

arcuate nerves, very prominent below, intramarginal veins generally not prominent. Flowers tetramerous, small, greenish, odorous, nearly sessile, in 3-flowered cymes, arranged in broad lax trichotomous panicles, with spreading or divaricate branches, arising from the leafless nodes of the previous year's wood. Calyx campanulate, with short obtuse marginate teeth. Petals cohering and falling off in a calyptra. Berry globose or ovoid, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, with but little mark of calyx, rugose, very juicy.

Sub-Himalayan forests from the Jumna to Assam, ascending to 2000 ft. Oudh and Gorakhpur forests, Chittagong, Burma, the western coast, and Ceylon. Outside India in South China and the Indian Archipelago. The fruit is eaten, and the tree is planted for its fruit. The leaves are renewed in April, the old leaves turning red before they are shed. Fl. April, May. The fruit ripens in June, July. In dry places a scrubby tree 35 ft. high and 5 ft. girth, but under favourable conditions grows to be one of the largest and most handsome trees of the genus. Bark 1 in. thick or more, cinereous, brown or blackish, rough with irregular hard scales, leaving cavities when they exfoliate. Inner substance red, fibrous. Sap and heart-wood similar, brown, close and fine-grained. Tough and durable, seasons and polishes well. Used in Kamaon and Garhwal for building and agricultural implements. The fruit is eaten.

4. BARRINGTONIA, Forst.

Trees with alternate leaves, usually approximate at the ends of branches. Flowers in terminal or lateral spikes or racemes, with small deciduous bracts. Calyx-tube ovoid or turbinate, not at all or scarcely produced above the ovary. Petals 4 or 5, adhering at the base to the staminal ring. Stamens indefinite, in many series, connate at the base into a short ring or cup; anthers small, versatile or fixed near the base. Ovary inferior, with an annular disc on the top within the stamens, 2-4-celled; 2-8 ovules in each cell; style filiform, with a small stigma. Fruit pyramidal ovoid or oblong, hard and fibrous, indehiscent. Seed solitary, with a thick testa; albumen none. Embryo thick, fleshy, consisting of two concentric homogeneous masses, the central mass corresponding to the pith, the outer to the bark, both separated by a thin layer of delicate vessels and fibres, corresponding to the woody portion of stem and root. Cotyledons rudimentary, scale-like. On the structure of the seeds of *Barringtonia* and *Careya*, see Thomson in Journ. Linn. Soc. ii. 47.

1. *B. acutangula*, Gärtner Sem. ii. t. 101; Bedd. Fl. Sylv. t. 204; Roxb. Fl. Ind. ii. 635; W. & A. Prodr. 333.—Vern. *Samundar phul*, *pamiāri*, *ingar*, Oudh; *Kanapa chettu*, Telugu.

A moderate-sized tree, with obovate or oblanceolate leaves, entire or serrulate, narrowed into a short petiole, glabrous, pale beneath, 3-5 in. long. Flowers red, in long slender pendulous racemes; bracts oblong, very deciduous. Ovary 2-celled, with 2 pendulous ovules in each cell. Fruit oblong, 4-angled, 1 in. long or longer.

Common on banks of streams, edges of swamps, and in moist places generally, in South India, Burma, Bengal, the Oudh forests, and the sub-Himalayan tract, extending west to the Jumna. Also Indian Archipelago and North

Australia. Leaves shed and renewed March, April. Fl. May; fr. Sept.-Oct. Attains a height of 30 and a girth of 5 ft., with a short trunk, and large crooked spreading branches. Bark 1 in. thick, cinereous or brownish black, rough with longitudinal reticulate cracks and furrows, and irregularly oblong exfoliating scales. Wood pale or reddish-brown, turns black if buried in mud, fine, close, but short-grained, hard, tough, strong, weight of cub. ft. 56 lb. (Skinner), 39.4 (Kyd); value of P. 315 (Kyd), 648 (Benson, green wood), 863 (Skinner). Said to be durable. No distinct heartwood. Used for boat-building, in wells, for carts, rice-pounders, and by cabinet-makers. The pounded bark is used to intoxicate fish; mixed with chaff and pulse, it is given as cattle-fodder.

5. *CAREYA*, Roxb.

Trees or undershrubs, with alternate leaves approximate near the ends of branches, and large showy flowers. Calyx wholly adnate to the ovary, ovoid or turbinate, with a 4-cleft limb. Petals 4, spreading. Stamens very numerous, in several rows; filaments distinct above, united at the base into a thick fleshy ring, inserted with the petals; the exterior and interior stamens generally without anthers, the middle row antheriferous; anthers small, versatile, dehiscing longitudinally. Ovary 4-celled, with numerous ovules attached to axile placentas; style filiform; stigma capitate, obscurely 4-lobed or -toothed. Fruit globose, with a thick rind, numerous seeds embedded in a fleshy pulp. No albumen. Embryo large, almond-like, structure similar to that of *Barringtonia*.

- | | | |
|------------------------------------|-----------|-------------------------|
| A large tree; flowers sessile | | 1. <i>C. arborea</i> . |
| An undershrub; flowers pedunculate | | 2. <i>C. herbacea</i> . |

1. *C. arborea*, Roxb. Cor. Pl. t. 218; Wight Ill. t. 99, 100; Bedd. Fl. Sylv. t. 205, Anal. t. 18 ii.; W. & A. Prodr. 334. Vern. *Kumbi kumbh*, *Khumbi*. Gond. names: *Kumri*, Chindwara; *Gumar*, Mandla, Balaghat.

A large tree, wholly glabrous. Leaves obovate-oblong, membranous, sessile or narrowed into short marginate petiole, crenate, with 10-12 pair of prominent main lateral nerves. Flowers large, sessile, a few together at the ends of branchlets, white and pink, with an unpleasant smell. Fruit globose, green, 3 in. across, crowned with the persistent calyx-segments.

Common in South India, Bengal, and Burma. Sparingly found in the forests of the Central Provinces, Oudh, and in the sub-Himalayan tract, where it extends west a little beyond the Jumna. Grown here and there in gardens in the Panjab. (In North Australia and Queensland a tree is found nearly related to this, *C. arborea*, var. *australis*, Benth. Fl. Austr. iii. 289.) Bare during part of the dry season, the new foliage appears in March, April. Fl. with the young leaves; fr. ripens and falls about July.

Under favourable circumstances attains a height of 50, and a girth of 8 ft., but in Central and North India is generally a much smaller tree. Bark 1-2 in. thick, dark grey, or dark brown, smooth or rough, with large exfoliating scales. Inner bark red, very fibrous. Sapwood yellowish white, large, heartwood dull red, or reddish brown, beautifully mottled, even-grained, hard and strong, does not season well, is apt to split, but takes a fine polish. The weight of a cub. ft. of seasoned wood is given by Skinner at 50 lb., and this may probably be

accepted as a fair average, though it seems to fluctuate between wide limits, the extremes being 35 and 60.75. My experiments with Burma wood gave 55 in 1862, 50.58 and 60.37 in 1864. The average of 9 experiments made by me in 1864 was $P.=768$, the extremes being 645 and 950; Skinner gives it at 870, which is probably somewhat too high. I am inclined to accept 800 as the mean value of the coefficient of transverse strength, with regard to the results of all experiments available to me. Annual rings fairly distinct, medullary rays very numerous, very fine, pores scanty, in oval groups of 3-6, uniformly distributed. Each annual ring marked by a narrow ring of darker wood. The wood is not much used in North-West India, save for agricultural implements. In South India and Burma used for cart-building. The bark is used as an astringent in native medicine. From the inner bark fuses for matchlocks are made, by pounding, cleaning, drying, and twisting it into a thin cord. These are said to burn at the rate of 12 inches per hour. Coarse strong cordage is also made of the bark.

2. *C. herbacea*, Roxb. Cor. Pl. t. 217.

A small undershrub; a thick woody root-stock producing annually a herbaceous stem 12-in. high, with cuneate leaves, and a number of pedunculate large beautiful pink flowers which appear in spring.

Grass lands in Bengal, Oudh, and the Central Provinces.

ORDER XXXVIII. LYTHRARIÆ.

Herbs, shrubs or trees with simple entire leaves, generally opposite, sometimes alternate or verticillate. Stipules none. Flowers bisexual, generally regular. Calyx free, campanulate cylindrical or hemispherical; lobes 4-8, valvate in bud, and often with as many intermediate, usually exterior teeth or appendices. Petals generally isomerous and alternate with the calyx-lobes, obovate, often corrugated in the bud, sometimes wanting, inserted inside the limb of the calyx. Stamens usually definite, perigynous; filaments inflected in the bud; anthers 2-celled, dehiscing longitudinally. Ovary free, usually 2-4-celled, cells with numerous ovules attached to an axile placenta; style simple, persistent. Fruit a capsule, 2-4- or many-celled, or by obliteration of septa 1-celled. Seeds numerous without albumen, embryo straight with a short radicle.—Gen. Pl. i. 773; Royle III. 208 (*Granateæ*), 212; Wight III. i. 204 (*Salicariææ*), ii. 2 (*Granateæ*).

Ovary free; leaves with black dots or glands beneath; calyx-tube curved

1. WOODFORDIA.

Ovary free; leaves without dots or glands; calyx-tube straight.

2. LAWSONIA.

Calyx-lobes 4; petals 4; stamens 8

3. LAGERSTREMLIA.

Calyx-lobes 6; petals 6; stamens numerous

4. PUNICA.

Ovary inferior; fruit with a hard coriaceous rind, crowned by the persistent calyx

5. SONNERATIA.

Ovary partially adnate to calyx; fruit fleshy, base and sides adnate to the persistent calyx; leaves thick

1. WOODFORDIA, Salisbury.

Calyx tubular, coloured, slightly curved and widened at the mouth, which is oblique, and has 6 small equal deltoid lobes, and as many exter-

nal short appendices, persistent in fruit, expanding and generally split below. Petals 6, alternate with the calyx-lobes, linear-lanceolate, minute. Stamens 12, inserted near base of calyx, much exserted; anthers ovate, versatile. Ovary 2-celled; style filiform, exserted. Capsule 2-celled, 2-valved, with numerous small seeds, covered with the persistent calyx.

1. *W. floribunda*, Salisb.; Boissier Fl. Orient. ii. 737.—Syn. *Grislea tomentosa*, Roxb. Cor. Pl. t. 31; Fl. Ind. ii. 233; W. & A. Prodr. 308. Sans. *Dhātri pushpika*, *Agnivāla* (the flame of fire). Vern. *Dāwi, tāwi, tāwa, dhā, thāwi, sawtha, dahāi, dhae, dhaura, dhawla*. Local names: *Dheutiz*, Oudh; *Dhuvie, surtāri*, C.P.; *Pitta marra*, Gonds, C.P.

A large shrub, with long spreading branches, pubescent, young branchlets and leaves with numerous small black glands. Leaves opposite or subopposite, sometimes in whorls of 3, sessile, 2-4 in. long, ovate-lanceolate from a cordate or rounded base, with 6-10 prominent arcuate lateral nerves on either side of midrib, joined by distinct intramarginal veins. Flowers on slender pedicels dilated above, shorter than calyx, with a few bracts at base, in axillary clusters. Length of style and stamens vary in this plant, as noticed for *Lythrum Salicaria* in Oliver's Ind. Bot. 213.

Common throughout India, beyond the Indus at Peshawar, and in Beluchistan. Ascends to 5000 ft. in the N.W. Himalaya. Fl. Feb.-April. 10 ft. high or more, bark smooth, peeling off in thin scales, wood pale nut-brown, close-grained, used as fuel. In the north-west the flowers are collected for export to the Panjab, for dyeing silks. The flowers secrete much honey.

2. LAWSONIA, Linn.

Calyx short, broad-turbinate, deeply cleft into 4, broad-ovate lobes, without appendices. Petals 4, sessile, corrugated in bud, inserted on a raised ring at the top of the calyx-tube. Stamens 8, inserted in pairs between the petals, sometimes 4 only; filaments subulate; anthers broad-oblong, the cells attached to a thick connective. Ovary globose, 4-celled; style filiform; ovules numerous, adnate to thick axile placentas. Capsule globose, supported at the base by the persistent calyx, pericarp brittle, bursting irregularly. Seeds truncate, cuneate or pyramidal, with a thick testa; cotyledons flat, orbicular; radicle short.

1. *L. alba*, Lamarck; Boissier Fl. Orient. ii. 744; Wight Ill. t. 87; W. & A. Prodr. 307.—Syn. *L. inermis*, Linn.; Roxb. Fl. Ind. ii. 258. *L. spinosa*, Linn. The *Henna plant of Egypt*. Sans. *Mendhi*. Vern. *Mendi, mehndi*.

A glabrous shrub, with angular branchlets sometimes spinescent, and opposite, sessile coriaceous small leaves, elliptic or obovate-elliptic, from a cuneate base; about 1 in. long. Flowers greenish yellow, very fragrant, $\frac{1}{4}$ in. across, on short slender pedicels, in large terminal paniculate cymes.

Indigenous in Beluchistan, on dry hills of the Coromandel coast, and perhaps in Central India. Cultivated throughout India for its leaves, and as a hedge-

plant. Probably indigenous in North Africa, Arabia, and Persia. Cultivated in most tropical and subtropical countries. Fl. throughout the year. Grown from seed and cuttings. The leaves are powdered and made into a paste which is used to dye nails, skin, and beard. Regarding its cultivation in the Amballa district, see Edgeworth Jour. As. Soc. vii. 754.

3. LAGERSTRÆMIA, Linn.

Trees and shrubs; leaves opposite or the uppermost alternate, petiolate, oblong or ovate, entire. Flowers in axillary or terminal panicles. Calyx-tube short, broadly turbinate, cleft into 6 ovate lobes. Petals 6, inserted between the calyx-lobes, clawed. Stamens numerous, inserted at the bottom of the calyx-tube; filaments long exserted, filiform; anthers versatile. Ovary sessile, 3-6-celled; style filiform; ovules numerous, attached to axile placentas. Fruit an oblong, coriaceous capsule, girt at the base by the persistent calyx, 3-6-celled, dehiscing loculicidally into 3-6 valves; dissepiments and placentæ attached to the middle of the valves. Seeds winged, with a membranous testa; cotyledons orbicular; radicle cylindrical.

1: *L. parviflora*, Roxb. Cor. Pl. t. 66; Fl. Ind. ii. 505; Bedd. Fl. Sylv. t. 31; W. & A. Prodr. 308.—Vern. *Bākli*, *dhaura*, *Kat dhaura*; N.W.P.; *Lendia*, *leindia*, *seina*, C.P.; *Sidda*, *āsīd*, Oudh and Mirzapore district; *Shej*, Banda; *Kākria*, *kākrio*, Banswara and Guzerat.

A large tree, glabrous, only youngest branches and leaves slightly pubescent. Leaves coriaceous, opposite, sessile or very shortly petiolate, oblong or ovate, with 6-10 prominent, arcuate lateral main nerves on either side of midrib. Flowers white, fragrant, $\frac{1}{4}$ in. across, on slender pedicels in panicles, few or many flowered. Calyx even, not ribbed, pubescent, the 6 outer stamens much longer than the rest. Capsule ovoid or cylindrical, $\frac{3}{4}$ - $\frac{1}{2}$ in. long, 3-4-celled. Seed with a terminal wing, longer than seed, the whole $\frac{3}{4}$ in. long, $\frac{1}{4}$ in. broad in the middle, with a straight thin edge on the inside, and a thick curved bark on the outside.

Common in Central India, Bandelkhand, Behar, Bengal, the Oudh forests, and the sub-Himalayan tract to the Jumna, ascending to 3000, and occasionally to 5000 ft. Banswara, Guzerat. South India (frequent in Mysore and on the east side). The old leaves shed in March, April, the young foliage comes out in May. Fl. April-June; fruit ripens in August, and remains long on the tree.

In North and Central India attains 50-70 ft., and a girth of 6-8 ft., with a straight clean stem, often 30-40 ft. to the first branch. Grows well from seed, coppices readily, the shoots growing rapidly into tall straight poles. Bark $\frac{1}{4}$ -1 in. thick, light ash-coloured, almost white, even, smooth, rarely marked with few shallow furrows, flaking off in dark-coloured scurfy pieces, leaving exposed the inner lighter-coloured layers. Wood light brown or yellowish, often with a reddish tinge, and mottled, smooth- and even-grained. Heartwood darker, but not sharply defined. Pores large; numerous whitish wavy concentric bands in the wood; annual rings not distinct. The cub. ft. weighs 40-50 lb. Elastic, tough, and of great transverse strength. Seasons well, works freely, and takes a fine polish. Fairly durable. Used extensively, and valued highly for ploughs and other agricultural implements, and for construction. Buggy-shafts

and axe-handles are made of it. A sweet gum exudes from wounds in the bark, and is eaten. Bark and leaves are extensively employed for tanning.

L. lanceolata, Wall.; Bedd. Fl. Sylv. t. 32.—Vern. *Bandāra*, *nāndi*, *nāna*, *nāni*, Western Ghats, a common tree in the forests on the west side of the Peninsula as far north as Khandeish, is similar to *L. parviflora*, but is readily distinguished by petiolate, ovate, acuminate leaves, which are bluish white beneath; larger flower-panicles, the calyx and pedicels clothed with dense grey pubescence, calyx-segments reflexed, and small capsules $\frac{1}{2}$ – $\frac{1}{4}$ in. long. (The large capsules figured by Beddome do not apparently belong to this species.)

L. indica, Linn.; Wight Ill. t. 86; a handsome shrub from China, with large white or purple flowers; petals long-clawed and much curled. Is cultivated in gardens.

L. Regiæ, Roxb. Cor. Pl. t. 65; Bedd. Fl. Sylv. t. 29; is a large, bulky, and valuable timber-tree with large showy lilac flowers, in moist forests of Eastern Bengal, Burma, the western coast of the Peninsula, and at the foot of the Ghats, extending north as far as the Ratnagiri district, where it is called *Taman*.—Vern. *Jarūl*, Bengal. *Pymma*, Burm. It differs from the three first-named species by the calyx longitudinally ribbed and furrowed, by all stamens being of equal length, and a large 6-celled ovoid or globose capsule. The wood is red, not heavy, and fairly strong, the cub. ft. weighs between 36 and 47 lb., and the average value of P. ranges from 600–850. It is used extensively for ship-building at Chittagong, and in Burma.

4. PUNICA, Linn.

Ovary inferior; calyx coriaceous, persistent, prolonged above the ovary, free part campanulate, cleft into 5–7 valvate lobes. Petals as many as calyx-lobes, inserted at the mouth of the calyx-tube, crumpled in bud. Stamens numerous, inserted at different heights below the petals; filaments distinct; anther-cells attached to a large ovoid connective. Style filiform; stigma capitate. Fruit large, globose, crowned by the somewhat tubular limb of the calyx, indehiscent, divided in 2 tiers or divisions, the lower 3-celled, the upper 5–9-celled; dissepiments membranous; placentæ in the lower division at the bottom of the cells, in the upper stretching from the side of the fruit to the middle. Seeds numerous, nestling in a pellucid pulp. Embryo oblong; radicle short, acute; cotyledons foliaceous, spirally convolute.

The structure of the fruit is remarkable. The bud in its youngest state shows a thick concave disc, closed by the valvate sepals or calyx-lobes. At the bottom of the disc appear the carpels, in two circles; at its edge the petals, alternating with the calyx-lobes, and the space between petals and carpels is occupied by numerous rows of stamens. The carpels of the outer circle appear first, they are 5–9; the number of the inner carpels is generally 3, sometimes 5. These carpels coalesce, and the upper portions uniting, form the style. Each carpel has numerous ovules, which originally appear at the bottom of its cavity. Meanwhile the sides of the concave disc keep on growing, finally the outer carpels are raised, and form the upper division of cells in the fruit, while those of the inner ring remain at the bottom, and form the lower tier or division. The position of the placentæ also is somewhat changed through the expansion and altered position of the carpels. The ripe Pomegranate may be compared to the

fruit of a Rose, with this difference, that in the Rose the carpels are more numerous, that they do not coalesce, though the styles sometimes do, and that they are 1-seeded. This brief indication of a most curious structure is intended to elicit further researches on the development of the ovary in the Indian genera of Rosaceæ, Myrtaceæ, and Lythariæ (*Sonneratia* and *Duabanga*). With regard to *Punica*, there should be consulted, besides Lindley's Vegetable Kingdom, and Wight's Illustrations, Agardh. Syst. Plant. 1858, t. xii.; Griffith Notulæ, iv. p. 641, Ic. t. 634; Payer Organogénie Comparée de la Fleur, Paris, 1857, p. 465, t. 99; Berg in Martius Fl. Brasiliensis, Myrtaceæ, p. 6, t. 8, 9. *Punica* is an anomalous genus, with some affinity to Myrtaceæ, but is separated from that order by the valvate calyx and other characters.

1. *P. Granatum*, Linn.; Roxb. Fl. Ind. ii. 499; W. & A. Prodr. 327; Wight Ill. t. 97. The *Pomegranate*. Sans. *Dalima*; Arab. *Rumân*; Pers. *Anâr*.—Vern. *Anâr* (tree and fruit), *dârim*, *dâlim*, *dâl*, *daru*, *dhâru*, *darnu*.

A shrub or small tree, deciduous, glabrous, often with spinescent branchlets. Leaves opposite or subopposite, often fascicled, on short petioles, oblong, quite entire, not dotted. Flowers sessile, terminal, solitary or in 3-flowered cymes, usually scarlet, rarely white or yellow. Fruit 2-3½ in. diam., with a coriaceous rind; pulp red, in some varieties white. Seeds angled.

Wild, common in Eastern Afghanistan and Beluchistan to 6000 ft. Hills west of Sindh to 4000 ft. East flank of Suliman range between 3500 and 6000 ft. Not uncommon in the Panjab Salt range, and in parts of the North-West Himalaya. Abundant in Kamaon (wild ?) at elevations between 2000-6000 ft. Believed also to be indigenous in Syria. Run wild in Greece (Fraas Syn. PL. Fl. class. 79). Cultivated extensively in many parts of India, in Western Asia, the Mediterranean region, and in many subtropical countries of the Old and the New World.* New leaves (in India) Feb., March; fl. chiefly April, May, but also at other seasons; the fruit ripens from July-Sept. Easily raised from cuttings; growth slow (18 rings per in. radius).

Rarely over 20 ft. high, with a short trunk attaining 3-4 ft. in girth; bark yellowish or dark grey. Wood whitish or yellowish white, close- and even-grained, hard, heavy, takes a fine polish. Several varieties of the fruit are cultivated in Kashmir, but the best Pomegranates are imported into India from Afghanistan; those of Jellalabad are valued most. The bark of the root is an excellent vermifuge, and is considered a specific against the tape-worm (Pharm. Ind. 93). The rind of the fruit, *nâspâl*, Pb. *chandi*, *chowdi*, *kûshâla*, Sindh, is extensively used as a dye- and tan-stuff; from the flowers a light-red dye is made. Morocco leather is tanned and dyed with the bark of the tree.

* The Pomegranate, the Fig, and the Vine are frequently mentioned in the Old Testament (e. g., Deut. viii. 8). The Pomegranate occurs in the Odyssey; its name (*poîd*) is supposed to suggest an affinity with the Hebrew and Syrian name *Rimmon*. There seems no doubt that the tree is not indigenous in Greece, and that its cultivation was originally introduced from Syria. Of the Latin names, *mala granata*, *que punica vocantur*, the first is explained by the number of seeds (*a granarum multitudine*), the second indicates that the fruit, or at least some of the better kinds, was brought from North Africa. The Pomegranate is not, however, indigenous in North Africa, and was probably brought to Carthage from Phœnicia.

5. **SONNERATIA**, Linn. f.

Glabrous trees or shrubs, with opposite, petiolate, thick leaves. Flowers large, solitary or in 3-flowered cymes. Calyx thick, the tube broadly campanulate, adnate to the ovary at the base; lobes 4-8, without appendices. Petals 4-8, narrow or none. Stamens numerous, inserted at the top of the calyx-tube, inflected in the bud. Ovary enclosed in, and partially adnate to the calyx-tube, depressed-globose, 10-15-celled; style elongated with a small capitate stigma. Fruit large, depressed, fleshy and indehiscent, surrounded by the persistent calyx, and adnate to it at the base. Seeds immersed in pulp, angular with a thick testa. Cotyledons oily.

1. *S. acida*, Linn. f.; Roxb. Fl. Ind. ii. 506; W. & A. Prodr. 327; Wight Ic. t. 340.

A small tree, with drooping branches and petiolate, broadly ovate or obovate leaves, generally with cuneate base. Calyx-segments about 1 in. long. Petals purple, linear, scarcely exceeding the calyx. Fruit 1-2 in. diam.

In salt marshes and creeks. Delta of the Indus, western coast, Sunderbans, and Burma coast. Also on the east coast of Africa, and in North Australia. Wood used as fuel (Grah. Cat. Bomb. 72).

ORDER XXXIX. **SAMYDACEÆ.**

Trees or shrubs, with simple, petiolate, alternate, distichous leaves, and small deciduous stipules. Flowers inconspicuous, regular, generally bisexual. Calyx coriaceous, persistent, gamosepalous, lobes 3-7, imbricate or valvate. Petals perigynous, none or as many as calyx-lobes, alternate with them and similar to them in substance. Stamens definite or indefinite, often alternating with barren staminodes; anthers 2-celled, the cells dehiscing longitudinally. Ovary free, rarely adnate to the calyx-tube, syncarpous; ovules attached to 3-5 parietal placentæ. Fruit a capsule, 1-celled, generally 3-5-valved, rarely indehiscent. Seeds generally few, with a coriaceous or crustaceous testa, and copious fleshy albumen.—Gen. Pl. i. 794; Royle III. 170.

1. **CASEARIA**, Jacq.

Trees or shrubs with alternate, distichous leaves; stipules small lateral. Flowers fasciculate, small, green or yellow, on articulate bracteate pedicels. Calyx-tube short, with 4-6 imbricate lobes. Petals none. Stamens 6-15, alternating with an equal number of barren staminodes, and usually connate with them into a short tube or ring. Ovary free, narrowed into a short style; ovules numerous, attached to 3-4 parietal placentæ. Capsule 3-4-valved, seeds numerous, attached to the middle of the valves. Seeds with a fleshy aril; albumen fleshy; embryo straight; cotyledons flat; radicle terete.

Tomentose; stipules minute; leaves oblong or ovate-oblong . . . 1. *C. tomentosa*.
Glabrous; stipules $\frac{1}{2}$ in. long; leaves elliptic. 2. *C. gracilens*.

1. *C. tomentosa*, Roxb. Fl. Ind. ii. 421.—Tab. XXXI.—Syn. *C. elliptica*, Willd.; Wight Ic. t. 1849. Vern. *Chilla*, *chilāra*, *bāiri*, *bhāri*. Local names, *Tondri mara*, Gonds, C.P.

A small tree; leaves and branchlets tomentose. Leaves oblong, or ovate-oblong from an oblique base, serrate, 3-7 in. long, on short petioles; 8-10 main lateral nerves on either side of midrib, joined by prominent parallel transverse veins; stipules small. Flowers tomentose, greenish yellow, on pedicels somewhat longer than calyx, numerous, in compact axillary fascicles. Calyx 4-5-cleft. Stamens 8; staminodes hairy. Fruit ovoid, $\frac{3}{4}$ in. long, somewhat fleshy, 5-6-ribbed, 3-valved, on short pedicels, solitary, or few together in lateral fascicles. Seeds embedded in a scarlet soft mass, consisting of the agglomerate arils.

Common in Central India, Behar, the Oudh forests, and the sub-Himalayan tract as far as the Indus. Also in Eastern Bengal, South India and Ceylon. The leaves shed Jan.-March; new leaves appear March, April. Fl. Jan.-May, generally about April.

Generally not exceeding 30 ft., with a short trunk, attaining a girth of 4 ft.; on good soil (frequently in the Baraich division of the Oudh forests), attaining 40 ft., and 7-9 ft. girth, R.T. Bark nearly 1 in. thick, cinereous, with white specks, or blackish brown by age, smooth, with longitudinal wrinkles, with rough furrows in old stems. Wood dirty white, or yellowish, even-grained, compact, hard, strong and elastic, 48 lb. per cub ft., R.T. Apt to split in seasoning, does not warp, and works smoothly. Heartwood not distinct, employed for ordinary purposes, not much valued, combs are made of it. All parts of the tree are very bitter; in Kamaon the pounded bark is used for adulterating the *Kamela* powder of *Rottlera tinctoria*. The pounded fruit yields a milky, acrid juice, used for poisoning fish.

2. *C. graveolens*, Dalzell; Kew Journ. of Bot. iv. 107 (1852); Bombay Fl. 11.—Vern. *Chilla*, *nāro*, *aloāl*, *kathera*, *pimpri*, North-West India; *Girchi*, *tündri*, C.P.

A shrub or small tree, glabrous; leaves elliptic, dentate, 4-8 in. long, on short petioles; 8-10 main lateral nerves on either side of midrib; stipules $\frac{1}{2}$ in. long, falcate or lanceolate, deciduous. Flowers green, numerous, with a disagreeable odour, clustered in the axils of the leaves. glabrous; pedicels very short. Calyx-lobes 5. Stamens 8, alternating with acute penicillate scales (staminodes). Fruit oblong, shining, 3-valved; seeds 12.

Abundant in the Oudh forests (associated with *Sāl*), also in the Central Provinces, the Konkan, and Canara. In the sub-Himalayan tract as far west as the Chenab, locally and sparingly only, ascending to 5000 ft. The leaves are shed in March and April, and renewed in May. Not higher than 20 ft., girth 12-15 in. Bark dark cinereous, with white specks, even, with a few longitudinal wrinkles. Wood light-yellow, fine-grained; the fruit is used to poison fish.

Homalium, Jacquin, is another genus of this order, distinguished by a half inferior ovary, styles 3-5, calyx-lobes and petals 6-7, flowers in slender axillary racemes or terminal panicles.

1. *H. tomentosum*, Benth.; Linn. Journ. iv. 34.—Syn. *Blackwellia tomentosa*, Vent. *Myaukshaw*, Burm. A large tree with smooth white bark (too smooth

for monkeys, the Burmese name), large subsessile obovate leaves, tomentose beneath, and flowers in axillary racemes. Burma. Java.

2. *H. nepalense*, Benth.—Syn. *Blackwellia nepalensis*, Wall. Pl. As. rar. t. 179, with ovate, petiolate, glabrous leaves and paniculate flowers, Nepal.

ORDER XL. PASSIFLOREÆ.

Herbs, shrubs, rarely trees, with alternate leaves with or without stipules. Flowers regular. Stamens definite; anthers 2-celled, dehiscing longitudinally. Ovary free, 1-celled, with numerous ovules, attached to 3-5 parietal placentæ. Fruit dry or fleshy with numerous seeds, covered with an arillus or pulpy integument, testa coriaceous or crustaceous; embryo large, with foliaceous cotyledons, enclosed in a fleshy albumen.—Gen. Pl. i. 807; Royle Ill. 220 (*Papayaceæ*); Wight Ill. ii. 33.

The principal genus of this family is *Passiflora*, comprising a large number of species, mostly American, and a few Indian, herbaceous or perennial climbers, with axillary tendrils, showy bisexual flowers, with a stalked ovary; stamens adnate to the gynophore, and a ring with filiform appendages arising from the calyx-tube. The genus *Carica* belongs to the tribe *Papayaceæ* with unisexual flowers and no ring or corona.

1. *CARICA*, Linn.

Soft-wooded trees or shrubs with milky juice, stem generally simple, or with few branches, leaves at the ends of branches. No stipules. Flowers in axillary racemes or panicles, uni- or bi-sexual. Calyx small, 5-lobed. Corolla in the male flowers gamopetalous, 5-lobed; in the female flowers, of 5, linear-oblong deciduous petals. Stamens 10, inserted in the mouth of the corolla, those opposite to the lobes on short filaments, those alternate with them sessile; anthers adnate to the filaments, 2-celled, dehiscing longitudinally. Ovary free, ovules numerous, attached in 2 rows to 5 parietal placentæ. Fruit fleshy, sulcate, indehiscent with numerous seeds. Embryo straight, in a fleshy albumen; cotyledons flat, oblong.

1. *C. Papaya*, Linn.; Roxb. Fl. Ind. iii. 824; W. & A. Prodr. 352; Wight Ill. t. 106, 107.—Vern. *Papaya*, *pepiya*.

A small soft-wooded, fast-growing, and short-lived tree, with large glabrous palmatifid and palminerved leaves, 12-24 in. across, on long hollow petioles, forming a round tuft at the top of the stem. Flowers on axillary panicles, pale yellow, fragrant, generally dioicous, but occasionally a few female flowers on a male plant. Male flowers in long drooping panicles. Female flowers in short clusters. Ovary 1-celled. Stigma sessile, 5-lobed, lacerated. Fruit succulent, indehiscent, 1-celled. Seeds numerous, black, enclosed in sweet mucous pulp, and covered with a loose hyaline skin or arillus; testa thick, brittle.

Indigenous in Brazil, and probably also in Central America and the West Indies. Cultivated throughout South India, Burma, and Bengal; in North-West India as far as Saharanpur and Delhi. The Papaya must have been introduced

- into India at an early date after the discovery of America, for in 1626 seeds were brought to Naples from India (De Candolle Geogr. Bot. ii. 917). The Indian name of the plant is derived from that under which it was known in America (*Papaw*, *papay*), and the Burmese name of *Thimbanthi* (fruit brought
- by sea-going vessels) is a further confirmation of its foreign origin. In flower and fruit nearly throughout the year, bears fruit 18 months after sowing. The unripe fruit is eaten as a vegetable and preserved, the ripe fruit is sweet and very pleasant, the seeds are pungent. Meat becomes tender by washing it with water impregnated with the milky juice, or by suspending the joint under the tree.

Tetrameles nudiflora, R. Brown; Bedd. Fl. Sylv. t. 212—Syn. *T. Grahamiana*, Wight Ic. 1956—is a large deciduous tree, of the Order *Datisceæ*. Fl. yellow, small, dioicous; male flowers in erect panicles, crowded at the ends of branchlets; female flowers in pendulous racemes. Calyx 5-cleft; petals none; stamens 4; styles 4. Capsules small, many-seeded, dehiscent at the top. Leaves cordate, long-petiolate, tomentose beneath. Fl. Feb.-March, while leafless. Burma. Western coast from Bombay southwards. Wood soft.

ORDER XLI. CACTEÆ.

Perennial plants, often arborescent, with succulent stems of anomalous form, flat, lobed, columnar, ovoid or globular. Leaves minute, scale-like, rarely perfect; epidermis of the younger parts of stem and branches green and furnished with pores. Flowers usually large and handsome, sessile, solitary, bisexual and regular. Calyx tube adnate to the ovary; limb short or tubular; lobes numerous, on the margin only, or covering the entire surface of the ovary. Petals numerous, inserted at the mouth of the calyx, the outer conform to the calyx-lobes. Stamens indefinite, filaments filiform, long; anthers ovate, versatile. Ovary inferior, syncarpous, 1-celled; ovules numerous, on parietal placenta; style terminal, simple; stigma radiating. Fruit succulent, 1-celled. Seeds numerous.—Gen. Pl. i. 845; Royle Ill. 223; Wight Ill. ii. 48.

1. OPUNTIA.

Branches flat, jointed, the joints ovate, obovate, or oblong, bearing tufts of spines or bristles. Leaves small, very caducous, under each younger tuft. Flowers arising from the tufts or margins of the joints, yellow or reddish. Calyx-tube not prolonged beyond the ovary; lobes numerous, the outer scale-like or foliaceous, adnate to the ovary, the inner short, flat. Petals numerous, connate at the base, spreading. Stamens indefinite, in many series; filaments shorter than petals, free or connate. Style cylindric, thicker below, constricted at the base; stigma with 2-7 thick erect branches. Fruit pyriform, umbilicate at the top, tubercled, and often having spines. Seeds with a hard osseous testa, foliaceous cotyledons, and copious or scanty albumen.

1. *O. Dillenii*, Haworth; W. & A. Prodr. 363; Wight Ill. t. 114.—Syn. *Cactus indicus*, Roxb. Fl. Ind. ii. 475. *Prickly Pear*. Vern. *Nāḡ-phana* (the hood of a serpent), *nāḡphansi*, Hindi; *Chappal sēnd*, Dekkan.

Erect, with numerous spreading branches, often 10-15 ft. high, gregarious, forming extensive and impenetrable masses of thorny, fleshy, articulate stems; joints obovate, flat, 6-10 in. long, glaucous-green, with minute, cylindrical or conical, fleshy, caducous leaves under each tuft on the youngest joints. Tufts on the surface of the joints about 1-2 in. apart, nearer together on the edges, subglobose, nearly $\frac{1}{4}$ in. diam., consisting of dense woolly hairs, and numerous short, very sharp spinescent brownish bristles; one or several strong, sharp cylindrical spines from each tuft, unequal in length, one much longer than the rest, 1-2 in. long. Spines whitish, except the point, which is darker coloured and somewhat transparent. Flowers from the upper edge of the joints, 2-3 in. across, yellow, tinged with red, open during the day only. Stamens half the length of petals.

Indigenous in America, but naturalised in India, extending north-west to the Jhelam. Ascends to 5000 ft. in the N.W. Himalaya. Often destroyed locally by the multiplication of a species of *coccus*; thus at Almora in 1846 (Madden l. c. 585), and in 1844 in the Panjab (Stewart Panjab Plants, p. 101). Forms impenetrable hedges, and was used by Tippoo Sultan to strengthen his fortifications. Was planted as a fence along portions of the Great India Peninsula Railway in the Dekkan; but is too much exposed to injury from fire, the grass which grows up abundantly between the stems drying up during the hot season, and catching fire readily, which destroys the entire hedge. Is regarded as an objectionable weed in most parts of India, as it harbours reptiles and spreads rapidly, occupying ground without return. The joints strike root, but its rapid extension is mainly due to the spread of the seed through birds which eat the fruit.

Three species of the genus, closely allied to the Indian species, are naturalised in the Mediterranean region; but it is a subject for farther inquiry whether they should be kept distinct as species, and whether any of them may be identified with the Indian *Opuntia*. The history of the distribution of these remarkable plants from America over such a large portion of the warmer regions of the Old World merits farther study on the part of Indian and Mediterranean botanists, and it may not be out of place here to state a few of the leading facts.

Boissier (Voyage Botanique dans le Midi de l'Espagne, 1837, ii. 229) mentions *Opuntia vulgaris*, Mill. only, as growing in the Mediterranean region, but adds that in Granada there are two forms, distinct by the length of their spines, leaving it undecided whether they are species or varieties. Grisebach (Vegetation der Erde, i. 322) enumerates three species, and under these may be brought all forms described by Visiani (Flora Dalmatica, 1842, iii. 143), Gussone (Flora Sicula Synopsis, 1842, i. 549), Tenore (Sylloge Fl. Neapolitana, 1831, p. 239), Webb (Hist. Nat. des Îles Canaries, 1840, iii. i. p. 209), and Lowe (Flora of Madeira, 1868, p. 313).

a. *O. Ficus Indica*, Mill.—Syn. *Cactus Opuntia inermis*, De Candolle Plantes Grasses, t. 138. Erect, 8-12 ft. high, joints oval or obovate, 1 in. thick, and more than 12 in. long, with short thick tufts of pale or yellowish bristles, without spines, or with feeble weak spines, or with one strong sharp spine. Flowers yellow; fruit prickly outside, eatable, 3-4 in. long. Abundant in North Africa, Syria, the South of Europe (Madeira and the Canaries?). The fruit, which ripens from July to Sept., forms an important article of diet for the inhabitants of those countries. Indigenous in Jamaica and South Florida, where the fruit is also eaten. The introduction of this sp. into India has been suggested (Boyle

III. 223). Called *Opuntia Ficus Indica* by Visiani and Gussone, *O. vulgaris* by Tenore. Webb calls *Ficus Indica* the principal species in the Canaries, but Lowe refers this and the Madeira Opuntia to *Opuntia Tuna*, Haw. (*Cactus Tuna*, Linn.) Whatever the correct name for the Opuntia on those islands may be, it is important to state that this is the species employed in the Canaries for raising Cochineal. The first introduction of the insect 30 or 40 years ago was violently opposed by the country people, especially in Teneriffe, on the ground of its rendering the *Tuneras*, or plants of Opuntia, barren, and injuring the crops of their favourite fruit, called Figos, which are much used, both fresh and dried, Lowe l. c. 316.

b. *O. amyclæa*, Tenore l. c. 240; Fl. Neap. t. 236. Stature of *O. Ficus Indica*, with 4-6 stout, divergent, unequal, whitish spines on each tuft, angular at the base, orange-coloured flowers, and smaller, hardly eatable fruit. Dalmatia, South Italy, Sicily, the Canaries. Webb l. c. calls this sp. *O. Tuna*, Mill, but Lowe refers it to the Indian species *O. Dillenii*, Haw.; and the specimens in Hb. Kew from the Canaries (coll. Bourgeau) seem to confirm this view. Tenore figures, Gussone and Visiani describe their plant as having very short, nearly obsolete tufts at the base of the spines; whereas the specimens from the Canaries have a thick tuft of woolly hairs. The spines of these specimens are more angular than those of the Indian Opuntia, and somewhat transparent along their entire length. The identity, therefore, of the Indian Opuntia with the spinescent kind of South Europe and the Canaries is a matter for farther inquiry. Lowe describes his plant with yellow flowers tinged with red outside.

c. *O. nana*, Visiani (*O. vulgaris*, Mill. in Koch Synops. Fl. Germ. 291), is a small spinescent plant, the joints only a few inches long, not erect, but diffuse, leaning against rocks, found in Dalmatia and the warmer valleys of Tyrol and Switzerland.

The Cochineal insect in Mexico and other parts of Central America lives on several *Opuntias* nearly allied to those here described. As stated above, its introduction has been successful on Teneriffe, and there it thrives on a species closely related to the Indian one. Wight (III. ii. p. 50), and Royle (III. p. 223), describe the steps that have been taken to encourage its cultivation in India. Some Cochineal has been produced in India, and though the price of the article has diminished of late, it may yet become a matter of some importance in the drier districts of the country.

ORDER XLII. ARALIACEÆ.

Erect or climbing shrubs or trees, rarely herbs, with alternate simple or compound leaves. Flowers regular, umbellate, or capitate. Calyx adnate to ovary, limb short, entire toothed or lobed. Petals generally 5, very deciduous, valvate or slightly imbricate in bud. Stamens as many as petals, rarely numerous; filaments inflexed; anthers didymous, versatile. Disk epigynous. Ovary 2- or more-celled, 1 ovule in each cell. Fruit a drupe or berry, with 1 or more 1-seeded cells. Seed pendulous; testa membranous; albumen dense, fleshy; embryo minute, ovoid or oblong.—Gen. Pl. i. 931; Wight III. ii. 60; Royle III. 233.

Soft-wooded Araliaceous shrubs and small trees, often scandent or epiphytic, are not uncommon in the tropical forests of India. Within the range of this Flora they are not numerous, and it will suffice to mention a few, besides the Ivy, as representative forms.

Petals imbricate; leaves digitate, pinnate, or bipinnate, leaflets serrulate; stipules not prominent	1. <i>ARALIA</i> .
Petals valvate; leaves simple, coriaceous	2. <i>HEDERA</i> .
Petals valvate; leaves digitate, coriaceous	3. <i>HEPTAPLEURUM</i> .
Petals valvate; leaves tripinnate	4. <i>HETEROPANAX</i> .

1. *ARALIA*, Linn.

Herbs or shrubs, leaves digitate pinnate or bipinnate, leaflets membranous, serrulate. Flowers umbellate. Petals 5, ovate, not unguiculate, imbricate in bud. Ovary 2-5-celled. Fruit drupaceous with 2-5 crustaceous or hard pyrenes in a fleshy exocarp. Albumen not ruminated.

1. *A. Cachemirica*, Decaisne; Jacq. Voy. Bot. t. 81.—Syn. *Panax decomposita*, Wall.

A large perennial herb 6-10 ft. high; leaves bipinnate, rough, with short hairs, leaflets ovate-lanceolate, acuminate, unequal-sided. Umbels in large terminal panicles. Styles 5, connate at base. Pyrenes 5.

Abundant in the North-West Himalaya 5000-9000 ft., up the Sutlej as far as Dippi. Sikkim at 10,000-14,000 ft. Fl. June-Oct.

Pentapanax, Seemann, nearly allied to *Aralia*, has glabrous, imparipinnate leaves, with 3-7 leaflets, and entirely connate styles: 1. *P. parasiticum*, Seem. Journ. Bot. ii. 296.—Syn. *Hedera parasitica*, Don. Vern. *Kot Semal*, Kamaon, is a climbing soft-wooded shrub; rootlets on branches, leaflets 5, ovate-lanceolate, coriaceous, entire, 2-3 in. long. East Bengal, Nepal, Kamaon, (ascending to 7500 ft.) 2. *P. Leschenaultii*, Seem.—Syn. *Hedera Leschenaultii*, Wight and Arn. Prodr. 377; *H. trifoliata*, Wight l.c. t. 307; *H. fragrans*, Don (not Roxb.), is a soft-wooded shrub, with 3, rarely 5, broad-ovate membranous leaflets 4-5 in. long, with long subulate serratures. Nilgiris, Sikkim, Nepal, Kamaon (ascending to 8500 ft.)

2. *HEDERA*, Linn.

Woody climbers. Leaves simple, stipules none. Flowers in paniculate umbels, polygamous. Disc tumid. Ovary 5-celled; styles short, connate. Berry subglobose, 5-celled, 5-seeded; endocarp membranous or parchment-like, closely investing the ovoid seed. Albumen ruminated.—Two species, one in Australia, the other in the temperate regions of the Old World.

1. *H. Helix*, Linn.; Wall. in Roxb. Fl. Ind., ed. Carey, ii. 515; Boissier Fl. Orient. ii. 1090; Hook. Stud. Fl. 172. *Ivy*. Vern. *Halbambar*, *arbambal*, Jhelam; *Karmora*, *mandia*, Kashmir; *Kurol*, Chenab; *Kurie*, *karür*, Ravi; *Brümbrüm*, *dakäri*, Bias; *Karbäru*, *käniüri*, Sutlej; *Banda*, Kamaon.

A large woody climber, stem and branches attaching themselves closely and adhering firmly to wood, rocks, walls, and the bark of trees, but not penetrating into the living tissue. Branchlets, leaves, and petioles wholly glabrous, shining. Leaves leathery, dark-green above, pale-green beneath,

2.5 in. long, exceedingly variable, those of flowering branches ovate or lanceolate, with a tapering base, the others more or less triangular in outline; 3- or 5-lobed, with a rounded or cordate base, the lobes deep or shallow, often lobulate; petiole slender, varying in length, generally shorter than leaf. Flowers yellowish-green, in pedunculate globose umbels; peduncles and pedicels clothed with minute stellate scales. Berry yellow, shining, 3- or 4-seeded.

Afghanistan, and hills trans-Indus. Panjab Salt range. Himalaya, 3000-9000 ft., from the Indus to Bhutan. Kasia hills. Europe, North Africa, Western Asia, Japan. Fl. Oct. to April. The berries of the European Ivy are black, rarely yellow. Attains a large size. Mathieu, Fl. For. 138, describes a stem grown near Montpellier, 433 years old, 6 ft. 7 in. girth. Wood light-grey or yellow, soft and light. The Ivy is not a parasite; nevertheless it considerably impedes the growth of the trees to which it attaches itself.

3. HEPTAPLEURUM, Gärtner.

Large shrubs or trees. Leaves digitate, leaflets coriaceous, entire. Stipules prominent, connate between branch and petiole. Flowers in racemes or in paniculate umbels. Petals generally 5-6, rarely more, valvate. Stamens as many as petals. Top of fruit generally raised beyond the calyx-limb.

1. *H. venulosum*, Seemann; Journ. Bot. iii. 80.—Syn. *Paratrophia venulosa*, Wight Ill. t. 118; *Hedera terebinthacea*, Wall.; *Arabis digitata*, Roxb. Fl. Ind. ii. 107. Vern. *Dain*.

A small, soft-wooded tree with straggling branches, often sending out rootlets. Leaflets 5-6, glabrous, elliptic-oblong, acuminate, unequal, the middle leaflet largest; common petiole 5-6 in. long, partial petioles $\frac{1}{2}$ -2 in. long. Flowers in paniculate umbels. Berry smooth, yellow, ovoid, 5-celled.

South India, Burma, Bengal, Satpura range, Kamaon, ascending to 3000 ft. Fl. Feb., March.

4. HETEROPANAX, Seemann.

1. *H. fragrans*, Seem. Journ. Bot. iv. 297.—Syn. *Panax fragrans*, Roxb. Fl. Ind. ii. 76.

A small soft-wooded tree 15-20 ft. high, leaves glabrous, tripinnate, 2-4 ft. long, leaflets ovate or rotundate, entire, 3-6 in. long, on short petioles. Flowers yellow, fragrant, polygamous, subsessile or shortly pedicellate, in compact subglobose, paniculate umbels, the umbels at the end of branches and branchlets generally composed of bisexual, the lateral ones of male flowers. Petals 5, valvate. Ovary 2-celled; styles 2, filiform, distinct. Fruit laterally compressed, $\frac{1}{2}$ in. across, broader than long, 2-celled; endocarp crustaceous; albumen ruminated.

Burma, East Bengal, sub-Himalayan tract Kamaon (above 2000 ft.) to Assam. Fl. Oct.-Dec.

Fatsia papyrifera, Decaisne.—Syn. *Aralia papyrifera*, Hook. Bot. Mag. t. 4897, the Chinese Rice-paper plant; belongs to this order. It is a shrub with large white pith, from which the rice-paper is cut, and large palmately 5-lobed leaves with stellate pubescence. Indigenous in Formosa, and cultivated in China.

ORDER XLIII. CORNACEÆ.

Shrubs or trees, with leaves usually petiolate, entire, without stipules. Flowers regular, the calyx-tube adnate to the ovary; limb none or cup-shaped, truncate or 4-5-dentate, persistent, open or valvate in bud. Petals wanting, or 4-5 inserted at the base of an epigynous disc. Stamens as many as petals, rarely 2 or 4 times their number; anthers 2-celled, dehiscing longitudinally. Ovary inferior, 1-4-celled, 1, rarely 2 ovules in each cell, pendulous. Fruit generally drupaceous, with a 1-4-celled kernel, or with 2 distinct stones. Seeds pendulous, with a membranous thin coriaceous testa, copious fleshy albumen, and generally thin foliaceous cotyledons.—Gen. Pl. i. 947; Royle Ill. 215 (*Alangieæ*), 234; Wight Ill. ii. 1, 68.

Leaves alternate; petals strap-shaped; anthers long, basifixed; style elongate.

Stamens numerous; flowers fasciculate 1. ALANGIUM.

Stamens as many as petals; flowers paniculate 2. MARLEA

Leaves generally opposite; petals short; anthers short, attached to the back; style short 3. CORNUS.

1. ALANGIUM, Lam.

Shrubs or small trees, with alternate, petiolate, oblong, entire, persistent leaves with 3 basal nerves. Flowers white, bisexual, in axillary fascicles. Calyx-tube turbinate, somewhat prolonged beyond the ovary, truncate or 5-10-dentate. Petals 5-10, strap-shaped, valvate, afterwards reflexed. Stamens as many as petals, or 2-4 times their number; filaments short, hairy; anthers linear; cells adnate to the connective, and dehiscent laterally. Ovary 1-celled, with 1 ovule; style filiform. Fruit a berry, crowned with the persistent limb of calyx. Seeds oblong, with ruminant albumen, a superior cylindrical radicle, and foliaceous, veined, cordate-ovate cotyledons.

1. *A. Lamarckii*, Thwaites, Enum. Plant. Zeyl. 133; Bedd. Fl. Sylv. i. 215.—Syn. *A. hexapetalum*, Roxb. Fl. Ind. ii. 502; W. & A. Prodr. 326; Wight Ill. t. 96. *A. decapetalum*, Wight Ic. t. 194; W. & A. Prodr. 325. *A. tomentosa*, Lam. Sans. Ankola, nikochaka. Vern. Akol, akola, akhōra, akaul, ghowl, koeli (*Alangi*, Tamil, whence generic name).

A shrub or tree, branchlets often spinescent. Leaves membranous, 3-6 in. long, on petiole $\frac{1}{4}$ in., exceedingly variable in shape, from linear-oblong to elliptic, obtuse acute or long-acuminate, pubescent or tomentose when young, glabrous or pubescent below when full-grown, main lateral nerves 5-8 on either side of midrib, joined by prominent transverse

and intramarginal veins. Flowers white, fragrant, on short bracteate pedicels, solitary or fasciculate; pedicels and calyx hairy. Calyx 6-10-dentate; petals 6-10; stamens twice as many; filaments with long stiff hairs at the base. Fruit $\frac{3}{4}$ in. long, tomentose, filled with red pulp.

I follow Thwaites in uniting the 3 species of Lamarck, *Encycl. Meth. Botanique* i. 174, and adopting his new specific name. The appearance of the plant is exceedingly variable, and the different forms, tomentose or glabrous, with broad acuminate, and with narrow, almost linear leaves, with or without spines, merit farther study.

Common in places in South and Central India, Bengal, Oudh, and North-West India. In the sub-Himalayan tract, only as far west as the Ganges. Ceylon and China. Never quite leafless; the foliage is renewed in April-May. Fl. usually Feb.-April; fr. May-Aug.

In North and Central India attains 30-40 ft. under favourable conditions, but generally remains much smaller. Trunk short, erect, to $2\frac{1}{2}$ ft. girth. Bark $\frac{1}{2}$ in. thick, grey with some white specks, smooth, with irregular undulations. Wood light- or yellowish-brown, often dark-coloured in the centre, fine-even-close- and smooth-grained, tough and strong, weight 49 lb. per cub. ft. Value of P. 875, easily worked, with a beautiful glossy surface, well suited for ornamental work. Used for pestles to crush oil-seeds, wooden cattle-bells, and various other purposes. Yields excellent fuel. Coppices well. Fruit mucilaginous, sweet, somewhat astringent and acid, is eaten. Root aromatic, used in native medicine.

2. MARLEA, Roxb.

Trees or shrubs, with alternate, entire or angularly-lobed leaves. Flowers bisexual, in axillary cymes. Calyx-limb minutely toothed. Petals 6-10, linear, valvate in bud. Stamens as many as petals; filaments short, adhering at the base to petals; anthers long and linear. Ovary adhering to calyx above the middle, 2-celled, with 1 pendulous ovule in each cell. Style filiform, with a 4-lobed stigma. Fruit a drupe, often 1-celled, 1-seeded.

1. *M. begoniæfolia*, Roxb. Cor. Pl. t. 283; Fl. Ind. ii. 261; Bot. Reg., 1838, t. 61. Vern. *Garkum*, *budhal*, *tumbri*, N.W.P.; *Bodara*, Bias; *Padlu*, Ravi; *Siālu*, Chenab; *Prot*, Kashmir; *Tilpattra*, *chitpattra*, *kurkni*, Jhelam.

A small tree, glabrous, youngest parts with rust-coloured pubescence. Leaves 3-10 in. long, varying from ovate acuminate, to broad obliquely cordate, often broadly and angularly lobed, petioles $2-1\frac{1}{2}$ in. long; basal nerves 3 or 5, main lateral nerves 2 or 3 on either side of midrib, petioles and nerves often reddish. Cymes a little longer than petioles, loosely 4-20-flowered. Flowers conspicuous, with white petals and yellow anthers. Stamens and style hairy, stigma 4-lobed. Drupe ovoid, $\frac{1}{4}-\frac{1}{2}$ in. long, crowned with remains of calyx, with scanty, soft, dark-coloured pulp, and a hard stone. Radicle short, superior. *M. affinis*, Dne. in Jacquem. Voy. Bot. t. 83, from Kashmir, is described with hairy style and 2-lobed stigma. The North-West Himalaya specimens which I have examined have hairy styles, and a 4-lobed stigma.

Siwalik tract and outer Himalayan ranges, ascending to 6000 ft., from near the Indus, to Bhutan, in Sikkim to 9000 ft. Kasia hills, Silhet, and Chittagong. Dense shady forests, sparse in the North-West Himalaya. Fl. March-May; fr. July-Oct. A handsome tree, never growing to any great height. Bark smooth, cinereous. Foliage resembles that of some Maples. In Silhet it is called *Marlea* or *Marlisa*, and the wood is employed for building. The leaves are collected for sheep-fodder in the North-West Himalaya.

3. CORNUS, Linn.

Trees, shrubs, rarely herbs, with opposite, rarely alternate leaves. Flowers bisexual, white or yellow, in heads or dichotomous cymes. Calyx-teeth 4, minute. Petals 4, oblong or ovate, valvate in bud. Stamens 4, alternating with petals, filaments subulate or filiform, anthers oblong. Ovary 2-celled, rarely 3-celled, one ovule in each cell. Fruit drupaceous, with a 2-celled, 2-seeded, hard, crustaceous or osseous putamen. Seeds oblong, compressed; testa membranous, albumen fleshy, cotyledons foliaceous, radicle sessile.

Flowers in compound cymes.

- | | |
|--|----------------------------|
| Leaves broad-ovate, acuminate, penniveined, main lateral nerves 5-8 pair | 1. <i>C. macrophylla</i> . |
| Leaves oblong, penniveined, main lateral nerves 3-5 pair | 2. <i>C. oblonga</i> . |
| Leaves elliptic or ovate-elliptic, 2-3 pair of lateral nerves, sub-basal | 3. <i>C. sanguinea</i> . |
| Flowers in globose, bracteate heads, drupes confluent | 4. <i>C. capitata</i> . |

1. *C. macrophylla*, Wall. — Tab. XXXII. — Roxb. Fl. Ind., ed. Carey, i. 433. Vern. *Kasir*, *kachir*, *haleo*, *allian*, *harrū*, *haddū*, *nan*, *kandara*, *Ravi* to *Jhelam*; *Kaksh*, *kachūr*, *kochan*, Sutl. and Bias; *Kāgsha*, *rūchia*, N.W.P.

A middle-sized tree, with opposite broad-ovate, acuminate leaves, pale glaucous beneath, 4-6 in. long, base rounded, sometimes slightly cordate, not narrowed into petiole; when young with short distant adpressed hairs, generally attached in the middle; main lateral nerves arcuate, 5-8 on either side of midrib, joined by prominent transverse and intramarginal veins; petiole $\frac{1}{2}$ -1 in. long. Flowers in ample, terminal compound cymes, 2-4 in. across, on peduncles, bearing 2 or 3 pair of opposite, or nearly opposite branches, dividing dichotomously; the flowers at the ends of branchlets in short unilateral racemes. Cyme longer than the naked portion of peduncle. Flowers before opening $\frac{1}{2}$ in. long, twice or three times the length of pedicels. Calyx, outside of petals, and pedicels strigose with white adpressed hairs; disc thick. Drupe globose, less than $\frac{1}{2}$ in. long, crowned with the remains of calyx and disc.

Frequent in many parts of the Himalaya, from near the Indus to Nepal, between 3000 and 8000 ft. Fl. May, June. Generally scattered, though sometimes in considerable numbers, in shady mixed forests, a handsome tree 40-50 ft. high, and attaining a girth of 5-6, at times 8 ft. Crown rounded, close, shady. Bark brownish, smooth, with longitudinal wrinkles. Wood light-red-dish, compact, and even-grained, noted as yielding excellent charcoal for gunpowder, 8-9 rings per in. rad. The fruit is eaten, and the leaves furnish fodder for goats.

2. *C. oblonga*, Wall. ; Roxb. Fl. Ind., ed. Carey, i. 432.—Vern. *Kas-mol*, N.W.P. ; *Bakar*, *ban-bākūr*, Pb.

A middle-sized tree, with opposite, oblong, acuminate leaves, base acute narrowed into petiole, glaucous beneath, 2-6 in. long, when young with short adpressed hairs, lateral nerves arcuate, 3-5 on either side of midrib, petiole $\frac{1}{4}$ - $\frac{3}{4}$ in. long. Ample terminal compound cymes on short peduncles. Flowers white or purplish white, odorous, full-sized buds less than $\frac{1}{4}$ in. long, on short pedicels. Outside of petals glabrous ; calyx and pedicels slightly strigose ; disc thick. Drupe ovoid, crowned with the remains of calyx, somewhat more than $\frac{1}{4}$ in. long.

Siwalik tract and outer Himalaya, from near the Indus to Bhutan, between 3000 and 6000 ft. Fl. Sept.-Oct. ; fr. Jan.-April. Attains 40 ft., and a girth of 4-5 ft. Bark reddish brown, very rugose, especially longitudinally. Wood white, shining, with numerous red and brown medullary rays, fine-grained and hard.

3. *C. sanguinea*, Linn. ; Hook. Stud. Fl. 172.—*Dogwood*.

A shrub or small tree, pubescent, with membranous, opposite, elliptic or ovate-elliptic leaves, acute or short-acuminate, main lateral nerves 4 pair, arcuate, the lower 2 or 3 pair proceeding from the base or the lowest third of midrib, all, or the upper 3 pair meeting at the apex of the leaf. Leaves 1-3 in., petiole $\frac{1}{2}$ in. long. Cymes terminal, dense-flowered, 2 in. across, peduncle longer than cyme. Flowers cream-white, buds before opening $\frac{1}{4}$ in. long. Berry subglobose, less than $\frac{1}{4}$ in. long, black when ripe.

Found by Dr Stewart, once only, in a close forest, with a northerly aspect, at 7000 ft., on the high mountain-range south of the Kashmir valley, a few small trees in fruit, 18-20 ft. high, ramous from near the ground, with straight branches into a lax roundish crown, and thin grey or brownish bark, covered with a smooth, silvery pellicle, which peels off. A common shrub in Europe and Siberia. I am doubtful whether Dr Stewart's specimen should be referred to *C. sanguinea* or to *C. australis*, C. A. Meyer ; Boissier Fl. Orient. ii. 1092, of Asia Minor, the Caucasus, and North Persia ; the difference between the two species is very slight, the hairs on the under side of the leaves of *C. sanguinea* ought to be simple, and somewhat curled, those of *australis* should be 2-armed and stiff. *C. sanguinea* in Europe is a slow-growing shrub, spreading readily by seeds and root-suckers, and standing a good deal of shade. The wood is hard and close-grained. The pericarp of the fruit contains oil. The young shoots are red in spring, the leaves turn red in autumn, hence the name.

4. *C. capitata*, Wall. Fl. Ind., ed. Carey, i. 434 ; Pl. As. rar. t. 214.—Syn. *Benthamia fragifera*, Lindley ; Wight Ill. t. 122. Vern. *Bāmora*, *bāmāur*, N.W.P. ; *Tharmal*, *tharbal*, *tharcār*, *thesi*, Pb.

A small tree, young branches and leaves scabrous with short stiff adpressed hairs. Leaves coriaceous, pale below, opposite, generally approximate at ends of branchlets, 2-3 in. long, elliptic-oblong, penniveined, with 4 pair of arcuate main lateral nerves ; petioles $\frac{1}{2}$ in. long, with a broad, almost sheathing base. Flowers closely packed, in globular terminal heads with a conspicuous involucre of 4 yellow, petal-like bracts,

peduncles 1-2 in. long. Drupes united in a yellowish strawberry-like fleshy head, 1-2 in. diam., each drupe with a hard, 1-seeded stone.

Himalaya 3500-8000 ft., from the Bias to Bhutan, Kasia hills. Fl. April-Oct. Wood close-grained, very hard. Fruit sweetish, mingled with a little bitter, eaten and made into preserves.

A remarkable genus of this order is *Aucuba*, Thunb., with evergreen, glabrous, shining serrate leaves, and dioicous flowers. *A. japonica*, Thunb., is now one of the most common hardy evergreen shrubs in England and western Europe. *A. himalaica*, Hf. & Th.; Hook. f. Ill. Himal. Pl. t. 12, from the outer ranges of Sikkim, is closely allied to it.

ORDER XLIV. CAPRIFOLIACEÆ.

Shrubs or small trees, rarely herbs. Leaves opposite, simple entire ternately cut or pinnate, usually exstipulate. Calyx-tube adnate to ovary, limb 3-5-toothed or lobed. Corolla gamopetalous, regular or irregular, lobes 5, imbricate in bud. Stamens 4-10, inserted on the corolla-tube, equal or unequal, anthers versatile. Ovary 1-6-celled, ovules solitary or numerous. Fruit a berry or drupe, rarely capsular, 1- or many-seeded. Albumen copious, fleshy, embryo generally minute.—Gen. Pl. ii. 1; Royle Ill. 235; Wight Ill. ii. 69.

Corolla tubular or campanulate; ovary cells with 1 or many ovules; style filiform.

Stamens 5; calyx 5-dentate; ovary 2-3-celled

1. LONICERA.

Stamens 5; calyx 5-lobed, lobes linear; ovary 5-celled

2. LEYCESTERIA.

Stamens 4; calyx 5-lobed, lobes linear, elongate; ovary 3-celled.

3. ABELIA.

Fruit 1-seeded

Corolla rotate or short-tubular. One ovule in each cell; style short, or stigma sessile.

Leaves simple

4. VIBURNUM.

Leaves pinnate

5. SAMBUCUS.

1. LONICERA, Linn.

Erect, prostrate or climbing shrubs. Leaves opposite, entire. Flowers in peduncled cymes or heads, often connate in pairs by the ovaries, and subtended by connate bracteoles. Calyx-tube ovoid or subglobose; teeth 5, often unequal. Corolla tubular, funnel or bell-shaped, limb oblique or 2-lipped, 5-lobed. Stamens 5. Disc tumid. Ovary 2-3-celled, style filiform, stigma capitate; ovules many in the inner angle of each cell. Berry fleshy, 2-3-celled, cells few-seeded. Seeds ovoid or oblong, testa crustaceous.

To this genus belongs the *Woodbine* or *Honeysuckle* of Europe, *L. Periclymenum*, Linn.; Hook. Stud. Fl. 175. From India 28 species, nearly all Himalayan, are enumerated in Hooker and Thomson's *Præcursores ad Floram Indicam*, Journ. Linn. Soc. ii. 165. Of these it must suffice here to mention 7 species which are characteristic of the forest vegetation in the outer and middle ranges of the N.W. Himalaya.

Corolla 5-lobed, not bilabiate; bracteoles large, generally connate, and enclosing the ovaries.

A large shrub, unarmed; leaves lanceolate

1. *L. angustifolia*.

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| A small bush, spinescent; corolla-tube long slender | 2. <i>L. spinosa</i> . |
| A small bush, corolla-tube broad-campanulate | 3. <i>L. Myrtillus</i> . |
| Corolla bilabiate, bracteoles large, more or less connate. | |
| Pubescent; leaves petiolate, flowers nearly sessile | 4. <i>L. quinquelocularis</i> . |
| Glandular hairy; leaves nearly sessile, white beneath, flowers pedunculate | 5. <i>L. hypoleuca</i> . |
| Corolla bilabiate, bracteoles small, free. | |
| Glabrous; main lateral nerves 8-12 pair | 6. <i>L. orientalis</i> . |
| Glandular hairy; main lateral nerves 6-8 pair | 7. <i>L. alpigena</i> . |

1. *L. angustifolia*, Wall.—Vern. *Gēang*, Jaonsar; *Pīru*, Sutlej.

A shrub 6-12 ft. high, with slender branches; bark grey, peeling off in long fibrous shreds. Glabrous, or youngest parts pilose; leaves lanceolate or oblong-lanceolate, pale beneath. Flowers in pairs, on slender axillary peduncles, $\frac{1}{2}$ -1 in. long; bracteoles connate, cup-shaped, enclosing the ovaries. Bracts 2, linear or foliaceous. Corolla $\frac{1}{2}$ in. long or less, regular, white or pale rose coloured, scented. Berry red, the size of a pea, with 1-6 seeds.

Not uncommon in the Himalaya, from near the Indus to Sikkim. In the North-West Himalaya at 6000-10,000 ft. Dippi, and other forests in Kunawar, Deoban range, Jaonsar Bawar. Fl. May, June; fruit sweet, eaten. Hardy in England.

2. *L. spinosa*, Jacquemont.—Syn. *Xylosteum spinosum*, Decaisne, in Jacq. Voy. Bot. t. 86. *L. linearis*, Hb. Royle.

A small rigid shrub, wholly glabrous, with stiff divaricate, spinescent branchlets and small, linear-oblong coriaceous leaves. Flowers $\frac{3}{4}$ in. long, on short peduncles, tube long, slender; limb broad, spreading; anthers and style exserted.

Inner arid Himalaya and Tibet, 11,000-15,000 ft. Fl. July.

3. *L. Myrtillus*, Hf. & Th. l. c. 168.

A small shrub with prostrate branches. Leaves $\frac{1}{2}$ - $\frac{1}{2}$ in. long, elliptic-oblong or obovate-oblong, glaucous beneath. Flowers white subsessile, corolla short, broad-campanulate, $\frac{1}{2}$ in. long; anthers and styles included.

Himalaya from the Indus to Sikkim, 9000-12,000 ft. Fl. June-Sept. Nearly allied are *L. parvifolia*, Edgew., and *L. purpurascens*, H. f. & Th. (*Xylosteum purp.*, Jacq. Voy. Bot. t. 87).

4. *L. quinquelocularis*, Hardwicke; Roxb. Fl. Ind. i. 537.—Syn. *L. diversifolia*, Wall. Roxb. Fl. Ind., ed. Carey, ii. 169; Bot. Reg. xxx. 1844, t. 33. *Himalayan Honeysuckle*. Vern. *Jarlangei*, *adei*, trans-Indus; *Phūt*, Jhelam; *Tita bateri*, *pākhar*, Kashmir; *Bakhrū*, Chenab; *Khūm*, Ravi; *Dendru*, Bias; *Khūnti*, *zhang*, *razbam*, *bijgai*, Sutlej; *Betukeri*, *bat kulera*, *cheraya*, *kurmali*, Kamaon.

A large erect shrub, pubescent or soft-tomentose. Leaves 1-2 in. long, ovate or elliptic, acute, on short petioles. Flowers nearly sessile, in axillary clusters of 2-4; ovaries free. Bracts linear, ciliate; bracteoles broad-ovate, ciliate, obtuse, connate at the base. Calyx-limb cup-shaped, 5-cleft,

hairy. Corolla yellow, $\frac{3}{4}$ in. long before opening; limb 2-lipped, upper lip broad, 4-dentate, lower lip linear. Berry sessile, ovoid, $\frac{1}{4}$ in. long, crowned with remains of calyx.

Common North-West Himalaya 2500-9000 ft., also Suliman range and Safedkoh trans-Indus. Bhutan. Fl. June, July. Bark grey, peeling off in long shreds. Cattle feed on its leaves and branches. Hardy in England. Closely allied to *L. xylosteum*, Linn., of Europe and Siberia, which, however, has smaller flowers in pairs on short axillary peduncles.

5. *L. hypoleuca*, Decaisne, Jacq. Voy. Bot. t. 89.—Vern, *Kharmo*, *kodi*, Chenab; *Zhiko*, *rapesho*, Sutlej.

A small shrub, with glandular hairs, particularly on bracteoles and corolla; leaves nearly sessile, from cordate base oblong or broad-ovate, obtuse, pale-grey beneath; flowers twin, on short peduncles; bracts linear-oblong; bracteoles connate, cup-shaped, enclosing the connate ovaries.

Arid tracts of the inner Himalaya on the upper Jhelam, Chenab, Sutlej, and in Garhwal, at 8000-10,000 ft. Fl. June.

6. *L. orientalis*, Lamarek; Hf. & Th. l. c. 170.—Syn. *L. Govariania*, Wall.

A slender glabrous shrub; leaves membranous, petiolate, ovate or ovate-lanceolate, 2-4 in. long, main lateral nerves 8-12 on each side of midrib, anastomosing by prominent reticulate veins. Flowers twin; ovaries connate, supported by minute rounded bracteoles and subulate arcuate bracts. Calyx-lobes subulate. Corolla $\frac{1}{2}$ in. long before opening, deeply bilabiate. The 2 ovaries connate into a pyriform black berry.

North-West Himalaya from Kashmir to Kamaon, 6000-10,000 ft. Also in Iberia and on the Caucasus. Fl. June. Hardy in England. Closely allied is *L. heterophylla*, Des., in Jacq. Voy. Bot. t. 88.

7. *L. alpigena*, Linn.; H. f. & Th. l. c. 171.—Syn. *L. Webbiana*, Wall.; *oxyphylla*, Edgew.

With glandular hairs; leaves petiolate, ovate-lanceolate, long acuminate, with 6-8 pairs of main lateral nerves, reticulate veins not prominent. Peduncles longer than of *L. orientalis*. Corolla with unequal very gibbous base.

North-West Himalaya, Kashmir to Kamaon, 8000-10,000 ft. Also in the Alps of Europe. Fl. June. Hardy in England.

2. LEYCESTERIA, Wall.

An erect shrub, with hollow, herbaceous stems; the flowers sessile, in bracteate whorls. Calyx-limb 5-lobed, lobes linear. Corolla funnel-shaped; stamens 5. Ovary 5-celled, with numerous pendulous ovules. Fruit a fleshy, 5-celled, many-seeded berry.

1. *L. formosa*, Wall.; Roxb. Fl. Ind., ed. Carey, ii. 182; Wight III. t. 121, D.—Vern. *Nalkarru*, *saunja*, Kamaon.

Leaves ovate or ovate-lanceolate, long-acuminate, the petioles connate

with their broad base. Bracts foliaceous, more or less purple, sessile, ovate-lanceolate, commonly 6 under each whorl, the two outer ones $1-1\frac{1}{2}$ in. long, generally connate at the base. Corolla white, with a tinge of purple. Berry dark-purple, approaching to black, as large as a small gooseberry, crowned with the persistent calyx, and covered with short glandular hairs.

Not uncommon in shady forests of the Himalaya between 5000 and 10,000 ft. Sutlej to Sikkim. Kasia hills. Hardy in England.

3. ABELIA, Brown.

Small shrubs, with bracteate flowers. Calyx-tube angular, limb 5-cleft, lobes foliaceous. Corolla funnel-shaped. Stamens 4. Ovary 3-celled, 2 cells with several abortive ovules, the third with one perfect ovule. Berry coriaceous, 1-seeded.

1. *A. triflora*, R. Brown in Wall. Pl. As. rar. t. 15.—Vern. *Adei*, *pukhtūwar*, trans-Indus; *Cheta būta*, Jhelam; *Ban bakhuru*, *salanker*, Chenab; *Dalūng*, *kūt*, *sāi*, Ravi; *Zhang*, *matzhang*, *peni*, Sutlej; *Munri*, *gogatti*, Kamaon.

A shrub, with ovate-lanceolate leaves, pale beneath, hairy along edges and midrib; petioles united by their broad bases. Flowers in dense terminal bracteate heads; bracts foliaceous, the upper sessile. Flowers 3 together on short peduncles, the middle sessile, the two lateral short-pedicellate, all supported at the base of the calyx by linear-lanceolate bractlets. Calyx hairy, 5-ribbed; lobes linear, ciliate, with a prominent midrib, $\frac{1}{2}$ -1 in. long at the time the fruit ripens. Corolla white, tinged with pink, scented.

Abundant in the North-West Himalaya between 4000 and 10,000 ft.; also on the Safedkoh and Suliman range. Fl. June-Aug. Is browsed by goats. Hardy in England.

4. VIBURNUM, Linn.

Shrubs or trees with simple leaves. Flowers white or pink, in terminal or axillary corymbs or panicles. Calyx-limb 5-toothed; corolla 5-lobed. Stamens 5. Ovary 1-3-celled; style conical, trifid, or stigmas 3, sessile; one pendulous ovule in each cell. Drupe dry or fleshy; endocarp crustaceous, 1-seeded, 1-celled, or spuriously 2- or 3-celled by the endocarp projecting into the cavity.

A large genus with some species widely spread in Europe, wild, and cultivated as ornamental shrubs. *V. Opulus*, the Guelder Rose, with large outer sterile flowers, a native of Europe, Siberia, and North America; and *V. Tinus* of the western Mediterranean region, remarkable because its showy flowers stand the cold of average winters in England, and are destroyed only in very severe seasons. Of the sixteen Indian species described by Hooker and Thomson in the Journ. Linn. Soc. ii. 174, it will suffice to enumerate seven, the most common in the North-West Himalaya.

Leaves membranous, deciduous; drupe 1-celled.

Corolla short-campanulate; leaves with dense grey tomentum beneath

Corolla rotate; leaves glabrous or pubescent

1. *V. cotinifolium*.
2. *V. stictolatum*.

- Leaves membranous, deciduous; drupe spuriously 3-celled.
 Flowers with the leaves, in slender drooping panicles . . . 3. *V. erubescens*.
 Flowers before the leaves in sessile corymbs.
 Main lateral nerves close, 8-10 pair; drupe $\frac{1}{2}$ in. long . . . 4. *V. nervosum*.
 Main lateral nerves distant, 7-9 pair; drupe $\frac{3}{4}$ in. long . . . 5. *V. fectens*.
 Leaves coriaceous, evergreen; drupe 1-celled.
 Corolla tubular, limb erect; corymbs without bracts . . . 6. *V. coriaceum*.
 Corolla rotate; corymbs with ciliate bracts . . . 7. *V. punctatum*.

1. *V. cotinifolium*, Don.; Bot. Reg. t. 1650; Wight Ill. t. 121 A.—Syn. *V. polycarpum*, Wall. Vern. *Mar glawalawa*, trans-Indus; *Rich ūktu*, *bankūch*, Jhelam; *Rīchabi*, *kūlmīch*, *gūch*, Kashmir; *Bathor*, *pāpat kalam*, *khīmor*, *rājāl*, *tūmma*, Chenab; *Kātomda*, Ravi; *Jāwa*, *khātīp*, *tūstūs*, *sūssū*, Suttlej; *Gwia*, Kamaon.*

A large shrub, inflorescence and under side of leaves clothed with dense grey stellate tomentum. Leaves 3-5 in. long, ovate or rotundate, entire or crenulate, 2-5 in. long, glabrous or pubescent above, on short thick petioles; main lateral nerves oblique, 5-6 pair, dividing into prominent branches half-way between midrib and edge of leaf. Flowers numerous, in sessile or short-pedunculate corymbs. Calyx-lobes short; corolla turbinate, white tinged with pink. Drupe oblong, $\frac{1}{3}$ in. long, compressed, with 2 furrows on each face.

Abundant between 4000 and 11,000 feet in the N.W. Himalaya, also on the Suliman range. Fl. June-July. The ripe fruit is sweetish, and is eaten. Hardy in England. Nearly allied to *V. Lantana*, Linn., of Middle and South Europe and the Caucasus, with white, rotate corolla.

2. *V. stellulatum*, Wall.; Pl. As. rar. t. 169.—Syn. *V. Mullaha*, Ham. Vern. *Jal bāgū*, Jhelam; *Amliācha*, *phulsel*, Kashmir; *Tit maliya*, Kamaon.

Branchlets, petioles, and inflorescence with stellate pubescence. Leaves glabrous above, more or less pubescent beneath, ovate or ovate-lanceolate, long-acuminate, dentate, with large, sharp teeth; 3-5 in. long; petioles $\frac{1}{2}$ -1 in. long; main lateral nerves 5-6 pair, oblique, undivided save near the margin, the lowest pair only with strong branches on the outside. Flowers small, in large, compound, nearly umbellate corymbs; corolla white, rotate, pubescent outside. Drupe ovate-oblong, compressed, shining, $\frac{1}{4}$ - $\frac{1}{2}$ in. long.

Common in the N.W. Himalaya, between 6000 and 10,000 ft. Fl. July-Aug.; fruit acid, eaten. *V. involucreatum*, Wall., probably does not differ from this species.

3. *V. erubescens*, Wall.; Pl. As. rar. t. 134.—Syn. *V. Wightianum*, Wall.; W. & A. Prodr. 388; Wight Ic. 1024.

A shrub or small tree, with slender cinereous branches, nearly glabrous or pubescent. Leaves broad-ovate or oblong, with cordate or rounded base, acuminate, serrate, 2-3 in. long; petioles $\frac{1}{2}$ - $\frac{3}{4}$ in.; main lateral nerves

* The vern. names of the sp. of *Viburnum* demand farther inquiry.

5-6 pair, arcuate, the lowest pair from the base. Flowers $\frac{1}{2}$ in. long, white, or yellowish white, or pale rose-coloured, in slender drooping pedunculate panicles. Calyx-lobes ovate, obtuse. Corolla tubular, wider above, limb spreading. Stamens 5, inserted at the same height in the mouth of the corolla. Fruit red, ovoid, $\frac{1}{2}$ in. long, the endocarp projecting into the cavity with two wings so as to give the appearance of 3 cells. Seed flat, concave, with the two edges bent inward.

Himalaya from Kamaon to Bhutan 5000-11,000 ft. Nilgiris and Ceylon above 4000 ft. Fl. March-May.

4. *V. nervosum*, Don.—Syn. *V. grandiflorum*, Wall. Vern. *Ambre*, *amrola*, *ari*, Ravi; *Ris*, *dab*, Bias.

A shrub, with stiff, stout, dark grey or brownish branchlets. Leaves generally approximate at the ends, elliptic or oblong, acuminate, serrulate, glabrous above, pubescent beneath, 3-4 in. long; petioles $\frac{3}{4}$ in.; main lateral nerves closely parallel, 8-10 pair. Flowers white or rose-coloured, odorless, $\frac{3}{4}$ in. long, appearing before the leaves in terminal, short, sessile, dense corymbs; peduncles, pedicels, and bracts with long white hairs. Calyx-lobes short, obtuse. Corolla funnel-shaped, with a spreading limb. Stamens unequal, 3 inserted below, 2 above, in the corolla-tube. Drupe flat, ovate, $\frac{1}{2}$ in. long; endocarp projecting into the cavity, and seed concave as in *V. erubescens*.

Himalaya from the Jumna to Sikkim. Jaunsar Bawar forests 7000-9000 ft.; ascends to 12,000 ft. Fl. May.

5. *V. foetens*, Decaisne; Jacq. Voy. Bot. t. 84. Vern. *Güch*, *üklu*, *kunch*, *Jhelam*; *Kilmäch*, *güch*, *kwillim*, *kulāra*, *jamāra*, Kashmir; *Tilhanj*, *pūtmu*, *Güts*, *tün*, Chenab; *Tulhang*, *tandei*, *tündhe*, *tunāni zenāni*, Ravi.

Closely allied to *V. nervosum*, differs only by larger, glabrous leaves, main lateral nerves more distant, 7-9 pair; corymbs lax; and drupes $\frac{3}{4}$ in. long. The stamens are biseriate, as in *V. nervosum*, 2 inserted above, 3 below, and the seed is concave. The flowers are sweet-scented, but the branches, when bruised, emit a bad smell.

Common in the Panjab Himalaya at from 5000-11,000 ft. Fl. May-June. The fruit is sweetish, and is eaten.

6. *V. coriaceum*, Blume.—Syn. *V. capitellatum*, W. & A. Prodr. 388; *V. cylindricum*, Ham. Vern. *Kala Titmaliya*, Kamaon.

A shrub or small tree, glabrous, only youngest branchlets, petioles, peduncles, and pedicels glandular-pubescent. Leaves coriaceous, entire or sinuate, oblong, long-acuminate, 3-6 in. long, with 3-4 pair main lateral nerves. Flowers $\frac{1}{2}$ in. long, numerous, in pedunculate, umbellate corymbs, without bracts. Corolla short, tubular, somewhat wider at the mouth; limb erect, with 5 obtuse, short lobes. Stamens exserted. Drupe 1-celled; endocarp not projecting into the cavity.

Himalaya 4000-7000 ft. from Sutlej to Sikkim. Kasia, Ceylon, Nilgiris. Fl. Nov.-May.

7. *V. punctatum*, Ham.—Syn. *V. acuminatum*, Wall.; Wight Ic. t. 1021.

A shrub with stout branches, wholly glabrous. Leaves coriaceous, elliptic, acuminate, 3-5 in. long; margins revolute, beneath with numerous fine round dots; main lateral nerves 4-6 pair. Flowers small, in large, terminal corymbs, with angular branches, and broad, ciliate bracts. Corolla rotate. Drupe $\frac{1}{2}$ in. long, 1-celled; endocarp undulate on a cross-section, not projecting into cavity.

Outer Himalaya in Kamaon and Nepal, ascending to 5000 ft. Nilgiris, pulneys, Anamallays, Western Ghats, Canara. Fl. Jan.-March.

5. *SAMBUCUS*, Linn.

Large herbs, shrubs or trees, with large pith. Leaves pinnate. Flowers small, in umbellate corymbs or panicles. Calyx-limb 3-5-toothed. Corolla rotate or campanulate, 3-5-cleft. Stamens 5. Ovary 3-5-celled; style short, 3-5-partite, or stigmas 3-5, sessile; one pendulous ovule in each cell. Drupe with 3-5 cartilaginous cells. Seed compressed, embryo long.

1. *S. Ebulus*, Linn.; Hook. Stud. Fl. 174. *Dwarf Elder*.—Vern. *Richh kus*, *mushkiāra*, *ganhūla*, Jhelam; *Gāndul*, *gwāndish*, *siske*, *tāsar*, Chenab.

Large herbaceous stems 3-6 ft. high, from a perennial root-stock, glabrous; leaflets 3-5 pair, shortly stalked, oblong-lanceolate, sharply and closely serrate. Stipules foliaceous, often pinnate. Flowers in a large, sessile or pedunculate, compact corymbose cyme 4-6 in. across. Corolla-limb concave.

Upper Chenab and Jhelam between 4000 and 11,000 ft. Europe, North Africa, West Asia. Fl. April-July. Leaves fetid when bruised.

ORDER XLV. RUBIACEÆ.

Trees, shrubs, or herbs, rarely climbers, with opposite or whorled leaves, and inter- or intra-petiolar stipules, either free or connate with the petioles, or forming a short sheath or ring round the stem within the petioles. Calyx-tube adnate to the ovary, the limb entire or with as many teeth lobes or divisions as lobes of the corolla, rarely more or fewer. Corolla gamopetalous, inserted round the epigynous disc; lobes 4, 5, or sometimes more, rarely only 3, either imbricate (often contorted) or valvate in the bud. Stamens as many as lobes of the corolla, alternating with them, and inserted in the tube; anthers versatile, with parallel cells opening longitudinally. Ovary inferior, 2- or more-celled, rarely 1-celled. Fruit various. Seeds with a fleshy or horny albumen, rarely with little or no albumen.—Gen. Pl. ii. 7; Royle Ill. 237; Wight Ill. ii. 72 (*Cinchonaceæ*).

Seeds numerous; flowers numerous, in globose heads.

Glabrous; corolla imbricate; fruit a fleshy syncarpium. 1. *ANTHOCEPHALÆ*

- Pubescent; corolla valvate; capsules dry, distinct, in globose heads.
 Leaves oval or obovate; calyx truncate; stigma with concave base
 Leaves cordate; calyx 5-lobed; stigma clavate or capitate
 Seeds numerous, in 2-valved capsules; flowers numerous, in spikes or panicles.
 Corolla valvate; flowers in 3-chotomous panicles; corolla lobes fringed; capsule dehiscing septically from below; leaves evergreen
 Corolla valvate; flowers in bracteate spikes; capsule dehiscing loculicidally; leaves deciduous
 Corolla imbricate; flowers in 3-chotomous panicles
 Seeds numerous, in indehiscent berries; flowers few; corolla contorted.
 Flowers large or middle-sized, solitary, rarely fasciculate.
 Ovary 1-celled; placentæ parietal; flowers 5-9-merous
 Ovary 2-celled; placentæ on dissepiment; flowers 5-merous
 Flowers small, in sessile opposite axillary fascicles
 Seeds 2, each enclosed in a chartaceous endocarp.
 Flowers in trichotomous panicles.
 Leaves coriaceous; stipules interpetiolar; style short exserted, 2-fid
 Leaves membranous; stip. sheathing; style long exserted, undivided
 Flowers in axillary fascicles
 Seeds solitary, fruit a fleshy syncarpium with numerous 1-seeded pyrenes, several pyrenes often connate
 Seeds 5; ovary 5-celled; flowers in trichotomous panicles
2. STEPHEGYNE.
 3. ADINA.
 4. CINCHONA.
 5. HYMENODICTYON.
 6. WENDLANDIA.
 7. GARDENIA.
 8. RANDIA.
 9. HYPTIANTHERA.
 10. IXORA.
 11. PAVETTA.
 12. COFFEA.
 13. MORINDA.
 14. HAMILTONIA.

1. ANTHOCEPHALUS, A. Richard.

Large trees, glabrous, with opposite, petiolate coriaceous leaves, and large interpetiolar caducous stipules. Flowers in globose, compact, terminal heads, without bracts and bracteoles. Calyx-tubes more or less connate, the limb cleft into 5 spatulate or oblong lobes. Corolla funnel-shaped, mouth glabrous, the lobes imbricate. Stamens 5, inserted in the mouth of the corolla-tube, on short flattened filaments, the anthers ovate-oblong, apiculate. Ovary 2-celled below, 4-celled above, the placenta bifid above; style filiform, exserted, stigma fusiform; ovules numerous in each cell. Fruit a fleshy syncarpium, with numerous pyrenes, 4-celled above, 2-celled below, each with few seeds. Seeds minute, with a fleshy albumen; embryo clavate, with short cotyledons and an obtuse radicle.

1. *A. Cadamba*, Benth. & Hook.—Syn. *Nauclea Cadamba*, Roxb. Fl. Ind. i. 512; Bedd. Fl. Sylv. t. 35. Sans. *Kadamba*, *nipa*. Vern. *Kaddam*, *karam*.

A large tree, with horizontal branches. Leaves ovate-oblong, glabrous and shining above, pubescent beneath, acuminate, 5-9 in. long, with 10-12 pairs of prominent main lateral nerves. Flower-heads solitary, pedunculate, 1-2 in. diam., orange-coloured, scented, with large, white, fusiform projecting stigmas. Fruit yellow, size of a small orange.

Cultivated in Bengal and North India, as far west as Saharanpur. Wild in

Ceylon and North Canara, and perhaps elsewhere along the western coast. Believed also to be indigenous in Assam. Fl. May-July. Trunk tall, erect, regularly shaped. Wood light yellow; the cub. ft. weighs 36-47 lb.; the mean value of P. was found 616 (Puckle), and 618 (Cunningham). The flowers offered in Hindu shrines; the fruit is eaten. Often cultivated for ornament and the shade of its close foliage.

Nauclea purpurea, Roxb. Cor. Pl. t. 54, Fl. Ind. i. 515, which has been confused with this species (Dalzell Bombay Fl. Suppl. 43) is a different tree, with purple flower-heads, capitate stigma, a 2-celled ovary, and a capsule splitting into 4 valves from the base.

2. STEPHEGYNE, Korthals.

Shrubs or trees, with opposite, petiolate leaves, and large caducous interpetiolar stipules. Flower-heads compact, globose, axillary and terminal, generally supported by 2 large bracts. Flowers surrounded by paleaceous bracteoles. Calyx-tube short, limb cup-shaped or tubular, truncate or indistinctly 5-dentate. Corolla funnel-shaped, tube elongate, glabrous or hairy inside, limb divided into 5 short, acute, valvate lobes. Stamens 5, filaments short filiform, inserted in the mouth or the upper part of the corolla-tube; anthers attached by the back, lanceolate, with a cordate base, apiculate. Ovary 2-celled, with a long filiform style, exserted, the stigma cylindrical, often with a concave base. Ovules numerous, imbricate, placentæ pendulous, or adnate to the dissepiment. Fruit globose, consisting of numerous dry distinct capsules, 2-valved, the valves dehiscing from the base, many-seeded. Seeds small, with a winged testa and fleshy albumen.

1. *S. parvifolia*, Korth.—Syn. *Nauclea parvifolia*, Roxb. Cor. Pl. t. 52, Fl. Ind. i. 513; Wight Ill. t. 123; W. & A. Prodr. 391; Bedd. Fl. Sylv. t. 34. Vern. *Kaddam*, *kallam*, *keim*, *kangei*. Local n. *Phaldu*, Kamaon; *Mundi marra*, Gonds, C.P.; *Kumra*, Banswara; *Htein thay*, Burm.

A large tree, pubescent or nearly glabrous. Leaves oval rotundate or obovate, varying much in size, 2-6 in. long, at times longer, on short petioles; main lateral nerves 6-8 pair, the lowest 2 pair from near the base of leaf. Stipules large, pale, obovate. Flower-heads light yellow, nearly white, 1 in. diam., on peduncles about twice the length of head, generally supported by 2 leaf-like, oblong bracts, narrowed into a long slender petiole. Bracteoles spatulate, as long as or somewhat longer than calyx-tube. Stigma cylindrical, with a concave base.

A common tree in the greater part of India and Burmah. Often gregarious, particularly in moist places. In the sub-Himalayan belt its western limit is the Bias river, but trees are found (doubtfully indigenous) as far as the Chenab, and it ascends to 4000 ft. The tree is leafless for a short time in spring; the new leaves come out in May. Fl. May-July; fr. Nov. Dec., often remains long on the tree.

50-60, at times 80 ft. high, with a short, erect, often irregularly-shaped trunk, sometimes buttressed, attaining a girth of 6-7, at times 10-12 ft. Bark thin, $\frac{1}{4}$ - $\frac{1}{2}$ in. thick, bluish grey, sometimes brownish grey, with dark patches of old exfoliating scales, leaving exposed the inner lighter-coloured bark. At times

marked with cicatrices, from which issues a whitish, afterwards rufescent gum. Wood grey to light-reddish brown, compact, close- and fine-grained, hard; weight 35-47 lb. per cub. ft. seasoned, 54 lb. green; value of P. 683 (Skinner), 586 (mean of 2 exp. by Cunningham). Durable, if not exposed to wet. No distinct heartwood. Medullary rays very numerous, very fine. Easily worked, and polishes well. Used for building, furniture, agricultural implements, combs, and to a large extent for turned and carved articles, platters, cups, spoons. The leaves are used for fodder.

To the same genus belongs *Stephegyne* (*Nauclea*) *diversifolia* of Burma (*Bingah*, Burm.)

3. ADINA, Salisbury.

Trees with opposite, petiolate leaves, and large interpetiolar caducous stipules. Flower-heads compact, globose, solitary or paniculate, with or without bracts, receptacle pilose. Flowers surrounded by paleaceous bracteoles. Calyx-tubes prismatic, limb 5-lobed. Corolla-tube elongate, funnel-shaped, glabrous inside, lobes 5, obtuse, valvate. Stamens 5, inserted in the mouth of the corolla-tube; anthers short, oblong, on short filaments, exserted. Ovary 2-celled; style filiform, exserted, stigma clavate or capitate, the placenta pendulous, with numerous, imbricate ovules. Fruit dry, globose, of numerous distinct 2-valved capsules, dehiscent septically, sometimes separating from a persistent axis. Seeds oblong, winged at both ends, albumen copious, cotyledons plane, radicle terete superior.

1. *A. cordifolia*, Hf. & Benth.—Tab. XXXIII.—Syn. *Nauclea cordifolia*, Roxb. Cor. Pl. t. 53; Fl. Ind. i. 514; W. & A. Prodr. 391; Bedd. Fl. Sylv. t. 33. Vern. *Haldū*, *hardū*. Local n. *Tikkoe*, Baraich and Gonda (Oudh); *Hardu marrah*, Gonds, Satp. range; *Haldwa*, *uldu*, Banswara; *Hedu*, *heddi*, Konkan; *Hnauben*, Burm.

A large tree, branchlets, leaves, petioles pubescent. Leaves cordate, short-acuminate, 4-9 in. long, nearly as broad as long, with 5-7 pair of prominent main lateral nerves, the 2 lowest pair from the base; petioles half the length of leaf or longer. Peduncles axillary, as long as petioles, each bearing 1, rarely 2, globose yellow flower-heads, 1 in. diam. to tips of styles, which are long-exserted, with capitate stigmas. Receptacle pilose, with short, linear bracteoles. Corolla-tube pubescent outside. Fruit-head consisting of numerous distinct dry, pilose, clavate capsules; axis of capsule persistent, flat, membranous, linear, 1-nerved.

A common tree throughout the moister regions of India, extending in the sub-Himalayan tract to the Jumna, and ascending to 3000 ft. Not gregarious, and seedlings not numerous. The old leaves shed April-May, the tree is then leafless for a short time, until the new foliage comes out in May and June. Fl. June, July, often later; seeds ripen Dec.-March. Young leaves often eaten by the larva of a moth, in such vast numbers as to strip the tree of all foliage, which in that case is usually renewed during the rainy season.

Attains 80 ft. in North and Central India, but grows much taller in Burma and on the west side of India. Trunk straight, tall, often with large buttresses near the base, girth of 10-18 ft. not uncommon in the Kamaon Bhābar, many large spreading and ascending boughs, forming a broad rounded crown. Foliage light

green. Bark 1-2 in. thick, grey or brownish grey, rough, with many longitudinal wrinkles and cracks, with a whitish pellicle on the smoothish persistent scales between the cracks. Inner substance of bark reddish brown, streaked with white, fibrous, laminated. Wood yellow, often changing when seasoning into a reddish nut-brown colour, with white specks, compact and fine-grained. No distinct heartwood. Skinner gives the weight of seasoned wood at 42 lb., and this agrees well with the results of my experiments, 42 (1862), 43 (1864). The extremes are 36.3 (Puckle) and 49 (Cunningham). The value of P. is given by Skinner at 664, which seems a likely average, and agrees well with Cunningham's experiments. In 1864 I obtained a higher average as the mean of 9 experiments—viz., 760, the extremes being 530 and 950. A valuable wood, for it is fairly durable. R. Thompson states that logs of it lying for years in the Kamaon forests were not touched by white ants or other insects, supposed to be protected by a bitter substance in the wood. In South India it soon decays when exposed to wet. Seasons well, works easily, takes a fine polish, and is good for turning, but is somewhat apt to warp and crack. Employed extensively in construction, for furniture, agricultural implements, opium-boxes, writing-tablets, gun-stocks, combs. Canoes are scooped out of the trunk.

To the same genus belongs *Adina* (*Nauclea*) *sessilifolia* of Burma (*Thit-payang*, Burm.).

4. CINCHONA, Linn.

Evergreen shrubs or trees, with opposite, petiolate leaves, and interpetiolar, deciduous stipules. Bark bitter. Flowers white red or purple, odorous, in terminal panicles, with short, linear or subulate bracts, the lower branches in the axils of leaves. Calyx-tube turbinate, pubescent, limb 5-dentate, persistent. Corolla tubular, pubescent outside, with a flat spreading 5-lobed limb; lobes valvate, edge fringed with soft hairs. Stamens 5, inserted in the corolla-tube, with short or long filaments, anthers linear, attached to the back near the base. Ovary 2-celled; style slender, with 2 short obtuse branches, papillose inside. Ovules numerous, attached to linear placentæ adnate to the dissepiment. Capsule ovoid, oblong or cylindrical, 2-celled, 2-valved, dehiscing from the base septicidally. Seeds numerous, peltate, testa broadly winged, with denticulate or irregularly lacerated edge; albumen fleshy, cotyledons ovate, radicle terete.

This genus, though not indigenous in India, is of the greatest importance for the wellbeing of its inhabitants, on account of the powerful medicinal qualities which the bark of many of the species possesses. Their cultivation has been attempted in Kangra, and on the Satpura range of Central India; some notice therefore appears called for in this place. About 36 species are known, and they are distributed over a narrow belt along the range of the Andes or Cordilleras of South America, at elevations between 2300 and 8000 ft., principally along their eastern declivities, from lat. 19° south in Bolivia to lat. 10° north in Venezuela. The bark of about 15 species has important medicinal value, and most of these have been introduced into India since 1860, mainly through the labours of C. R. Markham, C.B., who was deputed to Peru in 1859 by the Secretary of State for India, and was most successful in organising a regular supply of plants and seeds of the different species. Mr Markham himself collected and brought to the coast, in spite of great difficulties, large quantities of seeds and plants of the *Calisaya* and other species from the Carabaya district in South Peru. Mr R. Spruce sent seeds and plants of the *C. succirubra* (red bark). Mr Cross collected seeds of *C. officinalis* and allied species in the province of

boxa (crown bark); and the importation of *micrantha*, *peruviana*, and other grey-bark species of the Huanuco district, is due to Mr Pritchett. The plants collected by Mr Markham himself unfortunately perished on the voyage, but the seeds imported through the agency organised by him succeeded; and during a tour through Southern India in 1861, he selected the principal localities for plantations on the Nilgiris, and other hills on the west side of the Peninsula. The Government plantations on the Nilgiris have, since the commencement, been under the skilful superintendence of Mr M'Ivor. From Bengal the late Dr T. Anderson, then Superintendent of the Botanic Gardens, Calcutta, went to Java in 1862, brought from thence a supply of plants and seeds of various species, and established the Cinchona plantations in Sikkim with these, supplemented by plants and seeds from the Nilgiris, and by *Calisaya* seeds obtained from other sources. It will be sufficient to enumerate here the 4 principal species cultivated in the East Indian plantations, being the more valuable kinds of Ecuador, Peru, and Bolivia. Besides these there are several species in New Granada, the more important of which are: *C. lancifolia*, Mutis; Karsten Flora Columbica, i. t. 11, 12; and *C. pitayensis*, Wedd.; Triana, Nouvelles Etudes sur les Quitquinas, 1870, p. 61 (Syn. *C. corymbosa*, Karsten, l. c. t. 10, and *C. Trianae*, Karsten, t. 22), remarkable by the corolla-tube hairy inside, and believed to yield the Pitayo bark, introduced into India by Mr Cross.

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| Leaves broad-oval; flower-panicles pyramidal; capsule oblong | 1. <i>C. succirubra</i> . |
| Leaves oblong, obtuse, often narrow; flower-panicles pyramidal; capsule ovate | 2. <i>C. Calisaya</i> . |
| Leaves lanceolate or ovate-lanceolate; panicles short-corymbose; capsules oblong or ovate-oblong | 3. <i>C. officinalis</i> . |
| Leaves broad-ovate or obovate, decurrent into short marginate petiole, nearly glabrous; capsule lanceolate | 4. <i>C. micrantha</i> . |

1. *C. succirubra*, Pavon; Howard Illustrations of the Nueva Quinologia of Pavon, 1862, t. 8.—Syn. *C. cordifolia*, var. *E.*, Mutis; Triana, l. c. t. 20, bis.

A tree, 15-40 ft. high, pubescent. Leaves without pits in the axils of lateral nerves, broad-oval, 6-10 in. long, 4-6½ in. broad, acute at both ends, nearly glabrous above, soft-pubescent or tomentose beneath; petiole 1-1½ in. long; main lateral nerves 8-10 pair. Stipules oblong. Flowers rose-coloured with white hairs; ½-¾ in. long, close together in large terminal panicles. Branchlets, nerves, and underside of leaves often red. Capsule oblong, 1-1½ in. long. Varies with broader and narrower leaves, and with pale and pink flowers.

Indigenous in the warm and moist forests on the western and south-western slope of Chimborazo in Ecuador, north-east of Guayaquil, between 2300 and 4000 ft., but has probably a wider range. According to recent researches, this species yields the red bark of commerce, which is exported from Guayaquil, and which was long known and valued, though the tree yielding it had not been identified. Seeds and plants of this species were collected in the Limon forests west of the Chimborazo, and in the district of Guaranda, and sent to India by Mr R. Spruce in 1860; and from this source mainly have been raised the extensive plantations of *C. succirubra* on the Nilgiris and other parts of South India, and in Sikkim. The bark of this species is rich in Cinchonine and Cinchonidine, but comparatively poor in Quinine. The special advantage is that it thrives at lower elevations than any of the other species which yield valuable bark, but it is sensitive to frost and long-continued

drought. In Sikkim it thrives at an elevation of 1000 ft. in the vicinity of the Sal forest. It has been grown on the Chikalda hills in Berar, and on the Pachmarhis. The success of these experiments however, remains to be proved. In Burma it is grown on the hills east of Toungoo. The wood is close-grained but not hard; the medullary rays are numerous, and the pores are arranged in linear radial groups of 3-5 between the medullary rays.

2. *C. Calisaya*, Weddell, Histoire naturelle des Quinquinas, 1849, t. 3.

A large tree, or a shrub when stunted. Leaves oblong, or obovate-oblong, obtuse, rarely acute, sometimes very narrow, 3-6 in. long, narrowed into a short petiole, glabrous, shining above, more or less pubescent beneath; main lateral nerves 6-8 pair, with more or less indistinct pits (scrobiculi) in their axils. Flowers less than $\frac{1}{2}$ in. long, pubescent, light flesh-coloured, hairs white. Panicles large, terminal. Filaments generally shorter than half the length of anthers. Capsule ovate, $\frac{1}{2}$ in. long. The shape of the leaves varies exceedingly.

Indigenous on the east side of the second Cordillera range, between 13° and $16^{\circ} 30'$ S. lat., in the northern districts of Bolivia and the province of Carabaya in Peru, at an elevation between 4800 and 6000 ft. A stunted variety, *C. Josephiana*, Wedd. l. c. t. 3, bis, with oblong-lanceolate, somewhat coriaceous leaves, was found by Weddell on grass-lands (Pajonal) outside the forests. These grass-lands he believes were formerly covered with forest which gradually receded from the inroads of the jungle-fires, and the stunted *Calisayas* remained. A similar encroachment of the grass-lands upon the forest by the action of the annual fires is not rare in India. The trees outside the forest, which resist the action of the fires, get stunted and gnarled, and often present a different aspect from the same species in the forest. *C. Calisaya* yields the Royal, also called Yellow or *Calisaya* bark, which is exported from Arica in south Peru. It is perhaps the most valuable of all Cinchona barks, rich in alkaloids, of which Quinine forms more than one-half, sometimes four-fifths.

In Sikkim, *C. Calisaya* thrives remarkably well at moderate elevations. It seeds freely, and proves a free and rapid grower. This species was first introduced into the Buitenzorg Botanic Garden in Java by Justus Carl Hasskarl, who was sent to Peru by the Dutch Government in 1852. A large proportion of his importations, however, consisted of a comparatively worthless species, *C. Pahudiana*, Howard (identified by Triana, l. c. 68 with *C. carabayensis*, Weddell), with subcoriaceous, elliptic, not scrobiculate leaves, densely tomentose beneath, pink flowers, the corolla-tube pentagonous, with 5 longitudinal open slits at the edges, and pubescent capsules.

3. *C. officinalis*, Linn.; Bot. Mag. t. 5364.—Syn. *C. Condaminiana* Humb. et Bonpl.; Weddell, l. c. t. 4.

A large tree, leaves lanceolate or ovate-lanceolate, 3-6 in. long, narrowed into petiole 1 in. long or longer, glabrous, or slightly pubescent beneath, distinctly scrobiculate; main lateral nerves 8-10 pair, the pits in the axils distinctly visible on the upper side of leaf. Flowers pubescent, short corymbose pubescent panicles, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, flesh-coloured, capsules oblong or ovate-oblong, $\frac{1}{2}$ in. long or longer.

Indigenous in the forests of Loxa in Ecuador, on the east side of the Andes at elevations between 6000 and 9000 ft. Produces the Pale, also called Loxa or Crown bark. Cultivated at high elevations on the Nilgiris and

Ceylon. Rich in alkaloids, of which more than one-half is Quinine. Crown bark is yielded by several varieties or closely allied species, most of which have been introduced into the Indian plantations. In Howard's Nueva Quinologia the following are figured: 1. *C. Chahuarguera*, Pavon; 2. *C. crispa*, Tafalla; 3. *C. Uritusinga*, Pavon; 4. *C. heterophylla*, Pavon (identified by Triana l. c. 39 with *C. Chahuarguera*, Ruiz et Pavon),—all from the Loxa and other districts of Ecuador.

4. *C. micrantha*, Ruiz et Pavon; Weddell, l. c. t. 14, 15; Howard, l. c. t. 5.

A large tree. Leaves broad-ovate or obovate, 6-12 in. long, 4-8 in. broad, decurrent into a short marginate petiole, glabrous above, nearly glabrous beneath, with more or less distinct pits in the axils of the nerves. Main lateral nerves 10-12 pair. Flowers white, $\frac{1}{2}$ in. long. Capsule lanceolate, $\frac{1}{2}$ in. long.

Indigenous on the east side of the inner Cordillera in Peru and Bolivia. This, with *C. nitida*, Ruiz et Pavon; Wedd. l. c. t. 10, and *peruviana*, Howard, l. c. t. 27, yields the grey or silver barks which are rich in Cinchonine, though they contain no Quinine, or very little of it. The grey barks are cultivated on the Nilgiris and in Sikkim.

5. HYMENODICTYON, Wall.

Trees or shrubs, with opposite, petiolate, deciduous leaves. Bark bitter. Stipules interpetiolar, deciduous, glandular-serrate. Flowers small, pentamerous. Corolla funnel-shaped or narrow campanulate, pilose outside; lobes short, valvate. Anthers linear or oblong, filaments short, compressed, attached to the back of a broad connective. Disc annular. Ovary 2-celled; style filiform, long exserted, stigma fusiform, 2-lobed, ovules numerous, attached to cylindrical placentas adnate to the dissepiment. Capsule ovoid-oblong, 2-valved, dehiscing loculicidally. Seeds numerous, imbricate, testa winged, wing elongated, bifid below, edge lacerated; embryo small in a fleshy albumen.

Flower-spikes erect, in terminal panicles 1. *H. excelsum*.
Flower-spikes drooping, axillary 2. *H. flaccidum*.

1. *H. excelsum*, Wall. in Roxb. Fl. Ind., ed. Carey, ii. 149; W. & A. Prodr. 392.—Syn. *Cinchona excelsa*, Roxb. Cor. Pl. t. 106; Fl. Ind. i. 629. Vern. *Bartu*, *barthoa*, Pb.; *Bhulan*, *bhalena*, *bhamina*, *dhauli*, N.W.P.; *Kükürkät*, *bhürkür*, Oudh; *Bhehar*, *pötür*, *pütür*, C.P.; *Dondu*, *dandelo*, Panch Mehals.

A large deciduous and pubescent tree. Leaves elliptic or elliptic-oblong, acuminate, 6-12 in. long, main lateral nerves 8-10 pair. Stipules caducous, oblong, with a broad almost cordate base. Flowers greenish white, fragrant, very numerous, on slender pedicels in short clusters along the axis of dense cylindrical compound spikes, congregated in erect terminal panicles, the clusters in the axils of linear deciduous bracts, the spikes in the axils of long-pedunculate floral leaves or bracts, shaped like the leaves, but coloured and deeply reticulate. Corolla funnel-shaped,

with a long slender tube, and a broad campanulate mouth. Capsules $\frac{3}{4}$ in. long, recurved on pedicels half their length or longer. *Cinchona thyrsoflora*, Roxb. Fl. Ind. i. 530, fr. Bengal, is probably the same species.

Forests of the Peninsula and Central India, extending on the west side as far north as the Panch Mehals. Burma, Bengal, Behar, Oudh forests, and sub-Himalayan tract, west to the Ravi, ascending to 5500 ft. in the outer Himalaya. Leafless from November until May or June. Fl. June, July. Capsules ripen Oct.-Jan., remain long on the tree, conspicuous on the bare branches. A small tree in the C.P., but attains a large size, h. 50 ft., g. 6-8 ft., in Oudh and the north-west, and much larger dimensions in Burma. Very common in the Oudh forests, associated with *Sāl* and *Haldu*, also in the outlying Scrub jungle. Bark 1 in. thick, cinereous or dark brown, smoothish or with elevated corky ridges, peeling off in large membranous scales. Middle bark purplish brown, inner bark white, streaked with red and orange. Wood light-coloured, soft, light, but close-grained. Heart and sap not distinct. Used for agricultural implements, scabbards, grain measures, palanquins, toys, and similar articles. The inner bark is bitter and astringent, and is used as a febrifuge; the bark is also used for tanning, and the leaves as cattle-fodder.

2. *H. flaccidum*, Wall. l. c. 152; Pl. As. rar. t. 188.

A moderate-sized glabrous tree. Leaves approximate at the ends of branchlets, elliptic, acuminate, 6-10 in. long, main lateral nerves 8-10 pair. Stipules deciduous, oblong with narrow base. Flowers white, numerous, sessile, fasciculate in dense cylindrical, pedunculate, drooping, axillary spikes, each spike with one long pedunculate coloured reticulate floral leaf on the peduncle. Capsules $\frac{1}{2}$ in. long or less, reflexed, on short pedicels.

Hills of Eastern Bengal. Nepal, outer Himalaya, as far as the Jumna, ascending to 5000 ft. Fl. June, July. Capsules ripe Oct., and remain long on the tree. Bark cinereous or brown, somewhat rugose. Leaves red before being shed.

H. obovatum, Wall.; Bedd. Fl. Sylv. t. 219, on the hills of the western coast as far north as Bombay, has elliptic or obovate leaves, on long petioles, pubescent beneath, finely reticulate between 6-8 pair of main lateral nerves, flowers subsessile, fasciculate in erect spikes, each spike with a coloured floral leaf, forming short terminal panicles.

6. WENDLANDIA, Bartling.

Shrubs or small trees, leaves opposite and in whorls of three. Stipules interpetiolar or intrapetiolar. Flowers small, supported by bracteoles in many-flowered terminal panicles. Calyx-tube subglobose, limb with 5 nearly equal persistent lobes. Corolla tubular, limb spreading, of 5 imbricate lobes. Anthers versatile, exserted. Ovary 2- rarely 3-celled, style slender, stigma bifid, but lobes often cohering. Capsule globose, crustaceous, 2-valved, many-seeded. Seeds compressed horizontal, testa membranous, sometimes narrow-winged, embryo short in a fleshy albumen.

Grey-tomentose; stipules recurved; corolla-tube short; filaments as long as anthers

Nearly glabrous; stipules adpressed; corolla-tube long; filaments shorter than anthers

1. *W. exserta*

2. *W. tinctoria*

1. *W. exserta*, DC.; W. & A. Prodr. 402.—Syn. *Rondeletia exserta*

Roxb. Fl. Ind. i. 523. *R. cinerea*, Wall. Fl. Ind., ed. Carey, ii. 141. Vern. *Chaulai*, *chila*, *chilkiya*, *tala*, Kamaon; *Birsah*, *tilki*, Oudh; *Kursi*, Seoni district; *Marria kari*, Gonds of Chindwara; *Tilliah*, Baigas of Mundla.

A small tree, grey-tomentose. Leaves opposite, lanceolate or ovate-lanceolate, entire, pubescent above, clothed with short soft grey tomentum beneath, 6-9 in. long, main lateral nerves prominent, 16-20 pair. Stipules interpetiolar, ovate, upper part recurved. Flowers white, fragrant, in large tomentose panicles. Lobes of corolla reflexed, as long as tube. Filaments exserted, as long as anthers.

Common in South and Central India, Bengal and in the sub-Himalayan tract as far west as the Chenab. Abundant in the Baraitch and Gonda forests of Oudh, where in some places it grows in dense patches to the exclusion of other trees. Common on the Nerbudda, particularly in broken, raviny ground. Very abundant and of large size in the vicinity of the Pachmarhis. Fl. March, April. Generally only about 25 ft. high with 3 ft. girth, but in places attains 50 ft. and 5 ft. girth. Trunk short crooked or forking, branches upright. Foliage pale green. Bark rough, with longitudinal shallow cracks, exfoliating in long strips. Wood reddish, close-grained, extremely hard, fibrous and tough; though small, used for building and agricultural implements.

2. *W. tinctoria*, DC.—Syn. *Rondeletia tinctoria*, Roxb. Fl. Ind. i. 522.

A small tree, nearly glabrous, flower-panicles and under side of leaves pubescent. Leaves opposite, elliptic-oblong or obovate-oblong, acuminate, narrowed into short petiole, shining above, pubescent or glabrate beneath, main lateral nerves 10-12 pair, prominent. Stipules interpetiolar, adpressed, triangular-ovate, cuspidate with a long apex. Flowers white, sessile, fasciated, in large hairy panicles. Corolla-tube four times the length of the recurved lobes. Anthers exserted, on very short filaments.

Bengal, Behar, Nepal, Oudh forests (Gonda), Kamaon. Fl. Jan.-March. 20 ft. high, with a short crooked stem 3 ft. girth. Bark employed in Bengal as a mordant in dyeing.

7. GARDENIA, Linn.

Shrubs or trees, the young shoots often exuding a resinous gum. Stipules solitary on each side, entire, more or less connate round the stem within the petioles, often early deciduous. Calyx-limb produced beyond the ovary, truncate, toothed or divided into 5 or more lobes. Corolla-tube cylindrical, or slightly dilated upwards, lobes 5 or more, contorted in the bud. Anthers nearly sessile, usually more or less exserted. Ovary 1-celled, incompletely divided by 2, 3, or rarely more projecting parietal placentae, with several ovules to each placenta. Fruit fleshy, indehiscent, usually crowned with the limb of the calyx, endocarp often hard and imperfectly 2-5-celled. Seeds numerous, immersed in the fleshy or pulpy placentae.

Armed with strong axillary, often leaf-bearing spines; calyx truncate with 5 short subulate teeth. Fruit grey, 2-3 in.

long
Unarmed; flowers 5-6-merous; limb of calyx short.

Limb of calyx with 5 or 6 ovate or triangular divisions:

1. *G. turgida*.

- fruit oblong; leaves cuneate-oblong, sessile, with broad, often cordate base
- Limb of calyx with 5 long, subulate divisions; fruit ovoid; leaves elliptic-oblong, narrowed into short petiole
- Unarmed; flowers 9-merous; limb of calyx tubular, deeply cleft into 9 lanceolate hirsute segments; fruit nearly globose, leaves obovate, narrowed into short petiole
2. *G. gummifera*
3. *G. lucida*.
4. *G. latifolia*.

1. *G. turgida*, Roxb. Fl. Ind. i. 711; Wight Ic. t. 579.—Vern. *Thaneila*, N.W.P.; *Khurrur*, *khuriari*, Oudh, Singrowlee, Mirzapur, Mundla, Sion, Chindwara; *Ghurgā*, Oudh; *Pendra*, *Phendra marra*, Gonds, C.P.

A small tree. Branches with thick soft, mealy, grey, rarely light rust coloured bark, armed with strong axillary, often leaf-bearing spines. Leaves greyish green, soft-tomentose beneath, pubescent above, rarely (specimens from South India) nearly glabrous, obovate, obtuse or short acuminate, sessile, with a long tapering base, and 4-6 pair of main lateral arcuate nerves. Stipules interpetiolar, distinct, triangular. Flowers 1-4, axillary or at the end of short leafless lateral branchlets. Calyx short, campanulate, limb truncate with 5 short subulate teeth. Corolla white, fragrant, tube 3 times the length of calyx, limb with 5 oblong divisions, longer than tube. Fruit ovoid or turbinate, grey, rough, 2-3 in. long, with 9 obtuse longitudinal ridges at the base, crowned with the scar of calyx; shell of nut hard, bony, 5-valved.

Sub-Himalayan tract from the Kali to the Jumna, ascending to 4000 ft. Aravalli hills near Todgarh (*Karumba*), Banswara (*Gangāli*). Common in the Oudh forests, Behar. South India (the glabrous form, and limb of calyx more distinctly lobed). Old leaves shed in March, young foliage in May; fl. generally March and April. Barely 15 ft. high, with a short erect trunk, 2½ ft. girth, bark ½ in. thick, spongy, white or rusty farinaceous. Wood dirty white, with darker streaks, close-grained, hard, 56½ lb. per cub. ft. (R. T.) Splits and cracks in seasoning. Fruit not eaten, but used medicinally (in Kamaon).

2. *G. gummifera*, Linn.; Wight Ic. t. 576; Roxb. Fl. Ind. i. 708, 709 (*G. arborea*); W. & A. Prodr. 395.—Vern. *Dekāmāli*, *kamarri*, *kar-marri*, C.P.

A large shrub, rarely a small tree, nearly glabrous, unarmed, leaves pubescent when young, rough when old, buds resinous. Leaves sessile, often with cordate base, cuneate-oblong or obovate-oblong, 2-3 in. long, with 12-16 pair main lateral nerves, stipules sheathing. Flowers terminal, 1-3 together, almost sessile. Calyx pubescent and scabrous, limb short, with 5-6 ovate, or triangular divisions. Corolla large, white, yellow in the evening, fragrant, tube 1½-2 in. long, limb spreading, segments narrow, oblong, half the length of tube, almost glabrous. Stigma clavate, entire, striated. Fruit oblong, with numerous longitudinal, elevated lines, 1-1½ in. long, crowned with persistent calyx. Nut with a thin crustaceous shell, nearly 4- or 5-celled.

Ceylon, South India, and Satpura range, C.P. Bare of leaves until the end of the hot weather; fl. March, April, before the new leaves come out. Branchlets rough, reddish. Wood white and hard; the fruit is eaten. From wounds in the bark exudes a beautiful yellow gum-resin, which is collected and sold with the gum of *G. lucida*.

To the same group of *Gardenia* belongs *G. florida*, Linn.; Bot. Mag. t. 2627, 349, with oblong-elliptical coriaceous leaves, 2-4 in. long, acuminate, narrowed into short petiole, with 6-10 main lateral nerves, calyx-segments linear, nearly 1 in. long, fruit oblong, above 1 in. long, crowned by the persistent calyx-segments. Indigenous in China, and cultivated throughout India on account of its large white fragrant flowers.

3. *G. lucida*, Roxb. Fl. Ind. i. 707; Wight Ic. t. 575; W. & A. Prodr. 395.—Vern. *Dikamali*. Local n. *Konda manga*, *kokkita*, *tetta manga*, C.P.

Glabrous, unarmed, with resinous buds. Leaves elliptic-oblong, acute, or short-acuminate, narrowed into short, marginate petiole, 3-10 in. long with 20-25 pair main lateral nerves; stipules sheathing, cut into unequal segments. Flowers large, solitary, on pedicels $\frac{1}{2}$ -1 in. long from the axils of the uppermost leaves near the ends of branches. Limb of calyx with 5 long linear-subulate divisions. Corolla large, pure white, fragrant, tube long, glabrous, striated, limb spreading, with 5 obovate-oblong lobes, as long as or a little shorter than the tube, glabrous. Stigma entire. Fruit oblong or ovoid, smooth, marked with longitudinal lines, crowned with the persistent calyx; shell of nut hard, woody, thick, nearly 2-celled by the prominent placentæ.

Burma, South India, and Central Provinces. Fl. March-June; fr. C.S. A large shrub or a small tree 25 ft. high, trunk short erect, 3 ft. girth, numerous stiff decussate branches. Young shoots greyish-green, smooth, resinous. Wood close-grained, hard, is made into combs, and is recommended for turning. A gum-resin (*dikamali*) exudes from wounds in the bark, is collected and sold in the bazar, hard opaque, yellow greenish or brown, with a strong smell. Useful in the treatment of sores and cutaneous diseases, and for keeping off flies and worms.

4. *G. latifolia*, Aiton; Hort. Kew. i. 369; W. & A. Prodr. 395; Wight Ic. t. 759. Vern. *Papra*, *pāphar*, C.P.; *Ban pindālu*, N.W.P.; *Pannia*, *Mūl*, Gonds, Mandla; *Gūngat*, *bhandāra*, Gonds, Satpura; *Phiphar*, *Maigas*, Balaghat.

A small tree; nearly glabrous, young leaves pubescent, mature leaves dark green and glossy. Leaves opposite or in threes, oval or obovate, entire, narrowed into short petiole, with 10-20 pairs of prominent lateral nerves, and small, hairy glands in the axils of the nerves on the under side. Stipules connate in a sheath round the stem within the petioles. Flowers terminal, generally solitary, nearly sessile. Limb of calyx campanulate, deeply and irregularly cleft into generally 9 lanceolate hirsute segments. Corolla large, white in the morning, yellow in the evening, fragrant, tube 2-3 in. long, hirsute on the outside; limb spreading, divisions generally 9, obliquely obovate, hairy, on the outer edge overlapping in the bud, as long as the tube, or equal to half its length. Stigma obovate, thick and fleshy. Fruit nearly globose, $1\frac{1}{4}$ -2 $\frac{1}{4}$ in. long, adpressed when young, when ripe cinereous or speckled greenish yellow, crowned with the lower part or the whole of calyx, and enclosing a nut, with a thin, hard, but brittle shell, bearing on the inside 4 or 5 parietal placentæ.

Common in dry places, in many parts of India, in the sub-Himalayan forest ascending to 3000 ft., north-west as far as the Jumna, in Bengal, Behar, Central India, South India, and Ceylon. Trunk short, 3 and at times 4 ft. girth, with stiff divergent branches, forming a small rounded head, up to 30 ft. high. No leaves in the beginning of May; fl. in April and May; the fruit ripens in the ensuing cold season. Bark $\frac{1}{4}$ - $\frac{1}{2}$ in. thick, white, grey or greenish, scurfy and farinaceous, but upon the whole smooth. The wood is white, with a yellowish tinge, close- and fine-grained; it weighs when dry 52-53 lb. per cub. ft., is easy to work, and durable; combs are made of it, and it has been recommended for engraving and turner's work. Annual rings distinct.

A tree figured in Roxb. Cor. Pl. t. 134, and described in that work, and in Fl. Ind. i. 706, under the name of *G. latifolia* (*G. enneandra*, König; W. & A. Prodr. 394; Wight Ic. t. 574), from the Circars and the Carnatic, has the lobes of the corolla as long as the tube (no constant character in this group), and the calyx-limb short-dentate. Roxburgh identifies it with Aiton's *G. latifolia*, but thinks it different from that plant as figured by Gärtner, Carp. iii. t. 193. The question, whether the plant described and figured by Roxburgh is specifically distinct from *G. latifolia*, Ait., as here described, demands farther inquiry.

8. RANDIA, Linn.

Shrubs or rarely trees, often armed with opposite axillary thorns. Stipules solitary on each side, pointed, with a broad base, but not united, often deciduous. Calyx-limb more or less produced beyond the ovary, truncate, toothed or lobed. Corolla-tube cylindrical, short or long, rarely dilated at the top; lobes 5, contorted in the bud. Anthers nearly sessile, included in the tube or exserted. Ovary 2-celled, with several, usually numerous ovules in each cell, attached on the dissepiment to a fleshy placenta. Fruit succulent, indehiscent, often crowned by the calyx-limb. Seeds numerous, immersed in the fleshy or pulpy placenta.

Corolla-tube glabrous, much longer than calyx; fruit a small 4-seeded berry, $\frac{1}{2}$ in. long

1. *R. tetrasperma*.

Corolla-tube hairy, short; fruit large, more than 1 in. long.

Branches rust-coloured; spines 1-4, at the end of short branchlets; calyx with 5-8 short obtuse lobes; fruit grey, 2 in. long

2. *R. uliginosa*.

Branches grey; spines axillary; calyx with 5 broad ovate foliaceous divisions; fruit yellow, 1-1 $\frac{1}{4}$ in. long

3. *R. dumetorum*.

1. *R. tetrasperma*, Benth. & Hook. — Syn. *Gardenia tetrasperma* Roxb. Fl. Ind. i. 709, ed. Carey, ii. 555. Vern. *Bara garri*, Kamaon.

A small shrub, with grey, decussate, stiff branches, and short, often spinescent branchlets. Leaves glabrous, $\frac{1}{2}$ -2 in. long, obovate or oblong-ovate, narrowed into short petiole, approximate near ends of branchlets, stipules triangular-subulate. Flowers greenish-white, scented, sessile, pentamerous. Calyx-lobes as long as tube, subulate from a triangular base. Anthers exserted. Corolla-tube $\frac{1}{2}$ in. long; lobes nearly as long as the tube, oblong; apex subulate. Stigma long, spindle-shaped. Fruit a globose berry, crowned with the persistent calyx, $\frac{1}{2}$ in. long, 4-seeded.

Himalaya from Indus to Bhutan. In North-West Himalaya ascends to 6000 ft. Fl. April, May.

Nearly allied is *R. rigida*, DC. (*Posoqueria rigida*, Wall. in Roxb. Fl. Ind., ed. Carey, ii. 570); a rigid shrub about 6 ft. high, pubescent, with short, sharp axillary spines, $\frac{1}{4}$ – $\frac{1}{2}$ in. long, and ovate, acuminate leaves on short petioles, with cordate or rounded base, white fragrant flowers in axillary, nearly sessile fascicles; corolla-tube $\frac{3}{4}$ in. long; berries small, many-seeded, globose purple. Eastern Himalaya and Nepal. Probably also in Kamaon.

2. *R. uliginosa*, DC.; W. & A. Prodr. 398; Wight Ic. t. 397.—Syn. *Gardenia ul.*, Roxb. Pl. Cor. t. 135; *Posoqueria ul.*, Roxb. Fl. Ind. i. 712. Vern. *Pindālu*, *pindāra*, Kamaon; *Panār*, Oudh; *Paniah*, Gorakhpur; *Bharani*, *kātul*, C.P.; *Kaurio*, Panch Mehals; *Mhamben*, Burm.

A tall shrub or small tree; nearly glabrous, trunk and branches with dark, rust-coloured bark. Smaller branches quadrangular, bearing short, round, diverging, decussate branchlets, with several pair of approximate leaves, 1-3 flowers, and at the top 1-4 strong sharp decussate thorns, about $\frac{1}{2}$ in. long. Leaves shining, smooth above, pubescent with short scattered hairs beneath particularly along the nerves, obovate, or obovate-oblong, from cuneate base, with 6-8 pairs of main lateral nerves; petioles short. Limb of calyx tubular, obtusely 5-8-toothed or nearly entire, a little shorter than the tube of the corolla, which is large, showy, white or cream-coloured, with a broad spreading limb of 5-8 round obtuse lobes; mouth of tube shut up with a ring of close white hairs. Fruit ash-coloured, crowned with persistent calyx, 2-celled, ovoid, 2 in. long, with a thick hard dry pulp.

Common in many parts of India. In the sub-Himalayan forests as far west as the Jumna, ascends to 2500 ft. Panch Mehals, Oudh, Central Provinces, South India, Bengal, and Burma. Often gregarious, mostly in low, moist places. Fl. May-June; fr. Dec.-Feb. Leaves shed Feb., renewed April. 15-20 ft. high, with short erect trunk, 2 ft. girth. Branchlets decussate, horizontal, with spines and flowers at their extremities. Bark 1 in. thick, dark-rusty, rough with brown scales. Foliage dark or bright green. Wood whitish, close-grained, hard, 41 lb. per cub. ft. Fruit sold in bazaars of Oudh and Behar, eaten when cooked or roasted. Leaves browsed by deer and cattle.

2. *R. dumetorum*, Lam.—Syn. *Gardenia dumetorum*, Roxb. Cor. Pl. t. 136; (*Posoqueria*), Roxb. Fl. Ind. i. 713; Wight Ic. t. 580; W. & A. Prodr. 397. Vern. *Mindla*, *mandkolla*, Pb.; *Arara* (the shrub, Aitch. Cat. 71), Husharp.; *Mainphal*, *mānyūl*, *korhar*, N.W.P.; *Main*, *maini*, Oudh; *Mainhūri*, *manhūri*, C.P.

A shrub or small tree, armed with strong opposite axillary spines 1-1½ in. long. Leaves obovate, acute, from cuneate base, narrowed into a short marginate petiole, rough on both sides with short stiff hairs, rarely glabrous; main lateral nerves 4-6 pair. Flowers greenish-yellow or nearly white, fragrant, at the ends of short lateral leaf-bearing branchlets, solitary or 2-3 together, on short peduncles. Calyx campanulate, strigose with stiff adpressed hairs; limb with 5 broad-ovate foliaceous divisions. Corolla white; tube short, not much longer than calyx-lobes, strigose with stiff adpressed hairs; limb spreading, its divisions oval or oblong. Fruit glo-

bose or ovoid, yellow when ripe, 1-1½ in. long, with a thick, firm fleshy pericarp; kernel cartilaginous, 2-celled, the seeds embedded in a quantity of gelatinous pulp, attached to the middle of the partition. *R. longispina*, DC.; W. & A. Prodr. 398; Wight. Ic. t. 582; is probably the same species.

Exceedingly common in most parts of India, extending north-west to the Bias river, and ascending in the outer Himalaya to 4000 ft. Ceylon, Java, and South China. In Kamaon and Garhwal abundant in some of the Sâl forests, also in the Gonda and Baraith divisions of the Oudh forests. Loses its leaves Feb.-April; new foliage April-May. Fl. generally March-May; fr. Nov.-March. Very variable in habit and size, from a small stiff shrub to a handsome small tree, 15-20 ft. high, with a straight, often ridged and furrowed trunk, 2-4 ft. girth, with numerous thin, rigid branches, forming a rounded rather open crown. Bark ½ in. thick, cinereous or brownish-grey, rough with white elevated dots, wrinkled but not marked with cracks or furrows; at times quite white and smooth. Sapwood large, dirty-white, heartwood light brown, fine- and even-grained, compact, firm, hard, heavy and strong. Liable to warp. Used for agricultural implements, fences, and fuel. Bark of root and stem, and the fruit are used in native medicine. The unripe fruit is bruised, pounded, and used to poison fish; when ripe it is roasted, and eaten. The leaves are lopped and used as cattle-fodder. Growth slow; a section of a tree known to be 65 years old, 4 in. radius, hollow inside, showed 54 annual rings on 2 in. of the radius near the circumference.

9. *HYPTIANTHERA*, W. & A. Prodr.

Shrubs, wholly glabrous, with terete branches, and interpetiolar, triangular acuminate, persistent stipules. Flowers small, white, sessile in opposite axillary fascicles, bracteolate. Calyx-tube short, turbinate; limb cleft into 5, somewhat unequal, acuminate, persistent lobes. Corolla-tube short, pilose within; lobes 4-5, contorted in bud. Anthers 4-5, sessile on the corolla-tube. Ovary 2-celled; style short, with 2 large oblong, hirsute branches. Fruit an ovoid or globose, 2-celled, 6-10-seeded berry. Seeds imbricate; embryo small in a horny albumen.

1. *H. stricta*, W. & A. Prodr. 399.—Syn. *Randia stricta*, Roxb. Fl. Ind. i. 526.

Leaves lanceolate, shining, 3-5 in. long, on short petioles; main lateral nerves arcuate, joined by distinct intramarginal veins.

Bengal, Oudh forests, common on shady banks of streams. Generally a shrub, with many stems from one root, at times a small tree, 15-20 ft. high, with short erect trunk. Evergreen. Fl. April.

10. *IXORA*, Linn.

Shrubs or small trees, mostly glabrous. Leaves opposite, coriaceous, evergreen; stipules interpetiolar. Flowers in trichotomous corymbs. Calyx-tube ovoid, limb short, persistent, 4- rarely 5-dentate. Corolla hypocrateriform; tube slender, limb of 4, rarely 5 lobes, generally shorter than tube, contorted in bud. Stamens inserted in the mouth of the corolla, filaments short. Ovary 2-celled; style filiform, with 2 short exserted

branches, 1 ovule in each cell. Fruit a coriaceous or fleshy 2-seeded berry with chartaceous endocarp. Testa membranous, albumen cartilaginous, embryo incurved at the back of the seed, radicle inferior.

1. *I. parviflora*, Vahl; Roxb. Fl. Ind. i. 383; W. & A. Prodr. 429; Bedd. Fl. Sylv. t. 222.—*The Torch-Tree*. Vern. *Gandhat*, Hindi; *Rangan*, Bengal; *Kauria*, Sadri, Meywar; *Kurat*, Bombay.

A large shrub or small tree, wholly glabrous. Leaves short petiolate, coriaceous, hard, shining, cuneate- or obovate-oblong, often with a slightly cordate base, 4-5 in. long, with prominent reticulate veins, and about 10 pair of more or less prominent lateral nerves. Stipules triangular, subulate. Flowers white or pink, $\frac{1}{3}$ - $\frac{1}{2}$ in. long, in terminal corymbose trichotomous panicles.

Common in South India, extending north to the Satpura range. Bengal, Behar, Ceylon. Fl. March, April. The green branches make excellent torches, and are used for that purpose by Dāk runners. The wood is fairly close-grained.

I. coccinea, Linn.; Roxb. Fl. Ind. i. 375; W. & A. Prodr. 427.—Syn. *I. Bandhuka*, Roxb.; *I. grandiflora*, Ker; the *Flame of the Woods* (Sans. *Bandhuka*, *raktaka*); with oblong sessile leaves on a cordate base, bright scarlet flowers 2 in. long, in short compound terminal corymbs, is indigenous in South India, Chittagong, Burma, the Indian Archipelago. Cultivated in gardens all over India, and in most tropical countries. Naturalised in North Australia. Fl. throughout the year, particularly during the rains.

11. PAVETTA, Linn.

Shrubs and small trees, glabrous pubescent or tomentose. Leaves opposite, petiolate, mostly membranous. Stipules intrapetiole, deciduous, generally connate into a sheath. Flowers in trichotomous corymbs, white or greenish. Corolla hypocrateriform; tube slender, lobes 4-5, stamens inserted in the mouth of corolla. Ovary 2-celled; style long, slender, filiform, stigma fusiform undivided or 2-dentate; ovule one in each cell attached to the dissepiment. Fruit a fleshy 2-seeded berry, with chartaceous endocarp. Testa membranous, albumen corneous, embryo incurved at the back of the seed, radicle inferior.

1. *P. tomentosa*, Smith; W. & A. Prodr. 431.—Syn. *Ixora tomentosa*, Roxb. Fl. Ind. i. 386; Wight Ic. t. 186. Vern. *Jūi*, Beng.

A large shrub; branchlets, leaves, and inflorescence clothed with short tomentum. Leaves ovate or ovate-oblong, 5-8 in. long, on petioles 1 in. long; main lateral nerves 10-15 pair. Flowers white, faintly fragrant, in broad spreading trichotomous panicles. Corolla, before opening, 1 in. long, lobes $\frac{1}{4}$ in. long.

South India, Burma, Bengal; common in the outer Himalayan ranges of Garhwal and Kamaon, ascending to 4000 ft. Fl. March, April.

P. indica, Linn.; W. & A. Prodr. 431 (*Ixora Pavetta*, Roxb. i. 385), glabrous, with lanceolate or oblong-elliptic leaves on short petioles, 8-10 main lateral nerves, white flowers in broad flat-topped trichotomous corymbs, is a common deciduous shrub in South India as far north as Bombay, and probably on the south face of the Satpura range. Abundant in Bengal. Fl. April, May.

Electronia didyma, Benth. & Hook.—Syn. *Canthium didymum*, Gærtn. ; Bedd. Fl. Sylv. t. 221 ; *C. umbellatum*, Wight Ic. t. 1034 ; Dalz. & Gibb. Bomb. Fl. 113 ; is a beautiful evergreen tree 30 ft. high, with dark-green, oval, short-acuminate coriaceous leaves, and white flowers in axillary umbels on short peduncles. Corolla-segments valvate, tube hairy inside at the mouth. Drupes $\frac{1}{2}$ in. long, numerous, on slender pedicels, compressed, with two lateral furrows, almost didymous. South India, common along the western Ghats, possibly in the Central Provinces. Wood yellowish, with irregular masses of black wood in the centre, close-grained hard and heavy. Vern. *Arsul*, Bombay.

12. COFFEA, Linn.

Shrubs, mostly glabrous. Leaves opposite, rarely in whorls of 3. Stipules interpetiolar, broad, acuminate, persistent. Flowers white, sessile or on short pedicels, solitary or fasciated in the axils of leaves. Calyx-tube short, with a short, truncate or dentate limb. Corolla hypocrateriform or funnel-shaped ; lobes 4-5, oblong, obtuse, patent, contorted in bud. Stamens inserted in the mouth of the corolla ; anthers sessile, or attached to short filaments at the back near the base. Ovary 2-celled, style bifid at the top ; ovule one in each cell attached to the dissepiment. Berry globose or oblong, dry or fleshy, 2-seeded, each seed enclosed in a coriaceous or chartaceous endocarp (the husk of the coffee). Seeds plano-convex, the inner side flat, with a deep longitudinal furrow, filled up by the testa and a portion of the endocarp. Embryo curved, at the back and near the base of the horny albumen, cotyledons foliaceous, radicle inferior.

1. *C. arabica*, Linn. ; Roxb. Fl. Ind. i. 539 ; Wight Ic. t. 53. *Coffee*.—Vern. The bean *Bun*, when roasted and ground *Kahwa*.

A glabrous shrub or small tree. Leaves 5-7 in. long, opposite, oblong, acuminate, narrowed into short petiole ; main lateral nerves 6-10 pair, joined by intramarginal veins, and slender parallel reticulate veins. Flowers numerous, in axillary fascicles. Corolla funnel-shaped, lobes oblong, as long as tube. Filaments $\frac{1}{2}$ the length of anthers. Berry fleshy, purple when ripe.

Indigenous in Abyssinia, and in Soudan, where it is said to form large forests. The use of coffee has long been known in Abyssinia, but it is not certain when the shrub was first cultivated. In Arabia it has been cultivated since the fifteenth century ; there is, however, no proof of its being indigenous in that country. In the sixteenth century coffee became known in Europe, and in America its cultivation was commenced in 1718 by the Dutch in Surinam. Coffee was grown in Java in the latter half of the seventeenth century. It is said that into India it was first introduced (last century) by a Musalman saint, who lived and died on the summit of the great mountain in the Shimoga division of Mysore, called after him Baba Buden, that he brought the coffee-tree from Arabia, and planted it near his dwelling, whence it gradually spread to other parts of the country (Bowring, Eastern Experiences, p. 157). The coffee-tree accommodates itself readily to a moist climate, and under the influence of a rainfall of 100 inches on the Ghats of Munzerabad, Coorg, and Wynad, produces coffee similar in quality to that grown in Egypt, Arabia, and other countries, with a comparatively dry climate. It thrives in Chota Nagpur, on the Chikalda hills in Berar, and elsewhere in Central India. In the Dehra

Doon it grows freely, and produces fruit abundantly, but requires to be protected against frost while young. It is remarkable that coffee and tea contain the same substance, an alkaloid (Coffeine or Theine), to which (partly at least) the effect upon the nervous system of coffee and tea must be attributed. Tea contains between 1 and $3\frac{1}{2}\%$ of this substance, and coffee between $\frac{1}{2}$ and 1% . Coffeine is also found in the Maté or Paraguay tea, *Ilex paraguayensis*, in the *Rola*, *Korra*, or *Gorra* nuts, the seeds of a sterculiaceous tree, *Cola acuminata*, R. Br.; Bot. Mag. t. 5699, of tropical Africa, cultivated in Brazil and the West Indies, which form an important article of trade, and are chewed by the negroes of West Africa and the West Indies as a condiment. It is also contained in the seeds of a sapindaceous tree (*Paullinia sorbilis*, Mart.) in Brazil, which are powdered and made into a paste, called *guarana* bread; used to make a refreshing drink.

Coffea bengalensis, Roxb. Fl. Ind. i. 540; Bot. Mag. t. 4917; *Kath-jahi*, Kamaon; is a small shrub with large snow-white flowers, solitary or in pairs, and ovate, long-acuminate leaves. Eastern Bengal, Sikkim, and the outer hills of Kamaon. Fl. Feb.-March.

13. MORINDA, Linn.

Shrubs or trees, leaves opposite, rarely in whorls of three, generally membranous. Stipules interpetiolar, or connate into a sheath. Flowers white, sessile on a globose receptacle, forming globose or ovoid flower-heads, with the calyx-tubes often connate. Calyx-limb truncate or obscurely dentate, persistent. Corolla funnel-shaped, or hypocrateriform; lobes coriaceous, 5, rarely 4 or 6-7, valvate in bud. Stamens inserted in the mouth of corolla; filaments short, anthers attached by the middle of the back. Ovary 4-celled, 1 ovule in each cell, attached to the dissepiment below the middle (normally 2-celled, but the 2 cells are converted into 4 by the introverted carpellary leaves being so produced laterally, as to reach the walls of the ovary—Thwaites); style with 2 stigmatic lobes, rarely entire. Drupes of each flower-head distinct or united in a compound succulent berry, including a number of hard 1-seeded pyrenes, usually 2-4 proceeding from each flower.

1. *M. exserta*, Roxb. Fl. Ind. i. 545; W. & A. Prodr. 419.—Sans. *Achyuta*. Vern. *Al*, *Ach*, *ack*. Local. *Alleri*, *Allādi*, Panch Mehals; *Ainshi*, North Konkan.

A moderate-sized tree, glabrous or pubescent. Leaves opposite, narrowed into short marginate petioles, ovate or elliptic-oblong, 4-5 in. long, main lateral nerves 8-10 pair. Stipules triangular or ovate. Peduncles mostly solitary, leaf opposed by the abortion of the axillary leaf, 1 in. long or longer. Corolla-tube $\frac{3}{4}$ in. long. Stamens exserted. Style bifid. Drupes concrete into a fleshy syncarpium, irregularly ovoid or globose, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long.

Indigenous in many parts of India, in Bengal, Burma, the Peninsula, the Panch Mehals. A fast-growing tree 30-40 ft. high, with a deeply-cracked spongy bark of greyish yellow colour. Fl. March-June. Blossoms and bears seed at a very early age. Wood bright yellow, darkening into yellowish brown; made into plates and dishes. The bark of the root is used for dyeing red and yellow. Skinner gives the weight of the wood of *M. citrifolia* at 30 lb. What he enters under *M. exserta* from Burma is a *Randia*, possibly *R. uliginosa*.

Roxb. Fl. Ind. i. 541-546, describes 4 species closely allied to this, which are important, as the root of all is used for dyeing. 1. *M. citrifolia*, Linn., from Pegu, with glabrous, lucid leaves. 2. *M. tinctoria*, Roxb., cultivated throughout India, with glabrous, but not lucid leaves. 3. *M. bracteata*, Roxb.; Wight Ill. t. 126, from Ganjam, glabrous, flower-heads supported by a few linear-lanceolate bracts, adnate to the calyx-tubes of outer flowers. 4. *M. multiflora*, from Nagpore and Berar, downy, peduncles often opposite, axillary, the end of the branch forming a short panicle. These 4 species have the anthers not exerted, the stipules are interpetiolar, free, or only connate at the base, not sheathing. I am inclined, however, to think that the wild and cultivated plant cannot be specifically distinguished, and that it will be more convenient to consider the 5 species described by Roxburgh as one, which would then be called *M. citrifolia*, Linn. Beddome, Fl. Sylv. t. 220, unites *M. citrifolia* and *tinctoria*, and Thwaites, Enum. Pl. Ceyl. 145, points out that the presence of bracts and the exerted anthers are variable characters. *M. citrifolia*, Linn., is found in Java and other islands of the Indian Archipelago, in Queensland, on the Sandwich, and other islands of the Pacific. When the *ach* is cultivated, it is generally raised from seed, and dug up when a few years old, unless trees are wanted to produce seed. A full account of its cultivation in As. Researches, iv. 35 (1799).

Entirely distinct from this sp. are *Morinda angustifolia*, Roxb. l. c. 549; Cor. Pl. t. 237, from Bengal, Burma (cultivated in Toungyas as a dye), and Singapore, distinct drupes, and *M. umbellata*, Linn.—Syn. *M. scandens*, Roxb. l. c. 548, a diffuse or climbing shrub common in Southern and Eastern India, with 4-8 umbellate terminal peduncles.

14. HAMILTONIA, Roxb.

Shrubs with opposite, petiolate, ovate-lanceolate penniveined leaves, and short, intrapetiolar, broad, acute, persistent stipules. Flowers fasciculate, in large trichotomous panicles. Calyx-tube ovoid, limb 5-cleft, segments subulate, persistent. Corolla funnel-shaped; tube long, lobes 5, valvate. Stamens inserted in the mouth of the corolla, anthers attached by the back to short, subulate filaments. Ovary 5-celled, with 5 furrows, the dissepiments disappearing afterwards. Capsule 1-celled, 5-seeded, opening at the apex into 5 valves. Seeds triquetrous, testa of 2 layers, the outer reticulate. Cotyledons foliaceous, cordate, induplicate, radicle inferior.

1. *H. suaveolens*, Roxb. Fl. Ind. i. 554.—Syn. *H. propinqua*, Don, in Jacq. Voy. Bot. t. 91; *Spermadietyon suaveolens*, Roxb. Cor. Pl. t. 236; *S. azureum*, Wall. Bot. Reg. t. 1235. Vern. *Muskei*, *kantala*, *fisauñi*, Chenab; *Niggi*, *tulenni phul*, *gohinda*, Ravi; *Kanera*, *putari*, Bias; *Phillu*, Sutlej; *Iogia padera*, Kamaon.

A shrub, with divaricate, more or less herbaceous branches. Leaves elliptic-oblong, 6-9 in. long on short petioles, glabrous or pubescent, firm, hard and rough, main lateral nerves 10-16 pair, arcuate, anastomosing with intermediate more slender nerves. Branches of panicle pubescent. Flowers sessile or shortly pedicellate, in compact fascicles, with subulate bracts, white or blue, fragrant, calyx-segments linear or subulate, longer than ovary, clothed all over with long hairs, and often in addition with a few distant filiform gland-tipped teeth, or hairless, with glandular teeth, or clothed with short pubescence only. Corolla-tube $\frac{1}{2}$ in. long, pube-

cent outside, anthers more or less exserted, stigma included or exserted.

A common but somewhat variable shrub, on rocky dry hills, generally only a few feet high, but attaining in places 8-12 ft. It is known from Behar, the Aravalli hills (Mairwara), and Mount Aboo, the Salt range in the Panjab, and the Himalaya from the Indus to Nepal, ascending to 5000 ft. Fl. Oct.-Dec. Wood small, but in Chamba said to be used for making gunpowder-charcoal. *H. mysorensis*, W. & A. Prodr. 423, from Mysore and Western India, fl. white, Jan.-March, is closely allied, if not the same species; the glandular-tipped teeth of calyx-segments, which are supposed to be its specific character, are found equally in specimens from Behar, North-West India, and Mairwara. Graham, Bomb. Cat. 91, asks whether they are identical, and adds they look much like each other. I am inclined to think that farther researches on the spot will show that they are not specifically distinct.

Leptodermis lanceolata, Wall.; Jacquem. Voy. Bot. t. 90.—Vern. *Padera*, Kamaon; is a small shrub with white sessile flowers in bracteate heads, forming large terminal panicles. Each flower is enclosed in a tubular 2-toothed and 2-nerved membranous involucre, composed of 2 connate cuspidate bracts, the capsule is cylindrical, 5-valved, the valves terminate in ovate, persistent ciliate calyx-lobes, and separate from 5 central fibrous, reticulate 1-seeded bags. North-West Himalaya 5000-10,500 ft.; fl. June-Aug. Leaves fetid when bruised.

ORDER XLVI. ERICACEÆ.

Shrubs, small trees or rarely wiry herbs. Leaves usually alternate, simple, exstipulate. Calyx more or less deeply divided into 4 or 5 teeth or lobes, tube adnate to the ovary (*Vaccinieæ*) or quite free (*Ericineæ*). Corolla hypogynous or epigynous, the tube ovoid, globose, tubular, or campanulate. Stamens generally double the number of corolla-lobes, hypogynous or epigynous. Anthers 2-celled, opening at the top by 2 pores or oblong slits, or rarely longitudinally. Ovary inferior or superior, usually 4-5-∞-celled, with many ovules in each cell, on axile placentas. Style slender; stigma entire or minutely lobed. Seeds very small, with a fleshy albumen; embryo straight, often minute.—Royle Ill. 255 (*Vaccinieæ*), 257; Wight Ill. ii. 116, 119.

This Order comprises two sub-Orders: 1. *Vaccinieæ*, with inferior ovary, containing the Bilberry (*Vaccinium Myrtillus*, Linn.) of Europe, and numerous species of the same genus on the mountains of Southern and Eastern India. 2. *Ericineæ*, with superior ovary, comprising the numerous heaths of Europe and South Africa, and to which sub-Order belong the two genera which find a place in this Flora.

Capsule globose, 5-celled, dehiscing loculicidally 1. ANDROMEDA.
Capsule cylindrical or conical, 5-18-celled, dehiscing septicidally 2. RHODODENDRON.

1. ANDROMEDA, Linn.

Shrubs or trees with alternate, petiolate leaves. Calyx without bractlets. Sepals 5, wholly or partially distinct, valvate in the bud. Corolla 5-toothed. Stamens 10; anthers fixed near the middle, the cells opening by a terminal pore. Capsule globose, 5-celled, 5-valved, dehiscing loculicidally, dissepiments remaining on the valves. Seeds numerous, minute,

linear, on thick placenta projecting from the summit or the middle of the axis.

1. *A. ovalifolia*, Wall. ; Wight Ic. t. 1199.—Syn. *Pieris ovalifolia*, Don. Vern. *Ayatta*, *elan*, *ellan*, *ellal*, *arur*, *rattankāt*, Pb. ; *Eyār*, *ayār*, N.W.P. ; *Anfir*, *angiar*, Nepal.

A glabrous shrub or small tree. Leaves coriaceous, entire, 3-6 in. long, ovate or elliptic-oblong, acute or shortly acuminate, penniveined, on short petioles. Flowers white to bluish, flesh-coloured sometimes, in unilateral, bracteate racemes ; bracts lanceolate, deciduous. Corolla tubular, slightly constricted at the mouth. Filaments subulate from a thickened base, ciliate, included, but nearly as long as corolla-tube, with two spreading ciliate filiform appendices at the apex ; anthers awnless, oblong. Sutures of the capsule with a linear ridge, which pulls away separately when the capsule opens.

Common in the outer Himalaya from the Indus to Assam, usually between 4000 and 8000 ft., at times ascending to 10,000, and descending as low as 2000 ft. Kasia hills, Burma, and Japan. In oak and pine forests, and often associated with *Rhododendron arboreum*. Leafless for some time in winter, new foliage Feb. Fl. April-June ; capsules ripen July-Sept. Growth slow, 34 rings per inch. Bark rough, with numerous narrow, deep, close-set cracks, tailing off into each other. Inner bark fibrous. Wood light reddish-brown, compact, firm, not durable, used only as fuel and for making charcoal. Buds and young leaves are poisonous to goats ;* the young leaves are used to kill insects, an infusion and the juice of the leaves are applied externally in skin diseases.

A. formosa, Wall. ; Wight Ic. t. 1200.—Syn. *Pieris formosa*, Don. ; is an evergreen tree with lanceolate serrulate leaves, racemes in large terminal panicles. Bhutan, Sikkim (7000-10,000 ft.), Nepal, and (doubtfully, Madden) in Eastern Kamaon at 7000 ft.

2. RHODODENDRON, Linn.

Shrubs or trees, with evergreen, entire, alternate leaves and large showy flowers usually in compact terminal clusters or umbelliform corymbs, from large buds with scaly bracts. Calyx free, entire, 5-lobed or 5-parted, or obsolete. Corolla campanulate or infundibuliform, 5-12-lobed, sometimes slightly irregular. Stamens 10-20, commonly didinate, as well as the style ; anthers short, opening by terminal pores, awnless. Ovary superior. Capsule cylindrical or conical, 5-18-celled and -valved, dehiscing septically. Seeds numerous, scale-like. Placenta projecting from the axis, either 2 in each cell (the infected and distinct edges of the carpellary leaves), bearing seeds on the outside only, or one placenta in each cell bearing seeds on both sides.

Flowers in terminal corymbs ; calyx small, flattish.

Flowers on short pedicels ; capsules 10-celled, 10-valved	1. <i>R. arboreum</i> .
Flowers on slender pedicels $\frac{3}{4}$ -1 in. long ; capsules 5-6-celled	2. <i>R. campanulatum</i> .
Flowers in terminal corymbs ; calyx cleft to the base ; lobes foliaceous, membranous	3. <i>R. Anthopogon</i> .
Flowers solitary ; calyx foliaceous	4. <i>R. lepidotum</i> .

* See Cleghorn in Journ. Agr. Hort. Soc. of India, xiv. 260 (1867).

1. *R. arboreum*, Sm.—Tree *Rhododendron*. Vern. *Ardāwal*, Jhelam; *Mandāl*, Chenab; *Chiu, āru*, Ravi; *Brās, broa, būrāns, būrūnsh*, Bias to Sardah; *Bhorāns, gūras*, Nepal.

A small tree; leaves crowded at the ends of branches, coriaceous, elliptic-oblong, acute at both ends, rarely obtuse, 4-6 in. long, glabrous, shining above, with a dense silvery film of small scales beneath; main lateral nerves 15-25 on either side of midrib, prominent beneath, depressed on the upper surface. Flowers commonly crimson-scarlet, occasionally white pink or rose-coloured, or marked with purple or yellowish spots, 1-2 in. long, on short peduncles in sessile, dense, many-flowered terminal corymbs; buds subglobose, covered with broad tomentose scales. Calyx small, flat, persistent, with 5 spreading unequal teeth. Corolla between turbinate and campanulate, with 5 unequal lobes. Stamens alternately longer. Capsules on thick, hirsute peduncles, $\frac{1}{2}$ - $\frac{1}{4}$ in. long, cylindrical, about 1 in. long, curved, 10-grooved, 10-celled. Seeds minute, on bipartite placentæ.

Hills trans-Indus. Common on the outer ranges of the Himalaya from the Indus to Bhutan, between 3000 and 8500 ft., ascending at times to 11,000. Does not extend into the arid parts. Often associated with *Quercus incana* and *Andromeda*. Never leafless, the foliage is renewed gradually. Time of flowering varies, the usual period is March-May; has been seen in flower during winter, with snow on the ground. Again at times the blossoms do not come out until June or July (Simla, 1849, 1867). Growth slow, 14 rings per inch. Hardy at Kew in sheltered places.

Attains 30-40 ft., with a short, often gnarled, not straight trunk, 7-8 ft. girth, specimens of 15-17 ft. have been measured, but these large stems are always hollow. Bark 1 in. thick, chestnut brown, corky, rimose, wrinkled. Wood light or dark brown, close-grained and hard, but not strong; employed for building, made into dishes, and used for fuel and charcoal. Annual rings very clear and distinct. Flower-buds and young leaves believed to be poisonous to cattle. The flowers are eaten, and made into a pleasant subacid jelly; they are at times intoxicating. They are offered in temples, and are applied for headaches.

R. nilagiricum, Zenker.—Syn. *R. arboreum*, Wight Ic. t. 1201; Bedd. Fl. Sylv. t. 228; on the Nilgiris, Pulneys, and Anamallays; is closely allied, and perhaps not specifically distinct. It has shorter and generally broader leaves, with a rusty film beneath, and a broadly tubular or campanulate corolla-tube, with a spreading, nearly flat limb. At high elevations in the N.W. Himalaya *R. arboreum* is said to have a rusty, not silvery, film beneath.

2. *R. campanulatum*, Don; Bot. Mag. t. 3759.—Vern. *Gaggar, yurmi*, Kashmir; *Sargar, shincala*, Ravi; *Shargar*, Bias; *Simrung*, Suttlej.

A shrub; leaves crowded at the ends of branches, coriaceous, elliptic or elliptic-oblong, 3-5 in. long, smooth, shining above, with a dense buff-coloured film beneath; midrib prominent, main lateral nerves indistinct. Flowers whitish pink or lilac, 1-1½ in. long, on slender peduncles $\frac{3}{4}$ -1 in. long, in sessile terminal corymbs. Buds subglobose, covered with glabrous or pubescent scales. Calyx small, flat, persistent. Corolla campanulate. Capsules cylindrical, about 1 in. long, curved, 5-6-celled, 5-6-valved.

Himalaya 9500-14,000 ft., found in the inner more arid tracts (e.g., Kunawar), as well as on elevated points of the outer ranges (Chūr, Kedar Kanta). From the Indus to Nepal. *R. Wallichii*, Hook. fil.; Rhod. Sikk. t. v.; Bot. Mag. t. 4928; from Sikkim, 11,000-13,000 ft.; is believed to be a variety of this species. Fl. May-July. The leaves (*Tamāku, hulās, patti Kasmīri*) are brought to the plains and used as snuff. Wood close-grained. Hardy in England.

3. *R. Anthopogon*, Don; Royle Ill. t. 64.—Syn. *Osmothamnus fragrans*, DC. Vern. *Nichni, rattankāt, nera*, Jhelam; *Tazak-teun, Kashmir; Kāi zabān, morua, talisa*, Ravi; *Talisri*, Bias.

A small alpine shrub, with a heavy aromatic odour, young parts with glandular hairs and rust-coloured scales. Leaves approximate at ends of branchlets, 1-1½ in. long, elliptic or elliptic-oblong, shining above, ferruginous beneath, edge recurved. Flowers on short pedicels in short terminal corymbs. Calyx-lobes oblong, obtuse, membranous, ciliate. Corolla hypocrateriform, with a long slender tube, and a plain patent limb. Capsule surrounded by the persistent calyx, 5-celled, 5-valved. Style short, erect, clavate.

Himalaya, Kashmir to Sikkim, generally above the forest limit, between 11,000 and 16,000 ft. Chūr, Kedar Kanta, Kunawar. "Nothing exceeds the beauty of its flowers, whether we consider the texture of the corolla, exquisitely tender, translucent, or the rich blush of the first opening blossoms, which insensibly passes into snowy white, then faintly tinged with sulphur, all colours seen in one and the same plant."—Hook. Rhod. Sikk. p. 7. Fl. June-July. Hardy at Kew in sheltered places.

4. *R. lepidotum*, Wall.; Royle Ill. t. 64.—Vern. Names of preceding.

A small alpine shrub, aromatic, young parts with silvery or rust-coloured scales. Leaves approximate at ends of branchlets, ¾-1 in. long, oblong or obovate-oblong, acute, the under side with a silvery or brownish film, edge recurved. Flowers varying from red to dingy yellow, solitary or 2-3 together, on pedicels ½-¾ in. long. Calyx-lobes oval, obtuse, not ciliated. Corolla with a broad short tube and a patent concave limb. Style short, thick, recurved. Capsule 5-celled, 5-valved.

Himalaya, Kashmir to Sikkim, between 10,000 and 16,000 ft. Lahaul, Hattia, Kunawar, &c. The leaves of this and the preceding species (*talisfar*, Pb.) are used as stimulants in native medicine.

ORDER XLVII. MYRSINÆ.

Trees or shrubs, with alternate, simple, entire or toothed leaves, with-out stipules. Flowers small, usually pentamerous or tetramerous, in axillary clusters racemes or panicles, rarely in terminal panicles. Calyx free or rarely adhering to the ovary. Corolla regular, gamopetalous and polypetalous, rarely wanting. Stamens epipetalous, as many as petals or divisions of the corolla, and opposite to them. Ovary 1-celled, ovules numerous or few, attached to a free central placenta, which is often thick and globular. Fruit an indehiscent berry or drupe, rarely splitting length-

wise on one side. Seeds with few exceptions albuminous, often with more than one embryo.—Royle III. 264; Wight III. ii. 137.

Calyx-tube adnate to the ovary	1. MÆSA.
Calyx free; petals free to the base	2. EMBELIA.
Calyx free; petals united in a short tube, with a deeply-lobed limb.	
Corolla without appendages; anthers longer than short filaments.	
Flowers in dense axillary clusters	3. MYRSINE.
Flowers umbellate, corymbose, or paniculate	4. ARDISIA.
Corolla with appendages; filaments long; flowers in axillary clusters	5. REPTONIA.

1. MÆSA, Forskal.

Flowers in simple or compound racemes with small bracts and two bracteoles under each flower. Calyx-tube adherent, limb 5-lobed, corolla 5-lobed. Stamens 5, filaments slender, anthers short. Ovary inferior or half-superior. Ovules numerous, more or less embedded in a fleshy placenta. Style short. Berry crowned by the persistent calyx-lobes, many-seeded.

Glabrous, racemes much longer than petiole	1. <i>M. indica</i> .
Pubescent, racemes as long as petiole	2. <i>M. argentea</i> .

1. *M. indica*, A. DC.; Wight Ic. t. 1206.—Syn. *Bæobotrys indica*, Roxb. Fl. Ind. f. 557. Vern. *Kalsis*, Kamaon; *Atki*, Bomb.

A large shrub, sometimes with a tendency to climb; glabrous, inflorescence only slightly pubescent. Leaves elliptic-oblong ovate-oblong or lanceolate, 3-6 in. long, on petiole $\frac{1}{2}$ -in. long, membranous, dentate, with large distant teeth, edge revolute. Flowers white, mostly unisexual, on slender pedicels, as long as flowers, in compound, nearly sessile, axillary racemes, the racemes of male flowers 1-2 in. long, longer than those of the female flowers; bracts shorter than pedicel. Calyx-lobes obtuse, slightly ciliate or pubescent. Anthers broad, nearly rotundate. Berry globose, white, $\frac{1}{2}$ in. across. This and other species of *Masa* are liable to a peculiar monstrosity, the flowers being replaced by dense spikelets of closely imbricated bracts, which transform the racemes into dense sterile panicles.

A common shrub in South India, Burma, and Bengal. In the sub-Himalayan tract west to the Ganges, ascending to 5000 ft. Also in Ceylon, China, the Indian Archipelago. The specimens from N.W. India certainly belong to *M. indica*; whether *M. montana*, A. DC., is a distinct species, I do not venture to decide. Fl. at different times, chiefly April-Oct.; the berries ripen in the course of three months, and are eaten in Nepal. In Canara the leaves are used to poison fish.

2. *M. argentea*, Wall. Fl. Ind., ed Carey, ii. 233.—Vern. *Phusera*, *gogsa*, N.W.P.

A large shrub, 6-8 ft. high; branches subsacandent, clothed with soft and dense pubescence. Leaves elliptic, 6-10 in. long, dentate with sharp teeth, slightly pubescent above, white or grey-tomentose beneath, acuminate, on petiole 1 in. long. Flowers white, on short pedicels, in short compact axillary racemes as long as petiole, with a few short branches

at the base. Berry round, smooth, white, size of a peppercorn. Seeds numerous, minute, immersed in the surface of the fleshy globular placenta.

Outer Himalayan ranges, Kamaon and Nepal 4000-6000 ft. Fl. April-May. Fruit July, is eaten.

2. EMBELIA, Burm.

Shrubs or woody climbers. Flowers small, in simple or branched slender racemes, either axillary or forming a terminal panicle. Calyx free, deeply 5-lobed. Petals 5, rarely 4, distinct, spreading. Stamens as many, inserted at the base of and not exceeding the petals; filaments filiform, anthers short. Ovary superior; style short; ovules few, embedded in a globular fleshy placenta. Fruit a dry 1-seeded berry.

Flowers in large terminal panicles; main lateral nerves of leaves numerous, indistinct

1. *E. Ribes*.

Flowers in axillary racemes; main lateral nerves 6-10 pair, prominent

2. *E. robusta*.

1. *E. Ribes*, Burm.; Roxb. Fl. Ind. i. 586.—Syn. *E. glandulifera*; Wight Ic. t. 1207. Vern. *Kārkannie*, Bomb.; *Babering*, Silhet.

A large climbing shrub; glabrous, only branches of inflorescence densely pubescent. Leaves 2-3 in. long, coriaceous, entire, shining above, paler beneath, elliptic-oblong, acuminate, narrowed into a short marginate petiole; main lateral nerves numerous, parallel, not prominent; glands along midrib, petiole or edge of the leaf near base, or wanting. Flowers polygamous, small, pubescent, of a greenish-yellow colour, on pubescent pedicels longer than calyx, in slender racemes, forming large terminal panicles. Bracts shorter than pedicels. Calyx-lobes acute. Petals elliptic, acute. Stamens on short filaments, included. Berry the size of a peppercorn, black, succulent, wrinkled when dry; seed solitary, globose, aromatic and somewhat pungent.

Common in South India, Ceylon, Burma, Bengal, and will probably be found in the Satpura range. Also in China and the Indian Archipelago. In Silhet the berries are collected and used to adulterate black pepper (Roxb.) The berries, sold under the name of *Bebrang*, *Babarang*, *Waiwarang* in the bazaars of India as an anthelmintic, are the fruit of this species.

2. *E. robusta*, Roxb. Fl. Ind. i. 587.—Syn. *E. Tsjeriam cottam*, Wight Ic. t. 1209; *E. Basaal*, Don. Vern. *Amti*, *Ambat*, *Bārbatti*, *Byebering*, Bomb.; *Bebrang*, Oudh.

A large, spreading and scrambling shrub or small tree, very variable in appearance. Branchlets, petioles, under side of leaves, and racemes more or less rough with rust-coloured pubescence, sometimes glabrous. Leaves 2-4 in. long, membranous, entire, elliptic, short-acuminate; petioles short, terete, or channeled, but not marginate; main lateral nerves prominent, 6-12 on either side of midrib, with shorter intermediate ones, anastomosing by intramarginal veins. Flowers dioicous or polygamous, greenish white, glandular-pubescent, on pedicels longer than calyx, in axillary racemes varying in length, those of the male flowers longer, but

not generally exceeding the length of leaf. Bracts subulate, shorter than pedicels. Petals oblong, reflexed. Stamens in male flowers long-exserted. Berry dry, spherical, nearly $\frac{1}{2}$ in. diam., generally with more or less distinct longitudinal ribs.

Common in western India, Bengal, Behar, and the sub-Himalayan tract as far as the Jumna. Trunk short, erect, branchlets covered with numerous callous dots, round or linear. Fruit ripens Oct.-March.

E. villosa, Wall., Behar, leaves soft villous underneath, flower-racemes long, slender, 4-6 in. long, is closely allied to this, if specifically distinct.

3. MYRSINE, Linn.

Shrubs or small trees, with coriaceous leaves. Flowers small, on short pedicels, in dense clusters, usually from the axils of fallen leaves. Calyx 4- or 5-lobed. Corolla deeply 4- or 5-lobed. Stamens as many; anthers erect, ovate or lanceolate, on very short filaments. Ovary free, style short.

Small trees, wholly glabrous; fruit clustered.

- | | |
|---|----------------------------|
| Leaves serrate; main lateral nerves few | 1. <i>M. semiserrata</i> . |
| Leaves entire; main lateral nerves numerous, indistinct | 2. <i>M. capitellata</i> . |
| A shrub, branchlets pubescent; fruit solitary | 3. <i>M. africana</i> . |

1. *M. semiserrata*, Wall.; Fl. Ind. ed. Carey, ii. 293; Tent. Fl. Nep. t. 24.—Vern. *Parwana*, *kūṅkūṅ*, *gogsa*, *bamora*, *gaunta*, N.W.P.; *Bilsī*, *beresi*, *kalikatha*, Nepal. (*M. acuminata*; Vern. *Chupra*, Kamaon, Madden Journ. As. Soc. xvii. i. 368, is probably the same species).

A small or middle-sized tree, glabrous, with resinous leaf-buds. Leaves coriaceous, lanceolate, 3-5 in. long, narrowed into a short petiole, entire or sharply serrate from the middle to the apex, sprinkled with numerous resinous pellucid dots, edge revolute, midrib prominent beneath; main lateral nerves anastomosing by prominent reticulate and intramarginal veins. Flowers small, scentless, tetrandrous or pentandrous, polygamous, white, with a light pink tinge, on short pedicels in numerous axillary rounded fascicles, with small, ovate deciduous brownish scales at the base. Calyx persistent. Corolla-tube very short, lobes more than twice the length of calyx, oblong, recurved. All parts of the flower with resinous dots. Anthers ovate exserted. Ovules 3-4, semi-immersed in a horizontal line round the globose fleshy free placenta. Style short, with a fleshy stigma, expanding from a tubular base into a large unilateral, 3-lobed fimbriated limb. Drupe the size of a pea, red, globose, a little depressed, smooth and shining; exocarp soft, fleshy, endocarp crustaceous. Seed one, globose. Embryo cylindric, slightly curved, surrounded by a cartilaginous albumen, slightly ruminated and pitted on the outside.

Outer Himalayan ranges, 3000-9000 ft., from the Bias to Bhutan. Fl. and fr. Dec.-March. In favourable places attains 30-40 ft. Bark ash-coloured, often dark, nearly black, longitudinally wrinkled, with many prominent, callous dots. The fruit is eaten. Wallich states that the wood is chocolate-coloured, compact, heavy hard handsome and much esteemed in Nepal for carpenter's work.

2. *M. capitellata*, Wall. ; Fl. Ind., ed. Carey, ii. 295 ; Tent. Fl. Nep. t. 25 ; Wight Ic. t. 1211 ; Bedd. Fl. Sylv. t. 234.

A small or moderate-sized glabrous tree. Leaves coriaceous, lanceolate elliptic or obovate-oblong, 3-7 in. long, gradually narrowed into a short, marginate petiole, entire, with resinous dots near the edge, midrib prominent, lateral nerves numerous, slender, parallel, indistinct. Flowers polygamous, greenish, with copious minute, elevated, resinous, brown dots ; on short pedicels, in lateral rounded heads, sessile, or on short woody peduncles, axillary, or on the previous year's wood. Calyx small, persistent. Corolla-tube short, lobes oblong, recurved. Anthers oval, partly exserted. Stigma blunt or 2-lobed. Drupe globose, $\frac{1}{8}$ in. diam.

Mountains of South-Western India and Ceylon, Burma, and Eastern Bengal. Nepal. Fl. and fr. Dec.-March. The fruit is eaten ; wood similar to that of *M. semiserrata*.

3. *M. africana*, Linn.—Syn. *M. bifaria*, Wall. Vern. *Shamshād*, Afg. ; *Bebrang*, *kakkum*, *kokhūri*, *karuk*, *gūgul*, *jutru*, *chachri*, *prātshu*, *branchu*, *khūshin*, *pāpri*, *bandāru*, *bānsin*, *atūlgān*, Pb. ; *Guvaini*, *pahāri cha* (hill tea), *chūpra*, N.W.P.

A shrub ; branchlets, petioles, and lower part of midrib pubescent with short, ferruginous hairs. Leaves bifarious, coriaceous, lanceolate or obovate, narrowed into a very short petiole, $\frac{1}{2}$ -1 in. long, sharply serrate, the serratures cuspidate, midrib prominent ; main lateral nerves few, inconspicuous, anastomosing by reticulate veins. Flowers small, white, with a pale pink tint, dotted with brown resinous dots, male and bisexual, tetrandrous, nearly sessile, in axillary fascicles of 4-6. Anthers oblong, purple, twice the length of the corolla. Style short ; stigma large, flat, verrucose. Drupes solitary, globose, red, smooth, $\frac{1}{16}$ in. diam.

Common in N.E. Afghanistan and the hills trans-Indus, in the Salt range, and the outer Himalaya from 2500 to 8500 ft., extending eastward into Nepal. Abyssinia, Cape of Good Hope. Fl. March-May ; fr. Jan.-Nov. Attains 20 ft., branching from the ground. Bark grey, with numerous elevated specks, and shallow longitudinal wrinkles, occasionally a whitish pellicle peeling off. Well worth trying for garden-hedges. The wood is used for fuel ; the fruit is sold in the bazaars of North-West India under the name of *Bebrang*.

4. *ARDISIA*, Linn.

Trees shrubs or undershrubs. Flowers larger than in other *Myrsinaceæ*, in umbels or short corymbs, axillary or terminal, solitary, or forming branched panicles. Calyx free, 5-lobed. Corolla deeply 5-lobed, lobes spreading or reflexed, convolute in bud, tube very short. Stamens 5 ; filaments short ; anthers erect, lanceolate, appendiculate at the top ; base emarginate or bifid. Ovary 1-celled ; style subulate, usually long and persistent, the stigma not enlarged ; ovules generally 6-12. Fruit fleshy, globose, 1-seeded.

Flowers in axillary corymbs shorter than leaf . . . 1. *A. humilis*.
Flowers in terminal panicles 2. *A. floribunda*.

1. *A. humilis*, Vahl; Wight Ic. t. 1212.—Syn. *A. solanacea*, Roxb. Corom. t. 27; Fl. Ind. i. 580. Vern. *Kantena*, *maya rawa*, C. Prov.

A large shrub, wholly glabrous. Leaves 4-8 in. long, obovate-oblong, narrowed into a short marginate petiole, entire, short-acuminate; midrib prominent, main lateral nerves numerous, oblique, arcuate, parallel, not very conspicuous. Flowers light rose-coloured, $\frac{1}{2}$ in. across, in pedunculate, axillary corymbose racemes, shorter than leaves. Pedicels $\frac{1}{2}$ in. long, longer in fruit, red, in the axils of oblong or rounded concave, deciduous bracts. Calyx nearly to the base 5-cleft, lobes oval or rounded, obtuse. Berry size of a small cherry, round, black, 1-seeded, full of bright-red juice.

South India and Ceylon. Burma. Bengal. Sub-Himalayan tract as far west as the Jumna, ascending to 3000 ft. Generally on banks of streams and in moist places. Indian Archipelago, South China. Fl. at all seasons, principally March-May. Bark yellowish grey or brownish. Wood used as fuel.

2. *A. floribunda*, Wall.; Fl. Ind., ed. Carey, ii. 272.

A shrub or small tree, young shoots, tender leaves, and inflorescence clothed with short, loose, purple pubescence, full-grown leaves glabrous. Leaves pale beneath, narrowly oblong-lanceolate, 5-6 in. long, shallow and indistinctly crenulate, narrowed into a marginate petiole $\frac{1}{2}$ in. long; midrib prominent, lateral nerves indistinct. Flowers small, red, on short coloured pedicels, thickened at the top, in terminal compound ovate panicles, with linear bracts, the lower branches in the axils of leaves, and often leaf-bearing. Calyx almost white, lobes spreading, ovate, acute. Corolla rotate. Anthers bursting from the middle to the apex, terminated by a subulate appendix.

*Outer Himalaya to 5000 ft. Garhwal, Kamaon, Nepal, Sikkim, Assam, Kasia hills.

5. REPTONIA, A. DC.

Evergreen shrubs with entire coriaceous leaves, and small flowers. Calyx 5-lobed. Corolla with a short tube, and 5 spreading lobes, convolute in the bud, with 5 small scales alternating with the lobes, and inserted in the mouth of the tube. Ovary superior, 1-celled; ovules 1-4 on a small placenta at the bottom of the ovary. Drupe globose, seed albuminous.

1. *R. buxifolia*, A. DC.—Tab. XXXIV.—Syn. *Monothea Muscatensis*, A. DC.; *Edgeworthia buxifolia*, Falc.; Trans. Linn. Soc. xix. t. 9. Vern. *Garar*, Afg.; *Gürgura*, Pb.

A large shrub or small tree, with axillary spines and spinescent branchlets; young branches and leaves pubescent. Leaves 1-1 $\frac{1}{2}$ in. long, obovate-oblong-obovate, or oblong-elliptic, thick, coriaceous, with thickened edge, narrowed into a short petiole; when full-grown shining above, glaucous and puberulous beneath. Flowers whitish, or greenish yellow,

nearly sessile, in dense axillary clusters with minute, ovate, scaly persistent bracts. Calyx rusty tomentose, lobes ovate, obtuse, imbricate in bud. Stamens inserted on the corolla-tube; anthers short lanceolate, on long exserted slender filaments. Ovary hairy, with long subulate style, exserted in the bud; ovules 5. Drupe sessile, globose, supported by the persistent base of calyx, $\frac{1}{3}$ in. diam. or more, glabrous, greenish, with a fleshy sweet pericarp in a coriaceous rind. Seeds 1, globose, or 2 hemispherical; testa smooth, osseous, albumen white, cartilaginous, deeply ruminant. Embryo arcuate.

Common in the western part of the Panjab Salt range, and abundant on the hills trans-Indus from Peshawar to Dera Ishmael Khan, ascending to 4700 ft. According to Griffith common in Eastern Afghanistan. Also in Arabia. One of the characteristic plants of the trans-Indus territory, growing mostly on dry rocky hills. Evergreen; fl. Feb.-April; fr. May and onward, often remaining long on the branches. Attains 15-20 ft., often with a short straight trunk attaining girth of 2-3 ft., with numerous spreading divergent branches, forming a close rounded head. Young shoots clothed with delicate pubescence, bark of stem ash-coloured or blackish, tessellated into small irregularly quadrangular pieces by deep longitudinal and transverse furrows and cracks, resembling that of *Frazinus Moorcroftiana*. Wood beautifully variegated, light brown and whitish, with slender medullary rays, and indistinct annual layers, compact, even-grained, hard and strong. The fruit is much esteemed, and during the season is sold in most bazaars; the pulp is sweet, but there is not much of it. The hard seed is uneatable, it is strung in rosaries.

ORDER XLVIII. SAPOTACEÆ.

Trees or shrubs, frequently with milky juice. Leaves alternate, entire, usually coriaceous, without stipules. Calyx free, lobes 4-8. Corolla hypogynous, regular, divided into the same number of lobes, or a larger number in 2 or 3 series. Stamens inserted on the corolla-tube, as many as corolla-lobes, or as the lobes of the inner circle, and opposite to them, or numerous. Staminodes often alternating with the fertile stamens, or with the divisions of the corolla. Ovary superior, 2 or more-celled, 1 ovule in each cell; style simple, stigma entire or slightly lobed. Fruit a berry or drupe, usually indehiscent. Seeds either with a fleshy albumen and foliaceous cotyledons, or without albumen and with fleshy cotyledons. Testa hard, generally shining.—Royle III. 262; Wight III. ii. 142.

Leaves with prominent lateral nerves. Corolla campanulate or ovoid; limb with 5-14 lobes. Stamens 20-40 without staminodes. Seeds without albumen 1. BASSIA.
Leaves with numerous fine parallel veins. Corolla rotate; limb with 15-24 lobes in 2 rows. Stamens 5-8, alternating with staminodes. Seeds albuminous 2. MIMUSOPS.

Isanandra Gutta, Hook. Journ. Bot. vi. (1847), t. 16, the tree which yields the gutta-percha of commerce, has 6 corolla-segments, 12 stamens without staminodes and penniveined leaves. Singapore, Borneo, and other islands of the Indian Archipelago.

Achras Sapota, Linn. (*Sapota Achras*, Mill.), is a large tree with reddish-

brown, hard, heavy and very durable wood (Bullet or Bully wood) from Central America and the West Indies, which produces the *Sapota*, one of the most pleasant fruits known, when completely ripe; is grown in gardens in Bengal, and as far north as Saharanpur.

1. *BASSIA*, Koenig.

Trees, with milky juice. Flowers on axillary, generally fasciculate pedicels. Calyx divided nearly to the base into 4-8 biseriate lobes, the outer lobes subvalvate, the inner subimbricate in bud. Corolla ovoid or campanulate, limb of 5-14 divisions. Stamens numerous, or twice or thrice as many as lobes of the corolla, all fertile, in 1-3 series; anthers erect, lanceolate from a cordate base, cuspidate or aristate, 2-celled; cells distinct, dehiscing longitudinally. Ovary hirsute, 4-8-celled; style simple, long exserted. Fruit an oblong or globose berry, 1-4-seeded. Seeds oblong, exalbuminous, with a shining crustaceous testa. Cotyledons oblong-elliptic, fleshy, filled with oil, radicle inferior.

Corolla-tube fleshy; lobes erect; anthers 22-30, sessile 1. *B. latifolia*.
Corolla-tube not fleshy; lobes spreading; anthers 30-40, on long
filaments 2. *B. butyracea*.

1. *B. latifolia*, Roxb. Cor. Pl. t. 19; Fl. Ind. ii. 526; Bedd. Fl. Sylv. t. 41.—Sans. *Madhūka*. Vern. *Mahwa*, *mahūa*, *mohwa*. Local names: *Irūp mara*, Gondi.

A large tree; young branches, young leaves, pedicels and petiole pubescent or tomentose. Leaves coriaceous, firm, hard, clustered near ends of branches, elliptic or oblong-elliptic, 5-6 in. long, short-acuminate, on petioles 1-1½ in. long; main lateral nerves 10-12 pair. Stipules subulate, ½ or ⅓ the length of petioles. Flowers numerous, near the ends of branches below the terminal leaf-bud, drooping, on pedicels 1-1½ in. long. Calyx coriaceous, densely clothed with rusty tomentum; sepals 4-5, ovate. Corolla cream-coloured; tube ovoid, fleshy, limb with 7-14, often 8 or 9, short erect ovate teeth. Stamens 20-30, generally 24 or 26; anthers hispid at the back with stiff hairs, sessile, inserted in three series on the inside of the corolla-tube, the upper series near the mouth. Fruit green, fleshy, ovoid, 1-2 in. long, seeds 1-4.

Cultivated, propagating itself by self-sown seedlings, and protected in most parts of India. In the Panjab, it is grown in the sub-Himalayan tract and the outer valleys as far as the Ravi, but not commonly in the plains. Abundant in all parts of Central India from Guzerat to Behar. There seems no doubt that the tree is indigenous in the forests of the Satpura range, of Western India above Ghat, and perhaps also of eastern Kamaon. Thrives in dry stony ground. The old leaves are shed gradually from Feb. to April, the fresh leaves opening out immediately afterwards. The flowers generally appear before the new leaves, in March and April; and after the corollas have dropped, the leaf-buds above the flowers expand. Fruit ripens June, July.

Attains 40-60 ft., with a short trunk 6-7 ft. girth, and numerous spreading branches, forming a close, shady, rounded crown. Bark 1-2 in. thick, grey, brown or blackish, with shallow wrinkles and cracks. Inner bark red, milky. Sapwood large, reddish white, heartwood reddish brown, close and even-

grained. Seasons well, is strong tough and durable. The cub. ft. of seasoned heartwood weighs 63 (Fowke), 66 (Skinner), 68.5 (Cunningham, Gwalior). R. Thompson gives it 52.8 (heartwood?). Unseasoned, 78-81 lb. Value of P., 715 (Cunningham), 760 (Skinner). Not much used, as the tree is not generally felled. Has been used for railway-sleepers in the Cent. Prov. A gum exudes from cracks and incisions in the bark.

The succulent flowers fall by night in large quantities from the tree, and are gathered early in the morning; they have a sickly sweet taste and smell. They are dried in the sun, sold in the bazaar, and form an important article of food in many parts of India. They are eaten raw or cooked, often with parched grain, and put in sweetmeats. Coarse and strong spirit is distilled from them. The ripe and unripe fruit is eaten. From the seeds a greenish-yellow oil is expressed, which has at first the consistence of common oil, is eaten by Gonds and other tribes of the Satpura range, and is used to adulterate ghee (clarified butter). In a cold climate the oil keeps good a long time, but in the plains of India it gets a bitter taste and rancid smell after a few months' exposure to the air, separating into a heavy brown mass below, and a little clear fluid above. The oilcake is used to poison fish, and the smoke from burning it is said to kill insects and rats. It is also used as an emetic.

2. *B. butyracea*, Roxb.—Tab. XXXV.—As. Res. viii. 499; Roxb. Fl. Ind. ii. 527.—Vern. *Chāūra*, *Chaiūra*, Kamaon; *Cheult*, Oudh. (The butter is called *Chaiūra ka pīna* in Kamaon, and *phulel*, *phulwa*, *phalwara*, in the plains.)

A large tree; branchlets, petioles, pedicels and under side of leaves with soft floccose tomentum. Leaves coriaceous, clustered near ends of branches, obovate or obovate-oblong, 6-12 in. long, on petioles 1 in. long; main lateral nerves 15-20 pair. Stipules minute, caducous. Flowers numerous, near the ends of branches, below a tuft of leaves or in the axils of the lower leaves, drooping, on pedicels 1-1½ in. long. Calyx coriaceous, densely clothed with rusty tomentum; sepals 5, ovate. Corolla pale yellow, tube cylindric, not fleshy, as long as calyx, limb of 8 spreading, oblong obtuse divisions, as long as tube. Stamens 30-40, glabrous, inserted in the mouth of the tube, filaments as long as anthers. Berry ovoid, smooth, fleshy, 1-3-seeded.

Sub-Himalayan tract and outer Himalayan ranges, 1500-4500 ft., Kamaon to Bhutan. Sparse (as a small tree) in the hill forests of the Gonda division of the Oudh forests. Attains 40-50 ft., with a short, straight trunk 5-6 ft. girth. Fl. Nov.-Jan.; in Kamaon bees are believed to make excellent honey from the flowers (Madden). Bark ½ in. thick, dark grey, brownish or blackish.

The sweet, insipid pulp of the fruit is eaten. From the seeds a soft solid vegetable butter is extracted, of the consistence of fine lard, and of a delicate white colour, which does not melt in the heat of the plains, and keeps a long time without deteriorating. It melts completely at 120° F. Perfumed with cloves or attar of roses, it is used as ointment, and is held in high esteem as an external application in rheumatic and other painful affections (Pharm. Ind. 131). The cake left after the oil has been extracted is eaten. The flowers are not eaten.

Bassia longifolia, Willd.; Roxb. Fl. Ind. ii. 523; Vern. *Ippi*, *ippe*, *illupi*; is a common and most useful tree in the forests of western Mysore, Malabar, the

Anamallays, and the Circars, with lanceolate leaves. The flowers are dried, roasted, and eaten, and oil is pressed from the seeds.

The seeds of *Bassia Parkii*, Don., of tropical West Africa, yield the Shea butter, used as food and for burning, and described by Mungo Park.

2. MIMUSOPS, Linn.

Trees or shrubs; leaves with prominent midrib, and numerous fine parallel lateral veins. Flowers axillary, on recurved pedicels. Calyx-segments 6-10, in 2 series. Corolla rotate, lobes 3 times or rarely twice as many as calyx-segments, generally in 2 rows. Stamens 6-10, inserted opposite the inner corolla-lobes, and alternating with bifid or lacinate staminodia; anthers lanceolate, extrorse; filaments attached to the back of a broad connective. Ovary 6-8-celled, ovules attached near the base. Seeds more or less compressed, testa hard and shining; albumen copious, cotyledons broad and flat.

Leaves obovate-oblong, obtuse or emarginate; staminodes bifid,
glabrous

Leaves elliptic, obtuse; staminodes irregularly jagged, glabrous

Leaves elliptic, short-acuminate; staminodes lanceolate, densely
hairy outside

1. *M. indica*.

2. *M. Roxburghiana*.

3. *M. Elengi*.

1. *M. indica*, A. DC.; Prodr. viii. 205; Wight Ic. 1587.—Syn. *M. Kauki*, Wall. Cat. 4149 (not Linn.); *M. hexandra*, Roxb. of Bedd. Fl. Sylv. p. 141, and probably also of Roxb. Cor. Pl. t. 15, and Fl. Ind. ii. 338. Vern. *Khîr*, *khîrni*, *kirni*, Hind.; *Rain*, Bassi, Meywar; *Palla*, Tam. and Telugu.

A large evergreen tree. Leaves coriaceous, shining, wholly glabrous, sometimes approximate near ends of branches, blade 2-4 in. long, obovate-oblong obtuse or emarginate, petiole $\frac{1}{2}$ -1 in. long. Flowers whitish, $\frac{1}{4}$ in. across, in axillary fascicles of 3-6 flowers, peduncles shorter than petioles. Calyx-segments 6, ovate, acute, shortly tomentose outside, edges hairy. Corolla of two circles, the inner consisting of 6-8 oblanceolate segments, narrowed into a short claw, and alternating with 6-8 pairs of linear, sub-coriaceous acute segments of the same length, forming the outer circle. Stamens 6-8, exceeding half the length of corolla-segments, opposite to the lobes of the inner circle, alternating with an equal number of flat, bifid, more or less denticulate staminodia, which are as long as, or a little shorter than the filaments. Fruit a yellow berry, generally 1-seeded, size and shape of an olive.

Indigenous in the forests of South India and Ceylon, of Central India (Banda, Edgew.), and Guzerat. Commonly cultivated near villages in many parts of India, as far west as Multan, Lahore, and Gujranwalla. Fl. Nov.-Dec. In North India attains 50-60 ft., with an erect trunk. Bark dark grey or blackish, rough. Numerous rigid, spreading branches, forming a large shady head. Wood reddish-brown, heavy, hard and tough, close- and even-grained; used for sugar-mill beams, oil-presses, house-posts; it is an excellent wood for turning. Weight 70 lb. Value of P. 944 (Skinner; *Palla-wood*, *M. hexandra*). The fruit is eaten.

The naming of this well-known tree has been a matter of considerable diffi-

culty. Linnæus in his *Flora Zeylanica* (1747), p. 57, describes two species: *M. Elengi* (foliis alternis remotis), regarding which there is no doubt; and another, subsequently, in *Sp. Plant.*, called by him *M. Kauki* (foliis confertis). These species were based upon specimens collected in Ceylon by Paul Hermann, Professor of Botany at Leyden, between 1670 and 1677, and now preserved in the British Museum. Robert Brown (*Prodr. Fl. Novæ Holl.* 1810, p. 531) identifies with *M. Kauki* an Australian tree, which had been found by Solander in 1770 on islands off Cape Fear in Queensland. Grisebach (*West Ind. Fl.* 1864, p. 400) adheres to this view, and defines the area of the species as "Pacific islands, tropical Australia, and the East Indies on the sea-shore." He also refers to it a tree cultivated in the West Indies, and figured by Sir Wm. Hooker in *Bot. Mag.* t. 3157, under the name of *M. dissecta*. Benthams, however (*Fl. Austr.* iv. 285), considers that Hermann's Cingalese specimen differs from the Australian plant, which he calls *M. Browniana*, and that it should be referred to *M. indica*, A. DC., a tree, with extremely hard strong and very durable timber, which is common in the hot, drier parts of Ceylon (*Thwaites Enum.* 175). I have also examined Hermann's specimen, and though I do not venture to offer any opinion regarding its identity with the tree from Australia and the Indian Archipelago, I have no hesitation in saying that it cannot be referred to the North Indian tree. The leaves are obovate, acute, and the petiole more than one-half the length of the blade. They are pale beneath, though not in so marked a manner as the leaves of the tree from Australia and the Indian Archipelago; but it must be remembered that the specimen is 200 years old. It is in bud, too young for a satisfactory examination of the parts of the flower. The North Indian tree has concolor leaves, which are obovate-oblong, obtuse or emarginate, with a petiole about $\frac{1}{4}$ the length of leaf. The figure of Rumph. *Herb. Amb.* iii. t. 8, quoted in *Linn. Spec. Plant.*, does not prove anything either way; and under these circumstances I do not feel warranted in adopting the Linnean name for our tree. The *Linn. Herb.* at the Linnean Society contains two specimens of *Mimusops*: one is *M. Elengi*, though marked *Kauki*, König, in Linnæus' handwriting (apparently by way of indicating the origin of the specimen), but *Elengi* in pencil by Sir J. E. Smith; the other is very incomplete, and may be a large-leaved form of *M. Elengi*, it certainly is not *Khirmi*. It is marked *M. Elengi* in Linnæus' handwriting, and *M. Kauki*? in that of Sir J. E. Smith in pencil. Roxburgh's *M. hexandra* is supported by t. 15 of the *Coromandel plants*, and by a type specimen, in leaf only, in the Wallichian herbarium. This specimen apparently belongs to the tree under discussion, and Roxburgh's description also is evidently intended for it. But as pointed out in DC. *Prodr.* viii. 204, and in Wight's *Ill.* ii. p. 144, the staminodes are not correctly represented in the plate; and it is possible, as Wight suggests, that the flowering branch and fruit was taken from one species (*M. indica*), and the magnified flower from the other (*M. Roxburghiana*). Roxburgh's name, therefore, cannot be admitted. It is, moreover, inappropriate, as the tree has both hexandrous and octandrous flowers. Nothing therefore remains but to fall back upon De Candolle's name, *M. indica*, which is supported by good descriptions and the plate in Wight's *Icones*. The specimens of the tree from South and North India are identical, though there is a certain amount of variation in the shape of the staminodes, which, however, in all Indian specimens examined by me, and in some of the Ceylon specimens, are bifid. There are, however, Ceylon specimens with entire, not bifid staminodes, longer than stamens, which may possibly belong to a different species.

S. Kurz, in his Report on the Vegetation of the Andamans, and in *Journ. As. Soc.* xl. 1871, p. 70, calls the Andaman *Bullet-wood*, *M. indica*. The Martaban tree, which is (probably) erroneously quoted by De Candolle under this species, may very likely be identical with the Andaman *Bullet-wood*, but the Hindustan

tree, as described by De Candolle and figured by Wight, is certainly different; for Kurz describes the Bullet-wood with solitary flowers, the fruit depressed-globular, 5-6-seeded, and not unlike in shape and size to a wood-apple. The *Bullet-wood* (*Kuppali*, Burm.) is a large tree, attaining a girth of 14 ft., with a tall straight stem, 60 ft. clear, which forms nearly pure forests on the level lands along the coast of those islands behind the beach, and the Mangrove swamps. The heart-wood is dark reddish-brown, very strong, close-grained and durable, but apt to split. A large series of experiments which I made with this beautiful wood at Calcutta in 1864 gave the following results: Weight of cub. ft. between 66 and 71 lb., average 67.9 lb. Value of P. between 748 and 1091, average 895. Skinner describes, under the name of *M. indica* (*Pulawa*, Tam.), another, but much lighter wood, believed to have come from the jungles about Tinneveli, and used for gun-stocks in Madras, weight 48 lb., value of P. 845. I doubt, however, whether this is a sp. of *Mimusops*.

In conclusion, I may add that the Australian and Indian Archipelago tree (*M. Kauki*, R. Br., *Browniana*, Benth.), with long-petioled obovate leaves, grey beneath (soft with fine densely matted scales or hairs), and large ovoid fruit, 1-2 in. long, has been long cultivated in Calcutta. Roxburgh describes (Fl. Ind. ii. 238) and figures it (Ill. in Hb. Kew., 2480) under the name of *M. Kauki* (*Buasoh*, Malay), and it is mentioned from Goa in Dalz. & Gibson Bomb. Fl. Suppl. 50. In Java it is cultivated on account of the fruit, which is eaten, and it appears probable that the tree was cultivated in Ceylon, so that if Hermann's specimens should belong to it, they may have been gathered from a garden-tree.

2. *M. Roxburghiana*, Wight Ic. t. 1588.

A large tree, differing from the preceding by elliptic leaves, larger flowers on slender pedicels 1 in. long, calyx-segments ovate-oblong, acute, staminodes irregularly jagged, stamens half the length of corolla-segments. Fruit depressed-globose, about 6-seeded.

Nilgiris, Anamallays, and other forests on the west side of the Peninsula.

3. *M. Elengi*, Linn.; Roxb. Cor. Pl. t. 14; Fl. Ind. ii. 236; Wight Ic. t. 1586; Bedd. Fl. Sylv. t. 40. Sans. *Vakula*, *kesara*. Vern. *Bukal*, Beng., Mahr.; *Mulsāri*, *Maulsāri*, Hindi; *Barsoli*, Bassi, Meywar; *Khayaben*, Burm.

A large evergreen tree, glabrous; only youngest leaves, pedicels and outside of calyx with short rusty pubescence. Leaves coriaceous, shining, wholly glabrous when full-grown, blade about 4 in. long, elliptic, short-acuminate, on petiole $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Flowers pure white, fragrant, nearly 1 in. across, in axillary fascicles of 2-6 flowers, drooping, on peduncles shorter than, or as long as petiole. Calyx-segments 8, ovate-lanceolate, acuminate. Corolla of 2 circles of lobes, the inner consisting of 8-10 obovate-oblong segments, narrowed at base, alternating with twice their number of linear-oblong lobes of the outer circle, all lobes more or less dentate near the apex. Stamens 8, opposite to the lobes of the inner circle; anthers long-acuminate, alternating with an equal number of lanceolate staminodes, which are shorter than stamens, and densely hirsute on the back with long stiff hairs. Fruit a smooth, ovoid, 1-seeded berry, yellow when ripe, about 1 in. long.

Indigenous in the forests of the Northern Circars, Ceylon, and the western

Ghats, as far north as Kandalla (Graham, 106). Cultivated throughout India and Burma, extending north-west as far as Delhi, Lahore, and Multan. Fl. March-April. Attains 40-50 ft., with a short trunk, wood reddish-brown, close and even-grained, weight 61 lb. Value of P. 632 (Skinner). The tree is cultivated on account of its fragrant star-shaped flowers, which are used for garlands. The fruit is eaten, and oil is expressed from the seeds. The bark is used medicinally (Pharm. Ind. 131).

ORDER XLIX. EBENACEÆ.

Trees or shrubs, with entire, alternate, rarely subopposite leaves on short petioles, without stipules. Flowers axillary, or from the old wood, regular, usually dioicous, the female flowers often solitary, the male flowers in clusters or small cymes. Calyx free, 3-5-lobed, rarely with 6 or 7 lobes. Corolla hypogynous, lobes as many as those of the calyx, usually contorted in the bud. Male flowers: stamens inserted on the torus, or on the corolla-tube, generally near its base, number indefinite, or twice or four times the number of calyx-lobes. Anthers erect, linear or lanceolate, 2-celled, dehiscing at the sides longitudinally, connective usually prolonged beyond the anthers. Female flowers with or without staminodes. Ovary free, 3- or more celled, with 1 or 2 pendulous ovules in each cell. Styles 1-5, distinct or connate at the base. Fruit a berry, usually indehiscent. Seeds few, albuminous, radicle superior, cotyledons foliaceous.—Royle III. 261; Wight III. ii. 145; W. P. Hiern, A Monograph of Ebenaceæ in Cambridge Philos. Soc. Trans. xii., 1873.

1. DIOSPYROS, Linn.

Flowers dioicous. Calyx 3-7-lobed, usually 4-5-lobed, persistent and generally enlarged in fruit. Ovary 4-16-celled, generally with 1 ovule in each cell. Fruit generally pulpy, with 1-10 seeds. Albumen cartilaginous, white and uniform, or more or less ruminated on the outside.

- | | |
|---|-----------------------------|
| Leaves often opposite; albumen ruminated | 1. <i>D. Melanoxylon</i> . |
| Leaves always alternate; albumen uniform; stamens 16. | |
| Pubescent or tomentose; male flowers in short pedunculate cymes | 2. <i>D. montana</i> . |
| Pubescent or tomentose; male flowers in sessile compact fascicles | 3. <i>D. Chloroxylon</i> . |
| Nearly glabrous; male flowers sessile, 2-3 together | 4. <i>D. Lotus</i> . |
| Leaves always alternate; albumen uniform; stamens 40; leaves oblong, coriaceous shining, evergreen; flowers large | 5. <i>D. Embryopteris</i> . |

1. *D. Melanoxylon*, Roxb. Cor. Pl. t. 46; Fl. Ind. ii. 530.—Sans. *Kendu*, *tinduka*. Vern. *Tend*, *Tendu*, *taindu*, *kendu*, *temru*, *abnús*, (the heartwood). Local names: *Támri marra*, Gondi; *Timburni*, Mar.

A middle-sized tree, branchlets, young leaves, inflorescence clothed with soft grey or tawny tomentum. Leaves mostly subopposite, coriaceous, 3-6 in. long, but sometimes much longer, to 12 in. long, when full-grown glabrous above, tomentose or pubescent beneath; main lateral nerves 6-8 pair, often irregular and branching. Petioles $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Male flowers

tetramerous, sessile or nearly sessile, in short pedunculate 3-12-flowered, often drooping axillary or extra-axillary cymes, bracts subulate, as well as calyx and corolla densely tomentose. Stamens included, 12-16, free, inserted in 1 circle on the torus. Female flowers solitary, axillary or extra-axillary, generally 2, opposite to each other, larger than male flowers, subsessile, or on short thick peduncles. Calyx-lobes 4 or 5. Corolla somewhat less than twice the length of calyx, divided at the top into 4-5 short, cordate, acute or shortly acuminate lobes. Stamines 8-10 or fewer, sometimes connate in pairs, at the base or higher up. Styles 2 or 3, bifid, ovary densely hairy, 4-8-celled, 1 ovule in each cell. Fruit yellow when ripe, ovoid or globose, 1-1½ in. across, supported by the flat spreading calyx-lobes, with undulating, often reflexed edges. Pulp yellow, soft, sweet, slightly astringent. Seeds 4-8, compressed, oblong, the back curved, shining, brown, often marked with bands across. Albumen ruminated.

Under this species I unite *D. Tupru*, Buchanan; Hiern, Ebenaceæ, 158; and *D. Melanoxyton*, Roxb. ibid. 159, comprising *D. exsculpta*, Hamilton in Trans. Linn. Soc. xv. 110 (*D. Tupru*, ib. 111), which is described with 3-4-flowered male peduncles, female flowers 4-5-merous, with 6 staminodia; *D. tomentosa*, Roxb. Fl. Ind. ii. 532, Wight Ic. t. 182, 183 (*D. exsculpta*, Bodd. Fl. Sylv. t. 66), with 3-flowered male peduncles, female flowers pentamerous, without staminodia. Whether *D. Wightiana*, Wall.; Bodd. Fl. Sylv. t. 67, should also be referred here as done by Hiern (under *Melanoxyton*), I do not venture to decide. The figure shows numerous male flowers, pentamerous female flowers with a 5-winged calyx and 10 staminodia.

Common in the dry deciduous forests of the plains and lower hills, excepting the arid region and the northern part of the Panjab. In the sub-Himalayan tract the Ravi is its north-western limit. In Rajputana I have not found it north-east of Humirgarh on the Bunass river. The leaves are shed in March-April, about the time that the fruit ripens; they are renewed soon afterwards, the flowers appearing with the young leaves. Coppices well, throws out root-suckers, and is very tenacious, so that it often is the last of the forest-trees which disappear on land cleared for cultivation (R. Thompson). Attains 30-50 ft., and 6 ft. girth. Bark ½ in. thick or more, dark grey, or blackish, rough, with numerous transverse and longitudinal cracks and furrows, exfoliating in oblong scales. Inner bark red. Wood whitish, with a red tinge, tough and fairly durable, used for building, shoulder-poles, and shafts of carriages. The centre of old trees generally consists of an irregularly-shaped mass of jet-black ebony (*almûs, batti*), larger or smaller according to the age of the tree and other circumstances, and often with irregular projections. Trees, before felling, are generally tested by boring into the wood to see whether the ebony in the centre is sufficiently large. In large trees the ebony often attains a diam. of 12-18 in. According to the experiments available, the specific gravity of the ebony produced by this tree fluctuates between 1.080 (Fowke), and 1.362 (Centr. Prov. List). On an average it may be said that the cub. ft. weighs 75 to 80 lb. The value of P. has been found 1180 (Skinner), 862 (Cunningham, Gwalior wood), and 756 (Fowke). Kyd and R. Thompson found the weight of (probably) the outer wood 49.5 and 49.6 per cub. ft., and from Kyd's experiments the value of P. of this

wood appears to be 547. The fruit is eatable, has a pleasant taste, and affords an agreeable refreshment during the hot season in the dry leafless forests of the Satpura range. Forsyth (Highlands of Central India, 463) mentions a cultivated variety without stones.

The best Indian ebony is the produce of *D. Ebenum*, Kœnig; Hiern, l. c. 208; Thwaites, Enum. Pl. Zeyl. 180; Bedd. Fl. Sylv. t. 65; a large tree of South India and Ceylon, with glabrous, shining leaves, anthers 16-32 on 8 filaments, each filament divided into 2-4 antheriferous branches, albumen not ruminated.

D. quærita, Thwaites Enum Pl. Zeyl. 179; Hiern, l. c. 174; Bedd. Ic. Pl. Ind. Or. t. 128; a large tree of Ceylon, furnishes the most valuable of the timber known as *Calamander*, a beautiful wood for ornamental cabinet-work, with alternate bands of brown and black, caused probably by the irregular ramifications of the darker-coloured heartwood.

2. *D. montana*, Roxb. Cor. Pl. t. 48; Fl. Ind. ii. 538; Wight Ic. t. 1225.—Syn. *D. cordifolia*, Roxb. Cor. Pl. t. 50; Fl. Ind. 538; *D. Goindu*, Dalz. Bombay Fl. 141; *D. Waldemarii*, Klotzsch in Reise Prinz Wald. t. 55. Vern. Hirek, keindu, temru, pasendu, Pb.; *Tendu*, dasaunda, lohari, N.W.P.; *Bistend*, Oudh; *Makar tendi*, Banda; *Pasend*, Bhurtpur; *Temru*, Meywar; *Ambia*, Banswara; *Hādrū*, Panch Mehals; *Kanchan*, kadal (Forsyth), *Pattewar*, *patwan* (R. Thompson), C.P.

A moderate-sized tree, pubescent or tomentose, rarely glabrate, often armed with spinescent branchlets. Leaves always alternate, varying in shape, oblong linear-oblong elliptic- or obovate-oblong, from a rounded or cordate base, acuminate, 3-6 in. long, with 4-8 main lateral nerves on either side of midrib, and several smaller intermediate ones; petiole less than $\frac{1}{4}$ in. long. Male flowers 2-6, sometimes more, in pedunculate, axillary or extra-axillary* bracteate cymes, peduncle somewhat longer than petiole. Calyx deeply 4-cleft, lobes ovate, obtuse, pubescent or glabrous and ciliate at the edges. Corolla urceolate with 4 short lobes. Stamens 16, glabrous, in two series, the 8 inner shorter, opposite to the outer stamens, and connate with them at the base; anthers longer than filaments, more or less cuspidate, somewhat exserted. Female flowers solitary, axillary, larger than male flowers, nodding, pedicels as long as, or somewhat longer than petiole, with 2 small bracts at the apex. Calyx deeply 4-cleft, lobes ovate, pubescent or glabrous. Staminodes 4, 8, or 12, in one series. Ovary glabrous, 8-celled, 1 ovule in each cell. Fruit globose, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. diam., supported by the enlarged leathery calyx. Seeds 2-8, albumen not ruminated.

Common, but not gregarious, in most parts of India, excepting Sindh and the northern part of the Panjab. In the sub-Himalayan tract the Ravi is its north-western limit. It is found in Harriana, in the plains to the west of Delhi, in the public forest (Ghunna) near Bhurtpur, and in the Gangrar forest between Humirpur and Chitor (Meywar). Planted in Central Sindh (J. L. S.) Leaves renewed Feb.-March; fl. March-May; the fruit ripens in the ensuing cold season.

Generally 20-30, occasionally 50 ft. high, with an erect, not very straight, somewhat angular trunk. Girth 3-4, at times 5 ft.; branches lax, wide-spread-

ing, branchlets drooping. Bark $\frac{1}{2}$ in. thick, dark grey to rusty brown, smooth, rough in old trees from exfoliating scales. Inner bark woody, not fibrous, light yellow, turning orange, astringent. Wood beautifully variegated with black and white streaks, hard and durable, a beautiful furniture-wood. Twigs and leaves lopped for fodder in Oudh. The fruit has an unpleasant smell, a bitter taste, and a viscid bitter pulp; it is not eaten.

D. lanceæfolia, Roxb. Fl. Ind. ii. 537, Hiern, l. c. 213, is a moderate-sized tree, with coriaceous, oblong or lanceolate, acuminate leaves, narrowed at the base, male flowers fascicled in short cymes, corolla tubular, and tomentose subglobose fruit 1 in. long, Eastern Bengal, noted by Madden, l. c. 378 (vern. *Ar-dinia*), from the Kota Doon in Kamaon, which requires confirmation.

3. *D. Chloroxylon*, Roxb. Cor. Pl. t. 49; Fl. Ind. ii. 538.—Syn. *D. capitulata*, Wight Ic. t. 1224, 1588 (bis). Vern. *Ninai*, Surat, Nasik.

A tree or large shrub, with deeply-cracked bark; tomentose, sometimes armed with spinescent branchlets. Leaves alternate, 1-2 in. long, elliptic obovate- or elliptic-oblong, pubescent above, with rust-coloured tomentum beneath. Flowers white, tetramerous, the male subsessile, in compact, sessile axillary fascicles of 6-10 flowers; bracts ovate. Calyx nearly to the base 4-cleft, lobes rounded, acute, strigose outside with stiff hairs. Corolla glabrous, except 4 lines of hairs outside. Stamens 16, glabrous, in 2 rows, the inner smaller, inserted on the base of the corolla, anthers broad-oblong or ovate-oblong, as long as filaments. Female flowers solitary, sessile or subsessile. Calyx strigose outside, corolla glabrous, ciliate with long stiff hairs at the edges of lobes. Stamines 7-9, glabrous. Ovary glabrous, 8-celled, 1 ovule in each cell. Styles 4. Fruit globose, $\frac{1}{3}$ in. diam., eatable. Seeds 2-3, albumen uniform.

South India, as far as Orissa on the east, and Guzerat on the west coast. Fl. June. Wood yellow, hard and durable.

4. *D. Lotus*, Linn.—Tab. XXXVI.—Vern. *Amlök*, *amlük*, *malük* (the male tree *Gwalidär*), Pb.

A middle-sized tree, nearly glabrous, young branchlets and under side of young leaves only strigose with scattered hairs. Leaves alternate, 3-6 in. long, ovate- or elliptic-oblong, acuminate; main lateral nerves 6-8 pair, petioles $\frac{1}{2}$ in. long. Flowers tetramerous, rarely pentamerous. Calyx half-way down 4-lobed, lobes obtuse, ciliate. Corolla glabrous, lobes obtuse, ciliate at the edges. Male flowers nearly sessile, in small axillary or extra-axillary sessile clusters of 2-3 flowers. Stamens 16, in 2 series, filaments short; anthers lanceolate, cuspidate, hispid along the connective on both faces. Female flowers solitary, nearly sessile, stamens 8, in 1 series, hairy. Ovary glabrous, hairy near apex only, 8-celled; styles 4. Fruit dark purple or blackish when ripe, shining, glaucous with bluish bloom, globose or ovoid, $\frac{1}{2}$ - $\frac{3}{4}$ in. diam., supported by the enlarged, coriaceous, flat spreading calyx. Seed compressed, albumen uniform.

Wild, not uncommon in the western part of the Jhelam basin from the western end of the Kashmir valley at Baramūla, to the Indus at 2500-6000 ft.

More abundant trans-Indus, in Swāt and other districts north of the Peshawar valley, N.E. Afghanistan, Beluchistan, wild and cultivated. Three trees (probably brought by Fakirs) at Jagatsūkh in Kullu (6000 ft.) called *Bissahri pāla*, the largest 12 ft. girth. Outside India in Asia Minor, Persia, the Caucasus, China and Japan. Naturalised in South Europe. Hardy in England. The leaves turn yellow in autumn, and are shed about the end of the year, the new leaves coming out in spring. Fl. April-May; fr. June-Aug. Growth slow, 10 rings per in. radius. 30-40 ft. high in India, with a massive straight trunk, generally under 6 ft. girth. Foliage bright green. Bark 1 in. thick, dark brown or black, tessellated by cracks, somewhat resembling that of *Reptonia buxifolia*. The fruit is sweetish, and much prized by the Afghan tribes, who eat it fresh or dried, plain or with rice, and use it in sherbets. The *Lotus* of ancient writers is not this tree, but probably *Zizyphus Lotus*, p. 89.

5. **D. Embryopteris**, Persoon; Bedd. Fl. Sylv. t. 69.—Syn. *Embryopteris glutinifera*, Roxb. Cor. Pl. t. 70; Wight Ic. t. 843, 844. *D. glutinosa*, Koenig; Roxb. Fl. Ind. ii. 533. Vern. *Gāb*, Beng., N.W.P.; *Kūsi*, Banda.

A middle-sized tree; almost glabrous, youngest leaves only silky with adpressed hairs. Leaves alternate, distichous, coriaceous, smooth, shining, oblong, 5-8 in. long, on thick wrinkled petioles less than $\frac{1}{2}$ in. long. Flowers white or cream-coloured, scented, tetramerous. Male flowers in small axillary drooping pedunculate cymes of 3-6 flowers. Stamens 40; anthers linear, somewhat hairy, filaments shorter than anthers, 2 and 2 connate nearly to the anther, inserted at the base of the corolla-tube. Female flowers large, solitary, axillary, drooping, on short pedicels. Stamens 2-4. Ovary hairy; styles 4-6, with broad, pectinate stigmas. Fruit globose, supported by the enlarged calyx-lobes, covered with rusty-coloured, mealy tomentum, glabrous at last, greyish yellow when ripe, $1\frac{1}{2}$ -2 in. diam.; seeds 5-8, embedded in a viscid glutinous pulp.

South India. Common on the western coast, particularly along backwaters (Bedd.), Ceylon, Burma, Bengal, Banda. In the sub-Himalayan tract, extends to the Jumna, ascending to 2500 ft. Also in Siam and Java. Evergreen, fl. March-May; fr. Dec. Growth moderate, 7-8 rings per in. radius. Attains 30-35 ft., with an erect trunk, not always straight, 4 ft. girth, spreading branches, forming an open oval crown. Bark $\frac{1}{2}$ in. thick, black, generally with a thin, whitish or rust-coloured scaly pellicle. Wood pinkish grey or light brown, with dark patches, used for building, and in Ceylon for masts and yards. The fruit contains much tannin; an infusion of it is used to steep fishing nets and lines, to make them more durable. The viscid pulp of the ripe fruit is used as gum, in bookbinding, and in place of tar, for paying the seams of fishing-boats. The extract of the fruit is an excellent astringent (Pharm. Ind. 132). Oil extracted from the seeds by boiling, as well as the bark, and leaves are used in native medicine.

ORDER L. STYRACEÆ.

Trees or shrubs, with alternate simple exstipulate leaves. Flowers regular. Calyx-tube usually more or less adnate to the ovary, limb 5-, rarely 4-lobed. Corolla perigynous, regular, deeply divided into as many

lobes as the calyx, or rarely twice as many, imbricate or valvate in the bud. Stamens usually indefinite, epipetalous, attached in one or more series to the corolla-tube. Ovary more or less inferior, 2-5-celled, with 2 or more ovules in each cell; style undivided; stigma capitate, entire or lobed. Fruit generally indehiscent. Seed usually 1, the embryo in the axis of a fleshy albumen.—Royle Ill. 260; Wight Ill. ii. 149.

1. SYMPLOCOS, Linn.

Trees or shrubs with yellow, white, rarely pink flowers. Leaves often turning yellow in drying. Calyx 5-lobed, lobes generally ciliate. Corolla-lobes imbricate in the bud, the petals sometimes almost free. Stamens more than twice the number of corolla-lobes. Fruit a berry crowned by the calyx-lobes. Cotyledons shorter than radicle.

Flowers pedicellate; pedicels as long as, or longer than calyx; leaves membranous or subcoriaceous.

Flowers in terminal panicles; fruit ovoid, or nearly globose

Flowers in short lateral racemes mostly below the leaves, on the previous year's wood; fruit ovoid

Flowers sessile or nearly sessile; in compound axillary spikes; leaves coriaceous.

Fruit pitcher-shaped; calyx and ovary glabrous

Fruit ovoid or cylindrical; calyx ciliate, ovary hairy

1. *S. cratægoides*.

2. *S. ramosissima*.

3. *S. spicata*.

4. *S. racemosa*.

1. *S. cratægoides*, Hamilton; Don Prod. Fl. Nepal. 145.—Syn. *S. paniculata*, Wall.; *Lodhra cratægoides*, Decaisne in Jacq. Voy. Bot. t. 110. Vern. *Lū, lāudar, loj, losh*, Pb.; *Lodh*, Kamaon; *Ludh*, Jaunsar Bawar.

A large shrub or moderate-sized tree, young shoots and leaves pilose. Leaves membranous, elliptic or ovate, acuminate, 2-4 in. long, sharply serrate, on short petioles, turning yellow in drying. Flowers fragrant, snow-white, in cymose corymbs forming terminal panicles, pedicels slender, as long as flowers, bracts linear caducous. Calyx turbinate, tube glabrous, lobes rounded, ciliate. Corolla 5-cleft nearly to the base. Stamens numerous, filaments filiform, connate in 5 bundles. Ovary 2-celled; stigma capitate, papillose. Fruit ovoid or nearly globose, $\frac{1}{4}$ - $\frac{1}{3}$ in. long, crowned with the remains of calyx-limb, 1-seeded, embryo curved, cylindrical.

Himalaya 3000-8000 ft., from near the Indus to Assam. Scarce near its north-west limit. Kasia hills. The new foliage appears in May, and soon afterwards the tree is covered with a profusion of snow-white blossoms, which scent the air to some distance, and turn yellow in drying. Fr. July-Oct. Attains 30 ft., with a straight trunk 3-4 ft. girth. Young bark cinereous with large lenticels. Old bark grey, brownish, or dark bluish, rough. Wood white, hard, durable, has been recommended for turning. A yellow dye is extracted from leaves and bark, which is used to mix with madder.

2. *S. ramosissima*, Wall.; DC. Prodr. viii. 257.—Vern. *Lodh*.

A small glabrous tree. Leaves membranous, 4-6 in. long, lanceolate,