dry breaks with a short fracture, showing the pale yellow porous wood surrounded by a dark brown cambium-line and a thick white bark; with corcentric circles of milk-yessels of a brownish colour, and



separated by layers of thin-walled and axially elongated parenchyma. The meditullium has no medullary rays, and consists mainly of ducts varying in diameter and more or less interspersed with thin-walled, elongated cells.

After frost and early in the spring the root is sweet; during the spring and summer the milk-juice becomes thicker and the bitter taste increases; the root is, therefore, directed to be collected late in the autuma. The spring root yields a bitterish-sweet extract. Bentley regards the root collected about July as most efficient. (Stillé and Maisch.) The annual root as cultivated in India is very much smaller.

Chemical composition. — The bitter principle, Taraxacin, was obtained by Polex (1839) in a crystalline state by treating the milk-juice with boiling water and evaporating. Kromayer (1864) found it necessary to leave the aqueous solution in contact with animal charcoal, from which afterwards alcohol dissolved the bitter principle, requiring treatment with lead acetate and sulphuretted hydrogen to free it from colouring matter and other principles. Kromayer obtained taraxacin as an amorphous bitter mass. The milk-juice contains also resin and taraxacerin, C⁸H¹⁶O, which is insolable in water, crystallizes from hot alcohol, and when in an alcoholic solution has an acrid taste. The dry root yields from 5 to 7 per cent. of ash.

Dandelion root collected in autumn is rich in inulin. Dragendorff (1870) obtained from the root collected in October 24 per cent. of inulin and a little sugar, but when collected in March only 1:74 per cent. of inulin was found, and about 18 per cent. each of uncrystallizable sugar and *lavulin*, the latter being intermediate between inulin and sugar in having the composition of inulin, but being of a sweet taste, soluble in cold water, and without influence on polarized light. Frickhinger (1840), Widemann, and others had obtained notable quantities of *mannit* from the concentrated juice of dandelion, but T. and H. Smith (1849) proved that this principle does not pre-exist, and that, on the contrary, it is a product resulting from fermentation.



The presence of fermentable sugar has been observed by most investigators, and Dragendorff's observations confirm the results previously obtained by Frickhinger, Widemann, and Overbrook, that the sugar predominates in the spring root, and inulin in the root collected in autumn. It seems to follow therefrom that the extract and other preparations made from the expressed juice or by treating the autumn root with cold water should be more efficacious and less loaded with inert matters (sugar, &c.) than those obtained from the spring root. Old extract of taraxacum sometimes contains granular crystals of calcium lactate (Ludwig, 1861); the lactic acid is probably produced from inosit, which, according to Marmé (1864), exists in the leaves and stalks of dandelion, but is not found in the root. (Stillé and Maisch.) The fresh plant, which is used in Europe as a salad, has been analysed by H. Storer and S. Lewis, who found it to consist of Water 85.54, Nitrogenous substances 2.81, Fat 0.69, Non-nitrogenous extractive 7 45, Cellulose 1.52, Ash 1.90. In the dried plant they found Nitrogen 3.11, Carbohydrates 51.52 per cent. (König, Nahrungs Mittel.)

Substitutes for Taraxacum.

Launæa pinnatifida, Cass., Wight Ill., t. 133, a native of the sandy coasts of India, is much used at Goa as a substitute for Taraxacum under the name of Almirao. The plant has a filform, procumbent stem bearing roots and leaves here and there; leaves crowded, sinuate-pinnatifid, lobes obtuse or subacute; peduncles rather shorter than the leaf, having at the top scaly bracts which are scarious on the margin. The roots are fleshy, about the size of a crowquill, and 6 to 8 inches long; when fresh they are yellowish-white. A section shows a yellow central fibro-vascular column, containing very large fenestrated vessels arranged in a radiating manner Beyond the radii the parenchyma is loaded with large colourless bodies of irregular size and shape, which gradually diminish in number towards the cortex, where the parenchyma is not



occupied by them The cellular structure is delicate and the cells large. These bodies appear to be cells distended by some solid nearly transparent matter (inulin?) as they correspond in form and position with neighbouring empty cells. In Bombay under the name of *Pathri* it is given to buffalces to promote the secretion of milk. Murray refers the Ban-káhú of Sind to this plant, but his description agrees better with that of *Launæa nudicaulis*, Less. He says the juice of the Ban-káhú, called *Khee-khowa*, is used as a soporific for children in doses of half a massa, and is externally applied in rheumatic affections combined with the oil of *Pongamia glabra* or the juice of the leaves of *Vitex leucoxylon*.

Lactuca Heyneana, DC., Wight Ic., t. 1146, is also used as a substitute for Taraxacum, and is called by the Portuguese Taraxaco.

Emilia sonchifolia, DC., Rheede Hort. Mal. a. t. 68, appears to be used all over India much in^{*} the same manner as Taraxacum. Rumphius figures it, and says that the Portuguese call it Erva de Figado, *i.e.*, hepatis herba. It is the Muelschevi of Rheede, who says—" Decoctum antifebrile est etasthmaticum, succus ventris sedat fluctus cum saccharo assumptus. Contrita cum butyro apostemata maturat et aperit."

E. sonchifolia is the Sadamandi of Western India, the Shudimudi of Bengal, the Kadoo-para of Ceylon, where it is used as a sudorific, and we have received it from Cawnpore under the name of *Hiran-khuri*. It is a very common weed of cultivation, and may be found in every Indian garden.

Sonchus oleraceus, Linn., Wight Ic. t.1141, the Milk Thistle of the English and Laiteron of the French, is used in decoction as a laxative and emollient drink in chronic affections of the digestive organs. Dr. F. Landry (Med. Bullet.---1888) has pointed out that the inspissated juice, given internally in doses of 12 to 25 centigrams, is an active hydrogogue cathartic acting on the liver, duodenum and colon. Like elaterium, it produces copious watery stools, and would appear likely to be useful in ascites and hydrothorax. Its administration



requires watching, as like senna it causes griping and like aloes tenesmus. Dr. Landry suggests its combination with manna, anise and carbonate of magnesia; or with stimulants and aromatics. (*Pharm. Journ., Sept* 1888.) This weed is common in many parts of India in fields and cultivated places.

Some plants of minor importance used medicinally and belonging to this Order are :--

Echinops echinatus, DC., the Utáti of Sanskrit writers and the Utkatára of the bazars. It is a thistle-like plant 1 to 2 feet high, with pinnatifid spinous leaves, the under surface of which is cottony. The flower heads are about 1 inch in diameter and armed with many stout spines. The root is tapering and of a whitish brown colour. The drug is considered to be tonic and diuretic. It is bitter and appears to us to have much the same properties as the Carduus benedictus of Europe.

Dicoma tomentosa, Cass., Wight Ic., t. 1140. Vern.-Navananji-cha-pála (Belgaum). An erect much-branched annual, 10 to 13 inches high, clothed with white cottony wool; leaves sessile linear or linear-obovate, obtuse or acute, quite entire, cottony, 1 to 3 inches long; heads sub-axillary, involucre bracts, $\frac{1}{2}$ to $\frac{3}{3}$ in., subulate, spinescent, straight, glabrous, shining; achenes broad and short, $\frac{1}{6}$ in. long, turbinate, densely silky; pappus shining, elastic, brush-like. The herb is strongly bitter, and is used in the neighbourhood of Belgaum as a febrifuge, especially in the febrile attacks to which women are subject after childbirth. Dr. Peters, of the Bombay Medical Service, first brought to notice the use of this plant medicinally by the natives.

Notonia grandiflora, DO., Deless. Ic. Sel. iv., t. 61; Wight Ic. t. 484. Syn.—Cacalia Kleinia, Herb. Madras. The Wander-roti of the Malvattas, was named by DeCandolle after Mr. Benjamin Noton of Bombay, who first met with it on the Nilgiris; it is also found upon high rocky precipices in the Deccan. In 1860, Dr. A. Gibson brought forward this plant as a preventive of hydrophobia. The mode of admin-
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stration is as follows: about four cunces of the freshly gathered stems, infused in a pint of cold water for a night, yield in the morning, when pressed, a quantity of viscid greenish juice, which being mixed with the water, is taken at a draught. In the evening a farther quantity of the juice, made up into bolnses with flour, is taken. These medicines are directed to be repeated for three successive days. The Editor of the *Pharmacopæia of India* says that from official documents placed at his disposal, it appears that the remedy has been tried in numerous cases; but as at the time of the infliction of the wound, caustic was applied locally in the majority of cases, it is difficult to determine how far the Notonia operated, if at all, as a prophylactic. (*Phar. of India*, p. 126.)

• An extract of the herb was tried by the late Dr. Haines and one of us on dogs, and afterwards at the European Hospital in Bombay (1864). In one drachin doses it had a feebly aperient action; no other effect was observed. The dried plant was for a time issued to medical officers in Government employ, but no further information as to its properties would appear to have been obtained. N. grandiflora is a shrub, fleshy, smooth; stem thick, round, marked with the scars of fallen leaves; leaves oblong or ovate, entire; flowers terminal, corymbose, few, pale yellow. The dry stems, which are white, soft and fragile, yield an abundant greenish extract.

Tagetes erecta, Linn. Bot. Mag. t. 150. French Marigold (Eng.), Œillet d'Inde, Rose d'Inde (Fr.), Makhmal, Gul-jáferi (Hind.), Rojia cha phúl (Mar.), is quite naturalized in India. One tola of the jaice of the petals heated with an equal quantity of melted butter is given daily for three days as a remedy for bleeding piles; they are considered to have a purifying action upon the blood. The flowers of this plant are much used for making garlands to hang over doorways on festive occasions. Rojia (rose), the name current on the Western Coast, was probably introduced with the plant by the Portuguese, with whom it appears to represent the Rosa de ouro or golden rose, which the Pope usually blesses at mass on a Sunday in Lent. H-4I

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Anaphalis neelgerriana, DC., Frodr. vi. 272, and other species are used on the Nilgiris for cut wounds. The leaves are covered with woolly down, and are called by the natives Kaat-plaster or country plaster. The fresh leaves are bruised and applied to the wound under a rag.

The flowers of Carduus nutans, Linn. Reich. Ic. Fl. Germ. t. 146, Vern.--Kanchari, are employed as a febrifuge in Sind and in the Punjab.

Calendula officinalis, Linn. The pot Marigold (Eng.), Sonci des jardins (Fr.), Bot. Mag. t. 3204, a native of the Mediterranean Coasts, formerly esteemed as a domestic remedy, is found as a weed of cultivation in Northern India.

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LOBELIA NICOTIANÆFOLIA, Heyne.

Fig.--Wight Ill., t. 135. Wild Tobacco (Eng).

Hab .--- Bombay to Travancore, Ceylon. The plant.

Vernacular.--Dhavala (Mar.), Kattu popillay (Tam.), Adavipogaku (Tel.), Kadahogesappu (Can.).

History, Uses, &c.—This Lobelia was first described by Heyne, who found it near Bangalore. We have met with no mention of the plant in native medical works, but the Marathi name appears to be of Sanskrit origin and to signify "white," probably in allusion to the colour of the flowers. Graham (Bombay Plants) states that the dried stalks, which are hollow in the centre, are sold in the bazar at Mahableshwar, and used as Koluri horns for collecting herds of cattle and scaring wolves. In the Concan a kind of rustic pipe called qin (páņvá) is made from them. In the Pharmacopæia of India an infusion of the leaves is said to be used as an antispasmodic. The dry herb when handled is extremely acrid, the dust irritating the throat and nostrils. It is called wild tobacco among the Tamils

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and is regarded by the natives as poisonous wherever the plant grows. Physiological experiments conducted by Herr von Rosen at Dorpat have shown that this plant has properties exactly similar to those of Lobelia inflata. The physiclogical action of poisoneus doses of lobelia upon the carnivora and apon man is to cause death by paralysing the respiratory centre. Small doses first raise and then depress the blood pressure; large deses paralyse the vasomotor centre and the peripheral ends of the vagi. (Attwood.) The effects produced by lobelia on man have been carefully studied by Barallier of Toulon, who found that after taking an infusion of I grain of the leaves in 400 grains of water, he felt a burning and rawness in the fauces, headache, and a sensation of constriction beneath the sternum; his pulse became weak, slow and intermittent, and there was diuresis. Larger doses produced general muscular weakness, vomiting, difficult breathing, cardiac depression, reduction of temperature and dilatation of the pupils. The action of lobelia is therefore similar to that of tobacco and its alkaloid nicotine. (Barallier, Des effets physiol., &c., de la Lobelia inflata. Bull. de Therap., lxvi.)

The chief medicinal value of lobelia is in the treatment of asthma, whether the disease be purely spasmodic or associated with pulmonary emphysema, chronic bronchitis, heart disease, &c. It eliminates from the attack the bronchial spasm, which in the first-named affection constitutes the whole disease, and in the others is a complication only. A fluid drachm of the tincture should be given every hour, or, if the symptoms are argent, every half hour, until relief is obtained, or the characteristic effects of the medicine are produced. Its efficacy in other diseases, as in whooping cough, will depend mainly upon the predominance of the nervous element in them. Whenever dyspuces is due to inflammatory changes in the bronchia, or to the presence in these tubes of secreted matters. rather than to spasm, lobelia displays special virtues that entitle it to be preferred before numerous "expectorants." It is of no more advantage in inflammatory laryngitis than various other nauseants and emetics, but it is decidedly more effica-

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cious in spasmodic laryngitis than most other remedies of the same class. In almost all cases in which distress in breathing arises from a want of proper balance between the lungs and the heart, this medicine affords relief; as, for instance, when the lungs are congested by mitral obstruction and there is a tendency to cedema of those organs; and, again, when the lungs are themselves diseased so as to interfere with the cardiac circulation, as occasionally happens even in tuberculous consumption. (Stille and Maisch.)

Description.—The leaves resemble those of the tobacco; they are finely serrated and covered with simple hairs. The lower part of the stem is woody, an inch and a half or more in diameter, and almost solid; the upper portion is a hollow tube ending in a crowded head of flower spikes; the latter are about a foot in length, and when the plant is in fruit, are thickly set with globular capsules about the size of a pea, to which a portion of the dry flower is often adherent; the capsules are two-celled, each cell containing a fleshy placenta. The seeds are numerons and very small (1-50th of an inch in length), oval, flattened, of a light brown colour, and marked with delicate lines. Several small tubercles surround the site of the placental attachment.

The whole plant when dry is studded with small spots of resinous exudation, and is hot and acrid to the taste. The leaves and aerial parts of the fresh plant exude a white latex when broken.

Chemical composition.—Herr von Rosen's examination of the plant, supplied by one of us, showed it to contain two alkaloids; this led to a re-examination of Lobelia inflata, with the result that two similar alkaloids were found to be present in the latter plant. The discovery of von Rosen has been confirmed by J. U. and C. G. Lloyd (*Pharm. Rundschau*, 1887), but they describe the alkaloids somewhat differently; one, for which they appropriate the name Lobeline, was obtained as a colourless and odourless amorphous substance, non-hygroscopic, and apparently not affected by air; slightly soluble in water, and

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readily soluble in alcohol, chloroform, ether, benzol and carbon bisulphide. Its salts are most powerful emetics, producing emesis without disagreeable after symptoms.

The other alkaloid *Inflatine* was obtained in large colourless, odourless and tasteless crystals, insoluble in water or glycerine, but soluble in carbon bisulphide, benzol, chloroform, ether and alcohol.

Therapeutically inflatine has no apparent importance. In spite of the statements of previous workers, no volatile or liquid base was met with by the authors, and it would seem probable that the supposed liquid alkaloid previously observed was a mixture of lobeline, inflatine and oil.

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GAULTHERIA FRAGRANTISSIMA, Wall.

Fig. — Wall, in As. Research. xiii., 397; Wight. Ic. tt. 1195-96; Bot. Mag. 1984. Indian Wintergreen (Eng.).

Hab.—Hills of India, Burma and Ceylon. The essential oil.

Vernacular.-Gandapuro (Jav.).

History, Uses, &c.—This ramous shrub with thick coriaceous leaves, white flowers and blue berries, inhabits the grassy hills and affords an essential oil nearly identical with that of *Gauttheria procumbens* (*Canadian Winter Green*). Mr. Broughton, the late Government Quinologist at the Nilgiris, in a report to the Madras Government on the subject of this oil, says:—"The oil from this source contains less of the peculiar hydrocarbon which forms a natural and considerable admixture with the Canadian oil, and therefore is somewhat superior in quality to the latter. The commercial demand for the oil is not, however, considerable enough to make its occurrence in India of much direct importance.

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"It occurred to me in 1869 that methyl-salicylic acid would, however, under suitable treatment, furnish carbolic acid according to a decomposition described by Gerhardt. After a few experiments I was successful in preparing considerable quantities of pure carbolic acid. The method of manufacture is as follows: -The oil is heated with a dilute solution of caustic alkali, by which means it is saponified and dissolved, methylic alcohol of great purity being liberated. The solution of the oil is then decomposed by any mineral acid, when beautiful crystals of salicylic acid are formed. These are gathered, squeezed, and dried. They are then mixed with common quicklime or sand, and distilled in an iron retort ; carbolic acid of great purity, and crystallizing with the greatest readiness, passes into the receiver. This acid is equal to the purest kind obtained from coal tar, and employed in medicine-It, of course, possesses all the qualities which have rendered this substance almost indispensable in modern medical and surgical practice. (Pharm. Journ., Oct. 1871.)

The shrub has no vernacular name on the Nilgiris, and does not appear to be used by the natives except the berries which are eaten by the Badagas. The *Gandapuro* of Java (Ainslie, *Mat. Ind.* ii. 106) is referred to an Andromeda, and it is interesting to notice that on the authority of Dr. Horsfield, the volatile oil was used by the natives in rheumatic affections. Dr. de Vrij obtained a considerable quantity of oil from the leaves of two Javanese species, *G. leucocarpa* and *G. punctata*, and this was found by Köhler to be identical with Canadian Wintergreen oil.

Wintergreen oil is used as a flavouring agent on account of its agreeable odour. It is a convenient antiseptic, a drop or two of the oil will preserve a bottle-full of gum or of ink from mould for several months, and it is a useful adjunct to hypodermic injections and other pharmaceutical preparations. In large doses it produces the same effect as other aromatic essential oils. The large proportion of methyl salicylate contained in the oil naturally led to its employment in rheumatism. It was apparently first used for this purpose by Mr. Casamayor of Brooklyn, N. Y. (Ephemeris, i. 30), and next by Dr. Kinnicutt of New York (Med. Record, xxii. 505). Twelve cases of acute articular rheumatism treated by the latter gave an average duration of the pyrexia of 31 days; of the joint pains, 41 days; of the stay in hospital, 241 days. The oil was given at first in doses of 10 minims every two hours until eight doses had been taken, and afterwards the doses were increased as well as their frequency. The reporter believes that his cases presented less than the usual proportion of heart-complications ; but if so, the oil must differ in its effects from its active element, salicylic acid. Dr. Austin Flint (Phila-Med. Times, xiii., 846,) and Dr. Gottheil (Med. Record, xxiv., 258,) have reported analogous results. Dr. Waring (Brit. Med. Journ., June 6th, 1885) suggests the Indian oil for use as a stimulant, carminative and antiseptic.

Dr. Charteris, after experimenting on the comparative action of natural and artificial salicylic acid, concludes that the restlessness, confusion, delirium and retarded convalescence attendant on the use of the acid and its sodium salt in acuto rheumatism is due to the impurities of the acid prepared from coal-tar, and that natural salicylic acid and its salts are much safer remedies (*Brit. Med. Journ.*, Nov. 1889).

Description.—Oil of gaultheria is usually of a reddish colour, but may be obtained colourless by rectification. According to I. E. Leonard (1884), the colour is usually due to the presence of a little iron, and is readily removed by citric acid. It has a strong and agreeable aromatic odour and a sweetish, warm, aromatic taste, and begins to boil at a little above 200° C. Its specific gravity is 1.180 at 15° C. Occasionally, oil of gaultheria is lighter (1.170), in consequence of containing a light hydrocarbon, but the extent of this variation has not been fully determined. The oil is neutral or faintly acid to test-paper; has a slight dextrogyre rotation, and dissolves readily in alcohol and but to a small degree in water; the solutions acquire a dark-purple celour on the addition of ferric chloride. The pure-oil is not coloured on the addition of



strong nitric acid, but soon congeals into colourless crystals of a nitro-compound. A solid crystalline mass is also obtained on agitating the oil with concentrated solution of potassa or soda. -(Stillé and Maisch.) The Nilgiri oil has a sp. gr. of 1.087 at 15.5, and has no action on polarized light.

Chemical composition.—Procter (1842) recognized the presence in this oil of salicylic acid. Cahours subsequently (1843) proved it to consist to the amount of about 90 per cent. of methylsalicylic acid (methyl salicylate or mono-methylsalicylic ether), $CH^{5}C^{7}H^{5}O^{5}$. 100 grains of the oil contains 81 grains of salicylic acid. Pure methyl salicylate is a colourless oil, has the specific gravity of 1·18, boils at 222° C. (Cahours), and forms crystalline compounds with the alkalies. The remaining constituent of oil of wintergreen—of which Pettigrew (1884) obtained only 0·3 per cent.—is gaultherilene, a colourless thin hydrocarbon of the formula C¹°H¹⁶, boiling at 160° C., and having a strong peculiar odour, described as pepperlike by Cahours. Trimble and Schræter determined the hydrocarbon to be a sesquiterpene of the formula C³°H²⁴, and obtained crystals similar to benzoic acid from the oil.

Commerce.—The leaves yield more oil in the fine weather, from January to April, than at other times of the year; but owing to the sluggishness with which it comes over in the still, it could not be sold for much less than Rs. 6 per pound. The preparation of carbolic acid from the oil to compete with that from coal tar is out of the question at the present time but it might, with advantage, be used in making salicylic acid reducing the price of the natural acid which is quoted in London at 2s. 6d. per ounce.

PLUMBAGINEÆ.

PLUMBAGO ZEYLANICA, Linn.

Fig.—Rheede Hort. Mal. x., t, 8; Wight Ill., t. 179. Hab.—Throughout India. The root.



PLUMBAGO ROSEA, Linn.

Fig ___Rheede Hort. Mal. x., t. 9; Bot. Mag. tt. 230,5363.

Hab .- Sikkim, Khasia wild? Cultivated in India.

Vernacular. --Chitrak, Chita (Hind.), Chitra (Guz.), Chitraka (Mar.), Chita (Beng.), Chitri (Can.), Chittira (Tam.), Chitra, Agnimata (Tel.), Kotu-veli (Mal.), P. rosea bears the same names with the addition of the adjective red.

History, Uses, &c .- These plants, in Sanskrit Chitraka, are described as digestive, light, astringent, hot and appetizing; a remedy for dyspepsia, piles, leprosy, anasarca, worms, cough, phlegm, wind and biliousness. In the Nighantas, among other synonyms, they bear the names Dáruna, Dahana, and Agni, in allusion to their burning and acrid properties. P. zeylanica is much used as a stimulant adjunct to other preparations, in the form of a combination called Trimada, consisting of Plumbago root, Baberang (fruit of Embelia Ribes), and Nágarmoth (tubers of Cyperus pertenuis). It enters into the composition of numerous medicines for dyspepsia. The following is an illustration: Take of Plumbago root, Rock salt, Chebulic myrobalans and long pepper, equal parts; powder and mix. Dose about 40 grains. (Chakradatta.) A favourite medicine for flatulence is an old prescription of Susruta's called Shaddharanayoga. It is a powder composed of equal parts of the following substances: Plumbago root, seeds of Holarrhena antidysenterica, roots of Cissampelos Pereira, of Picrorrhiza Kurroa and Aconitum heterophyllum, Chebulic The root of P. zeylanica myrobalans. Dose about 1 drachm. is said to exercise a beneficial effect on piles, in which disease it is given in various combinations. One mode of administering it is as follows :- An earthen jar or pot is lined in its interior with a paste of the root, and curdled milk (dadhi) or Kanjika (rice vinegar) is prepared in this pot, Plumbago root reduced to a paste is applied to abscesses with the object of opening them. It enters also into the composition of several prepara-

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tions used as canstics. Religious mendicants attending fairs use the root for the purpose of raising sores upon their bodies in order to obtain pity and alms. In the Concan the following formula is used:—Chitrak root, Emblic myrobalans, small black myrobalans (Bál-hartaki), Long pepper, Pepper root, Rhubarb and Rock salt. Powder and give 6 mashas (90 grains) with hot water every night at bed-time in flatulence with rheumatic pains.

In paralysis, the bark, with Cratæva bark, Indian elm bark (Vávalá), Wild Moringa bark, and the bark of Vitex trifolia, is boiled in one part of white, and two of black mustard oil and applied. Mahometan writers treat of the drug under the name of Shitaraj, a corruption of the Indian name Chitrak; they describe it as caustic and vesicant, an expellant of phlegmatic humors; useful in rheumatism and spleen, digestive; it also causes abortion. For external administration it is made into a paste with milk, vinegar or salt and water. Such a paste may be applied externally in leprosy and other skin diseases of an obstinate character, and be allowed to remain until a blister has formed. In rheumatism it should be removed after 15 to When administered internally the dose is one 20 minutes. dirhem. Mir Muhammad Husain speaks of several kinds of Shitaraj, and says one of them is the Libadiyan or Lifadiyan Rhazes describes two kinds, Indian and of the Greeks. Svrian.*

The Shitaraj of Mahometan writers must, therefore, be considered to refer to the genus *Plumbago*, and not to any particular species. *P. zeylanica* is mentioned by several European writers upon Indian drugs, but has not attracted the same amount of attention as *P. rosea*, which is said to be more active. However, this may be, the former is the Chitrak of the native physiciaus, and very possibly may have been used

* Plunbago europea is considered to be the $\tau purotion$ of Dioscorides by Sprengel. $\lambda i B d d i o r f el terræ$ is the name of a plant mentioned by Pliny (25, 31), which has not, we believe, been identified by European writers with Plumbago.



by some under the supposition that it was the root of P. rosea. In the Pharmacopæia of India, Dr. Oswald is said to have employed P. zeylanica in the treatment of intermittents with good effect. It acts as a powerful suborific. In many parts of India the root is one of the most important drugs of the itinerant herbalist; it is also sold by all druggists. Ainslie, speaking of P. rosea, remarks.—"The bruised root of this plant is, in its natural state, acrid and stimulating, but when tempered with a little bland oil, it is used as an external application in rheumatic and paralytic affections; it is also prescribed internally in small doses for the same complaints, in combination with some other simple powder." (Mat. Ind., II., p. 379.)

O'Shaughnessy, who instituted a series of trials with the root as a vesicant, has expressed a very favourable opinion of it as a cheap substitute for cantharides. Dr. Waring thinks less favourably of it; be found that it caused more pain than an ordinary blister, and that the resulting vesication was less uniform, and not always easily healed. From what we have seen of its use, we are inclined to support Dr. Waring's opinion. Given internally in large doses, Plumbago root acts as a narcotico-irritant poison. In small doses it acts first as a powerful stimulant of the mucous membrane of the digestive organs, and after absorption, as a stimulant of the excretory glandular organs. Its action is well worthy of accurate scientific investigation.

Description.—The roots of P. zeylanica are from 1 to 2 or more inches in diameter, seldom branched. When dry, the external surface of the bark is of a dark reddish brown colour, somewhat shrivelled, and marked here and there by small warty projections; internally it is brown and striated; the fracture is short; the taste acrid and biting. Wood hard, reddish, close-grained. A section of the fresh bark when magnified shows numerous bundles of bright yellow stone cells forming an irregular zone towards the inner part of the middle layer of the bark. The cells of the parenchyma are large and contain much starch. In the dried root the yellow plumbagin



is seen in the cell walls both of the parenchyme and the woody tissue, but not in a crystalline form. (*Flückiger and Gerock.*) The root of *P. rosea* has a similar structure, but is much smaller.

Ohemical composition .- The activity of the drug depends upon the presence of plumbagin. This acrid principle was first separated by Dulong from the root of P. europæa by repeatedly boiling the ethereal extract with water, whence it was deposited on cooling, and purified by crystallization from alcohol or ether-alcohol. Plumbagin crystallizes in delicate needles or prisms, often grouped in tufts ; has a styptic saccharine taste, with acrid biting after taste ; melts very easily, and partly volatilises unaltered when heated. It is neutral, nearly insoluble in cold, more soluble in boiling water, very soluble in alcohol and ether. It dissolves with yellow colour in strong sulphuric and faming nitric acid, and is precipitated by water in yellow flocks. Alkalies change the colour of the solution to a fine cherry-red; acids restore the yellow colour. Flückiger (1887) examined the root of P. zeylanica supplied by one of us, and found that plumbagin could be obtained by submitting it to steam, when the latter is carried off by the water, from which it can be separated by shaking with ether. On evaporating the ether fine crystalline tufts of plumbagin of a bright orange colour are obtained; they have a peculiar odour and an intensely acrid, but not bitter taste. On heating them but very moderately, they are volatilized; they readily dissolve in alkaline solutions and impart to them. a red colour, but at the same time the plumbagin is altered, probably by exidation. The yield is very small, from about 50 lbs. of root only 31 grains of raw plumbagin could be obtained. Professor Flückiger found the proportion of plumbagin in P. europæa to be about the same as in P. zeylanica. An acid was also separated from the root by distillation. M. Greshoff, who has been investigating the chemistry of the medicinal plants of Java (Meded. uit S'lands Plant. VII., p. 55, Batavia, 1890.) is of opinion that the roots (supposed to be from Rauwolfia serpentina) examined by



Wefers Bettink (Haaxmans Tijdsch., Jan., 1888,) were really those of Plumbago rosea. Prof. Bettink extracted with chloroform a yellow crystalline principle, apparently the plumbagin of Dulong, which on crystallization from hot water and several times from alcohol was obtained in needles melting at 72° C., and showing the composition $C^{16}H^{15}O^6$. It was with difficulty soluble in water, but easily soluble in chloroform, benzol, carbon bisulphide and glacial acetic acid. On careful heating it sublimed, the yield was about 0.2 per cent. The principle somewhat resembled Juglone and possessed anthelmintic properties.

A further examination P. europæa made in 1889 by Prof. Flückiger and Mr. T. E. Gerock, showed that plumbagin is not contained in the aërial parts of the plant, with the exception of a small quantity in that part of the stem which is near the root. They found the root, when freshly cut, to be nearly devoid of colour, but on exposure it immediately assumed a yellow hue, from which they conclude that the plumbagin is probably the product of a rapid oxidation of some primary substance contained in the plant. In the dried root the plumbagin is seen in the cell walls both of the parenchyme and of the woody tissue, but not in a crystalline form. We have submitted to steam two cwts. of bazar plumbago root, and on shaking the distillate with ether obtained half a fluid ounce of a deep yellow oily fluid having a peculiar penetrating odour. On cooling it artificially, a few colourless crystals formed, which redissolved when the oil was gently warmed. The oil floated on water, and the mixture was unaffected by dilute acids and alkalies and salts of iron, lead. mercury and silver; it dissolved readily in ether and bi-sulphide of carbon, and to a small extent in rectified spirit. It struck a reddish colour, without dissolving in sulphuric acid. A drop of the oil in a watch glass was solidified by passing the vapour of ammonia over it. Heating on a water bath for two days was not sufficient to dissipate the whole of the oil. Heated to 250° for some time it turned reddish brown, and a vellowish fatty body was given off and occupied the higher part of the tube. A fow drops of the oil smeared upon the upper part of the arm was not vesicating, and occasioned no inconvenient symptoms.