

Flowers small, bluish purple, in opposite lateral cymes, forming an elongated terminal thyrus, often compound at the base. Calyx-teeth triangular. Corolla  $\frac{1}{2}$ - $\frac{1}{3}$  in. long.

Common nearly everywhere in the plains and lower hills of India, westward to Peshawar and Sindh. Ascends to 5000 ft. in the North-West Himalaya. China. Fl. March-May. The branches are used for wattle-work.

*V. trifolia*, Linn.; Roxb. l. c. 69, is very closely allied, but is supposed to differ by shorter calyx-teeth, leaves often unifoliate, white-mealy beneath, leaflets short-petiolate, generally sessile, always entire. Bengal, South India, Burma, Indian Archipelago, Australia.

*V. Agnus-castus*, Linn., of South Europe and Western Asia, to Afghanistan, has flowers nearly  $\frac{1}{2}$  in. long.

*V. altissima*, Linn.; Roxb. l. c. 71; Wight Ic. t. 1466; Bedd. Fl. Sylv. t. 252. — Vern. *Nauladi mara*, Can.; with 3- rarely 5-foliate leaves, broadly winged petioles (on young shoots), the flowers in a terminal thyrus, is an important timber-tree with strong wood in South India and Ceylon.

*V. Leucoxylon*, Linn. fil.; Roxb. l. c. 74; Wight Ic. t. 1467; with lax axillary cymes, 5-foliate coriaceous leaves and unwinged petioles, is a large timber-tree in Burma, also found in South India and Ceylon.

### 8. CARYOPTERIS, Bunge.

1. *C. Wallichiana*, Schauer in DC. Prodr. xi. 625. — Syn. *Clerodendron odoratum*, D. Don. Vern. *Moni*, Kamaon.

A shrub with 4-sided glabrous branches; extremities and young leaves pubescent. Leaves opposite, lanceolate or ovate-lanceolate, acuminate, serrate; blade 2-4 in., petiole  $\frac{1}{2}$  in. long. Flowers sweet-scented, in short axillary dichotomous bracteate axillary cymes, opposite or in whorls of 4-6. Calyx parted into 5 lanceolate segments with distinct middle nerves. Corolla-tube twice the length of calyx; limb bilabiate, upper lip 2-fid, lower 3-fid. Stamens 4, didynamous. Ovary 2-celled. Capsule dry, surrounded by the somewhat enlarged calyx, separating when ripe into 4 valves, each with a 1-seeded kernel attached to the inside of the valve, so that the kernels appear to have a narrow winged edge.

Outer Himalaya, from the Indus to Bhutan, ascending to 3000 ft. Salt range. Oudh forests in ravines. Fl. April; the seed ripens soon after flowering.

### 9. HOLMSKIOLDIA, Retz.

1. *H. sanguinea*, Retz.; Jacq. Voy. Bot. t. 140. — Syn. *Hastingia coccinea*, Koenig; Roxb. Fl. Ind. iii. 65. Vern. *Kul tolia*, Kamaon.

A large woody climber with showy flowers. Leaves opposite, petiolate, ovate, crenate. Calyx membranous, scarlet tinged with orange, tube short, limb large, circular, 1 in. diameter, entire. Corolla tubular, curved. Stamens exserted.

Outer Himalaya. Sutlej to Assam, ascending to 3000 ft. Fl. Oct.-Dec.

## 10. AVICENNIA, Linn.

1. *A. officinalis*, Linn.—Syn. *A. tomentosa*, Jacq.; Wight Ic. t. 1481; Wall. Pl. As. rar. t. 271.

A small tree or large shrub, with thick fleshy branchlets and opposite coriaceous, elliptic-lanceolate leaves. Flowers yellow, sessile, in rounded heads. Calyx of 5 sepals, supported by ovate ciliate bracts. Corolla-tube short, limb of 4 nearly equal segments. Capsule compressed, ovate, mucronate, 2-valved, 1-seeded. Radicle woolly, cotyledons thick, fleshy, folded. The seed often germinates on the tree.

Salt marshes on the coasts of the peninsula, the Red Sea, Africa, Burma, Australia. Fl. April, May.

*Phytolacca acinosa*, Roxb.—Syn. *Rivina Latbenia*, Wall.; *Pircunia Latbenia*, Moquin, DC. Prodr. xiii. ii. 29; Vern. *Lubar*, Hazara; *Jirka*, Bias; *Matazor*, Sulej (Order *Phytolaccaceæ*); is a large perennial plant, not uncommon in the North-West Himalaya from Hazara to Nepal, between 3500 and 9000 ft., also in Sikkim and Bhutan, with alternate, short-petiolate, ovate-lanceolate leaves, 6-10 in. long, and greenish white pedicellate bisexual flowers in lax cylindrical racemes, with lanceolate or subulate bracts. Perianth of 5 nearly distinct segments. Stamens 8-10. Pistil of 6-8 distinct 1-ovuled carpels. Fruit dark purple and succulent, the carpels remaining distinct, forming an erect cylindrical raceme, 4-8 in. long, 1-1½ in. diameter. Fl. June; fr. Sept., Oct. In some places the leaves are eaten as a vegetable, and it is cultivated in Jaunsar (vern. *Jerunga*) and Kamaon.

*Phytolacca acinosa*, Roxb., has been referred by Moquin, l.c. 33, to *P. decandra*, Linn., as a variety; this, however, is a much larger plant, distinguished from *P. acinosa* by 8-10 carpels, which, when ripe, are connate into a smooth flat circular berry. Upon this character Moquin bases the generic distinction between *Phytolacca* and his new genus *Pircunia*, with 6-8 carpels, which remain distinct when ripe. Roxburgh states (Fl. Ind. ii. 458): "Berries composed of from 6-8 distinct acini," and this description is supported by the unpublished illustration in Hb. Kew, No. 1556. *P. decandra*, Linn., like most species of the genus, is indigenous in America, but has long been cultivated, and become naturalised in South Europe. In France it is called *raisin d'Amerique*, and the purple juice of the berries is used to colour wine and confectionery. It is a matter for inquiry whether *P. decandra* grows in India and whether the North-West Himalayan plant, which is found in the forest tracts of remote valleys (e.g., Dippi and Kilba in Kunawar), is really indigenous in India. In North America the root of *P. decandra* is used medicinally as an emetic, purgative, and narcotic.

*P. dioica*, Linn. (*Pircunia dioica*, Moq.), known as *Bella Sombra*, is a fast-growing tree with thick-barked trunk and soft coarse-grained fibrous wood, indigenous in La Plata and Brazil, grown (in avenues) in Spain, Gibraltar, Malta, and introduced to Bombay and Calcutta.

## ORDER LXI. POLYGONEÆ.

Herbs or shrubs, rarely trees, with alternate simple stipulate leaves. Stipules usually sheathing the stem (ochreate). Flowers small hermaphrodite or unisexual. Perianth herbaceous or coloured, 3-6-lobed or 3-6-phyllous, lobes or leaves 1- or 2-seriate, equal or inner series larger.

Stamens perigynous or subhypogynous, usually 6, 9, 10, rarely more, alternate with the perianth-lobes when 1-seriate. Ovary usually free, compressed or trigonous, rarely 4-gonous, 1-celled, with a solitary erect ovule. Fruit a 1-seeded nut. Seed albuminous; albumen farinaceous. —Royle III. 313.

Stamens 10-20; nut setose or echinate . . . . . 1. *CALLIGONUM*.

Stamens 6-8; nut smooth, enclosed within the accrescent inner perianth-leaves . . . . . *ATRAPAXIS* (p. 373).

### 1. *CALLIGONUM*, Linn.

Nearly leafless, much-branched shrubs. Flowers hermaphrodite. Perianth 5-partite, scarcely or not at all accrescent. Stamens 10 or more. Styles 4; stigmas capitate. Nuts subtetragonous, with numerous closely forking setæ disposed in 8-16 vertical series.

1. *C. polygonoides*, Linn.; DC. Prodr. xiv. 29.—Syn. *C. comosum*, L'Heritier in Trans. Linn. Soc. i. 180. Vern. *Balanja*, *berwaja*, *tatûke*, Afg.; *Phok*, *phog*, Pb., Sindh and Shekhawatti (flowers *phogali*).

A glabrous, almost leafless shrub, with numerous branches, which are grey or reddish grey, flexuose and twisted, branchlets often fascicled, green and shining when young, internodes 1-2 in. long. Stipules short, sheathing, thinly membranous, transparent. Leaves scarce, subulate, very small. Flowers small, numerous, on filiform pedicels, in fascicles of 2-5 from the axils of the sheathing stipules. Perianth deciduous, deeply cleft into 5 thin obtuse membranous segments, red with broad white edges, the 2 outer somewhat smaller. Stamens 10, filaments dilated and pubescent at base. Nuts oblong,  $\frac{1}{3}$  in. long, densely covered with long filiform, twice or thrice dichotomously branching setæ,  $\frac{1}{3}$  in. long, placed in 8-16 longitudinal lines, their base thickened and confluent so as to form irregularly-shaped crests.

Common locally in the more arid parts of the Panjab plains, both cis- and trans-Indus, north as far as Lahore. Abundant west of Mozafergarh, where it constitutes in places half the larger vegetation, the other half consisting of *Salvadora oleoides*. Sindh all along the base of the hills. One of the most abundant and characteristic plants of the Bikanir desert. North-East Afghanistan, ascending to 5000 ft. Persia, Arabia, Syria, Egypt, Algeria. Grows generally in groups or clumps, often on hummocks, generally a small shrub 3-4 ft. high, but when old, often arborescent, 12-15 ft. high, stems 2-3 ft. girth, with spreading branches. The young shoots come out about Feb., March, and the shrub is soon after covered with small pinkish flowers, filling the air with a strong pleasant odour, as of over-ripe strawberries. The fruit ripens about June. The bark of stem is whitish or reddish-grey, rough with broad, shallow furrows, inner substance red. The wood is red, with a tinge of brown, often mottled, fibrous and hard. Heartwood distinct, of darker colour. In the Panjab it is only used as fuel, but in Bikanir twigs and branches are much employed for walls and roofs of huts. Most old stems are hollow, even those under 4 in. diam. The abortive flowers, which fall in great numbers, are (in the South Panjab, and sometimes in Sindh) swept up, made into bread, or cooked with ghee, and eaten. The shoots and branchlets are eagerly browsed by goats and camels.

*Atraphaxis spinosa*, Linn. (*A. afghanica*, Meissner, DC. Prodr. xiv. 76), is a thorny shrub, with small thick ovate leaves,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, perianth 4-cleft to the base, the outer segments smaller, remaining unchanged, and reflexed when the seed ripens, the two inner enlarged in fruit into 2 broad-ovate, reticulate wings,  $\frac{1}{2}$  in. diam., closely adpressed to, but much larger than the flat nut, which is enclosed by them. Dry stony hills in Afghanistan and Beluchistan, and throughout Western Asia.

One of the few trees belonging to this Order is *Coccoloba uvifera*, *Sea-side grape*, common on the sea-shore of the West Indies, introduced to Calcutta. Leaves broad-cordate, fruit reddish-purple, pear-shaped, sweetish, acid, in drooping racemes, consisting of the fleshy perianth, which encloses a solitary seed. Wood light, used in cabinet-work.

## ORDER LXII. LAURINEÆ.

Trees or shrubs, more or less aromatic, with alternate exstipulate, rarely opposite, usually entire and evergreen leaves. Perianth regular, deeply 6-sometimes 4-cleft, segments equal or the outer ones smaller, imbricate in bud. Stamens normally 12, biseriate, those of the inner series opposite to those of the outer, and to the segments of the perianth, usually however half or more of the inner or outer stamens are wanting, or reduced to short staminodia. Anthers adnate, cells 2 collateral or 2-pairs superposed, each cell opening by a valve. Ovary free, 1-celled, rarely imperfectly 2-celled (adnate in *Hernandia*), ovules 1, rarely 2 or 3, pendulous; style simple; stigma dilated. Fruit a 1-seeded berry or drupe, often supported by the persistent perianth or base of perianth. Seed pendulous, exalbuminous; testa membranous; cotyledons thick, oily, filling the seed and enclosing the plumula and short superior radicle.—Royle Ill. 324.

Flowers usually bisexual; anthers 4-celled, those of the inner stamens extrorse.

Berry supported by the persistent cup-shaped, truncate or dentate base of perianth

Berry supported by the entire 6-cleft perianth, which is indurated and somewhat enlarged

Berry supported by the entire 6-cleft, not indurated, spreading or reflexed perianth

Flowers bisexual; anthers 2-celled, those of the inner stamens lateral; fruit large, base imperfectly 2-celled.

Flowers dioicous; anthers 4-celled, all introrse.

Flowers in pedunculate heads, enclosed in an involucre of 4-6 bracts; flower-heads arranged in corymbs racemes or clusters

Flowers in sessile or subsessile clusters, enclosed (in bud) by deciduous imbricate bracts

Flowers dioicous; anthers 2-celled, all introrse

1. CINNAMOMUM.

2. PHOEBE.

3. MACHILUS.

4. BEILSCHMIEDIA.

5. TETRANTHERA.

6. LITSÆA.

7. DAPHNIDIUM.

Several American trees of this Order yield excellent timber. The *Greenheart* of Demerara, *Nectandra Rodiaei*, Schomb., is a splendid timber, hard heavy close-grained and exceedingly durable. It is not attacked by *Teredo navalis*. The bark (*Bebeeru* bark) is used as a febrifuge in Guiana, and has been found to contain an alkaloid (*Beberia*), which has been identified with the alkaloid in the bark of *Butea sempervirens*, and in *Parcira Brava* (the root of *Chondrodendron tomentosum*, Ruiz et Pavon, not of *Cissampelos Parcira*, as erroneously stated on p. 10. It is believed that *Beberia* is with *Quinine* an ingredient of Warburg's drops.



## 1. CINNAMOMUM, Burman.

Evergreen trees or shrubs, bark and leaves more or less aromatic. Leaves opposite or alternate, 3-nerved or penniveined. Flowers in axillary or terminal panicles, often unisexual. Segments of perianth 6 (sometimes more by the transformation of the outer stamens). Stamens biseriate, the outer series consisting of 6 perfect stamens, with introrse 4-celled anthers, each cell opening by a valve, the inner series of 3 perfect stamens with twin glands at their base, and extrorse sometimes 2-celled anthers, and 3 short staminodia, alternating with the stamens. Ovary free; style filiform, terminating in an obtuse, discoid, often oblique, sometimes 3-dentate stigma. Fruit a 1-seeded berry, supported and surrounded at the foot by the persistent base of the truncate or 6-toothed perianth.

Leaves opposite or subopposite, 3-nerved; persistent base of perianth 6-dentate (Section *Malabathrum*) . . . . . 1. *C. Tamala*.  
 Leaves alternate, penniveined; persistent base of perianth truncate (Section *Camphora*) . . . . . 2. *C. glanduliferum*.

1. *C. Tamala*, Nees; DC. Prodr. xv. i. 17.—Syn. *C. albiflorum*, Nees; Wight Ic. t. 140. *Laurus Tamala*, Hamilton; *L. Cassia*, Roxb. Fl. Ind. ii. 297 (not of Willd.) Vern. *Dālchīni*, Pb., N.W.P.; *Kirkiria*, *kikra*, *sinkami*, *silkauli*, N.W.P.

A handsome, moderate-sized tree; young twigs 4-sided, greenish grey, glabrous, smooth. Leaves subcoriaceous, opposite or subopposite, rarely alternate, elliptic-oblong, from an acute base acuminate, 3-6 in. long, glabrous, shining, the midrib dividing some distance (up to  $\frac{1}{4}$  in.) above the base into 3 longitudinal nerves, joined by distinct reticulate veins. Flowers whitish, numerous, in axillary and terminal pubescent panicles, pedicels as long as calyx. Calyx silky-pubescent, lobes membranous, with 3-7 distinct longitudinal nerves, ovate-oblong, obtuse, separating in a transverse line above the base, but below the middle, and falling off after flowering. Berry black when ripe, succulent, ovoid,  $\frac{1}{2}$  in. long, supported by the 5-lobed somewhat thickened base of the calyx.

Himalaya from 3000 to 7800 ft., common east of the Sutlej, extending sparingly to near the Indus. Kasia hills, Silhet, Tipperah, Burma, also in Queensland (Australia). Generally in shady, moist glens, not gregarious, but scattered in mixed forests. The leaves are renewed in May, and at that period the tree is conspicuous by the delicate pink colour of the young foliage. Fl. Feb., March, often on to April, May; the fruit ripens June-Oct., frequently remaining on the tree for months. Growth probably slow.

Attains 40 ft., with a straight trunk 4-5 ft. girth, bark compact, aromatic, brown or with a yellow tinge, with numerous whitish specks and blotches, wrinkled but not marked by cracks, fissures or furrows. The leaves have a fine aromatic smell and taste, stronger when dry. Wood light-brown, mottled, even-grained, with a glossy surface. The bark, especially that of the root, is used medicinally, and exported to the plains as *tajkalmi*, *tajkalam*, but under this name the bark of other sp. of *Cinnamomum* also is sold. The leaves also

are medicinal, and are sold under the name of *tezpat*, *tajpat*.—(Pharm. Ind. 196.)

Closely allied to this species is *C. zeylanicum*, Breyne; DC. Prodr. xv. i. 13—Syn. *Laurus Cinnamomum*, Roxb. ii. 295, the true or *Ceylon Cinnamon*-tree, distinguished by thick coriaceous leaves, pale beneath, with 3 main nerves from the base, large terminal flower-panicles, and coriaceous calyx-lobes, without nerves, separating at about the middle from the lower half, which is persistent. The flowers have an unpleasant smell. The true Cinnamon is indigenous in the forests of Ceylon, ascending to 8000 ft. Cultivated in Ceylon, and in other tropical countries. According to Leschenault de la Tour, *Mémoires du Muséum d'histoire naturelle*, viii. (1822), 436, and notes on the subject collected during a late visit to Ceylon, which I owe to the kindness of Dr George King, the Cinnamon tree in Ceylon is generally grown in irregular coppice-woods, pure or mixed with other shrubs. Some of the stools are of great age and girth, and are said to have been planted by the Dutch when they held the island. The formation of fresh Cinnamon coppice is thus described by Leschenault de la Tour: The tree flowers more or less throughout the year, but most abundantly in Jan., Feb., and the fruit ripens from June to August. The seeds, which are oily, do not long retain their vitality; they are sown soon after ripening, either in nurseries to be transplanted in Oct. or Nov., or on the spot in plots about 1 ft. square and 6-7 ft. apart. The plants attain 7-8 ft. in 6-7 years, and those which are then fit to be peeled are cut, and the shoots which spring up are thinned out when they are 2, 3, or 4 years old, or even at an earlier age. They are not cut when less than  $\frac{1}{2}$  in., or more than  $2\frac{1}{2}$  in. diam. The whole growing crop in one plot is never cut over at once, as would, for instance, be done in a regularly managed Oak coppice-wood, but those shoots only are selected which appear fit to be used, and are in such a state as to be peeled readily. The main point attended to seems to be, to cut the shoots when quite young and tender; it is said that the bark of the older shoots yields inferior Cinnamon (G. King). The cutting is done during the rainy season, between May and October; the bark is peeled off after cutting in 3 or 4 long narrow strips from each shoot; it is then tied tightly together in parcels, and left for 24 hours. At the end of this time the epidermis and the outer bark are removed, and the inner bark, which is the aromatic and valuable part, is dried, the first day in the shade, the second day in the sun, when it gradually rolls up, forming the quills of Cinnamon, which are placed into each other and tied in bundles. The fruit of the Cinnamon tree is eaten greedily by crows, pigeons, and other birds; the seeds pass uninjured, and thus the spread and preservation of the tree is secured apart from the planted coppice-woods. Indeed, formerly almost all Cinnamon brought to market was from naturally-grown trees; and to enable their Cinnamon collectors to enter the forests beyond the limits of their own possessions, the Dutch concluded a treaty with the King of Candy: and it is said that planting was only resorted to when the supply from natural sources had become deficient.

The following species, among others, are described by Meissner in De Candolle's *Prodromus* as distinct; but they are so closely allied to the true Cinnamon that Thwaites, Enum. Pl. Zeyl. 253, and Bedd. Fl. Sylv. (under *Cinn. Wightii*), consider them as mere varieties: 1. *C. obtusifolium*, Nees (*Laurus obtusifolia*, Roxb. Fl. Ind. ii. 302), a large tree, as large as a Mango, with opposite, thick coriaceous, elliptic-oblong leaves (6-12 in. long), which are often in fours under the large terminal spreading panicles. Indigenous in East Bengal and Burma. 2. *C. iners*, Reinward (*L. nitida*, Roxb., *C. dubium*, Nees); Wight l.c. t. 130, 132, 132 (bis), and 135, lateral nerves and reticulation indistinct. South India, Burma, East Bengal, Nepal, and (doubtfully) Kamaon. 3. *C. Wightii* Meissner; Bedd. Fl. Sylv. t. 262. Nilgiris.

2. *C. glanduliferum*, Meissner; DC. Prodr. xv. i. 25.—Syn. *Laurus glandulifera*, Wall. Vern. Malligiri, marisgiri, Nepal.

A large (probably) deciduous tree; branchlets very glaucous when fresh; leaf-buds large, ovoid, covered with ovate imbricate scales. Leaves alternate, thick-coriaceous, elliptic, acuminate, penniveined, main lateral nerves 4-8 pair, narrowed into petiole  $\frac{3}{4}$  in. long, blade 3-4 in. long; small glandulose pits, generally hairy, in the axils of the lateral nerves. Flowers small, yellowish-green, fragrant, in axillary grey-pubescent corymbs, several corymbs approximate near the ends of branchlets. Berry supported by the truncate base of perianth.

East Bengal (Chittagong, Silhet, Sikkim). Nepal, 6000-8000 ft. (Chandagiri, south, and Sheopore, north of the Nepal valley), Petora in Kamaon (about 5000 ft.) Fl. May, June. Attains 60-80 ft., with a straight erect trunk of 12 ft. girth and above. Foliage dense, shady. Bark 1-2 in. thick, the outside cracked and spongy; inner substance of a fine cinnamon colour, regularly striped with white lines, owing to a number of parallel layers of a white resinous substance. The smell and taste of the bark, while fresh, is extremely aromatic and pleasant, somewhat pungent, resembling that of *Sassafras*; that of the root is more powerfully scented than the bark of trunk and branches. Wood pale-yellow, very light, not strong; while fresh it has a strong smell of Camphor, like that of which the China camphor-wood trunks are made, becoming by age somewhat fainter, but more agreeable, resembling that of the bark. Grows freely at Calcutta.—Wall. in Transactions of Medical and Physical Society, vol. i., 1823, p. 5.

*C. Camphora*, Nees & Ebermaier; DC. Prodr. xv. i. 24.—Syn. *Laurus camphorifera*, Kæmpfer; Roxb. Fl. Ind. ii. 304, *Camphora officinarum*, Bauh.; Wight Ic. t. 1818; the *Japan Camphor-tree*, belongs to the same section, but has longer-petiolate leaves, main lateral nerves 2-3 pair, the lowest pair proceeding from near the base of the leaf. Camphor is a crystalline volatile substance, in chemical composition akin to volatile oils, which is obtained by boiling chips of the wood and roots with water, when the crude camphor is sublimed with the steam and deposited on straw, with which the head of the retort is filled. It is afterwards purified by sublimation with lime or chalk. The tree attains a considerable size, and is indigenous in China, Japan, and Cochinchina; some of the China camphor-wood trunks sold in Calcutta are made of it.

The *Sassafras tree*, *Sassafras officinale*, Nees; DC. Prodr. xv. i. 171, belongs to a different tribe of this Order: it is a large dioecious tree, the male flowers have 9 fertile stamens, all with introrse anthers, and without staminodia, the female flowers have 6 short sterile stamens, the leaves are obovate, with cuneate basis, often 3-lobed. Bark and wood of the root are fragrant and a valuable medicine (Pharm. Ind. 192). North America, from Canada to Florida.

## 2. PHOEBE, Nees.

Shrubs and trees (always?) evergreen. Leaves alternate, penniveined. Flowers bisexual, in axillary panicles, bracts deciduous. Perianth funnel-shaped, 6-cleft. Stamens biseriate, the outer series consisting of 6 perfect stamens opposite to the segments of the perianth, with introrse, 4-celled anthers, the cells opening by valves; the inner series of 3 perfect stamens,

with twin glands at their base, and extrorse anthers, alternating with 3 short staminodia. Ovary free; style filiform, stigma discoid. Fruit a 1-seeded berry, supported by the persistent, somewhat enlarged and indurated 6-cleft perianth, fruit-bearing pedicel thickened.

1. *P. lanceolata*, Nees; Wight Ic. t. 1821.—Syn. *Laurus lanceolaria*, Roxb. Fl. Ind. ii. 309; *Ocotea lanceolata*, Nees in Wall. Pl. As. rar. ii. 71. Vern. Chan, chandra, badror, shalangi, Pb.; •Haulia, dandora, k̄awal, s̄un kauwal, bilphari, N.W.P. •

A shrub or middle-sized tree, glabrous, only youngest branchlets pubescent. Leaves alternate, often approximate and subverticillate at the base of the flower-panicles, lanceolate, 6-9 in. long, narrowed into a short petiole; main lateral nerves 6-10 pair, joined by more or less prominent reticulate veins. Flowers pale yellow, in lax pedunculate axillary panicles, often congregated in the axils of the upper leaves, pedicels a little longer than perianth. Perianth glabrous outside, the segments acute, edge finely ciliate, hairy inside. Inner series of stamens and staminodia hairy, staminodia obtusely sagittate, on a short stalk. Fruit black, succulent, oblong-ovoid,  $\frac{1}{2}$  in. long.

Outer Himalayan ranges, from Bhutan to the Jumna, ascending to 6000 ft. (west to the Jhelam, not common, J.L.S.) Kasia hills, Silhet, Upper Burma (Bhamo on the Irawaddi). Fl. Feb.-June; the fruit ripens June-July.

*P. pallida*, Nees; DC. Prodr. xv. i. 34, a small tree with pubescent panicles and perianth, and somewhat more coriaceous leaves, is probably only a pubescent variety; I can find no other distinguishing characters. Kamaon, Nepal, ascending to 5000 ft. Moist ravines of eastern Oudh forests. Fl. June.

*P. paniculata*, Nees; DC. Prodr. xv. i. 37—Syn. *P. villosa*, Wight Ic. t. 1822; *Laurus villosa*, Roxb. ii. 310, (probably) with broader leaves, tomentose beneath, tomentose branchlets, petioles, and grey-hairy panicles and perianth, Nepal, Sikkim, Kasia hills, Kamaon? (Madden),\* is closely allied to, if not identical with, *P. Wightii*, Meissner l. c. 38; Wight Ic. t. 1820 (*P. paniculata*), of the Nilgiris.

Similar in appearance is *Apollonias Arnotti*, Nees; Wight Ic. t. 1819; Bedd. Fl. Sylv. t. 291, with 2-celled anthers, those of the 6 outer stamens introrse, of the 3 inner ones extrorse. Berry  $\frac{1}{2}$  in. long. Tinnevely, Travancore ghats, Malabar (Beddome).

### 3. MACHILUS, Rumphius.

Evergreen trees. Leaves alternate, penniveined. Flowers bisexual, in terminal and lateral panicles. Perianth divided to the base into 6 biseri-ate

\* "There (towards the summit of the Kamola Ghat, above the Kotah Doon) is also a species of *Embelia*, with fruit in umbels (probably *E. robusta*, Roxb., D.B.), and a handsome shrub, *Tetranthera fruticosa*, or *apetala*, which also grows at Pūnagiri, below Gangoli, &c., and is sometimes known as the *Gar-bijaur*, or wild Citron, and *Maida* or *meda-lakri*; but the tree particularly so designated, pointed out to me near Ramesar, appeared to be *Laurus villosa*, Roxb., and its hill-name *Kapua kauwal*."—Madden in As. Soc. Journ. xvii. i. 391. At p. 587 he mentions the same vernacular name (*Kapua kauwal*), as *L. tomentosa*? Sarda (Sarju) river at the Gangoli or Shera bridge (2500 ft. elev.)

segments, persistent, but not changed in fruit. Stamens biseriate, the outer series of 6 perfect stamens, opposite to the segments of the perianth, anthers introrse, 4-celled, the cells opening upwards by valves; the inner series of 3 perfect stamens with twin glands at their base and extrorse anthers, alternating with 3 short staminodia; stamens and staminodia of the inner opposite to the stamens of the outer series. Ovary free; style filiform, stigma discoid. Fruit a 1-seeded berry, supported by the persistent, often reflexed, segments of the perianth.

1. *M. odoratissima*, Nees.—Syn. *Laurus odoratissima*, Wall. Vern. *Dalchini*, *mith-patta* (sweet leaf), *prora*, *badror*, Pb.; *Kāwala*, N.W.P.

A middle-sized or large tree with deep-green foliage. Leaves glabrous, shining, lanceolate, 6-9 in. long, petiole  $\frac{1}{2}$  in. long, main lateral nerves 15-20 on either side of midrib, often alternating with shorter intermediate nerves, veins very finely and uniformly reticulate, raised so as to leave minute hollows between. Flowers pale yellow, fragrant. Perianth  $\frac{1}{2}$  in. long, the inner segments a little longer than the outer ones, peduncles, pedicels and outside of perianth with soft silky hairs. Berry ovoid,  $\frac{1}{2}$  in. long, dark purple when ripe.

Outer Himalayan ranges, ascending to 7000 ft. in the north-west, and to 8000 ft. in Sikkim. Is found, although rare, as far north as Hazara. Kasia hills, Burma. Fl. March-Aug. The leaves have a pleasant orange-like aroma, they have frequently small rounded excrescences.

*M. macrantha*, Nees; Bedd. Fl. Sylv. t. 264; Wight Ic. t. 1824 (probably the same species as *M. glaucescens*, Wight Ic. t. 1825), a small tree with elliptic thick-coriaceous glaucous leaves, grows on the Western Ghats, and the Nilgiris (Dalzell Bombay Fl. 221).

*Persea gratissima*, Gaertn.; Wight Ic. t. 1823; Bot. Mag. t. 4580; the *Avocado* or *Alligator Pear*, is a large tree, indigenous in South America, introduced into tropical India (fr. July-Aug. in Calcutta), has paniculate greenish-white flowers, similar to those of *Machilus*, and a pear-shaped fruit 4-6 in. long, with a large seed in a soft butyraceous pulp. The perianth falls off before the fruit ripens. In the West Indies and South America the fruit is eaten raw or as a vegetable.

#### 4. BEILSCHMIEDIA, Nees.

Trees with subopposite or alternate penniveined leaves. Flowers bisexual, in short axillary racemes. Perianth deeply 6-cleft, deciduous. Outer circle of 6 perfect stamens, opposite to the segments of the perianth, generally alternating with small glands; anthers introrse, the inner circle of 3 perfect stamens, with lateral, semi-extrorse anthers alternating with 3 short staminodia; anthers 2-celled, valves opening upwards. Ovary incompletely 2-celled, with 3 ovules; style filiform, stigma discoid. Fruit a dry oblong 1-seeded berry, base incompletely 2-celled.

1. *B. Roxburghiana*, Nees; DC. Prodr. xv. i. 63; Wight Ic. t. 1828.—Syn. *Laurus bilocularis*, Roxb. Fl. Ind. ii. 311. Vern. *Konhārah*, Oudh.

. A small evergreen tree with dark-green shady foliage. Leaves glabrous, shining, thick-coriaceous, subopposite or alternate, 4-6 in. long, elliptic-oblong, main lateral nerves 6-8 on either side of midrib, joined by prominent reticulate veins, petiole 1 in. long. Flowers whitish, in short axillary racemes, peduncles, pedicels and perianth pubescent, stamens strigose, with short white hairs, glands and staminodes yellow, thick, fleshy, stipitate. Berry 2 in. long, dark purple when ripe, with much whitish grey bloom, which rubs off easily, pulp pale yellow.

Burma, East Bengal, Nepal, Oudh forests (sparingly in moist shady ravines of the Gonda and Baraich district), Durga Deo forest in Kamaon ? leaves only, D.B. Fl. April. Attains 30 ft. and 6 ft. girth. Bark smoothish, grey or brown, peeling off in small corky scales, inner substance red,  $\frac{1}{2}$  in. thick. Heartwood small, dark grey, sapwood white.

*B. fagifolia*, Nees; Bedd. Fl. Sylv. t. 263; of Canara and the Konkan, is very similar. Dalzell, Bombay Fl. 222, refers the tree of the Bombay Ghats to *B. Roxburghiana*.

### 5. TETRANTHERA, Jacq.

Trees or shrubs with alternate, rarely subopposite leaves. Flowers dioicous, in small umbels or clusters (flower-heads), enclosed in bud by an involucre of 4-6 large concave deciduous imbricate bracts, arranged in short racemes or clusters, axillary, or in the axils of fallen leaves. Perianth-segments usually 6, equal or nearly so, sometimes wanting. Male flowers: stamens 9-12, sometimes more, all polleniferous; filaments of the inner stamens with 2 glands at the base, anthers 4-celled, those of the inner stamens sometimes 2-celled. Female flowers: ovary free, 1-celled, 1-ovuled; stigma dilated and lobed, staminodes sterile or wanting. Berry supported by the flattened or cup-shaped base of the perianth.

Perianth of a few hairy subulate deciduous segments, or wanting; flower-heads in pedunculate umbels or corymbs . 1. *T. laurifolia*.

Perianth 6-cleft; flower-heads in sessile umbels or clusters . 2. *T. monopetala*.

1. *T. laurifolia*, Jacq.; DC. Prodr. xv. i. 178.—Syn. *T. apetala*, Roxb. Cor. Pl. t. 147; Fl. Ind. iii. 819; *T. Roxburghii*, Nees. Vern. Maida, *meda lakri*,\* Pb., N.W.P.; *Gwā, riān, chandra*, Pb.; *Gar bjaur*,\* *singrauf*, N.W.P.; *Medh*, Oudh; *Mēnda*, C.P.; *Ungdungnet*, Burn.

A middle-sized evergreen tree, very variable, branchlets inflorescence and leaves more or less pubescent, the older leaves often glabrate. Leaves alternate, ovate ovate-lanceolate elliptic- or obovate-oblong, pale beneath,

\* Madden (see footnote to p. 377) gives these names to *T. fruticosa*, Roxb. But this is a shrub with racemose flower-heads, probably synonymous with *T. glabrata*, Wall. (*Lepidadenia glabrata*, Wight Ic. t. 1838); and *T. Panamōnja*, Hamilton; Wight Ic. t. 1836; DC. Prodr. xv. i. 197. Roxburgh's *T. fruticosa* is from Silhet (8. June-July); *L. glabrata* from the Pulneys, the Nilgiris, and Mergui (Wight); and *T. Panamōnja* has been found in Assam, Mergui, and (according to Wight) near Courtallum.



blade 5-10 in., petiole  $\frac{1}{2}$ -2 in. long, main lateral nerves 8-12 pair, joined by prominent reticulate veins. Flower-heads yellowish, in pedunculate umbels or corymbs, generally as long as petiole, or a little longer, partial peduncles shorter than common peduncle, flowers 8-12, rarely less, on slender pedicels; involucre of 4 rounded concave membranous bracts,  $\frac{1}{2}$  in. long; involucre, pedicels and peduncles grey-tomentose with soft long hairs. Perianth-segments very irregular, generally wanting. Filaments hairy, with long soft hairs. Berry subglobose,  $\frac{1}{4}$  in. diam., black and almost dry when ripe, supported by the thickened club-shaped pedicel and base of perianth.

Common in the shady parts of the Oudh forests, scarce in the Central Provinces, abundant in Kamaon and Garhwal, ascending to 4500 ft., often in Sal forests, not uncommon in the outer Himalaya to the Ravi. Panjab Salt range, ascending to 2500 ft. South India, Ceylon, Bengal, Burma, Indian Archipelago, China, North Australia, and Queensland. Fl. June-July, the leaves are renewed April-May. Numerous forms of this extremely variable tree have been described; a marked variety from Garhwal (T. Thomson, June 1845), Patlidoon and Lalldang (April 1863, D.B.), has elliptic-lanceolate leaves, clothed with dense grey tomentum, but there are intermediate forms which undoubtedly belong to *T. laurifolia*. A similar variety has been found in Canara (Dr Ritchie, May 1853). *T. tomentosa*, Roxb.; DC. Prodr. xv. i. 177; Wight l.c. t. 1834, of South India, the leaves of which resemble this variety, has solitary flower-heads, and is quite different, though Dalzell, Bomb. Fl. 222, seems to make it synonymous with *apetala*.

Attains 40-50 ft. and a girth of 4-5 ft. Bark 1 in. thick, dark grey or brownish, somewhat excavated by the exfoliation of dark, rough scales, not marked by cracks or furrows. Inner bark brown, viscid, and glutinous. The leaves when bruised have a smell of cinnamon. Wood greyish brown, close and even-grained, durable, not very hard, no distinct heartwood. Medullary rays fine, numerous, pores small, numerous, surrounded by patches of white tissue. The bark, of this and of the next sp., is sold and exported to the plains under the name of *Meda-lakri*, given medicinally and applied externally (bruised and mixed with goat's milk) on sprains and bruises.

2. *T. monopetala*, Roxb.—Tab. XLV.—Cor. Pl. t. 148; Fl. Ind. iii. 821.—Syn. *T. macrophylla*, Wall. Vern. *Meda (māda) lakri*, plains of North India; *Gwa*, Pb.; *Singraf*, *sangran*, *marda*, *kat marra*, *kakuri*, *kerauli*, *patoia*, N.W.P.; *Katmorā* (the male), *papriā* (the female tree), Ganges above Hardwar (Hardwicke As. Res. vol. vi. 378); *Randharri*, *katmēdh*, Oudh; *Mendah*, Gonds of Balaghat; *Ungdung*, Burm.

A middle-sized evergreen tree, branchlets, under side of leaves, and inflorescence with slight, often rust-coloured pubescence. Leaves alternate, elliptic-oblong, acute, blade 4-8 in., petiole  $\frac{1}{2}$ -1 in. long, main lateral nerves 8-10 pair. Flower-heads whitish, pedunculate, in sessile or subsessile axillary clusters, peduncles shorter than petioles, flowers 5-6 on short hairy pedicels; involucre of 5 rounded concave membranous bracts,  $\frac{1}{2}$  in. long. Perianth 5-6 cleft, membranous. Stamens 9-13; filaments hairy, the inner shorter with a pair of kidney-shaped glands at the base. Berry ovoid,  $\frac{1}{4}$  in. long, black when ripe, supported by the spreading, somewhat enlarged base of the perianth.

Abundant in the Oudh forests, sparingly on the Satpura range, not uncommon in Kamaon and Garhwal. Siwaliks and sub-Himalayan tract west to the Ravi, ascending to 3200 ft. Salt range to 3000 ft. Extends farther north than *T. laurifolia*. Bengal, Burma (everywhere in the plains and the valleys of the principal rivers). South India, Ceylon, Indian Archipelago. Fl. March-May, the leaves are renewed about the same time; the fruit ripens June-July. Generally found in ravines on the banks of streams, or on rich deep soil.

Attains 30-40 ft., trunk short, erect, 4-6 ft. girth, generally hollow when old. Bark dark grey, smooth, but scabrous with elevated white dots, the older parts with reticulate cracks, exfoliating in corky scales. The leaves are often beset with round hollow galls or excrescences. Pith large, wood whitish, pale yellow or brown, heartwood distinct, darker coloured (R. Th.) Is used for ordinary agricultural or domestic purposes. The bark has an astringent and somewhat aromatic taste, and is used in native medicine. The leaves when bruised have a smell of cinnamon; silkworms are fed with them.

*T. Doshia*, Don Fl. Nep. 65.—Syn. *T. oblonga*, Wall.; *Cylicodaphne oblonga*, Meissner; DC. Prodr. xv. i. 205; *Lepidadenia Griffithii*, Wight Ic. t. 1846, is an evergreen tree with oblong-lanceolate glabrous leaves, 6-9 in. long, flower-heads on long slender pedicels in sessile or short-pedunculate axillary corymbs; berries half immersed in the cup-shaped persistent perianth. Nepal, Assam, Malay peninsula, Canara.

*Dodecadenia grandiflora*, Nees; DC. Prodr. xv. i. 210, is a tree with penni-veined lanceolate glabrous leaves, with fine prominent reticulation, and large solitary (or twin) subsessile axillary flowers, surrounded by numerous imbricate pubescent bud-scales, berry ovoid,  $\frac{1}{2}$  in. long, supported by the flat, persistent base of the perianth. Kamaon, East Himalaya.

*Actinodaphne* is a large genus nearly allied to *Dodecadenia* and *Tetranthera*. The flowers are in lateral clusters, generally pedicellate, enclosed (in bud), by imbricate bracts. The leaves are penni-veined, whorled at the ramifications and at the ends of branches, and the branchlets are mostly whorled likewise. *A. Hookeri*, Meissner; Bedd. Fl. Sylv. t. 296—Syn. *A. lanceolata*, Dalz. Bombay Fl. 312, is a large shrub, with ovate or ovate-lanceolate leaves, glabrous, dark green and shining above, glaucous beneath, young shoots and petioles rusty-tomentose, common along the Western Ghats of Canara and Sattara, and particularly abundant in the Mahableshwar forest, also found by Beddome in the North Arcot and Cadapah forests. *A. angustifolia*, Nees; Wight Ic. t. 1841, similar in habit to the preceding, but the leaves rusty-tomentose beneath. Courtallum, Nilgiris, East Bengal, Burma, where it is common in the evergreen forest-patches of the Pegu Yomah and other hills (*Shwoaygyo* and *Nalingjo*, Burm.)

#### 6. LITSÆA, Juss.

Trees or shrubs with alternate leaves, often whorled and crowded at the ends of branches, usually penni-veined; main lateral nerves not numerous, and the lowest pair often proceeding from near the base and more prominent, so as to make the leaves appear triplinerved. Flowers dioicous, pedicellate, in sessile or nearly sessile lateral clusters, surrounded by deciduous bracts which are imbricate in bud. Perianth-segments usually 4. Stamens of the male flower usually 4 in the outer, and 2 in the inner circle, all perfect, anthers 4-celled, introrse, the lower pair of anther-cells often lateral; a pair of glands at the base of each of the two inner

ft., Burma, on the higher mountains between the Sitang and Salween, and the Thoungyeen and Houndrow rivers. In Burma it is called *Karawayben*. 2. *Laurus nobilis*, Linn.—*Sweet Bay* or *Laurel—Ghar*, Arab., well known on account of its aromatic leaves, is a small slow-growing evergreen tree, indigenous in the Mediterranean region. Hardy in England. Differs from *Daphnidium* by a 4-cleft perianth and 12 fertile stamens. A greenish coloured fat is expressed from the seeds.

### ORDER LXIII. THYMELACEÆ.

Shrubs small trees or wiry herbs with tenacious bark, and alternate or opposite, entire, exstipulate leaves. Flowers usually bisexual, regular. Perianth gamophyllous, hypocrateriform or funnel-shaped; lobes 4-5 imbricate; throat with or without scales. Stamens usually as many or twice as many as perianth-segments, inserted in the throat or tube. Ovary free, 1-celled (in Thymelaceæ proper), with a solitary pendulous ovule; style simple or 0, stigma capitate. Fruit indehiscent, a nut or drupaceous. Seed usually exalbuminous; embryo straight with a superior radicle.—Royle III. 321.

Leaves evergreen, coriaceous; perianth not splitting laterally  
Leaves deciduous, submembranous; perianth splitting laterally as the fruit enlarges . . . . .

1. DAPHNE.

2. WIKSTREMLIA.

#### 1. DAPHNE, Linn.

Shrubs with alternate, mostly evergreen leaves. Flowers bisexual, generally in terminal heads. Perianth coloured, tubular or funnel-shaped, limb of 4 equal spreading segments, without scales. Anthers on short filaments inserted in two rows of 4 each, those of the upper series opposite to the perianth-segments, those of the lower alternate with them. Stigma capitate, subsessile. Fruit fleshy or coriaceous, remaining enclosed until near maturity in the inflated perianth-tube. Testa thick, crustaceous.

Flower-heads without bracts; leaves 1-2 in. long . . . . . 1. *D. mucronata*.  
Flower-heads with numerous bracts; leaves 3-5 in. long . . . . . 2. *D. papyracea*.

*D. Laureola*, Linn.; Hook. Stud. Fl. 322—*Spurge Laurel*—with poisonous berries, West Europe, North Africa, West Asia, has greenish flowers in short lateral racemes. *D. Mezereum*, Linn.; Hook. Stud. Fl. 322, is deciduous, the pink flowers in lateral clusters before the leaves. North-East Europe. Siberia. The bark is used as a vesicant.

1. *D. mucronata*, Royle III. t. 81.—Vern. *Laghūne*, Afg.; *Kūṭāl*, *kanthan*, *gūndalūn*, *gandlena*, *channi niggi*, *shalangri*, *zhikak*, *zoshō*, *shing*, *mashūr*, *swāna*, *jūkri*, *dona*, *kāgsari*, *sind*, *kānsian*, *kānsai*, *sonāi*, Ph.; *Pech*, Sindh.

A tall shrub, branchlets and young leaves soft-pubescent. Leaves coriaceous, lanceolate oblanceolate or linear-lanceolate, 1-2 in. long, subsessile, midrib prominent, terminating in a short sharp mucro with indis-

• tinted reticulate veins. Flowers white, with a pink tinge, slightly scented, subsessile, in terminal heads of 3-9 fl., without bracts, or with a few small early deciduous bracts. Perianth-tube  $\frac{1}{3}$  in. long, outside densely grey-tomentose, segments acute, ovate or lanceolate, half or three-fourths of the length of tube, tube glabrous inside and marked with 8 longitudinal nerves, 4 terminating in the tips of segments. Stamens inserted on the longitudinal nerves, those of the lower series in the upper half of the tube. Fruit when ripe orange or scarlet.

Eastern flanks of Suliman range between 3000 and 7000 ft. Common in the Himalaya between 2300 and 9000 ft. Also found in the inner more arid valleys of the North-West Himalaya. Fl. Sept., Oct.; fr. May, June ("blooms May-July, at times Oct., the fruit usually ripening June-Oct."—Stewart). The inflorescence is sometimes abnormally enlarged and transformed into angular subglobose lumps. Attains 7-8 ft., bark shining, dark grey or reddish brown, rugose and irregularly undulate. Wood white, mottled with wavy lines, soft, used in Chamba to make charcoal for gunpowder. Bark and leaves are used in native medicine, the berries are eaten, but are said to cause nausea and vomiting. On the Sutlej a spirit is distilled from them.

*D. Cachemireana*, Meisner in DC. Prodr. xiv. 535, from the Firpanjal, is described with wholly glabrous leaves and axillary short-pedunculate flower-heads. I have not seen specimens corresponding to the description.

*D. acuminata*, Boiss. et Hohenacker; DC. Prodr. 536, from Kurdistan, Persia, Afghanistan, Beluchistan, has longer pedunculate flowers and short obtuse segments of perianth. There are, however, specimens from Afghanistan intermediate between this species and *D. mucronata*, and the question arises whether these species should not be united.

*D. oleoides*, Schreber; as described by Meisner in DC. Prodr. xiv. 533, is closely allied to the Himalayan plant, which he partly refers to it. All Himalayan specimens, however, both from the inner and outer ranges, belong to one species. Dr Stewart proposed to unite under *D. oleoides* the Himalayan, West Asiatic, and Mediterranean forms, including *D. acuminata*, *buxifolia*, *collina*, and *sericea*, and this view will probably be confirmed by farther researches of botanists who may be fortunate enough to study these shrubs in the Mediterranean region, Western Asia, and India. At present it seems preferable briefly to state the slight and variable characters by which these European and West Asiatic forms are supposed to be distinguished:—

1. *D. oleoides*, var. *brachyloba*, Meisner, a small depressed shrub. Leaves crowded at the ends of branches, glabrate, acute. Heads of 2-6 white fl., tinged with pink. Segments of perianth ovate, acute, shorter than half the tube. Fl. May, June. Western Asia.

2. *D. oleoides*, var. *jaminea*, Meisner—Syn. *D. jaminea*, Sibth. Fl. Græca, t. 358; *D. glandulosa*, Reichenb. Fl. Germ. t. 553. Same as preceding, but segments of perianth acute, lanceolate, nearly as long as or longer than half the tube. South Europe.

3. *D. buxifolia*, Vahl; DC. Prodr. 534. Leaves pubescent, segments of perianth subobtusely, shorter than half the tube. Western Asia.

4. *D. collina*, Smith; Sibth. Fl. Græca, t. 359; Reichenb. Fl. Germ. t. 554. Leaves hairy beneath. Fl. large, pink or purple, segments of perianth ovate, obtuse. South Europe, Asia Minor. Hardy in England.

5. *D. sericea*, Vahl; DC. Prodr. xiv. 535. Leaves oblanceolate, obtuse, pubescent beneath, flowers numerous in bracteate heads, segments of perianth obtuse, shorter than one-third the tube. Greece, Western Asia.

2. *D. papyracea*, Wall. ; Jacq. Voy. Bot. t. 148.—Syn. *D. cannabina*, Wall. ; *D. odora*, Don Prodr. Fl. Nep. 68 (not Thunb.) Vern. *Niggi*, *mahadeo ka phul* (God's Flower), Pb. ; *Set barūwa*, *satpūra*, N.W.P.

A tall shrub, branches often bi- and tri-furcate, youngest branchlets slightly pubescent. Leaves subcoriaceous, approximate near ends of branches, glabrous, lanceolate, 3-5 in. long, narrowed into a short, marginate petiole, midrib prominent, lateral nerves numerous, indistinct. Flowers scented, white yellowish or purple, sessile, in terminal heads of 6-12 fl., surrounded by numerous oblong or lanceolate bracts. Perianth-tube  $\frac{1}{2}$  in. long, pubescent outside, segments ovate, acute, less than half the length of tube. Stamens of the lower series inserted in the middle of the tube. Fruit ovoid, succulent, red or orange when ripe.

Himalaya between 3000 and 9000 ft., from near the Indus to Bhutan. Kasia hills. Fl. March-April, also in autumn. Attains 7-8 ft., bark ash-coloured, smooth, smells unpleasantly when bruised. In Nepal and Kamaon, paper is made of the inner fibrous bark, which is boiled with wood-ashes, washed, and beaten to pulp on a stone, and spread on frames made of bamboo matting. Daphne paper is very strong and tough, does not crack or break, very durable, is not eaten by insects, and used for important records. There is a tradition in Nepal that the art of making paper was introduced from China about 500-600 years ago. Indian Daphne paper much resembles some kinds of Chinese paper. The flowers are offered up in Hindu temples.

*D. odora*, Thunb. ; Japan, is similar, but has more coriaceous leaves and a glabrous perianth.

## 2. WIKSTRÆMIA, Endl.

Trees or shrubs with opposite or alternate, submembranous, deciduous leaves. Style terminal, short ; stigma capitate. Berry at first included in the perianth, which splits open laterally, and ultimately falls off.

1. *W. virgata*, Meisner ; DC. Prodr. xiv. 547.—Syn. *W. canescens*, Meisner ; *W. salicifolia*, Dac. in Jacq. Voy. Bot. t. 149 ; *Daphne sericea*, Don Prodr. Fl. Nep. 69 ; *D. canescens*, Wall. ; *D. virgata*, Wall. Vern. *Bhat niggi*, *thilak*, Pb. ; *Chamlia*, Kamaon.

A small shrub, with slender branches, pubescent with long soft hairs. Leaves subopposite and alternate, lanceolate-oblong, about 2 in. long, on short petioles. Flowers white, subsessile, in many-flowered heads or spikes, which are arranged in terminal panicles. Perianth-tube slender, pubescent outside with soft silky hairs, many times longer than the ovate-oblong, obtuse segments. Ovary hairy.

Himalaya, in the Panjab to near the Indus, between 5000-7000 ft. Common in Kamaon and Nepal. Kasia hills, Ceylon. Fl. June-Aug. Paper (inferior) and rope are made from the bark in Kamaon.

*Edgeworthia Gardneri*, Meisner—Syn. *Daphne Gardneri*, Wall., is a large shrub with herbaceous lanceolate leaves, and large, dense, subglobose flower-heads,  $1\frac{1}{2}$  in. diam. Ovary with a dense tuft of stiff hairs, style long, filiform. Nepal, Sikkim.

*Lagetta lintearia*, Lamarek ; Bot. Mag. t. 4502, the *Jamaica Lace-Bark*, is a middle-sized tree, with ovate leaves and white flowers in loose terminal spikes. The inner bark consists of numerous distinct (annual) layers of finely reticulate fibre, made into ropes, whips, paper, lace, and all kinds of wearing apparel.

Under this Order is generally classed *Aquilaria Agallocha*, Roxb. Fl. Ind. ii. 422, and Trans. Linn. Soc. xxi. 199 ; Hook. Ic. t. 6 ; Royle Ill. p. 171, t. 36, a large tree, with alternate leaves and decandrous, bisexual flowers, the stamens alternating with short scales placed in the mouth of the perianth, which yields a great portion of the famous *Aloes* or *Eagle-wood*, used as incense and to make ornaments and rosary beads. Mountains east of Bengal.

#### \* ORDER LXIV. ELÆAGNEÆ.

Trees or shrubs, more or less lepidote, with alternate exstipulate entire leaves. Flowers usually hermaphrodite, or unisexual in *Hippophaë*, regular. Perianth inferior, gamophyllous, tubular, with a 4-lobed limb, valvate in æstivation, or dimorphic in *Hippophaë* (of male fl. diphyllous, of female fl. tubular). Stamens usually 4, epiphyllous, alternate with the perianth-lobes ; 4, with subsessile anthers, between the 2 perianth leaves in *Hippophaë*. Ovary free, 1-celled, with a solitary erect ovule, closely invested by the persistent accrescent base of the perianth-tube ; style simple, laterally stigmatose. Fruit indehiscent, enclosed within the at length succulent perianth-base ; albumen thin ; radicle inferior.—Royle Ill. 322.

Flowers unisexual, dioicous ; perianth of male fl. 2-leaved . . . . .	1. HIPPOPHAË.
Flowers bisexual ; perianth tubular, 4-cleft . . . . .	2. ELÆAGNUS.

##### 1. HIPPOPHAË, Linn.

Shrubs or small trees, often spinescent, with alternate narrow leaves and precocious flowers. Male flowers sessile, in the axil of deciduous bracts. Perianth of 2 opposite round or oblong leaves. Stamens 4. Female flowers axillary, solitary, pedicellate. Perianth tubular, minutely bifid at the mouth.

Under side of leaves white, velvety, with a dense tomentum of short stellate hairs . . . . .	1. <i>H. salicifolia</i> .
Under side of leaves densely clothed with white or rust-coloured stellate scales . . . . .	2. <i>H. rhamnoides</i> .

1. *H. salicifolia*, Don Prodr. Fl. Nep. 68.—Syn. *H. conferta*, Wall. Vern. *Ashūk*, Nepal ; *Sürch*, Bassahir.

A large shrub, with scattered lateral thorns, the ends of main branches often thorny. Leaves membranous, 2-3 in. long, linear-lanceolate, narrowed into a short petiole, edges revolute, green and glabrate above (pubescent while young), white velvety beneath, with dense soft tomentum of short stellate hairs ; branchlets, petiole and midrib clothed beneath with circular, irregularly indented rust-coloured scales, a few ferruginous scales occasionally on the under side of leaves. Fruit fleshy ; seed dark brown, shining, compressed, ovate or obovate,  $\frac{1}{8}$  in. long, with a deep longitudinal furrow on one and a shallow furrow on the other face.



Outer and middle Himalaya. Suttlej valley up to Chini. Baspa valley (Shoang, Sangla). 5000 to 10,000 ft. Kamaon, Nepal, Sikkim (7000-10,000 ft.) Probably also on the Bias river, and in the lower Chenab and Jhelam valley. Fl. June, July; fr. Sept., Oct. Attains 20 ft. Hardy in England.

2. *H. rhamnoides*, Linn.; Hook. Stud. Fl. 323.—Syn. *H. tibetana*, Schlechtendal in Linnæa, xxxii. 296. Vern. *Tsarapp*, *tsarma*, *tsarmang*, *sirma*, *tsük*, *tarru*, *nieshak*, *tserkar*, Ladak, Piti, and Lahoul. Regarding the following names it is uncertain whether they relate to this or to the preceding species: *Kula bis*, *bäntphünt*, *amb*, *kanda*, *mlech*, *Pb.*; *Dhür chük*, *tärca*, *chuk*, *chuma*, N.W.P.

A large thorny shrub, sometimes a small tree. Leaves subcoriaceous,  $\frac{1}{2}$ -2 in. long, linear-lanceolate or oblanceolate, narrowed into short petiole, edges flat or revolute, branchlets and under side of leaves densely clothed with silvery or rust-coloured circular, irregularly indented scales, but not pubescent; upper side of leaves with a few scales when young, glabrous and dull green afterwards. Fruit fleshy, orange or bright scarlet when ripe, seed dark brown, nearly black, shining, obovoid, slightly compressed, less than  $\frac{1}{2}$  in. long, with a deep longitudinal furrow on one and a slightly depressed line on the other side. The specimens from the inner Himalaya, Tibet, Afghanistan, and Central Asia are silvery, whereas the European shrub has often ferruginous, mixed with silvery scales, and this character does not furnish any distinction between *H. tibetana* and *rhamnoides*. In the seeds I can discover no difference.

Afghanistan. Inner arid tract of the N.W. Himalaya, chiefly in the moist gravelly stream-beds (Lahoul, Ladak, Piti, upper Kunawar, inner Kamaon, Tibet), between 7000 and 12,000 ft., found as high as 15,000 ft. at Darma Yankti in Tibet (R. Strachey and Winterbottom). Beyond India, in Central Asia, and in Europe, where it is abundant in the shingly and gravelly valleys of the Alps and Apennines, along the Rhine (as far as Strasburg), and on other rivers descending from these mountains, and common in many places on the coast of the Mediterranean, the Atlantic, the German Ocean, and the Baltic. Cultivated for ornament in Europe, and (as a fruit-tree) at Kabul. Fl. and fr. May-Nov. The geographical limits of these two species demand farther inquiry on the spot. In the upper Suttlej valley Dr Stewart and I collected specimens (in 1864) of *H. salicifolia* as far up as Chini, and of *rhamnoides* as low down as Riba, below the mouth of the Tidong river, and the specimens collected in the arid region of the upper Suttlej, Chenab and Indus valleys, and on their tributaries, all belong to *H. rhamnoides*. Dr Stewart regarded both as one species, and it remains for future observers to determine whether there are intermediate forms, and whether (which is quite possible) *H. salicifolia* is identical with the European and Central Asiatic plant, modified by the influence of a moister climate, and less severe cold in winter. I do not attach much value to the different shapes of the seeds, discussed in detail by Schlechtendal (l. c. 295), for I find that there is considerable variation in this respect; but the stellate hairs (with 6-9 distinct arms) of *salicifolia*, are completely different from the flat circular, irregularly indented scales of *rhamnoides*, composed of numerous elongated cells radiating from a dark centre. It should, however, be borne in mind, that scales and stellate hairs differ in degree only; and it will be an interesting inquiry to trace intermediate stages, if there are any, and to indicate the connection of the structure of this fine tomentum with the difference in the climatic conditions. At present I had no alternative but to keep the two forms apart as distinct species.

Gregarious, on dry ground a low prostrate shrub, in moist places a small tree 20 ft. high, with stiff thorny branches, trunk sometimes 5-6 ft. girth, often forming dense thickets, extending continuously for miles, and nearly impervious, except along certain beaten tracts (T. Thomson, West Himalaya, 195). The roots of the European shrub are long spreading, with numerous root-shoots (drageons), and the shrub is very useful in the French Alps in fixing the loose gravel and rubble of mountain torrents and stream-beds. The bark is described by Stewart as follows—the description probably refers to the Tibetan plant: “The older bark gets reddish brown, and remains for a time pretty smooth, that of the trunk is 3 lines thick, inner substance brownish black with white dots, externally very dark, almost black-edged, white occasionally showing through long deep, very irregular, vertical and shallow short transverse furrows, which divide it into tessellated plates, the surface of which is smoothish, somewhat shining, but undulated, brownish grey, the base being brown, with white elevated specks, circular and transverse-oblong to 6 in. long. The bark has from a little distance some general resemblance to that of *Acacia modesta*.” The wood of the European shrub is yellowish brown, and has distinctly-marked annual rings, the inner or spring wood of each ring being porous, and mainly composed of numerous moderate-sized vessels, the outer or autumn wood being more compact with fewer pores, medullary rays numerous, very fine. It is used for fuel and charcoal. The thorny branches are used for piled-up hedges, and the shrub is invaluable in the dry treeless tracts of the inner Himalaya. In Lahoul the thickets of *Hippophaë* are “so valued as to be considered village property” (Cleghorn, Panjab Forests, 151). The fruit is intensely acid, but boiled with sugar it forms a palatable and wholesome preserve (H.C.) In Kunawar it is made into a condiment (*Chatni*).

## 2. ELÆAGNUS, Linn.

Trees or shrubs, occasionally spinescent, with alternate entire leaves, densely lepidote at least on the under surface. Flowers hermaphrodite or unisexual by abortion, regular, pedicellate in axillary fascicles. Perianth tubular or dilatated above, with a spreading 4-valved limb, base of the tube closely constricted around the ovary; limb at length deciduous, circumsciss immediately above the ovary. Stamens 4, epiphyllous, alternate with the perianth lobes. Fruit enclosed in the succulent persistent and accrescent base of the perianth, with a bony or coriaceous kernel.

Kernel thick, osseous; a deciduous tree . . . . . 1. *E. hortensis*.

Kernel thin, coriaceous, inside clothed with a dense felt of white hairs.

Free part of perianth campanulate, not more than twice the length of segments; fruit 1-1½ in. long; an evergreen shrub . . . . . 2. *E. latifolia*.

Free part of perianth tubular, more than twice the length of segments; fruit ½ in. long; a deciduous shrub . . . . . 3. *E. umbellata*.

1. *E. hortensis*, M. Bieberstein. — Syn. *E. angustifolia* and *E. orientalis*, Linn. (partly); Sibth. Fl. Græca, t. 152; Reichenb. Ic. Fl. Germ. t. 549; Bot. Reg. t. 1156. *E. Moorcroftii*, Wall. Pers. Zin. zaid. Vern. *Sanjūt*, *sanjata*, Afg.; *Sirsing*, *sirshing*, Tibet; *Shiulik*, N.W.P.

A middle-sized tree with silvery grey foliage and branchlets; branches shining, reddish-brown. Leaves ovate- or oblong-lanceolate, obtuse,

blade 1-3 in., petiole  $\frac{1}{4}$  in. long, under side, as well as petioles and branchlets, covered continuously by silvery circular scales, composed of radiating cells; upper side dull green with copious scattered scales, midrib prominent beneath, main lateral nerves 4-6 pair, indistinct. Flowers yellow, fragrant, axillary, pedicellate, 1-3 together. Perianth silvery outside, glabrous and yellow inside, the upper free portion campanulate, 4-dentate. Fruit axillary, solitary, ovoid-oblong, red when ripe,  $\frac{3}{4}$  in., stalk  $\frac{1}{8}$  in. long, kernel oblong, with a thick osseous shell. Seed oily.

Indigenous in Central Asia, Syria, Macedonia and Greece. Cultivated in the Mediterranean region, Afghanistan, Beluchistan, Yarkand, and in Tibet, between 7000 and 10,600 ft. (Baltis, near Leh, Nubra). Thomson, l. c. 243, describes the *Elæagnus* (and Apricot) growing in places in Baltistan where "no cultivation could ever have existed," but adds that "they were too few in number to be really regarded as indigenous." Is this tree ever cultivated in the Panjab Himalaya under the name of *Ghewāin*? Fl. (in Tibet) May-July; fr. Aug. The tree is deciduous, but the withered leaves remain attached to the tree instead of falling off at the end of autumn. Attains 25 ft., with an erect, straight trunk, 5-6 ft. girth, and a rounded, close handsome crown. Bark thick, fibrous, smooth, light grey, between deep longitudinal, ragged, dark-brown furrows. Sapwood narrow, heartwood dark brown, porous and soft, medullary rays numerous, used for fuel. A transparent brown and white gum, similar to gum-arabic, exudes from wounds in the bark (Beluchistan, Stocks). The tree is mainly cultivated on account of its fruit, which is acid (sweetish acid and mealy when ripe in Greece) and eatable. A spirit is distilled from it in Yarkand, and Moorcroft states that the annual yield of a tree is often 16-20 lb. of dried fruit. Hardy in England.

2. *E. latifolia*, Linn.—Tab. XLVI.—Wight Ic. t. 1856.—Syn. *E. conferta*, Roxb. Fl. Ind. i. 440. *E. ferruginea*, A. Rich.; DC. Prodr. xiv, 610. Vern. *Ghiwāi*, *mijhauā*, Kamaon.

Evergreen, with divergent axillary spines; branchlets, petioles and under side of leaves densely clothed with silvery or ferruginous, circular, lobed and dentate scales. Leaves ovate-oblong, acuminate, blade 5-6 in., petiole  $\frac{1}{4}$  in. long, upper surface glabrous, shining. Flowers few or numerous, pale yellow, scented, pedicellate, in axillary, often shortly pedunculate clusters. Perianth clothed outside with silvery scales, the upper free part (in the bisexual flowers) campanulate, not more than twice the length of segments. Fruit ovoid-oblong, 1-1 $\frac{1}{2}$  in. long, red or yellow when ripe, succulent, putamen coriaceous, with 8 prominent ribs, clothed inside with a thick felt-like coating of white silky hairs.

Himalaya, Kamaon to Bhutan. (Panjab 1500 to 9000 ft., according to Dr Stewart.) Kasia hills, Silhet, Burma, South India, Ceylon, Indian Archipelago. Fl. (usually) Nov.-Feb.; fr. May, June, often remaining long on the tree. A tall straggling or more or less scandent shrub, or a small tree. The wood resembles that of *E. hortensis*. The fruit has an agreeable acid taste, somewhat astringent, and is eaten.

Roxburgh, l. c. 441, describes *E. arborea* (with white flowers, III. in Herb. Kew, 2432) as a large tree, a native of the Garrow hills, fruit shaped like an olive, but much larger. Is this a distinct species?

3. *E. umbellata*, Thunberg.—Syn. *E. parvifolia*, Wall.; Royle III. t.

81, fig. 1; Bot. Reg. xxix. t. 51. Vern. *Ghūwāin*, *kankol*, *kankoli*, Pb., N.W.P.; *Giwāin*, *gawāi*, *gāhān*, *ghūn*, *gāhen*, *giānhān*, *kiāin*, *banmera*, Pb. (Dr Stewart gives these names to *E. latifolia*, which is not, as far as I am aware, a native of the Panjab.)

A deciduous shrub, often thorny, the current year's shoots and under side of leaves silvery grey with shining white scales, branches dull greyish-brown. Leaves oblong-lanceolate, obtuse, blade 1-2½ in., petiole ¼ in. long, under side densely clothed with silvery scales, upper side bright green, with a few scattered stellate hairs. Flowers white, axillary, often 2 or 3 together, appearing with the leaves on the current year's shoots. Perianth silvery outside, white or pale yellow inside, the upper free portion slender, tubular or elongate-conical, the 4 teeth less than half the length of (the free) tube. Fruit ovoid or globose, ½ in. long, succulent, putamen ribbed, coriaceous, clothed inside with a dense felt of soft white hairs.

Himalaya from near the Indus to Bhutan, between 3000 and 10,000 ft. China. Japan. Hardy in England. Fl. April-June. The fruit is eaten.

I follow Maximowicz, Diagn. Plant. Nov. Jap. Dec. viii. 560, in uniting *E. umbellata* and *parvifolia*, and in distinguishing them from *E. latifolia*, with which they are united by Thwaites, Enum. Pl. Zeyl. 252. Dr Stewart considered that both *E. latifolia*, the flowers (*gūl sanjad*, *dākū phal*) sold in the Panjab drug-shops, and *parvifolia* were found in the Panjab, but the latter, with white, exquisitely Heliotrope-like scented flowers, much less common.

# ORDER LXV. LORANTHACEÆ.

Evergreen parasitic shrubs, living on stems, branches or roots of other shrubs or trees. A few species apparently terrestrial, are probably root-parasites. Leaves coriaceous, entire, usually opposite, often wanting. Flowers small and inconspicuous or larger and gaily coloured, regular, hermaphrodite or unisexual. Perianth in *Viscum* and *Arceuthobium* simple, epigynous, with 2-4 valvate lobes, in *Loranthus* apparently double, the outer (calyx) adnate to the ovary with a free truncate or toothed limb (probably an annular dilatation of the axis), the inner (corolla) of 3-6 free or equally or unequally cohering segments (petals), valvate in aestivation. Stamens as many as perianth-lobes or petals, opposite and adnate to them. Ovary inferior with a solitary erect ovule adnate nearly throughout to the wall of the ovary, which thus presents a homogeneous mass on section. Fruit more or less baccate, often with a strongly viscid mesocarp. Seed solitary, albuminous, in *Viscum* occasionally polyembryonous.—Royle Ill. 235; Wight Ill. ii. 63; Oliver on Loranthaceæ in Linn. Soc. Journ. vii. 90.

Flowers unisexual, dioicous or monoicous; perianth coriaceous or fleshy, inconspicuous.

Joints not sheathing; anthers with many cells, dehiscing by numerous pores

Joints terminating in a cup-shaped sheath; anthers 1-celled, dehiscing by a transverse slit

Flowers bisexual, showy; petals 5-6, long, linear, free or connate

1. *VISCUM*.

2. *ARCEUTHOBIMUM*.

3. *LORANTHUS*.

## 1. VISCUM, Linn.

Glabrous shrubs with trichotomous or dichotomous branches. Leaves opposite or wanting. Flowers minute, dioicous or monoicous. Male fl.: perianth 3-4-fid, anthers adnate to the perianth-lobes, multilocellate, dehiscing by pores on the inner face. Female fl.: perianth 3-4-lobed, lobes deciduous or persistent. Style short or 0.

Leaves flat, conspicuous; perianth-segments deciduous.

Flowers dioicous; berries white . . . . . 1. *V. album*.

Flowers monoicous; berries dark-coloured.

Berry ovoid-oblong, smooth; leaves falcate or obliquely ovate, acute . . . . . 2. *V. monoicum*.

Berry subglobose, warty or with minute elevated dots; leaves obovate, obtuse . . . . . 3. *V. orientale*.

Leaves wanting; branches flat, jointed.

Joints cuneate; berries minute; perianth-segments persistent . . . . . 4. *V. articulatum*.

Joints linear; berries  $\frac{1}{2}$  in. diam.; perianth-segments deciduous . . . . . 5. *V. attenuatum*.

1. *V. album*, Linn.; Hook. Stud. Fl. 324.—Syn. *V. stellatum*, Don Fl. Nep. 142 (probably). *Mistletoe*. Vern. *Tūrapāni*, Afg.; *Bhangra*, *bānda*, *bambal*, *kakbang*, *ahalu*, *wahul*, *rene*, *reori*, *reng*, Pb.; *Bān*, *bānda*, N.W.P.

A rounded, very ramous, yellowish-green shrub, about 2-3 ft. diam., wholly glabrous. Stems terete, branches jointed, dichotomous. Leaves flat, cuneate-oblong or oblanceolate, apex rounded, about 2 in. long, with 3-5 indistinct longitudinal nerves. Flowers dioicous, sessile, in clusters of 3 or 5, in the bifurcations of branches, enclosed in fleshy, slightly ciliate concave bracts, the terminal flower solitary in a cup-shaped bract, the lateral flowers in pairs (at right angles in the case of 5 fl.), each pair included in an elongated concave bract, with rounded edges. Perianth-segments triangular, acute, thick, deciduous. Berry white, smooth, almost transparent, subglobose,  $\frac{1}{4}$  in. diam.

Afghanistan. Trans-Indus on the eastern slopes of the Suliman range at 3000-4000 ft. N.W. Himalaya from the Indus to Nepal, between 3500 and 9000 ft. Europe, Syria, Caucasus, Siberia, Amurland, Japan. Fl. March-May; fr. Sept.-Nov., often remaining long on the tree. The *Mistletoe* lives on most trees (rare on *Oak*, and never on the Horse- and Sweet Chestnut) in Europe. In the N.W. Himalaya it is chiefly found on the *Apricot*, *Peach*, *Pyrus variolosa*, *Crataegus Pyracantha*, the *Walnut*, *Elm*, *Alnus*, *Populus nigra*, less often on *Pavia*, the *Pear*, *Olea cuspidata*, *Morus serrata*, *Salix*, *Quercus Ilex* (Afghanistan and Suliman range), and has once been found on *Oak* in the N.W. Himalaya. In Lahoul it is used medicinally, and in Europe bird-lime is made of the viscid pulp of the fruit.

When the seed of the *Mistletoe* germinates, the roots penetrate the bark to the surface of the wood, where they spread and are gradually enclosed by the new layers of wood, and thus it comes to pass that the roots of *Viscum* (and *Loranthus*) get embedded in the wood of the foster-plant. The tissue of parasite and foster plants, however, remains always distinct. Branches infested with these parasites swell out irregularly, are often twisted and deformed, and even-

tually perish. The tissue of the parasite-roots is softer than the surrounding wood of the foster-plant, and decays readily. This explains the curiously grooved cavities or cup-shaped hollows in the wood of trees which have been attacked by *Loranthus*. Some species of *Viscum* throw out superficial roots from their stem, which attach themselves to the bark of the foster-plant by suckers. Regarding the anatomy of the Mistletoe, and the alterations which the wood-tissue of the Maple and other trees undergoes when attacked by it, see Harley on the Parasitism of the Mistletoe (Trans. Linn. Soc. xxiv. 175).

2. *V. monoicum*, Roxb. Fl. Ind. iii. 763. — Syn. *V. bengalense*, Roxb. Ill. in Herb. Kew, t. 1181; *V. falcatum*, Wall.

Stems terete, branches jointed, trichotomous, or dichotomous by the abortion of the central or one of the side shoots. Leaves bright green, flat, falcate or obliquely ovate, acute, narrowed into a short petiole, 2-4 in. long, with 3-5 prominent longitudinal nerves, edge slightly undulate. Flowers monoicous (sometimes dioicous?), short-pedicellate, in axillary pedunculate clusters of 3-5 flowers, supported by a common transversely oblong concave bract, with acute cusps. Berry smooth, oblong, blackish-brown when ripe,  $\frac{1}{4}$  in. long, on a short stalk.

This species is with certainty known only from the Sundarbans (Roxburgh), Silhet, the Kasia hills (to 3000 ft.), the Sikkim Terai and lower hills (to 4000 ft.), and Gorakhpur. Oudh forests (on *Elæodendron Roxburghii*), according to sp. collected by R. Thompson and identified by Dr Stewart, which, however, I have not seen. There are also specimens in Herb. Kew collected by Edgeworth in Banda, on *Zizyphus xylopyra* and *Bassia latifolia*, which probably belong to this species. Fl. May; fr. Aug., Sept.

3. *V. orientale*, Willd.; W. & A. Prodr. 379; Benth. Fl. Hongkong. 141; Blume, Fl. Javæ (Loranthæe), tab. 24, 25. — Syn. *V. verticillatum*, Roxb. Fl. Ind. iii. 764 (not Linn.)

Stems terete, branches jointed, trichotomous or by abortion dichotomous. Leaves flat, thick, fleshy-coriaceous, obovate, obtuse, 1-2 in. long, with 3-5 indistinct longitudinal nerves. Flowers monoicous, short-pedicellate, in axillary short-pedunculate or sessile clusters of 3-5 flowers, often several clusters in one axil, each cluster supported by a common, transversely oblong concave bract. Berry globose or subglobose,  $\frac{1}{4}$  in. diam., with numerous minute prominent dots, and often with larger warts.

Behar, South India, Ceylon, Indian Archipelago, Hong Kong. Fl. March-June. The characters, geographic distribution, and foster-plants of this and the preceding species demand farther inquiry, and particularly better examination of the growing plants; they seem to be very closely allied.

4. *V. articulatum*, Burm.; Benth. Fl. Hongkong. 141. — Syn. *V. moniliforme*, Blume, l. c. t. 25 B; W. & A. Prodr. 380; Wight Ic. t. 1018, 1019. Vern. *Pand*.

A small leafless parasite, with numerous slender branches, forming tufts from a few inches to 2 ft. in length. Stems terete, branches fleshy,



trichotomous, flat, jointed, joints  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, linear-cuneate, from a narrow base widening upwards, not striate, but often with a prominent middle line. Flowers monoicous (sometimes dioicous, var. *coralloides*, R. Wight), sessile and clustered at the end of joints; segments of perianth minute, triangular, persistent. Berry globose, very small, crowned by the persistent segments of perianth, 3-4 in sessile clusters.

Himalaya from Hazara to Kamaon 4000-9000 ft. Kasia hills, mountains of South India and Ceylon. Mt. Ophir, Malacca, Java, China and Japan, Queensland and New South Wales. Fl. May-July; fr. Oct.-Nov. Grows on a great variety of trees; in the N.W. Himalaya on *Quercus flex* (Jani and Kunai in Kunawar), *incana*, *annulata*, *dilatata* (Jannsar), on *Rhus*, *Olea*, *Rhododendron arboreum*, and the *Apricot* tree; in the Nilgiris on *Eurya*; in Japan on *Symplocos* and *Litsaea*.

5. *V. attenuatum*, DC.; W. & A. Prodr. 380.—Syn. *V. dichotomum*, Don Fl. Nep. 142 (probably). Vern. *Būdu*, *pand*, Pb., N.W.P.; *Patha*, Banda; *Bānda*, C.P.

Stems terete, branches flat, jointed, di- or tri-chotomous, forming loose tufts up to 3 ft. long; joints 1-2 in. long, striated with 6-12 prominent ribs, tapering towards the base, generally linear, less than  $\frac{1}{4}$  in. wide, but sometimes oblong or ovate-oblong. Flowers monoicous, sessile, in sessile clusters of 3 at the ends of joints, each flower supported by a rounded, often ciliate concave bract. Perianth-segments thick, triangular, deciduous. Berry subglobose,  $\frac{1}{8}$  in. diam., yellow when ripe. I retain the name accepted by Wight & Arnott, but believe that farther researches will identify the plant with *V. compressum*, Poiret, Encycl. Méth. Suppl. ii. 861 (1811); Blume, l. c. t. 26, in which case this name will take precedence. Miquel's identification of *V. articulatum* (*moniliforme*) with *V. compressum* (Fl. Ned. Ind. i. pt. i. 806) I fail to understand, the 2 species (as I take them) being completely different.

Sub-Himalayan tract and outer ranges from the Ravi to Assam, ascending in the Panjab to 3000, in Kamaon to 5000, in Sikkim to 6000 ft. Kasia hills. Behar, Banda, South India, Ceylon, and Java. Fl. June-Oct.

## 2. ARCEUTHOBIUM, M. Bieberstein.

Leafless parasitic shrubs with articulate branches. Flowers minute, dioicous. Male fl., perianth 3-5-partite. Anthers sessile, 1-celled, dehiscing by a transverse slit. Female fl., perianth 2-dentate. Stigma sessile.

1. *A. Oxycedri*, M. Bieb.; Ledebour, Fl. Ross. ii. 380.—Syn. *Viscum Oxycedri*, DC. Vern. *Shūk*, *Sāi*, Lahoul.

A small parasite, with fleshy stems, dividing di- or tri-chotomously into numerous jointed branches, forming close tufts 1-5 in. long; joints (of the lower branches) about  $\frac{1}{4}$  in. long, nearly four-sided, somewhat compressed, terminating in a cup-shaped sheath which encloses the base of

the next joint. Flowers dioicous, sessile in fascicles of 2-5, half immersed in concave bracts. Fruit short-stalked, ovoid, mucronate,  $\frac{1}{2}$  in. long, fleshy, deep green or blackish, white when dry; seed in the lower half, cylindrical, thrown out with great force when the fruit is ripe, often 2-3 ft. off, and being covered with a viscous pulp, attaches itself readily to any branch upon which it falls.

This remarkable plant grows on *Juniperus excelsa*, in Laloul on the Upper Chenab, at 9000-11,000 ft., where it was discovered by the Rev. H. A. Jäschke of the Tibet Moravian Mission. It pushes long creeping roots between bark and wood, and thus, as well as by seed gradually overspreads the plant on which it has once taken root, often killing the branch or the entire tree. Male and female plants are found on the same foster-tree. The fruit ripens in winter, fourteen months after flowering. The same species grows on *Juniperus Oxycedri* and on *J. communis* on the Caucasus, in Armenia and Kurdistan, Dalmatia, the French Alps (Basses Alpes near Sisteron), Algeria, and (on *Pinus ponderosa* and other species) in America on the Rocky Mountains, in California and Mexico.

### 3. LORANTHUS, Linn.

Shrubs with opposite, rarely alternate leaves, often with stellate hairs. Flowers usually large, showy, usually hermaphrodite. Calyx adnate, limb entire or toothed. Petals 3-6, epigynous, free or equally or unequally cohering below. Stamens subequal or alternately shorter, epipetalous (rarely free); anthers variously affixed, elliptical to linear, occasionally multilocellate, dehiscing longitudinally. Ovary inferior; style elongate, stigma capitate. Fruit more or less fleshy, with a single seed.

Petals free; pedicels opposite, in the axils of deciduous bracts. 1. *L. ligustrinus*.

Petals connate into a tube; pedicels generally alternate.

Flowers tetramerous; pedicel and ovary pubescent.

Branchlets and under side of leaves stellate-tomentose.

Ovary turbinate; berry club-shaped.

Leaves ovate, 5-7 in.; petiole 1 in. long . . . . . 2. *L. pulverulentus*.

Leaves broad-ovate from sub-cordate base, 2-3 in.; petiole  $\frac{1}{2}$  in. long . . . . . 3. *L. cordifolius*.

Ovary cylindric; berry cylindric or ovoid . . . . . 4. *L. vestitus*.

Branchlets and leaves glabrous; flowers red and green in lateral fasciculate umbels or corymbs . . . . . 5. *L. umbellifer*.

Flowers pentamerous; pedicel and ovary glabrous . . . . . 6. *L. longiflorus*.

#### 1. *L. ligustrinus*, Wall. in Roxb. Fl. Ind., ed. Carey, ii. 219.

A parasitic shrub or a small (apparently) terrestrial tree, probably parasitic on roots. Branches grey, young shoots and inflorescence with slight ferruginous pubescence. Leaves opposite, glabrous, coriaceous, the upper sometimes alternate, ovate-lanceolate, narrowed into a short petiole, 1-3 in. long. Flowers  $\frac{1}{2}$  in. long, pale-pink outside, deep-red inside; pedicels opposite in the axils of lanceolate deciduous bracts, in axillary, often trichotomous, panicles or racemes, which are shorter than the subtending leaf; small persistent ciliate bracteoles at the base of calyx. Corolla of 4 distinct linear petals, the upper half spreading or reflexed, the

lower half converging into a four-sided, slightly expanding tube. Filaments red, attached to the base of petals; anthers basifixed. Ovary rusty-tomentose, campanulate, supported by an ovate, acute, semi-amplexicaul, adpressed bracteole, and topped by the narrow, entire calyx-limb; stigma capitate. Fruit ovoid,  $\frac{1}{4}$  in. long, truncate at top, brown when ripe.

Siwalik tract and outer Himalayan ranges from the Jumna to Sikkim, ascending to 4000 ft. Kasia hills. Fl. May-July. Generally parasitic, on *Albizia Lebbek*, *Olea*, *Litsea*; found (apparently) terrestrial by Dr Hooker in the Kasia hills.

2. *L. pulverulentus*, Wall. l. c. 221.—Vern. *Parand*, Kamaon; *Bānda*, C.P.

A stout, woody parasite; inflorescence, young shoots, and under side of young leaves with dense yellowish-white, mealy, stellate tomentum. Leaves deep-green, opposite, coriaceous, ovate, blade 5-7 in., petiole 1 in. long; 8-10 main lateral nerves on either side of midrib. Flowers pale-green, 1 in. long, thickly tomentose, on short pedicels, in lateral racemes about 2 in. long, which are often fasciculate and axillary, or in the axils of fallen leaves; bracts none, but a small persistent bracteole at the base of ovary. Corolla slender, tubular, curved; segments linear, unilateral, about one-third the length of the tube. Anthers basifixed, about as long as free portion of filaments, cells adnate to a brown linear connective. Stigma minute, capitate. Berry  $\frac{1}{3}$  in. long, club-shaped, mealy.

Kamaon, ascending to 4000 ft., Nepal, Sikkim Terai and outer hills, Bhutan, Central Provinces (on *Butea frondosa*), Konkan. Fl. Dec.-June.

3. *L. cordifolius*, Wall. l. c. 222; DC. Prodr. iv. 302.

A stout, woody parasite; branchlets, young shoots, inflorescence, and under side of leaves soft-tomentose. Leaves opposite, broad-ovate, obtuse, from a subcordate base, blade 2-3, petiole  $\frac{1}{2}$  in. long. Flowers 1 in. long, outside with tawny or rusty stellate tomentum, on short pedicels, in short lateral dichotomous corymbs; bracts none, but a small persistent bracteole at the base of ovary. Corolla slender, tubular, straight or slightly curved, segments 4, lanceolate, about one-third the length of tube. Anthers basifixed, longer than free portion of filament, cells adnate to a linear obtuse connective. Stigma club-shaped, with a pointed conical tip. Berry club-shaped,  $\frac{1}{3}$  in. long.

Kashmir (often abundant on dead tops of *Platanus*), Garhwal and Kamaon, ascending to 5000 ft. Hazaribagh in Behar. Fl. Nov.-Dec.

4. *L. vestitus*, Wall. l. c. 218, and Pl. As. rar. t. 230.—Vern. *Pand*, N.W.P.

A stout, woody parasite; branchlets, young shoots, inflorescence, and under side of leaves with dense ferruginous tomentum. Leaves coriaceous, opposite, ovate-oblong or lanceolate, narrowed into a petiole  $\frac{1}{2}$  in. long;

blade 2-3 in. long, shining above, concave and densely tomentose beneath, margins recurved. Flowers  $\frac{3}{4}$  in. long, tomentose, rust- and cinnamon-coloured outside, purple and smooth inside, subsessile in compact lateral clusters; bracts none, but a small persistent ovate acute bracteole at the base of ovary. Calyx indistinctly toothed. Corolla tubular, apex subglobose in bud; segments 4, thick, concave, ovate, acute, spreading, half the length of tube. Anthers basifixed, shorter than free part of filaments. Ovary cylindric, rounded at the base; stigma capitate, 3-lobed. Berry cylindric, or ovoid,  $\frac{1}{3}$  in. long.

N.W. Himalaya from the Ravi to the Sarda, ascending to 7000 ft., on *Quercus incana*, *Odina Wodier*, *Schleichera trijuga*, *Randia*. Oudh forests, Nepal, Kasia hills (on Oaks and *Elæagnus*). Fl. Oct.-Jan. (most part of the year, Wall.)

5. *L. umbellifer*, Schultes.—Syn. *L. umbellatus*, Wall. l. c. 222 (not Roth). Vern. *Bānda*.

Glabrous, with long verrucose branches. Leaves opposite, ovate-lanceolate, glabrous, coriaceous, blade 4-6 in., petiole  $\frac{1}{2}$  in. long. Flowers  $1\frac{1}{2}$  in. long, blood-red at base, green at top, in lateral fasciculate umbels or in short corymbs; bracts none, but small bracteoles at the base of ovary; peduncles, pedicels, ovary, and outside of corolla slightly pubescent. Calyx short, 4-dentate. Corolla tubular, slender; segments 4 linear, reflexed, quarter the length of tube. Anthers basifixed; filaments short, strap-shaped, free portion much shorter than anthers. Style angular, stigma minute, capitate.

Himalaya, Sutlej to Bhutan, between 3000 and 10,000 ft. Kasia hills. Has been found on *Rhododendron arboreum*, *Andromeda*, and *Salix babylonica*.

6. *L. longiflorus*, Desrousseaux; W. & A. Prodr. 384; Wight Ic. t. 302.—Syn. *L. bicolor*, Roxb. Cor. Pl. t. 139; Fl. Ind. i. 548. Vern. *Pandamūt*, Pb.; *Bānda*, C.P.; *Patha*, Banda; *Bara manda*, Beng.

A large handsome parasite, wholly glabrous, bark grey, with numerous woody branches, large leaves, and handsome flowers. Leaves thick-coriaceous, usually opposite, extremely variable in shape, from linear (*L. falcatulus*, Linn., South India, Ceylon) to oblong broad-ovate and retundate with amplexicaul base (*L. amplexifolius*, DC., South India, Ceylon); lateral nerves usually indistinct. Flowers large,  $1\frac{1}{2}$ -2 in. long, the lower part red, the upper green, in unilateral racemes; pedicels as long as or longer than ovary; bracts none, but a semi-amplexicaul concave bracteole at the base of ovary. Corolla tubular, curved, split half-way down between two segments, swelling from the base to within a third of the mouth, then contracting a little; segments 5, linear, reflexed to one side. Anthers basifixed, narrow-linear, equal in length to the free portion of filaments; filaments attached above the base of corolla-segments. Ovary glabrous, cylindrical or urceolate, with a rounded base, topped by the projecting, entire, or irregularly dentate calyx. Berry oblong, pulpy, crowned with the cup-shaped calyx, black,  $\frac{1}{3}$ - $\frac{1}{2}$  in. long. A remarkable form with oblong

leaves and pubescent ovary and pedicels from Western India, perhaps a distinct species. (Belgaum—Vern. *Kokam phul ka bandu*, on *Flacourtia*, *Chloroxylon*, and *Garcinia*.)

The most common of the Indian species of *Loranthus*. In the Siwalik tract and outer Himalaya it extends west to the Jhelam, ascending to 3000 and at times to 6000 ft. in the Panjab, and to 7500 ft. in Kamaon. Common in Oudh, Bengal, Central and South India, Ceylon, and Burma; also in North Australia, Queensland, and New South Wales. Grows on most trees,—in North India chiefly on *Melia*, *Bauhinia*, *Albizia procera*, *Acacia modesta*, the Peach and Pear trees, on *Rottlera tinctoria*; in Oudh on *Buchanania*, *Bassia*, *Diospyros*; and in most parts of India it infests the *Mango* tree; the branches on which it grows swell, get disfigured, sickly, and eventually die. Fl. chiefly from Nov. to June, but in places throughout the year.

### ORDER LXVI. SANTALACEÆ.

Shrubs, undershrubs, or trees, sometimes (*Thesium*) parasitic on the roots of other plants. Leaves alternate or opposite, entire, without stipules. Flowers regular, hermaphrodite or unisexual. Perianth epigynous, gamophyllous; limb 3-4 lobed; lobes valvate or subvalvate in aestivation. Stamens as many as, and opposite to perianth-lobes, epiphyllous. Ovary inferior, 1-celled, with a free central placenta, bearing 2-5 pendulous ovules. Fruit a nut or drupe, 1-seeded; seed albuminous, with a straight embryo, radicle superior.—Royle Ill. 322.

Flowers bisexual, in short axillary panicles; stamens 4-5; small trees with opposite leaves

1. SANTALUM.

Flowers male and bisexual; stamens 3; male fl. in pedunculate clusters, arranged in leafy racemes; female fl. solitary; shrubs with alternate leaves

2. OSYRIS.

#### 1. SANTALUM, Linn.

Trees or shrubs with opposite, rarely alternate leaves. Perianth campanulate; limb usually 4-lobed. Stamens opposite to the perianth-lobes. Central placenta of the ovary filiform, ovuliferous near the base. Fruit a drupe with a pitted or roughish putamen.

1. *S. album*, Linn.; Bedd. Fl. Sylv. t. 256; Roxb. Fl. Ind. i. 442; Bot. Mag. t. 3235.—Syn. *S. myrtifolium*, Wall.; *Sirium myrtifolium*, Roxb. Cor. Pl. t. 2. *Sandalwood*. Sans. *Chandana*. Vern. *Chandan*, *chand-dal*, *sandal*. (*Gandha*, Can.)

A small evergreen, glabrous tree; leaves opposite, ovate or ovate-lanceolate; blade about 2 in. long, narrowed into petiole  $\frac{1}{2}$  in. long. Flowers deep brownish-purple or blood-red, inodorous, in axillary cymose panicles. Perianth campanulate, limb of 4 valvate triangular segments. Stamens exserted, adnate to the perianth-tube, and alternating with 4 rounded obtuse scales. Style as long as perianth. Berry black, globose, 1-seeded. (For development and fertilisation of the ovule, see Griffith on the Ovulum of *Sant. album* in Trans. Linn. Soc. xviii. 59.)

Indigenous in the drier districts of the peninsula, particularly in Mysore, extending south to the Madura district and north to Kolapur; also on the hills of the Coromandel coast. Timor and East Java. Grown in gardens in the Dekkan, Bengal, Central India, Guzerat, Rajputana, as far north as Saharanpur. Fl. March-July, also at other seasons. Attains 20 ft. and a girth of 3 ft., with slender drooping branchlets, and light foliage. Is mainly spread through the agency of birds, and springs up abundantly in hedges and in the midst of shrubs.

The sapwood is white and scentless, the heartwood yellowish-brown and strongly scented; weight 55 lb. (Fowke), 58 lb. (Skinner); value of P., 878 (Fowke), 874 (Skinner). The heartwood is used as incense and perfume, and for carving. It is an important article of trade in India, and largely exported to China and Arabia, where it is mainly used as incense. In Madras, the wood has been found admirably suited for engraving, nearly as good as boxwood, though not quite so hard. Sandalwood oil is distilled from the wood.

Plantations of Sandalwood have been established in Mysore and in the Madras Presidency. The climatic conditions under which it seems to thrive best are: a rainfall between 20 and 50 inches; and the following limits of temperature during the different seasons—cold season 70°-80°, hot season 80°-90°, rainy season 70°-80°, autumn 70°-80°. The heartwood of the tree grown in North India has a slight scent.

The export of Sandalwood from India to China is very old. Other species of *Santalum*, which likewise yield fragrant Sandalwood, grow on the islands of the Pacific. About 1778 the export of Sandalwood from the Sandwich Islands to China commenced on a large scale. An interesting sketch of the history of the Polynesian Sandalwood trade is given in Seemann's *Flora Vitiensis*, p. 212.

## 2. OSYRIS, Linn.

Trees or shrubs, with alternate or rarely opposite leaves. Flowers hermaphrodite or unisexual. Perianth of male fl. slender, of hermaphrodite fl. obconical, 3-4-lobed above. Stamens 3-4. Central placenta of ovary very short, ovuliferous at the apex. Fruit drupaceous. Seed solitary, with copious albumen.

1. *O. arborea*, Wall.—Syn. *O. Wightiana*, Wall.; Wight Ic. t. 1853 (sometimes called *O. nepalensis*). Vern. *Bakardharra*, *bakarja*, Kamaon (Jameson Catalogue, 200); *Popti*, Belgaum.

A twiggy glabrous shrub; branchlets 3-sided, with prominent sharp angles. Leaves coriaceous, obovate or elliptic-oblong, 1-1½ in. long, mucronate, subsessile or narrowed into a short marginate petiole; male flowers 5-10, on short pedicels, in axillary, pedunculate clusters, often arranged in racemose panicles. Bisexual flowers solitary, axillary on long slender pedicels. Drupe subglobose, glabrous, ¼ in. long, red when ripe.

Himalaya, ascending to 7000 ft., Simla, Kamaon, Nepal, Bhutan, mountains of South India, Western Ghats. Fl. Dec.-April. Specimens collected by R. Thompson in the Central Provinces (in fruit) are pubescent all over, also perianth and drupe; the leaves are smaller, elliptic-oblong,—perhaps a new species. Similarly pubescent specimens are in Herb. Kew, collected by Dr Stocks (in Sindh?).



## ORDER LXVII. URTICACEÆ.

Trees shrubs or herbs with alternate, rarely opposite stipulate leaves. Flowers apetalous, dioicous or monoicous, more rarely bisexual or polygamous, inconspicuous, solitary or variously disposed. Perianth simple, 3-5-lobed or -partite, or reduced to 1 or 2 segments, in the female flower occasionally tubular and undivided, or wholly wanting. Male fl.: stamens usually as many as perianth-segments and opposite to them. Female fl.: ovary free rarely adherent, 1- rarely 2-celled; styles often 2, connate at base, usually laterally stigmatose or stigma sessile; ovule solitary, erect and orthotropous, or laterally affixed or pendulous with a superior micropyle. Fruit a nut or small drupe, in *Moreæ* and *Artocarpææ* usually consolidated in a syncarpium, in *Ulmus* samaroid; seed with or without albumen; embryo various, radicle superior.—Royle III. 333, 335, 341.

This Order is here taken in a wide sense, including the following Tribes, which are commonly regarded as separate Orders:—

*Urticææ*.—Fl. unisexual; stamens equal in number to perianth-lobes; filaments inflected in bud, uncoiling elastically when the fl. opens; style 1, simple—*Boehmeria*, *Girardinia*, *Urtica*, *Laportea*, *Pouzolzia*, *Sarcocochlamys*, *Debregeasia*, *Villebrunea*, *Maoutia*.

*Moreææ*.—Fl. unisexual, usually in dense spikes or heads; stamens equal in number to perianth-lobes, filaments inflected in bud; style 1, oftener 2, connate at the base—*Plecosperrum*, *Morus*, *Broussonetia*, *Streblus*, *Taxotrophis*, *Phyllochlamys*.

*Artocarpææ*.—Fl. unisexual, in dense spikes or heads, often with fleshy axis, or enclosed in a fleshy receptacle; stamens as many as perianth-lobes or fewer, not inflected in bud; trees or shrubs with milky juice, leaves convolute in bud and amplexicaul stipules—*Ficus*, *Cudrania*, *Antiaris*, *Artocarpus*, *Castilloa*, *Brosimum*.

*Celtidææ*.—Fl. unisexual or polygamous in axillary or lateral cymes; filaments short, erect or slightly incurved in bud; styles 2, ovary 1-celled; fruit drupaceous—*Celtis*, *Sponia*.

*Ulmaceææ*.—Fl. mostly bisexual; stamens not inflected in bud; styles 2, ovary 1-2-celled; fruit dry, usually winged—*Ulmus*.

Stamens inflected in bud; style one, simple.

A shrub, armed with axillary thorns; female flowers in globose heads; perianths connate, tubular with a small 4-dentate mouth; fruit a fleshy compound berry with few large seeds.

Trees or shrubs without thorns; female fl. in heads, spikes, or panicles; perianths not connate.

Stigma long linear; fruit dry.

Flower-heads in spikes or panicles; stigma persistent.

Flower-heads sessile, axillary; stigma articulate.

Stigma sessile, tufted; fruit of numerous small berries in globose heads.

Female perianth none; stigma penicillate; flower-heads in axillary panicles.

## 1. PLECOSPERMUM.

## 2. BOEHMERIA.

## 3. POUZOLZIA.

## 4. DEBREGEASIA.

## 5. MAOUTIA.

Stamens inflexed in bud ; styles two more or less connate at the base.

Female fl. numerous, spicate . . . . . 6. MORUS.

Female fl. solitary . . . . . 7. STREBLUM.

Stamens not inflexed in bud ; style one.

Flowers on the inside of a hollow, globose, or pear-shaped receptacle . . . . . 8. FICUS.

Flowers on the outside of a fleshy receptacle ; in globose or cylindrical heads.

Flowers dioicous ; perianths of 4, free, not connate segments or leaves . . . . . 9. CUDRANIA.

Flowers monoicous ; male perianth of 2-4 segments or leaves ; female perianths tubular connate with each other . . . . . 10. ARTOCARPUS.

Stamens not inflexed in bud ; styles two, more or less connate at the base.

Flowers polygamous ; ovary 1-celled ; fruit fleshy.

Perianth deciduous ; stamens shorter than perianth . . . . . 11. CELTIS.

Perianth persistent ; stamens longer than perianth . . . . . 12. SPONIA.

Flowers commonly bisexual ; ovary 1-2-celled ; fruit a winged samara . . . . . 13. ULMUS.

### 1. PLECOSPERMUM, Trecul.

Tree or shrub with alternate entire leaves. Flowers dioicous, collected in dense globular heads. Male fl. : perianth 4-fid, segments imbricate. Stamens free ; filaments inflexed in aestivation ; anthers globose, 2-celled. Ovary rudimentary. Female fl. : perianth gamophyllous, with a narrow 4-dentate mouth. Ovary free, 1-celled, with a solitary pendulous ovule ; style filiform, exserted ; stigma papillose. Fertile nuts consolidated with the succulent perianth-segments and abortive ovaries into an irregular few-seeded berry-like syncarpium ; seed exalbuminous.

1. *P. spinosum*, Trecul ; DC. Prodr. xvii. 233 ; Wight Ic. t. 1963.—Syn. *Batis spinosa*, Roxb. Fl. Ind. iii. 762 ; *Trophis spinosa*, Willd. (partly).

A large shrub or small tree, armed with straight axillary spines ; branchlets glabrous, only extremities and inflorescence pubescent. Leaves glabrous, short-petiolate, oval elliptic or obovate, obtuse or acute, entire, 2-3 in. long, lateral nerves and reticulate veins indistinct. Flower-heads yellowish, axillary, solitary or 2-3 together, on peduncles as long as heads, the male heads  $\frac{1}{2}$  in. diam., the female heads smaller while in flower, but enlarging in fruit to about  $\frac{1}{2}$  in. Male fl. : perianth-segments obtuse or emarginate, hairy outside. Stamens inserted around a hairy rudimentary ovary, inflexed in bud, exserted afterwards. Perianths of female fl. connate into a pubescent globose head, the orifice of each perianth indistinctly 4-toothed, and a single filiform papillose style protruding from it. Fruit a compound irregularly-shaped 1-2-seeded berry,  $\frac{1}{2}$  in. diam., the other ovaries being abortive.

Nepal, Rohilkhand (Salt range, rare, on the top of mountains at 3000 ft.—J. L. S.) South India, Ceylon. Fl. Feb.-April. Bark fibrous.

2. **BOEHMERIA**, Jacq.

Shrubs or small trees with opposite or alternate toothed or occasionally lobed simple stipulate leaves. Flowers small dioicous or monoicous, in globose usually 1-sexual clusters. Male fl.: perianth 4- (rarely 3-) lobed or -partite, segments valvate in æstivation. Stamens as many as perianth-segments. Pistil rudimentary. Female fl.: perianth tubular, compressed or ventricose, usually narrowed to a minutely 2-4-toothed mouth. Ovary free or adherent, 1-celled, with a solitary erect or ascending ovule; style laterally stigmatose. Nut dry. Seed with more or less albumen.

Leaves alternate; branches terete.

Leaves broad-ovate, acuminate; petiole half the length of leaf or longer

Leaves elliptic-lanceolate; petiole many times shorter than leaf

Leaves opposite; branches four-sided.

Leaves broad-ovate; petiole one-fourth the length of leaf or longer

Leaves lanceolate; petiole many times shorter than leaf

1. *B. nivea*.

2. *B. rugulosa*.

3. *B. platyphylla*.

4. *B. macrophylla*.

1. *B. nivea*, Hook. et Arn. ; DC. Prodr. xvi. i. 206 ; Hooker's Journal of Botany, iii. (1851) 315, t. 8.—Syn. *Urtica nivea*, Linn. *U. tenacissima*, Roxb. Fl. Ind. iii. 590 ; Wight Ic. t. 688. *China grass*, *Rheea*.

A shrub ; young branches and shoots herbaceous, branches and petioles tomentose, with long soft hairs. Leaves alternate, broad-ovate, 3-6 in. long, acuminate, dentate with large triangular, slightly curved teeth, base truncate but tapering suddenly into petiole, the upper side of leaf pubescent and rough, the under side white, densely matted with closely adpressed hairs ; basal nerves 3, all penniveined, the lateral nerves joined by prominent transverse veins ; petiole half the length of leaf or longer, stipules subulate, deciduous. Flowers greenish, monoicous, in axillary panicles ; panicles in pairs, shorter than petiole, bearing numerous sessile flower-heads along their entire length, female panicles in the upper, male panicles in the lower axils. Style much exserted, hairy.

Indigenous, and cultivated in China, Japan, and the Indian Archipelago. Cultivated in Assam, upper Bengal, and (within the last 20 years) in North-West India. Fl. July-Sept. The inner bark of the young shoots contains one of the finest fibres produced by the vegetable kingdom. It is soft, fine, with a beautiful silky gloss, and at the same time exceedingly strong. The exquisite textures known under the name of China grass cloth are made of it. Examined under the microscope, Rheea fibre consists of large single tubes or elementary fibres, whereas the fibre of jute, hemp, and flax, consists of bundles of tubes or elementary fibres. The elementary fibres of Rheea are much longer than those of jute, hemp, or flax. Cotton, like Rheea, consists of single tubes (hairs), but they are thinner, much shorter, and less strong. Rheea fibre is an article vastly superior to jute (the produce of *Corchorus capsularis*, p. 37). Both fibres were brought to notice in Europe about the beginning of this century, both are produced in Bengal, but the value of the jute exported from India exceeds £4,000,000 a-year, and is now inferior in value only to the exports of cotton, opium, and rice, whereas the export of Rheea is as yet insignificant. The reason of this is twofold. The preparation of jute is easy, and that of Rheea difficult ; and secondly, jute thrives

luxuriantly in the climate of Bengal on comparatively poor soil, whereas *Rheea* requires rich soil and continuous moisture. *Rheea* is easily propagated from cuttings, and when grown for its fibre, it resembles a perennial plant, the herbaceous shoots being cut several times a-year.

2. *B. rugulosa*, Weddell.—Syn. *Urtica rugulosa*, Wall.

A small tree with greyish-brown branches, the youngest branchlets as well as petioles and under side of leaves hoary. Leaves alternate, elliptic-lanceolate, short-petiolate, 3-5 in. long, obtusely dentate, with 3 longitudinal nerves from the base to the apex of leaf, each nerve penniveined, the lateral veins of the midrib anastomosing in a marked manner with those on the inside of the two side nerves, the lateral veins on the outside of the side nerves being joined by an intramarginal vein running close under the edge of leaf, nerves and veins prominent on the under side, impressed and (the veins) indistinct on the upper side of leaf. Flowers dioicous in round sessile clusters, each cluster in the axil of a cordate membranous bract, the clusters arranged in long undivided lateral spikes. The leaves somewhat resemble those of *Sarcochlamys pulcherrima*, with which it has sometimes been confused, but it is readily distinguished by the long simple flower-spikes.

Garhwal (Kotridun), Kamaon, Nepal, Sikkim, Bhutan. *B. nervosa* of Madden (The Terai and outer mountains of Kamaon, Journ. As. Soc. xvii. i. 587), and of Jameson (Catalogue, 1854); "Vern. *Geti, gainti*; wood excellent for making bowls, for which purpose it is extensively used in Kamaon," is probably this species.

3. *B. platyphylla*, Don Prodr. Fl. Nep. 60; DC. Prodr. xvi. i. 210.—Syn. *B. rotundifolia*, Don, ibid. *U. macrophylla*, Wall. Vern. *Gargela*, Kamaon.

A shrub with four-sided herbaceous branches; branchlets and leaves rough with scattered short adpressed hairs. Leaves broad-ovate, acuminate, dentate with large triangular teeth, basal nerves 3, all penniveined, blade 3-9, petiole 1-5 in. long. Flowers whitish, monoicous and dioicous, in long axillary interrupted spikes, generally much longer than the subtending leaf. Male spikes often branching, in monoicous plants occupying the lower axils of the leaves. Styles hairy, exserted. An extremely variable plant, of which 3 principal varieties may be noted in the North-West Himalaya. *α. macrostachya*; *Splitgerbera macrostachya*, Wight Ic. t. 1977, with very large long-petiolate leaves, female spikes generally undivided. *β. rotundifolia*, with rotundate abruptly acuminate leaves. *γ. scabrella*; *Urtica scabrella*, Roxb. Fl. Ind. iii. 581; Wight Ic. t. 691, with small leaves, flower-spikes as long as leaf or shorter.

Outer ranges of the Himalaya, ascending to 7500 ft. Parismath in Behar. East Bengal, hills of South India and Ceylon, Indian Archipelago, Japan and China. Fl. April-Aug.

4. *B. macrophylla*, Don Prodr. Fl. Nep. 60; DC. Prodr. xvi. i. 209.—Syn. *Urtica penduliflora*, Wall.

A shrub or small tree, branchlets four-sided, and strigose with short adpressed hairs. Leaves 6-12 in. long, lanceolate, obtusely serrate, soft-

pubescent beneath, upper side rough, the substance of the leaf projecting in raised angular plots between the impressed veins, basal nerves 3, the side nerves extending through three-fourths of the length of leaf, the midrib pinniveined in its upper part. Stipules lanceolate, with a prominent hairy midrib, petioles strigose, 1 in. long. Flowers monoicous, in long drooping axillary simple spikes; the clusters of flowers in the axils of lanceolate bracts.

Kamaon, Nepal, Sikkim, ascending to 4000 feet. Kasia hills. Fl. Aug.-Sept.

The true nettles (*Urtica*, *Girardinia*, *Laportea*) differ from *Boehmeria* and its allies by stinging hairs and the perianth of the female flower being 2-4 cleft, not tubulose. *Girardinia heterophylla*, Dne. in Jacq. Voy. Bot. t. 153—Syn. *Urtica heterophylla*, Willd. Vern. *Keri*, Jhelam; *Kingi*, Chenab; *Ein*, sanoli, Ravi; *An, jān, kal*, Bias; *Kārla, bhābar*, Sutlej; *Awa, alla, chichru, bichua*, N. W. Himalaya, is a large gregarious forest weed, multiplying exceedingly on rich soil; covered all over with long stinging bristles, leaves large, dentate, pinnatifid, 3-lobed, and sometimes entire, stipules ovate, flowers dioicous, in branching, more or less glomerate, paniculate spikes, female perianth of two unequal segments, nuts flat, ovate, acute, 1-2 lines long, glabrous, shining, surrounded by a mass of bristles, with which the ramifications of the panicle are thickly set. Himalaya, 2500 to 8000 ft. Kasia hills. Fl. July, Sept. Closely allied, and perhaps not specifically distinct, are *G. palmata*, Wedd., DC. Prodr. xvi. i. 101—Syn. *G. Leschenaultiana*, Dne., with large cordate stipules, edge of leaves cut into long lanceolate triangular teeth—Nilgiris; and *G. zeylanica*, Dne.; DC. Prodr. ibid.—Syn. *Urtica heterophylla*, Roxb. Fl. Ind. iii. 586, Wight Ic. t. 687; female panicles when in fruit short compact, irregularly reniform, but sometimes cylindric, stipules ovate—Burma (abundant in the forests of the Pegu Yoma, particularly in the Zamayi), Mount Abou, Western Ghats, and the Konkan, Ceylon. The *Nilgiri nettle* includes both *G. palmata* and *G. zeylanica*. These 3 species (or varieties) yield a fine and strong fibre, which is made into twine and ropes. Coarse cloth is made of it in Sikkim.

*Laportea crenulata*, Gaudich.; Bedd. Fl. Sylv. t. 306—Syn. *Urtica crenulata*, Roxb. iii. 591; Wight Ic. t. 686—*Mealum-ma* of Sikkim, is a large shrub, with glossy penniveined entire or crenulate leaves, 6-18 in. long, flowers dioicous, female perianth minute, campanulate, 4-lobed; numerous minute poisonous hairs on young shoots, which make the handling and even the vicinity of the plant extremely painful, the effects lasting for days. It is a remarkable fact that the sting of this plant is poisonous only in autumn (Hook. Him. Journ. ii. 188). East Bengal, Burma, evergreen forests of the western coast; Ceylon and Java. Ropes are made of the fibre. Well known to children in Europe is the burning sting of *Urtica dioica*, Linn.; Hook. Stud. Fl. 332, a perennial herb of Europe, and the temperate regions of the northern and southern hemisphere (Kashmir and Kunawar in the N.W. Himalaya).

### 3. *POUZOLZIA*, Gaudichaud.

Shrubs or herbs, usually with alternate leaves. Flowers monoicous, rarely dioicous, in sessile axillary clusters or spikes, the male and female flowers usually intermixed. Male flowers: perianth 4-5-lobed or partite, segments valvate in aestivation. Stamens 3-5. Pistil rudimentary. Female flowers: perianth tubular or ovoid, narrowed at the 2-4-toothed mouth. Ovary included, usually free, 1-celled with a solitary erect or ascending ovule; style laterally stigmatose, filiform, deciduous. Nut enclosed in the persistent, sometimes winged perianth.

1. *P. viminea*, Wedd. ; DC. Prodr. xvi. i. 228.—Syn. *P. ovalis*, Miq. *P. borbonica*, Wight Ic. t. 2100.

A small shrub with slender virgate branchlets ; branches, petioles and nerves on the under side of leaves, strigose. Leaves alternate, ovate-lanceolate, pale beneath, acuminate, dentate with large acute teeth, rough with numerous minute raised points, blade 3-6, petiole  $\frac{1}{2}$ -1 in. long ; basal nerves 3, extending to three-fourths the length of leaf. Flowers monoicous, in sessile axillary clusters, with numerous ovate bracts.

Kamaon, Nepal, Sikkim, ascending to 5000 ft. Bhutan, Assam, Kasia hills, Chittagong, Burma, Java. Fl. June-Sept. In Sikkim the leaves are eaten.

*Sarcochlamys pulcherrima*, Gaudich.—Syn. *Urtica pulcherrima*, Roxb. Fl. Ind. iii. 588, is a large shrub with beautiful, alternate, serrate, lanceolate leaves, grey beneath, shining but rough above, with 3 longitudinal nerves, joined by regularly transverse reticulate veins, blade 6-12, petiole 1-2 in. long ; flowers dioicous, in short axillary recurved panicles, 2 from each axil, composed of short glomerate spikes, female perianth obliquely campanulate, the mouth lateral, 4-toothed. Assam, Silhet, Chittagong, Burma, forming in Pegu, with *Blumea grandis*, *Buddleia*, and other fast-growing large herbs and shrubs, the dense thicket which springs up on deserted Toungyas. (Tsatyaben, Burm.)

#### 4. DEBREGEASIA, Gaudich.

Shrubs with rough serrate alternate leaves. Flowers monoicous or dioicous, the male clustered, the female in small heads. Male flowers : perianth 4- rarely 3-partite, segments valvate in aestivation. Stamens 4 or 3. Pistil rudimentary. Female flowers : perianth tubular, dilated below, with a narrow 4-toothed mouth, more or less adnate to the 1-celled ovary. Ovule solitary, suberect ; stigma sessile, tufted. Fruit a small drupe, the outer fleshy layer resulting from change during maturation of the perianth and outer stratum of the ovary. Albumen copious.

Flower-heads in dichotomous cymes . . . .	1. <i>D. longifolia</i> .
Flower-heads sessile or subsessile . . . .	2. <i>D. bicolor</i> .

1. *D. longifolia*, Weddell in DC. Prodr. xvi. i. 235<sup>24</sup>.—Syn. *Conoccephalus niveus*, Wight Ic. t. 1959. *Missiessya velutina*, Wedd.

A large shrub, branchlets pubescent and often with long scattered hairs. Leaves lanceolate, serrate, upper side rough, under side grey with soft pubescence of fine adpressed hairs, penniveined, the lowest pair of lateral nerves from the base, blade 4-6, petiole 1 in. long. Flowers monoicous, in small heads, on dichotomous axillary cymes, numerous bracteoles mixed with the flowers. Male perianth longer than bracteoles. Fruit yellow, of numerous minute, pointed fleshy berries.

Kamaon, Nepal, Sikkim, ascending to 5000 ft. Kasia hills, Burma (common on deserted Toungyas), South India, Ceylon, Java. Fr. Oct.-Jan.

2. *D. bicolor*, Wedd. l. c. 235<sup>25</sup>.—Syn. *D. hypoleuca*, Wedd. *Missiessya hypoleuca*, Wedd. *Urtica bicolor*, Roxb. iii. 589. *Boehmeria salicifolia*, Don Prodr. Fl. Nep. 60. Vern. *Kharwala*, *shakai*, Afg. ; *Chainchar*, *chainjli*, *chenjūl*, *umrer*, *sandāri*, Jhelam ; *Sansaru*, *sūs*, Chenab ; *Siāru*,



*sihāru*, *tulsiāri*, east of Ravi; *Pincho*, *prīn*, Upper Sutlej; *Tushiāri*, Kamaon.

A large shrub, branchlets and petioles with soft grey tomentum. Leaves lanceolate or linear-lanceolate, shortly petiolate, serrate, upper side rough with numerous minute round elevated dots, under side white, with soft densely matted tomentum, penniveined, the lowest pair of lateral nerves basal. Flowers monoicous, in round axillary sessile or subsessile heads, numerous bracteoles mixed with flowers. Male perianth outside white-tomentose, as long as bracteoles. Fruit yellow, of numerous minute pointed fleshy berries.

Afghanistan. Salt range. Common, generally in valleys near water, in the North-West Himalaya east to the Sarda river, ascending to 5000 ft., and extending up the Sutlej valley as far as Wangtu. Fl. March, April; fr. June-Aug. Twine and ropes are made of the fibre.

*Villebrunea frutescens*, Blume; DC. Prodr. xvi. i. 235<sup>a</sup> (Syn. *Urtica frutescens*, Thunb.; Roxb. Fl. Ind. iii. 589, and *Boehmeria frutescens*, Thunb.), is a shrub, with slender pubescent branches, ovate, acuminate, serrate leaves, concolor or white beneath, 3-nerved, the midrib penniveined in the upper half of leaf, blade 2-4, petiole 1-2 in. long. Flowers dioicous, in sessile or subsessile compact heads, lateral, below the leaves, numerous bracteoles between the flowers. Fruit of many minute dry ovoid nuts, the base surrounded by the connate, half fleshy bracteoles.—Kamaon, Vern. *Gur tushiara* (?), Madden, Nepal, Sikkim, ascending to 5000 ft., Bhutan, China, Japan.

#### 4. **MAOUTIA**, Weddell.

Shrubs, with alternate triplinerved leaves, hoary-tomentose beneath. Flowers monoicous or dioicous, clustered or capitate, the clusters loosely and irregularly cymose, cymes usually in pairs from the axils. Male flowers: perianth 5-partite. Segments valvate in aestivation. Stamens 5. Pistil rudimentary. Female flowers: perianth usually 0. Ovary ovoid, with a solitary suberect ovule; style short; stigma sublateral persistent. Nut slightly compressed or trigonous, outer stratum slightly fleshy. Al-bumen thin.

1. **M. Puya**, Wedd.—Syn. *Urtica Puya*, Wall. *Boehmeria frutescens*, Don Prodr. Fl. Nep. 59. *B. Puya*, Hook. Journ. Bot. iii. (1851) t. 7. Vern. *Poi*, *pūa*, N.W.P. See Madden in Journ. As. Soc. xviii. i. 622.

A shrub, branches with long soft hairs. Leaves elliptic, long-acuminate, dentate with large triangular teeth, white beneath with densely matted hairs, 3 prominent basal nerves, blade 3-6, petiole 1-2 in. long, stipules axillary, deeply bifid. Flowers monoicous, in small round heads, either unisexual or composed of male and female flowers mixed, the flower-heads in axillary dichotomous panicles shorter than petioles, with slender branches. Female flowers without perianth. Nuts triquetrous.

Garhwal, Kamaon, Nepal, Sikkim, ascending to 4000 ft. Kasia hills. Burma, hills east of Toungoo above 2500 ft. (D. B.) Fl. May-July. Cloth and fishing-nets are made of the fibre. Regarding this and other Nettle-fibres, see Royle, Fibrous Plants of India.

## 6. MORUS, Linn.

Trees or shrubs with alternate, simple leaves and deciduous stipules. Flowers unisexual, monoicous or dioicous; male flowers in deciduous spikes, female flowers in spikes or heads. Perianth in male flower always deeply 4-parted, in female flower of 4, sometimes of 2 or 3 segments or distinct leaves. Stamens 4, opposite to and longer than perianth-segments, inserted around a minute rudimentary ovary, anthers 2-celled, introrse, opening longitudinally, filaments flattened at base. Ovary 1-celled or 2-celled, one cell smaller and often without an ovule, otherwise one ovule in each cell. Fruit a compound berry, consisting of the succulent perianths, enclosing each a 1-seeded carpel with a thin membranous, afterwards gelatinous pericarp. Embryo curved in a fleshy albumen.

Perianth of female flowers of 4 leaves or segments, the 2 inner flat or concave, the 2 outer more or less keeled.

Female flower-spikes short ovoid.

Leaves acute; styles short, free, glabrous or slightly hairy

1. *M. alba*.

Leaves long-acuminate; styles long, hairy, connate to one-fourth their length

2. *M. indica*.

Female flower-spikes long, cylindric

3. *M. laevigata*.

Perianth of female flowers of 2-4, generally 3, equal, oblong segments

4. *M. serrata*.

Bureau, in the xvii. vol. of De Candolle's Prodrômus, unites all these under *M. alba*, but maintains *M. nigra* as a distinct species. The matter seems to demand farther inquiry on the spot in India.

1. *M. alba*, Linn.—Tab. XLVII.—Roxb. Fl. Ind. iii. 594; DC. Prodr. xvii. 238; Reichenb. Fl. Germ. t. 657.—Syn. *M. tatarica*, Linn. *Mulberry*. *Mûrier blanc*, Fr.; *Maulbeerbaum*, Germ.; *Moro*, It. Vern. *Tût, tûl, tûlklu, chînni, chûn*.

A middle-sized deciduous tree, youngest branchlets, petioles, and under side of leaves along nerves slightly pubescent. Leaves ovate, base often cordate, dentate, frequently lobed, blade 2-3 in., petiole  $\frac{1}{2}$ -1 in. long, 3 basal nerves, middle nerve penniveined. Fl. monoicous, the sexes often on distinct branches (Willkomm). Female spikes pedunculate, peduncle as long as spike or nearly so, perianth and style glabrous or slightly ciliate. Perianth-segments of male flower elliptic. Styles distinct, varying in length. Fruit white or red, sweet.

From this species *M. nigra*, Linn.; Reichenb. Fl. Germ. t. 658—the *Black Mulberry*; *Gelso nero*, It.—is distinguished by tomentose broader more firm and thick leaves, often 5-nerved, short-pedunculate or subsessile female flower-spikes, perianth and styles densely hairy, and purple, acidulous and sweet fruit. Male and female fl. on distinct branches, often dioicous (Willkomm). I do not venture to decide whether *M. atropurpurea*, Roxb. l. c. 595, with long cylindric dark-purple fruit, brought to Calcutta from China, should be referred to *M. alba*, of which Bureau makes it a variety.

The Mulberry is commonly cultivated in Afghanistan, Beluchistan, abundantly

in the Peshawar valley and the northern part of the trans-Indus territory. Also in the Panjab plains, in Kashmir and the North-West Himalaya, ascending in Ladak to 11,000 ft. Likewise in Europe, Western, Central Asia, and China. The home of the *Black Mulberry* is unknown; it is stated to be wild in Persia and Afghanistan (classic writers were familiar with the tree, which was early introduced to Greece, and thence to Italy). The black is a larger tree than the white *Mulberry*; both are hardy in England. In Eastern Europe *M. nigra* is more tender than *M. alba*. The home of the *White Mulberry* is probably China; it was not known to ancient writers, and was introduced into Europe in the fifteenth century (Hehn *Kulturpflanzen*, 283). In North India the tree is leafless during the cold season, the new leaves appear from the middle of February to March or even to April—there is great variation in that respect; and trees are often seen bare, while others close to them are in full leaf. Fl. March, April; the fruit ripens May, June, later of course at great elevations. Attains 30-40 ft., with an erect trunk 6-8 ft. girth (occasionally 10-12), one in the Salt range 16 ft. Bark grey or light brown, with shallow furrows. Sap white, soft, heartwood yellow, yellowish-brown or reddish-brown, with distinct annual rings, which, as in the *Ash*, are marked by an inner belt of large pores close together, forming the spring wood, the outer belt being wider, with small, scanty, but uniformly distributed pores. Medullary rays numerous, showing in a vertical section like narrow horizontal bands. Polishes well, and is a strong useful wood, much employed for building, furniture, and agricultural implements. Also used in boat-building on some of the Panjab rivers. Weight of the European wood 38-56 lb. The twigs are tough and strong, in Kashmir they are used for binding loads. The leaves are largely used as fodder, particularly for sheep and goats. In Kashmir the tree is important for feeding the silkworm, and the felling of trees even in private gardens is prohibited.

The chief product of this tree, however, in the Panjab, Beluchistan, and Afghanistan, is the fruit, of which there are many varieties, sweet and acid, and of all shades of colour, from white to a deep blackish purple. The large white kind of the Peshawar valley (*Shah tūt*) is one of the best. The following kinds are cultivated in Beluchistan, according to Stocks: *Shah*, colour black and white mixed; *Bedana* (seedless); *Pewandi* (grafted), with delicious pearly small white fruit; *Shah tūt* (Royal *Mulberry*); *Khar tūt* (Jackass *Mulberry*). It remains for farther inquiry on the spot which of these varieties should be classed under *M. alba* and *nigra*, and it is not impossible that it may, in the Panjab and Afghanistan at least, be found impracticable to maintain the distinction between the two species. In Kashmir and Afghanistan the fruit furnishes a considerable portion of the food of the inhabitants in autumn, and much of it is dried and preserved.

2. *M. indica*, Linn.; Roxb. Fl. Ind. iii. 596.—Syn. *M. parvifolia*, Royle. Sans. *Tula*. Vern. *Tul*, Pb.; *Tūtri*, N.W.P.; *Tūt*, Bengal.

A deciduous shrub or small tree; buds, stipules, and youngest leaves with long hairs. Leaves pubescent when young, rough afterwards with minute round raised dots, ovate, long-acuminate, sharp-serrate, often deeply lobed, with 3 basal nerves, midrib penniveined, blade 2-5 in., petiole  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long. Male fl. short - pedicellate, perianth - segments elliptic, hairy as well as pedicel and peduncle. Female fl.: spikes short-ovoid, on slender peduncles about half the length of spike; leaves of perianth obovate, with broad white edges; styles long, hairy, connate to about one-fourth their length. Fruit small, ovoid or subglobose, black when ripe. Dr Stewart considered this as merely a variety of *M. alba*. Farther researches on the

spot will perhaps confirm this view; the question is, whether the characters here stated—long-acuminate leaves, connate styles, and the shape of perianth-segments—are constant or not.

Not uncommon wild in the sub-Himalayan tract and outer hills of the Panjab and Kamaon, ascending to 5000 and occasionally to 7000 ft. Wild in the valleys of Sikkim, ascending to 4000 ft. China, Japan. This is the Mulberry which is generally cultivated as a low shrub in Bengal, Burma, and in places in the peninsula for its leaves, which are used to feed the silkworm. Fl. Feb.; fr. May. Grows sometimes into a small tree, 20-25 ft. high, with 16-18 in. girth. Bark grey. Wood hard and close-grained.

3. *M. lævigata*, Wall.—Syn. *M. glabrata*, Wall. Vern. *Tūt*.

A middle-sized or large deciduous tree; stipules and bud-scales with long soft hairs, extremities and youngest leaves slightly pubescent. Leaves glabrous, smooth or slightly rough, ovate, short-acuminate, sometimes lobed, base often cordate, blade 3-7 in., petiole about 1 in. long, basal nerves 3, midrib pinniveined with 4-6 pairs of main lateral nerves. Flowers in long, drooping, short-pedunculate spikes, peduncles hairy. Male fl. sessile, perianth-segments concave, very hairy outside, filaments slightly dilated at base. Female fl.: perianth of 4 glabrous, rotundate, concave segments; styles slightly connate at base, papillose, otherwise nearly glabrous.

Wild and cultivated in the Himalaya from the Indus to Assam, ascending (in East Nepal) to 4000 ft. Burma (evergreen forests, Thoungyeen, D.B., March 1859). Cultivated (scarce) on the Soane in Behar. Fl. Nov.-March; fr. March-May. The fruit is long, cylindrical, yellowish-white, sweet but insipid.

4. *M. serrata*, Roxb. l. c. 596.—Syn. *M. pabularia*, Dne. in Jacq. Voy. Bot. t. 151. Vern. *Krūn*, *karūn*, *tūt*, *kāura*, *karu*, *tūlūkāl*, *tūlklu*, *soā*, *ān*, *shā*, *chīmu*, *kimu*, Pb.; *Kimu*, *himu*, N.W.P.

A large deciduous tree with scaly buds; branchlets, petioles, and young leaves soft-pubescent or tomentose. Leaves broad-ovate, acuminate, often lobed, edge deeply cut with large acute serratures, stipules broad-lanceolate, blade 2-8 in., petiole 1-2 in. long. Flowers (dioicous, Madden) in short-pedunculate cylindrical spikes, male spikes 1-2 in., female spikes  $\frac{1}{2}$  in. long, peduncles soft-tomentose, with long hairs. Male fl.: perianth-segments elliptic-oblong, very hairy outside; filaments tapering from a broad flat 1-nerved base. Female fl.: perianth-segments 2-4, commonly 3, equal, ciliate, styles connate at base, very hairy. Fruit not very fleshy, mucilaginous, sweet, purple.

Common wild locally, in many parts of the N.W. Himalaya, generally from 4000 to 9000 ft., descending in places to 2500 ft. Cultiv. up to Chergaon in Kumaon. The young leaves come out in May; fl. April, May; fr. June-Aug. Attains 60-70 ft., with an erect trunk of great girth, 9-10 ft. not uncommon. Dr Stewart noted several of 20 ft., and one, a magnificent specimen, at the Hindu temple, Barnaor on the Ravi, in the Chamba State (elev. 7000 ft.), of 28 ft. girth. Growth apparently slow, annual rings distinct. Bark pale greyish-brown, with a reddish tinge, smooth or rough with irregular shallow vertical

fissures, not running into each other. Sometimes the outer bark peels off in scales, somewhat similar in appearance to the bark of *Asculus indica*. Heart-wood yellowish or dark reddish-brown, with white medullary rays. Easily worked, not heavy, polishes beautifully, and might answer for cabinet-work. Is used for agricultural implements, toys, troughs, and similar articles. The tree is often lopped for cattle-fodder.

*Broussonetia papyrifera*, Vent. ; DC. Prodr. xvii. 224 ; Bot. Mag. t. 2358, the *Paper Mulberry*, is a middle-sized dioicous tree, with ovate dentate leaves, the upper side rough, the under side soft-tomentose, male flowers in cylindrical catkins, female flowers in compact, tomentose heads, from which project, at the time of maturity, long fleshy stalks, bearing 1-seeded carpels. The leaves of young trees and root-suckers are often lobed. Japan, China, Polynesia, Siam. Hardy in England, also in France and Western Germany. Wood light-coloured, even-grained, not hard and not heavy. The *Tapa*-cloth of the South Sea Islands is made of the inner bark ; in Japan paper is made of it, particularly the thick paper for the eggs of the silkworm ; and in Siam and Burma the thick blackened card-boards, used like slates in Europe for accounts and other writing. (*Pala-baik* Burm.) In February 1859 I found it growing apparently wild, on the Salween river (lat. 18° 40') near Kolodo and Dahguin zeik, at the borders of the Karenee country. This useful tree seems to accommodate itself readily to different conditions of climate, and might advantageously be cultivated in North-West India.

## 7. STREBLUS, Loureiro.

Tree or shrub with alternate coriaceous distichous leaves and small lateral early deciduous stipules. Flowers dioicous, male in shortly pedunculate axillary clusters, female singly pedunculate. Male fl. : perianth 4-partite, segments imbricate, stamens inflexed in aestivation. Female fl. : perianth 4-phyllous, segments dry concave concealing the ovary. Ovary 1-celled with a solitary pendulous ovule, stigmas 2 filiform. Fruit globose, enclosed in the accrescent perianth. Albumen none.

1. *S. asper*, Lour. ; Bedd. Fl. Sylv. Anal. gen. t. 26. — Syn. *Trophis aspera*, Retz. ; Roxb. Fl. Ind. iii. 761 ; *Epicarpurus orientalis*, Blume ; Wight Ic. t. 1961. Vern. *Jindi*, Pb. ; *Siora, sihoura, kar-channa, rusa*, Oudh, N.W.P. ; *Barranki, barinika*, Tel.

A rigid shrub or a small scraggy tree with dark-green foliage, branchlets hairy, all parts full of milky juice. Leaves short-petiolate, elliptic or obovate, 2-4 in. long, penniveined, irregularly dentate, rough on both sides with minute raised round dots ; stipules obliquely lanceolate. Flowers dioicous. Male fl. in short-petiolate globose heads, with a few bracteoles at the base ; perianth campanulate, 4-fid, pubescent outside. Female fl. solitary, on slender peduncles, longer than flower, supported by 2 bracteoles ; perianth 6-fid, closely imbricate, two opposite segments inside, two outside ; styles two, long-filiform, connate at the base. Fruit a yellow 1-seeded berry, partly enclosed in the enlarged perianth.

\* Sub-Himalayan tract west to the Bias river. Oudh forests, Banda, Behar, Bengal, South India, Ceylon, Burma, Siam, and Indian Archipelago. Generally in dry open forests, often on poor soil. Male trees generally more abundant than female trees. The leaves are renewed in March. Fl. Jan.-March; fr. May-July. Attains 20 ft., with a short erect trunk, 3-4, rarely 6 ft. girth. Bark  $\frac{1}{2}$  in. thick, grey, greenish-white or brown, smooth, with faint ridges, rough when old, with small corky exfoliating scales. Inner substance milky, composed of greenish-white, reticulate, soft silky fibres. Wood white, tough and elastic, no distinct heartwood. Weight 42 $\frac{1}{2}$  lb. (Kyd), 45 lb. (Skinner). Value of P. 570 (Kyd), 604 (Skinner). A good hedge-plant, coppices well, and has been recommended for the production of fuel. The twigs are used as tooth-brushes, and the leaves to polish wood and ivory. In Siam paper is made of the bark. The leaves are lopped extensively for fodder. The milky juice is used medicinally, the berries are greedily eaten by birds.

*Phytloclamys spinosa*, Bureau in DC. Prodr. xvii. 218—Syn. *Taxotrophis Roxburghii*, Blume Mus. Bot. Lugd. Bat. ii. 78; Bedd. Fl. Sylv. Anal. gen. t. 26; *Trophis spinosa*, Roxb. l. c. 762; *Epicarpurus spinosus*, Wight l. c. 1962—Vern. *Sukali*, Tel, is a small tree on the hills of the Coromandel coast and farther south in the peninsula, with straight axillary, often leaf- and flower-bearing spines, male fl. in sessile heads, female fl. solitary, short-pedunculate, perianth of 4 lanceolate tapering leaves, enlarged in fruit, and much longer than the yellow cup-shaped berry, from which the seed, enclosed in a thin endocarp, protrudes in a way similar to the seed of *Taxus*, whence the name of *Taxotrophis* (uniting the characters of *Taxus* and *Trophis*).

### 8. FICUS, Linn.

Trees or shrubs, juice usually milky. Leaves alternate, rarely opposite, entire or lobed; stipules amplexicaul, usually deciduous. Flowers unisexual, minute, on the inside of a hollow, globose ovoid or pear-shaped receptacle, commonly called a fig, supported at the base by 3 or 4 bracts, the mouth of the receptacle closed by numerous scales in several rows, the inner scales turned inwards, those of the outer row more or less erect. Numerous bractlets generally between the flowers. Receptacles usually androgynous, male flowers few, near the mouth, rarely numerous, mixed with the female flowers, or in separate receptacles. Perianth thin, colourless, hyaline or membranous or subcoriaceous, and then frequently red, of 3-6 segments or distinct leaves, the segments of the female perianth often narrow, and sometimes very thin or entirely wanting. Stamens 1 or 2, rarely more, and then opposite to the perianth-segments; anthers generally of two distinct cells, versatile or basifixed. Ovary 1-celled, very rarely 2-celled, style usually lateral, short or filiform; stigma terminal, peltate, or long, penicillate, or bifid. Receptacles either in the axils of leaves, generally in pairs, or clustered on leafless but often bracteate racemose or paniculate branches on the old wood. The fruit generally requires several months to ripen; it consists of the enlarged, generally fleshy receptacle, often stalked, with the bracts at the base of the stalk, enclosing numerous minute seed-like nuts, often surrounded by the persistent membranous or succulent perianth. Embryo curved in a fleshy albumen.

A large genus, comprising upwards of 600 species, of which more than 60 are Indian. *Orostigma*, *Covellia*, and other genera, established by Gasparri and



Miquel, are now reunited with *Ficus* in the enumeration of species published by Miquel in the third volume of *Annales Musei Bot. Lugduni Batavi*, 1867.

I. Receptacles axillary, usually in pairs; the ripe fruit often in the axils of fallen leaves.

Receptacles sessile or subsessile; leaves glabrous or hairy, never rough; male fl. monandrous; stigma elongated, feathery (subgenus *Urostigma*).

Main lateral nerves 4-15 pair, prominent.

Petioles short, less than one-fourth the length of blade.

Roots from branches numerous, growing into supports and secondary stems; fruit pubescent, red when ripe

Roots from branches not numerous; fruit tomentose, grey when ripe

1. *F. bengalensis*.

2. *F. tomentosa*.

Petioles one-third or one-half the length of blade.

Fruit sessile; main lateral nerves 8-12 pair; fruit white when ripe

3. *F. infectoria*.

4. *F. Wightiana*.

Fruit on short peduncles; main lateral nerves 6-8 pair

Petioles long, exceeding half the length of blade; fruit black when ripe.

Point (acumination) of leaf linear, 1-3 in. long; petiole generally as long as greatest breadth of leaf

5. *F. religiosa*.

Point of leaf subulate,  $\frac{1}{2}$  to 1 in. long; petiole shorter than greatest breadth of leaf

6. *F. cordifolia*.

7. *F. retusa*.

Main lateral nerves numerous, slender

Receptacles pedunculate; leaves generally rough; male fl. often 2-3-androus; stigma generally bifid. (These spp. belong to various subgenera, the characters and limits of which are not yet exactly defined.)

Petioles between one-fourth and one-half the length of leaf.

Leaves generally lobed; branchlets pubescent or glabrous

8. *F. Carica*.

Leaves dentate, not generally lobed; branchlets tomentose

9. *F. virgata*.

Petioles less than one-fourth the length of leaf.

Leaves elliptic-oblong or ovate.

Leaves elliptic-oblong; main lateral nerves 7-10 pair

10. *F. parasitica*.

Leaves ovate; main lateral nerves 4-6 pair

11. *F. scandens*.

Leaves oblong-lanceolate, long-acuminate

12. *F. trachycarpa*.

II. Receptacles on leafless racemose or paniculate branches from the old wood; generally on the trunk; male fl. generally monandrous, perianth of 3-4 large hyaline segments, enveloping each other; female perianth none or small, or very thin and transparent (subgenus *Coccolia*).

Leaves alternate.

Leaves short-petiolate, very unequal-sided, the lower lobe of the base rounded, projecting

13. *F. Cunia*.

Leaves not unequal-sided; petioles 1-4 in. long.

Leaves lanceolate

14. *F. glomerata*.

Leaves broad-ovate, with deeply cordate base

15. *F. Roxburghii*.

Leaves opposite

16. *F. hispida*.

1. *F. bengalensis*,\* Linn.—Syn. *F. indica*, Roxb. Fl. Ind. iii. 539;

\* There is some doubt as to what tree was intended by Linnæus under the name of *F. indica*, and I follow Miquel in calling the *Banyan*, *F. bengalensis*, though Roxburgh referred it to *F. indica*, Linn. The tree which Miquel refers to *F. indica*, Linn., is mentioned at p. 415.

*Frostigma bengalense*, Gasp. ; Wight Ic. t. 1989. *Banyan*.—Sans. *Vata*. Vern. *Bor, bar, bera, bargat*, Hind. ; *War*, Bombay.

A large tree with spreading branches, sending down numerous slender roots, which descend to the ground and afterwards become trunks. Leaves alternate, approximate near the ends of branches, ovate, entire, obtuse, base cordate or rounded, 3-5-nerved, the midrib with 4-6 pair of main lateral nerves, joined by fine transverse reticulate and distinct intramarginal veins, coriaceous, smooth above, soft-tomentose pubescent or glabrate beneath, blade 4-8, petiole 1-2 in. long, a broad smooth gland at the top of the petiole on the under side ; stipules sheathing, leaving annular scars on branchlets. Receptacles sessile, axillary, each receptacle supported by 2-4, more or less connate, broad obtuse bracts. Male and female fl. in the same receptacle mixed with long linear bracteoles ; perianth 3-4-parted, male fl. monandrous. Fruit globose, pubescent, red when ripe,  $\frac{1}{2}$  in. diam.

Commonly planted by Hindoos throughout India, as far north as Peshawar, in the outer Himalaya as high as 4000 ft. Wild in the forest tracts of the sub-Himalayan tract, Oudh, Bengal, and Central India, irregularly distributed, common in places, and wanting in others. In North India the leaves are renewed in March and April ; the fruit ripens April, May, and remains long on the tree ; the young foliage has a brownish colour. The Banyan sends down aerial roots from the branches to a greater extent than any other *Ficus* ; they root in the ground and grow into trunks, which serve as a support for the horizontal branches, and as feeders, thus gradually increasing the diameter of the crown. Many specimens are known in Bengal with the crown 200-300 ft. in diameter and larger. Grows 70-100 ft. high, the main stem generally of moderate girth. In North-West India the rootdrops are much less numerous and strong than in the moister and warmer climate of Bengal and the peninsula, but the trunk attains a large size, 25 or 30 ft. girth being not uncommon, and trees exist even in the dry climate of the Panjab, with numerous rootdrops covering considerable areas. The bark is 1 in. thick, grey, but darker coloured than that of the Peepul, smooth and even, with circular shallow furrows, inner bark pale-red, fibrous. The bark of old stems often exfoliates in flat roundish scales. Wood open-grained, not durable, whitish, with concentric wavy bands of lighter-coloured tissue. Medullary rays numerous, distinctly marked. Pores large, few, often in pairs ; the cub. ft. weighs 30-36 lb., and Skinner gives the value of P. at 600. Hindoos do not generally fell the tree, but the wood is occasionally used for boxes, door-panels, and is said to be valued for well-rings. The rootdrops are tough and elastic, and are used for tent-poles, poles for carrying loads, also for cart-yokes. A coarse brown cordage is made of them, which the Sikhs used largely for slow-matches for their matchlocks. Birdlime is prepared from the acrid milky juice ; when dried it has the form of dark-brown lumps. Brahmans use the leaves as plates, and leaves and twigs are a favourite fodder of cattle and elephants. Lakh is collected from the tree in some parts of the eastern and central Panjab and in Ceylon, not in Sindh. The fruit is sweetish, and is eaten during times of scarcity ; it is greedily devoured by birds. The leaves are applied to bruises, and the bark is used in native pharmacy. Like other sp. of *Ficus*, the Banyan often grows from seeds left by birds in the fork of another tree, whence it sends down aerial roots, which gradually form a network of thick woody roots or stems, enclosing the trunk of the parent tree, which is buried in the mass of the *Ficus*, and at last perishes. Trees killed in

this manner by epiphytic *Ficus* are called *Nyaungthat* in Burma. The Toddy palm (*Borassus flabelliformis*) is often seen thus encircled by the *Ficus*, the crown alone appearing.

2. *F. tomentosa*, Willd.; Roxb. l. c. 550; Wight Ic. t. 647.—Syn. *Urostigma tomentosum* and *obversum*, Miquel; Hook. Journ. Bot. vi. (1847) 573.

A large tree, throwing out roots from the branches, which do not, however, grow large; branchlets, petioles, and under side of leaves grey-tomentose. Leaves coriaceous, elliptic or obovate-oblong, acute, base cordate, lateral nerves 6-8 pair, the lowest pair basal; transverse and intramarginal veins distinct; blade 3-7, petiole  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long. Receptacles axillary, in pairs, tomentose. Fruit  $\frac{1}{4}$  in. across, grey, woolly, supported by 3 large tomentose bracts.

Banda district, Behar, and probably Satpura range. Western Ghats of Canara and Mysore.

*F. mysorensis*, Roth.—Syn. *Urostigma mysorensis* and *dasyacarpum*, Miq., is closely allied, but has larger oblong fruit and 12-15 pairs of main lateral nerves. A large tree, yielding excellent shade, in Malabar, Canara, and the Konkan. Ceylon. Common in the western forests of Mysore.

3. *F. infectoria*, Willd.; Roxb. Fl. Ind. iii. 551; Wight Ic. t. 665.—Syn. *F. venosa*, Ham.; *Urostigma infectarium* and *U. Tjakela*, Miq. l. c. 566, 567. Sans. *Plaksha*. Vern. War, var, *batbar*, *jangli pipli*, *palākh*, *trimbal*, Pb.; *Pīlkhān* (also in Pb.), *ramanjūr*, N.W.P.; *Pakhar*, *pakharia*, Oudh, N.W. and C.P.; *Keol*, *kaim*, *khavar*, *pakri*, *sohun pāhar*, C.P.

A large tree, young shoots slightly pubescent. Leaves coriaceous, glabrous, shining, abruptly acuminate; main lateral nerves 8-12 pair, alternating with shorter intermediate nerves, the lowest pair from the base; blade 4-8 in., petiole 2-3 in. long. Receptacles sessile, axillary, in pairs, each supported by 3 small bracts. Style filiform, stigma long, penicillate. Fruit globose,  $\frac{1}{4}$  in. diam., white when ripe.

Not uncommon on the lower hills of the Suliman range trans-Indus, in the Salt range, the Siwalik tract, and outer Himalaya, ascending to 4000 ft. in the Panjab, to 5000 ft. in Kamaon. Common in the Oudh forests, Bengal, Burma, and the Central Provinces. West side of the peninsula from the Konkan to Malabar. The leaves are renewed between Feb. and April; the fruit ripens May, June, and often remains on the tree until the ensuing year's fruit is formed. Attains 40-50 ft., trunk short, irregularly shaped, not rarely sending down single roots from stem or branches. Often found as an epiphyte on other trees. Bark grey, even, but exfoliating in long strips; inner substance fibrous, tough, milky. Wood reddish or brownish-white. The cub. ft. weighs 30 lb. Not durable. The young shoots are eaten in curries, and the leaves are used as fodder for cattle and elephants. A good avenue-tree, grows rapidly, quicker than *Siris*.

4. *F. Wightiana*, Wall.; Benth. Fl. Hongk. 327.—Syn. *Urostigma Wightianum* and *perseafolium*, Miq. in Hook. Journ. Bot. vi. (1847) 566, 567.

A large tree, wholly glabrous. Leaves ovate-oblong, shortly acuminate; main lateral nerves 6-8 pair, with intermediate slender ones, the lowest

pair basal, intramarginal veins distinct; blade 3-6 in., petiole 1-1½ in. long. Receptacles axillary, in pairs, sometimes in the axils of fallen leaves, pedunculate, peduncles 1 line long. Fruit subglobose, ½-¾ in. diam, supported by very small bracts.

South India, Ceylon, Hongkong. I refer to this sp. specimens collected by R. Thompson in the Baraich forests of Oudh ("a small tree"). Dr Stewart, however, referred them to *Urostigma Pseudo-Benjaminum*, Miq. l. c. 566, which he, as well as Beddome, Manual Fl. Sylv. 223, identify with *F. comosa*, Roxb. Cor. Pl. t. 125; Fl. Ind. iii. 552. *F. comosa* is described and figured by Roxb. with slender, often pendulous branchlets, and oval, long-acuminate leaves tapering into a slender petiole about 1 in. long. Fruit contracted at the base, rich deep yellow or purple when ripe, the size of a gooseberry. Tinnevely hills and mountains on the east side of the peninsula.

This group of Indian figs to which *F. Wightiana* and *comosa* belong, demands further study on the spot. Nearly allied to them are the two following species: 1. *F. Tsiela*, Roxb. l. c. 549; Wight Ic. t. 868; Bedd. Fl. Sylv. t. 314; Miq. Ann. Mus. Lugd. Bat. iii. 286—Syn. *Urostigma Pseudo-Tiela*, Miq. (1847) 566. A large tree with smooth bark, wholly glabrous, leaves ovate, long-petiolate; lateral nerves slender, numerous, some more prominent than the others; fruit turbinate, purple when ripe. Bengal, mountains of South India. 2. *F. indica*, Linn. Syst. Veg. 922; Miq. Ann. Mus. Lugd. Bat. iii. 287—Syn. *U. Tiela*, Miq. Hook. Journ. Bot. vi. 580, with thick-coriaceous, shining, short-petiolate leaves. East Bengal, Burma, Philippine Islands.

5. *F. religiosa*, Linn.; Roxb. Fl. Ind. iii. 547; Bedd. Fl. Sylv. t. 314.—Syn. *Urostigma religiosum*, Gasp.; Wight Ic. t. 1967. *Peepul*. Sans. *Pippala*. Vern. *Pipal*, Hind.; *Pipro*, Panch Mehals; *Rari*, Telugu; *Baude nyaung*, Burm.

A large tree wholly glabrous, with irregularly-shaped trunk and wide-spreading branches. Leaves drooping, coriaceous, shining, broad-ovate, 3-4 in. broad, edge undulate, with a long narrow acumen (1-3 in. long), basal nerves 5-7, midrib penniveined, basal and lateral nerves anastomosing by close and prominent reticulate veins, petiole slender, generally as long as greatest breadth of leaf. Receptacles sessile, generally in pairs, axillary, each receptacle supported by 3 obtuse pubescent bracts, often splitting as the receptacle expands. Male and female flowers in the same receptacle, mixed with lanceolate bracteoles; perianth 3-4-parted, male flowers monandrous. Fruit subglobose, somewhat flattened, ½ in. across, dark purple when ripe.

Commonly planted by Hindoos throughout India, and by Buddhists in Ceylon and Burma. This tree is peculiarly sacred to the Buddhists. Rare in the arid tract of North-West India. In the outer Himalaya planted trees are found as high as 5000 ft. Wild in the forests of the sub-Himalayan tract, Bengal, and Central India. Not indigenous in Burma. In North and Central India the tree is leafless during a short time, generally only for a week or two; the leaves are renewed between February and April, the young foliage is reddish. The fruit ripens during the hot season, in April, May in the Panjab, and sometimes as late as Oct., Nov. (Centr. Prov., R. Th.) Attains 80-90 ft., trunk short, most irregularly shaped, fluted and buttressed, of large girth, 25-30 ft., not uncommon, Stewart mentions a tree 25 ft. girth at 5000 ft. in Chamba, and another of 36

ft. in Sindh. The roots spread wide near the surface, and are often above ground. Bark thick, light-grey, smooth, on old trunks rough with large exfoliating scales, inner substance red, fibrous, milky.

The seed of the Peepul, like that of the Banyan, often germinates on roofs, walls, and on other trees. The Peepul is particularly destructive to buildings. It is often found as an epiphyte on *Dalb. Sissoo*, *Bauhinia purpurea*, and other trees. *Loranthus* and other parasites are not generally found on this species or on *F. infectoria* and *glomerata*. The wood is pinkish-white, with narrow concentric bands of lighter colour, open-grained, not strong or durable. Medullary rays marked, showing like narrow horizontal bands on a vertical section. Pores few, large. The cub. ft. weighs 44½ lb. (Cunningham, Gwalior), 34 (Skinner); the value of P. is 458 according to Cunningham's, and 584 according to Skinner's experiments. The tree, being sacred, is rarely felled; the wood is used as fuel and to make packing-cases. In Central India the young leaf-buds are eaten as a vegetable by the hill tribes during times of scarcity, the twigs and leaves are a favourite fodder of elephants; Roxburgh states that silkworms like the tender leaves of this tree next to the Mulberry leaves. Stick-lakh is largely produced on the Peepul in Central India. Apart from being a sacred tree, it is planted on account of its dense shade, and is easily raised from seed and cuttings. In the Panjab cuttings do not succeed so well as those of the Banyan. Grows more rapidly than *Sissoo*, *Siris*, or even *Albizia procera*. At high elevations (4000 ft.) the extremities are often nipped by frost. The leaves, bark, and fruit are officinal in native medicine. The skeleton leaves are used for painting by the Chinese artists.

6. *F. cordifolia*, Roxb. l. c. 548 (not Blume\*).—Tab. XLVIII.—Wight Ic. t. 640.—Syn. *Urostigma cordifolium*, Miquel in Lond. Journ. Bot. vi. (1847) 564. *Ficus populiformis*, Schott; Miquel Mus. Lugd. Bat. iii. 287, perhaps *F. terminalioides*, Griffith, and *afinis*, Gr. Ic. Pl. As. t. 550, 553. Vern. *Rūmbal*, *palāk*, *badha*, *pil Khan*, Pb.; *Kābar*, *gajūn*, *gajua*, *pīpal*, N.W.P.; *Gajāira*, Oudh; *Pakar*, *khavar*, C.P.; *Pakri*, Assam; *Pār*, Bomb.

A large tree. Leaves wholly glabrous, shining, ovate, acuminate, with rounded or cordate base, edge undulate, basal nerves 3-5, midrib pinnately-veined, basal and lateral nerves joined by closely reticulate and distinct intramarginal veins, prominent in young, less distinct in old leaves, blade 4-5, petiole 2-3 in. long. Receptacles sessile, axillary, in pairs, each supported by 3 bracts, male and female flowers in the same receptacle, perianth 3-4-parted, male flower monandrous. Fruit globose, black when ripe, ½ in. diam.

Wild; here and there, not common, in the Siwalik tract and outer Himalaya, ascending to 5000 ft., and extending west to the Chenab. Bengal, Central India, and Western Ghats near Bombay. The leaves are renewed in March, and the fruit ripens in May and June. Attains 40-50 ft., trunk short, of irregular shape, deep-furrowed and fluted, girth 7-8 ft., branches numerous, spreading. Resembles *F. religiosa* on a small scale. Often epiphytic, embracing

\* *F. cordifolia*, described from Java by Blume (Bijdragen, 1825, 438), has priority, as Roxburgh's *Flora*, though written early this century, was not published until 1832, but has, according to Miquel Mus. Lugd. Bat. iii. 260, not been found since Blume's time. Under these circumstances, Roxburgh's well-known name for a well-known tree may be permitted to stand for the present, pending a revision of this difficult genus.

other trees and killing them. Bark 1 in. thick, yellowish grey, longitudinally wrinkled, with hard scales exfoliating. Wood pinkish white. The leaves are used as cattle-fodder. The fruit is eaten. In the Durrung district of Assam it is cultivated for rearing the lakh insect (G. Mann).

7. *F. retusa*, Linn.; Benth. Fl. Hongk. 327; Fl. Austr. vi. 166.—Syn. *F. Benjamina*, Roxb. l. c. 550. *F. nitida*, Thunb.; Wight Ic. t. 642. *F. pallida*, Wall. (!) *Urostigma pisiferum* and *ovoideum*, Miq. in London Journ. Bot. vi. (1847) 581.

A large handsome tree with dense foliage, wholly glabrous. Leaves coriaceous, shining, oval or obovate, acute or short-acuminate, blade 2-3 in. long, narrowed into petiole  $\frac{1}{2}$  in. long; main lateral nerves numerous, slender, not very prominent. Fruit subglobose,  $\frac{1}{2}$  in. diameter, sessile, axillary, solitary or in pairs, purple when ripe, with small yellowish specks (Roxb. Fl. Ind.); the Ill. in Hb. Kew, No. 688, has greyish yellow fruit.

Kamaon (Kosilla valley at 3000 ft., Strachey & Winterbottom), Banda, Bengal, South India, Ceylon, Indian Archipelago, Burma, China, North Australia, Queensland. Dense shade, makes an excellent avenue-tree. Specimens collected in Oudh, not seen by me, identified by Dr Stewart with this species, are described by R. Thompson as from a small epiphytic tree, with full dark-green foliage.

*F. Benjaminea*, Linn., has slender drooping branches, elliptic or broad-ovate, shortly petiolate leaves, elegantly marked with numberless fine parallel lateral veins, close together, and joined along the edge by a distinct intramarginal vein. Fruit  $\frac{1}{4}$  in. diameter. East Bengal, Burma, Indian Archipelago, Queensland. This species, as well as *F. retusa*, is called *Nyauing-thabieh* (*Eugenia Ficus*) in Burmese.

*F. elastica*, Blume; Bijdragen tot de Flora van Nederlandsch Indie, 446; Roxb. Fl. Ind. iii. 541; Wight Ic. t. 663; Griff. Ic. Pl. As. rar. t. 552—the Assam Caoutchouc-tree—vern. *Borgach*, *attah bar*, Assam; *Kagiri*, Kasia (Griffith); *Kasmir*, Silhet (Roxb.),—is a large tree, with irregularly-shaped stem and spreading branches, from which roots descend to the ground. The leaves are thick-coriaceous, shining, elliptic, midrib very prominent, with numberless straight parallel fine lateral veins, nearly at right angles to the midrib, blade 3-6 in. long, on seedlings and root-shoots much longer, stipules long, sheathing, rose-coloured. Fruit ovoid, greenish yellow, the size of an olive. Sub-Himalayan tract from Sikkim to the extreme eastern boundary of Assam, foot of the hills at the head and on the south side of the Brahmaputra valley. Pandua and Jantipur hills, which bound the Silhet valley on the north. The tree towers above the surrounding forest; Griffith (Journ. As. Soc. vii. i. 1838, 132) describes a specimen, 100 ft. high, circumference of main trunk 74 ft., of trunk and supports 120 ft., of area covered by the branches 610 ft. The Assam Caoutchouc, when pure, is a superior article, but it seems certain that Para rubber, the produce of several species of *Hevea* (p. 445), retains its firmness longer and is more suitable for work requiring great elasticity and power of resistance. In Assam, however, it is often mixed, not only with pieces of bark, wood, sand, stones, but also with the milk of other species of *Ficus* which is inferior in quality.

*F. elastica* is a free and rapid grower, easily propagated by cuttings, and its cultivation in Assam on a large scale will doubtless prove successful. In Germany, where it is commonly grown as an ornament of drawing-rooms, it was formerly known under the name of Berlin weed. It is cultivated in gardens throughout the tropics and as an avenue-tree in Java. In that island, however, it seems also to be indigenous; Blume (l. c.), in 1825, states that it grows on



limestone, gives the vernacular names as *Karet*, *karet tapok*, and describes a variety, *bengalica* (introduced from Calcutta\*), with acuminate, undulate leaves. In the Preface to Rumphia, ii. (1836), he says that the Java tree is capable of yielding Caoutchouc. Miquel, Fl. Ind. Bat. i. ii. 348, makes three species—*Urostigma elasticum* (introduced), *U. Karet* and *odoratum* (indigenous in Java); but in his latter work, Ann. Mus. Lugd. Bat. iii. 287, he unites the three under *F. elastica*, Nois (evidently a misprint for Nobis in Blume). A species nearly allied to *F. elastica* is *F. macrophylla*, Desf. Queensland and New South Wales. There is no proof of *F. elastica* being indigenous in Australia. (Benth. Fl. Austr. vi. 170.)

*F. laccifera*, Roxb. l. c. 545; Wight Ic. t. 656,—vern. *Kathal Bat*, Silhet,—a large tree, wholly glabrous, with large, firm, shining, ovate or elliptic, short-acuminate leaves, petioles 1-2 in. long, with 3 basal and 4-8 main lateral nerves on either side of midrib, and numerous fine intermediate nerves between; fruit sessile, axillary, ovoid, the size of a gooseberry—is said to be tapped for Caoutchouc, like *F. elastica*. This tree grows in Assam, Silhet, the Andamans, Malabar (Beddome Man. 223), and probably in Burma; the Caoutchouc yielded by it merits farther examination. In Silhet Lakh is collected from its branches.

8. *F. Carica*, Linn.—*Fig-tree*. Vern. *Anjūr*. Local names: *Kimri*, *fāgu*, *fagūri*, *fagūri*, Pb.

A middle-sized deciduous tree, with glabrous, smooth, grey or brown branches, the branchlets of the current year pubescent. Leaves cordate, 3-5-nerved, dentate, and more or less deeply lobed, lobes obtuse, blade 4-8, petiole 2-3 in. long, upper side rough, under side tomentose; stipules early deciduous. Receptacles pedunculate, axillary, turbinate, narrowed into a stalk, and supported at the base by a few membranous, early deciduous bracts. The receptacles which appear first, in the lower axils, are androgynous, containing a few male, with numerous female flowers, those which appear later in the year, in the upper axils, only produce female flowers. Male fl. near the mouth of the fig, perianth-segments 3-5, stamens 1-5, generally 3, filaments longer than perianth. Female fl.: perianth-segments 3-5, ovary sometimes 2-celled, style lateral, filiform, bifid at the top. Fruit, when ripe, yellow or dark purple, greatly varying in size and colour.

Cultivated in the plains of N.W. India, and in the outer hills of the N.W. Himalaya, as high as 5000 ft., also in the Dekkan. Cultivated largely in Beluchistan and Afghanistan, and said to be wild about Kandahār. Cleghorn (Panjab Forests, 177) states that Figs are indigenous (but small) in Kughan. The Fig-tree is indigenous in Syria and Palestine, and its cultivation in those countries is as old as that of the vine. In South Europe it is completely naturalised, and is not uncommonly found in an apparently wild state. Hardy in England. In the Panjab the fruit generally ripens from May to August. Bark whitish or light grey, smooth or finely rugose. Wood soft, white with a yellowish tinge. Figs are an important article of food in Western Asia. In Afghanistan, numerous varieties are cultivated (*makkai* with black, *sada* with white fruit). The Figs grown in India are generally poor. Dried Figs are used extensively in native pharmacy (Pharm. Ind. 215). Gasparrini, an Italian botanist, studied the classification of the genus, the varieties of the (apparently) wild and cultivated Figs, and the process of

\* Blume may have received the name *F. elastica* from the Bot. Garden, Calcutta, but it is not included in Roxburgh's Hortus Bengalensis, and the Flora Indica did not appear until 1832, so that Blume must stand as the authority.

caprification, an old practice, by which it was supposed that the setting and ripening of the Fig was promoted. He established the genera *Urostigma* and *Covellia* (p. 412), and divided the common Fig-tree (*F. Carica*) into two genera, *Ficus* and *Caprificus*, each of which he subdivided into numerous species. Gasparrini distinguishes *Caprificus*, which comprises the wild Figs, the fruit of which is not eatable, from *Ficus* by the 3-partite female perianth, and the ovary always 1-celled, but the minute sexual organs of this genus, which develop themselves in a crowded state, pressing against each other, while the delicate parts of the flower are being formed, present great variation and irregularity, the limits of which for each species are as yet only imperfectly known. The kind called by Gasparrini *Caprificus* is generally inhabited by an insect (*Psenes caprifici*), and it was an old practice in Greece, described by Aristotle and Theophrastus, to plant the Capri Fig by the side of the Fig, or to suspend the fruits of the one to the branches of the other, the supposition being that the insect enters the unripe fruits of the domestic Fig and causes them to set or accelerates their ripening. This practice of caprification seems to have spread to South Italy from Greece, and it is still practised in parts of these two countries, as well as in Asia Minor, though it is unknown in Spain, the South of France, and, as far as I am aware, in Afghanistan and India. Numerous endeavours to explain the rationale of this practice have been made by scientific men ever since the time of Theophrastus, the generally accepted opinion being that the insect promotes the fertilisation of the Fig, making an opening by which the pollen escapes, or by carrying the pollen from the Figs with male flowers to those which have only female flowers. Against this stands the fact, that many kinds of Fig attain maturity with sterile seeds—that is, seeds in which the embryo has not been developed, and therefore fecundation is not an essential condition to the ripening of Figs. Gasparrini, however, not satisfied with general objections, made a series of interesting experiments, which he published in 1845, from which it would appear that caprification has no effect whatever on the ripening of the Fig, and that, however old the practice of Greek and Italian gardeners may be, its advantage or usefulness can in no way be established. Twenty years later (in 1865), the same author published the result of experiments, which he had undertaken to investigate another practice of the Neapolitan cultivators, called *puncturation*, which consists in anointing the mouth of the unripe Fig, when it has arrived at a certain size, with a very small quantity of olive oil. There is no doubt that this practice advances maturation by about ten days, and Gasparrini found that, while the application of other liquids was without any effect, most oils or fatty substances, as well as most acids (particularly tartaric and diluted sulphuric acid), if applied to the scales at the mouth of the fig, had the effect of considerably accelerating maturity. These remarkable experiments seem to suggest the possibility of an action by the insect upon the development of the fruit, which has not yet been discovered. English translations of these two interesting memoirs will be found in the Journal of the Horticultural Society of London, iii. 185, and New Series, ii. 1.

*Ficus Sycomorus*, Linn.—Syn. *Sycomorus antiquorum*, Gasp., is a large, spreading, very shady tree, common in Egypt and Abyssinia, planted in avenues near Cairo, and believed to attain a great age. Branchlets, petioles, and nerves hairy; leaves coriaceous, glabrate, upper side shining, broad-ovate with cordate base, entire or repand; basal nerves 3, midrib pinniveined. Receptacles on leafless paniculate branchlets from the trunk or larger boughs, male and female flowers in distinct receptacles. The wood was used by the old Egyptians for mummy cases.

9. *F. virgata*, Roxb. Fl. Ind. iii. 530; Wight Ic. 649.—Syn. *F. caricoides*, Roxb. l. c. 529; Wight Ic. t. 634 (probably). Vern. *Anjir*, *inzar*,

Afg. ; *Fāgu*, *fōg*, *fāg*, *faḡōru*, *dhūdi*, *dhūra*, *phedu*, *kak*, *kok*, *daholia*, Pb. hills ; *Fagwāra*, *thapur*, Pb. plains ; *Gūlar*, *khābāra*, *anjiri*, *beru*, *bedu*, N.W.P.

A small or middle-sized tree with hoary or pubescent branches, branchlets of the current year, as well as petioles, young shoots and young leaves soft-tomentose. Leaves rough above, soft-tomentose beneath, broad-ovate, dentate, not or very rarely lobed, 3 basal nerves, and 4-6 pair of main lateral nerves on midrib ; blade 3-5, petiole 1-2 in. long. Receptacles tomentose, pedunculate, axillary, pear-shaped, not stipitate when young, but when farther advanced narrowed into a stalk, which lengthens out and often attains  $\frac{1}{2}$  in., being supported at its base by 3-4 ovate membranous bracts, mouth half closed with numerous cordate ciliate scales ; peduncle  $\frac{1}{2}$ - $\frac{3}{4}$  in. long. Fruit yellow when ripe,  $\frac{1}{2}$ -1 in. diam. Leaves of this sp. sometimes slightly resemble those of *F. Roxburghii*, but these have more prominent transverse veins, and the upper surface always glabrous, never rough or tomentose. The branchlets of *F. Roxburghii* are hollow, those of *F. virgata* solid with large pith, like those of *F. Carica*. From *F. Carica* it is best distinguished by tomentose branchlets and the rarely lobed leaves, which are less rough than those of the common Fig. There is some doubt regarding *F. caricoides*, which is represented by Roxb. in Ill. Hb. Kew, 1730, with larger leaves and the fruit not, or very shortly stipitate.

Common wild on the eastern slopes of the Suliman range, ascending to 5000 ft., and in the plains of the trans-Indus territory, in the Salt range, the Siwalik tract, and outer hills, extending eastward to Nepal, and ascending to 5000 ft. (on the Sutlej to 9000 ft.) Up to the upper limit in Kunawar. Oudh forests, plains of the Panjab. Cultivated in N.W. India, in Sindh, Beluchistan, and Afghanistan. The leaves are renewed in March, the fruit ripens June-Oct. The tree resembles *F. Carica* in habit so much as to be easily confused with it; the trunk is short, 6-7 ft. girth (one of 10 ft. noted by Dr S.), with a rounded bushy crown, but it often is only a shrub. Bark of a dull-grey colour (ashy white, Madden), very smooth, with only a few small scars and specks. In the plains the fruit is not generally eaten, in the hills it is eaten largely, and is often succulent, sweet, and pleasant.

10. *F. parasitica*, Koenig ; Thwaites Enum. 266 ; Miq. Ann. Mus. Lugd. Bat. iii. 292.—Syn. *F. Ampelos*, Koen. ; Roxb. Fl. Ind. iii. 553 ; Wight Ic. t. 652. *F. excelsa*, Vahl ; Roxb. l. c. 552.

A large tree, or epiphytic on other trees. Leaves rough on both sides, or on the under side only, short-petiolate, elliptic-oblong, entire, main lateral nerves 7-10 pair, joined by reticulate and distinct intramarginal veins, blade 5-6, petiole  $\frac{1}{4}$  in. long. Receptacles pubescent, in pairs, axillary, pedunculate. Male flowers few, monandrous, perianth-segments 3-5, linear, hairy. Female flowers : perianth of 5-6 long, linear, hairy segments ; style lateral, short, stigma indistinctly lobed. Fruit yellow when ripe, subglobose,  $\frac{1}{4}$  in. diam.

Kamaon, at the foot of the hills, Banda, Behar, Bengal, South India, Ceylon. Often epiphytic, encircling the stems of other trees with its anastomosing roots. The leaves are used to polish ivory (Roxb.)

11. *F. scandens*, Roxb. l. c. 536; Wight Ic. t. 643. (Not *F. scandens*, Roxb. of Stewart Pb. Plants, 214.)

A climbing shrub; leaves coriaceous, rough on both sides, or on the under side only, short-petiolate, ovate, entire, main lateral nerves 4-6 pair, with shorter intermediate nerves between, the lowest pair basal, joined by slender reticulate and intramarginal veins, blade 4-6, petiole  $\frac{1}{2}$ -1 in. long. Receptacles in pairs, axillary, pedunculate, but not stipitate, supported at the base by 3-4 ovate bracts. Male flowers few, monandrous; perianth of both sexes red, glabrous, of 4 linear segments. Style lateral, short, stigma 2-lobed. Fruit subglobose,  $\frac{1}{2}$  in. diam., yellowish-green when ripe, peduncle  $\frac{1}{2}$  in. long.

Kamaon, Parisnath in Behar, Eastern Bengal.

*Ficus radicans*, Roxb. l. c. 536; Wight Ic. t. 671—Syn. *F. urophylla*, Wall., is a scandent shrub with rooting stems, often epiphytic. Leaves short-petiolate, elliptic or elliptic-oblong, suddenly narrowed into a long linear apex, midrib, nerves and veins very prominent beneath, impressed on the upper side of leaf, main lateral nerves 3-4 on either side of midrib, anastomosing by stout intramarginal transverse and reticulate veins. Fruit axillary, subglobose, pedunculate,  $\frac{1}{4}$  in. diam., yellow or orange when ripe. East Bengal, Burma, Indian Archipelago.

12. *F. trachycarpa*, Miq. in Hook. Journ. Bot. vii. (1848) 430; Ann. 291.

A shrub or small tree, with rough branchlets. Leaves rough, short-petiolate, oblong-lanceolate, long-acuminate, dentate with large distant teeth, main lateral nerves 6-8 pair, arcuate, blade 4-6 in., acumen (tail) 1 in., and petiole  $\frac{1}{4}$  in. long. Receptacles axillary, solitary, short-pedunculate, male and female flowers in one receptacle. Male flowers: perianth gamophyllous, segments 3-5, hairy; stamens 1 or 2, anthers versatile, cells parallel, distinct. Female flowers: perianth-segments linear, ciliate, generally 5. Ovary stipitate, style short, lateral, bifid at the top, but early deciduous. Fruit ovoid,  $\frac{3}{4}$  in. long, rugose with a very uneven surface, on short peduncle.

Sutlej valley near Rampur, Kamaon, ascending to 5000 ft. Sikkim, Kasia hills, Burma. Fr. May, June.

13. *F. Cunia*, Buch.; Roxb. l. c. 561; Wight Ic. t. 648; Miq. Ann. Mus. Lugd. Bat. iii. 296.—Vern. *Kheumau*, Garhwal; *Khūrūr*, Oudh; *Kassā*, Gorakhpur; *Ghūi*, C. Prov.

A small or sometimes a large tree, branchlets scabrous. Leaves alternate, bifarious, unequal-sided, oblong-lanceolate, acuminate, serrate, rough on both sides, under side soft-tomentose while young, base semicordate, the lower half forming a large rounded, projecting, 3-nerved lobe; main lateral nerves 8-12 pair, with prominent transverse veins, blade 6-15, petiole  $\frac{1}{2}$  in. long. Fruit turbinate, ribbed, pedunculate, in pairs or in threes, in long leafless paniced racemes from the trunk, often several feet long.

Sub-Himalayan tract, ascending to 4000 ft. in the outer hills, and extending west to the Chenab. Oudh forests, in ravines and water-courses. East Bengal, Parisnath, Coromandel coast, Burma. The principal crop of the fruit ripens in

Aug., Sept. In Oudh it only attains 12 ft., with a girth of 2 ft. It is said that the leaves are used for polishing wood. The fruit is eaten.

*F. conglomerata*, Roxb. l. c. 559, Wight Ic. t. 669, is probably the same species; it is said to differ by shorter leaves and sessile receptacles.

14. *F. glomerata*, Roxb.—Tab. XLIX.—Cor. Pl. t. 123; Fl. Ind. 558; Wight Ic. t. 667.—Syn. *Covellia glomerata*, Miq. Sans. *Udumbara*. Vern. *Kāthgūlar*, *krūmbal*, *rumbal*, *kakammal*, *dadhūri*, Pb.; *Gūlar*, *paroa*, *telka*, N.W.P.; *Gūlar*, Oudh, Banda; *Umar*, *Umrāi*, *tue*, C.P.; *Thapan*, *yay thapan*, Burm.

A middle-sized or large tree, youngest shoots pubescent. Leaves lanceolate, glabrous when full-grown, entire, under side pale, and covered with minute green dots, main lateral nerves 6-8 pair, the lowest pair near the base, blade 4-6, petiole 1-2 in. long. Receptacles pedunculate, downy, in short thick paniculate clusters on the trunk and larger branches. Male flowers few, near the mouth of receptacle, perianth of broad, very thin, hyaline segments closely enveloping each other, enclosing 1 or 2 unequal stamens, filaments short, connate at the base. Female flowers mostly long-pedicellate. Fruit subglobose, 1-2 in. diam., downy, red or orange coloured when ripe.

Salt range (rare), Siwalik tract and outer Himalaya. Common in Oudh and the Gangetic plain. Bengal, Central and South India. Generally on the banks of streams and rivers. North Australia and Queensland (Benth. Fl. Austr. vi. 178). Often planted, also in the plains of the eastern Panjab. The fruit generally ripens from April to July; the leaves are renewed between Jan. and April. Attains 40-60 ft., and a girth of 5-8 ft., with a short stem and large spreading branches. Stewart measured an old hollow tree in the Bias valley of 14 ft. girth, and trees 80-100 ft. high have been reported from the Sutlej. Bark  $\frac{1}{2}$  in. thick, grey or brown, without cracks or furrows, but in old trees occasionally rough from exfoliating scales. Wood reddish or brownish grey, no distinct heartwood, the cub. ft. weighs 36.26 lb. (Cunningham, Gwalior), 26.5 lb. (R. T., Cent. Prov.) From Cunningham's experiments, the value of P. appears to be between 403 and 513. Lasts well under water, but is otherwise not durable. It is used for well-frames. The tree abounds in milky juice, from which bird-lime is made; the leaves are used for cattle- and elephant-fodder. The ripe fruit is eaten; in times of scarcity the unripe fruit is pounded, mixed with flour, and made into cakes. Leaves, bark, and fruit are used in native medicine.

15. *F. Roxburghii*, Wall.; Miq. Ann. Mus. Lugd. Bat. iii. 296.—Syn. *F. macrophylla*, Roxb. Fl. Ind. iii. 556 (not Desf.); Wight Ic. t. 673. *F. sclerocarpa*, Griff. Ic. Pl. As. t. 558 (!) *Covellia macrophylla*, Miq. Hook. Journ. Bot. vii. 465. Vern. *Urbūl*, *urmūl*, *baru*, *tūsi*, *trimbal*, *trūmal*, *tramal*, *tirmi*, *tiamle*, Pb.; *Trimmal*, *timal*, *timla*, N.W.P.

A middle-sized tree, with hollow branchlets; under side of leaves hoary or with soft grey pubescence. Leaves broad-ovate, with deeply cordate base, acute, irregularly dentate, 3 basal and 4-6 main lateral nerves on either side of midrib, joined by prominent transverse veins at right angles to basal and lateral nerves; blade 6-18 in. long, petiole 1-4 in. Fruit tubercled, hairy, yellowish green, tinged with red when ripe, turbinate, 1-2 in. long. 2-3 in. broad, marked with 8-12 longitudinal ridges, mouth closed with

numerous cordate scales, pedunculate, in clusters of 6-20, on short thick leafless branchlets, on the trunk and at the base of main branches.

Siwalik and outer Himalaya, ascending to 5000, and in places to 6000 ft., and extending west to the Indus. Silhet and Chittagong. Fruit ripens (in North India) March-May. Trunk short erect, dividing into a few stout branches, which spread into a broad shady crown. The leaves are valued as elephant- and cattle-fodder. The fruit is eaten and sold in bazaars; its flavour is not unpleasant. Wood heavier and harder than that of other species.

*F. triloba*, Ham.; Miq. Ann. Mus. Lugd. Bat. iii. 290—Syn. *F. hirsuta*, Roxb. Fl. Ind. iii. 528; Wight Ic. t. 670; *F. hirta*, Roxb. l. c. 531; *F. Roxburghii*, Miq. Lond. Journ. Bot. vii. 456, is a tree of Eastern Bengal, belonging to another section of the genus, branches leaves and receptacles densely clothed with ferruginous tomentum, leaves large, cordate or 3-lobed, fruit large, sessile, axillary, in pairs, hairy, of a rich yellow colour, ovoid, thick fleshy, supported at the base by 3 ovate acuminate bracts, perianth deeply 3-5-parted, red, male fl. diandrous.

16. *F. hispida*, Linn. fil.; Benth. Fl. Austr. vi. 176.—Syn. *F. oppositifolia*, Roxb. Cor. Pl. t. 124; Fl. Ind. iii. 561; Wight Ic. t. 638; Griff. Ic. Pl. As. t. 560. *F. demonum*, Koenig; Roxb. l. c. 562; Wight Ic. t. 641. Sans. *Kako dumbara* (the Crow's Udumbara). Vern. *Dadūri*, *degar*, *rūmbal*, Pb.; *Kāgsha*, *gobla*, *totmila*, Kamaon; *Kat gularia*, Oudh; *Dhēdu mera*, Panch Mehals.

A small or middle-sized tree, young luxuriant shoots hollow, nodes marked by annular scars, branchlets rough with short stiff hairs. Leaves all opposite, ovate- or obovate-oblong, entire or dentate, rough above, tomentose beneath, main lateral nerves 4-6 pair, the lowest pair from the base of leaf, joined by prominent transverse veins, blade 4-8 in., petiole 1-2 in. long. Receptacles pedunculate, sometimes axillary in pairs, more generally clustered on leafless, often long pendulous branchlets from the old wood on trunk and branches. Male flowers: a few near the mouth of receptacle, monandrous, perianth of 3 or 4 broad hyaline segments enveloping each other. Female flowers numerous, pedicellate; perianth thin and transparent; ovary stipitate, stigma large, funnel-shaped. Fruit obovoid, hairy, with 6 longitudinal ridges, 1 in. long, greenish when ripe.

Siwalik tract and outer Himalaya, ascending to 3500 ft., and extending west to the Chenab. Abundant (in moist ravines) in the Oudh forests. Common in Bengal and the Central Provinces. Panch Mehals, South India, Ceylon, Burma, Indian Archipelago, North Australia and Queensland. The leaves are renewed Feb., March; the fruit ripens April, May, and often remains long on the tree. Usually a small tree, but attains 60 ft. in Sikkim. Bark thin, grey or greenish, rough, inner bark milky. Wood coarse-grained, very light, 24½ lb. per cub. ft. P.=360 (Kyd). The acrid milk is used medicinally in Kangra. The tree is much lopped for cattle-fodder.

The following frutescent species of *Ficus*, which are found in the North-West Himalaya, may be briefly mentioned here: 1. *F. foveolata*, Wall. Cat. No. 4493; Griff. Ic. Pl. As. t. 561, ii.; scandent, branches often rooting, branchlets, petioles, under side of leaves and peduncles hairy, leaves short-petiolate, coriaceous, oblong-lanceolate, main lateral nerves 6-10 pair, alternating with shorter ones, all anastomosing by prominent reticulate and intramarginal veins. Fruit axillary, pedunculate but not stipitate, hairy, subglobose, supported at its base



by 3 membranous bracts. Style long filiform, undivided. Wangtu bridge, Sutlej valley, Kamaon, ascending to 7500 ft., Sikkim, Bhutan (a middle-sized tree, with red, fleshy fruit, Griff. It. not. 137), Kasia hills. Probably = *F. reticulata*, Miq. Ann. iii. 294 (identified with *F. scandens*, Roxb., in Stewart Pb. Plants, 214), and *F. Luducca*, Roxb. 534; Madden As. Soc. Journ. xviii. i. 644—Vern. *Kabra*, Almora.

2. *F. nemoralis*, Wall. Cat. 4517. Glabrous. Leaves membranous, lanceolate, long-acuminate, main lateral nerves arcuate, 10-16 pair, with numerous shorter intermediate ones, joined by very fine, distinct, but not prominent reticulate veins, blade 5-6, petiole  $\frac{1}{2}$  in. long. Male fl. numerous, mixed with females, 2-3-androus; perianth red, of 3-4 lanceolate segments, anthers large, basifixed, on short filaments; female perianth of 3-4 lanceolate subconcave segments; style short. Fruit globose,  $\frac{1}{2}$  in. diam., in pairs, pedunculate but not stipitate, supported at its base by 3 acute membranous bracts. Outer Himalaya, from the Jhelam to Sikkim, ascending to 7000 ft.

3. *F. pubigera*, Wall. Cat. No. 4518, identified by Miquel with *F. erecta*, Thunb. (Ann. Mus. Lugd. Bat. iii. 294). Extremities and petioles hairy. Leaves glabrous, or with floccose hairs beneath, oblong-lanceolate, entire, long-acuminate, main lateral nerves 8-10 pair, blade 5-8, petiole  $\frac{1}{2}$  in. long. Fruit hairy, globose,  $\frac{3}{4}$  in. diam., short-pedunculate but not stipitate. Kamaon, ascending to 3000 ft. Nepal, Sikkim, Assam, Kasia hills.

A remarkable shrub, of the subgenus *Covellia*, common on banks of rivers and in rocky river-beds in Sikkim, Kasia, the hills of Oudh and Kamaon, is (4.) *F. tuberculata*, Wall. Cat. No. 4539 (but not of Roxburgh). S. Kurz (Journal As. Soc. of Bengal, xlii. pt. ii. 1873, 106) identifies it with a similar shrub which grows in Pegu and Martaban (*F. pyrrocarpa*, Kurz), but the identity of the Burman and North Indian species seems doubtful. The North Indian shrub has rough and hairy branchlets, lanceolate opposite leaves, approximate near the ends of branches, 5-7 in. long, narrowed into a short hairy petiole, harsh on both sides with short adpressed hairs, stipules lanceolate, persistent, hairy; receptacles hairy, with circular raised tubercles, and a few scales on the outer surface, pedunculate, on short leafless bracteate panicles from the old wood; perianth of female fl. none or early caducous, style long filiform, hairy. Further inquiries may perhaps identify it with, either *F. lanceolata*, Buch., Roxb. l. c. 557; Miq. Ann. iii. 297, or *F. laminosa*, Hardwicke; Roxb. 531; Madden As. Soc. Journ. xviii. i. 643—Vern. *Chanherri*, the leaves used to feed cattle.

5. *F. heterophylla*, Linn. fil.; Roxb. Fl. Ind. iii. 532; Wight Ic. t. 659, is a straggling shrub, with alternate, short-petiolate, very rough leaves, either undivided oblong, or variously lobed. Receptacles axillary in pairs, pedunculate, yellow when ripe, with whitish scabrous spots. On the banks of rivers and in moist places generally. Oudh, Banda district (Edgeworth), Bengal, South India, Ceylon.

6. *F. repens*, Willd.; Roxb. l. c. 535; Wight Ic. t. 636, is a small scandent or procumbent shrub, with rooting stems, common in grass-lands of Oudh, Bengal, Burma and South India; leaves alternate, long-petiolate, very rough, ovate, often with cordate base, undivided or variously lobed. Fruit obovoid, narrowed into a long stalk, supported at the base by bracts, the stalk as long as or longer than the axillary solitary peduncle. Male fl. few, near the mouth of receptacle, monandrous, perianth of 4 hyaline oblong segments; female fl. numerous, perianth of 5 thin hyaline lanceolate segments; style short, undivided.

## 9. CUDRANIA, Trecul.

Spinose shrub with alternate leaves and axillary globose flower-heads. Flowers dioicous. Male fl.: perianth of 4-5 narrow segments, concave and obtuse above. Stamens 4, pistil rudimentary. Female fl. of 4 int-

bricate concave segments. Ovary free, 1-celled, with a solitary pendulous ovule; style simple, stigma filiform. Nuts free, enclosed in the consolidated fleshy perianth and receptacle; pericarp crustaceous. Albumen scanty or 0.

1. *C. javanensis*, Trecul; Benth. Fl. Austr. vi. 179 (not Wight Ic. t. 1960).—Syn. *Maclura javanica*, Blume Mus. Bot. Lugd. Bat. ii. t. 31. *Trophis spinosa*, Wall. Vern. *Mānda*, *mandei*, *kangu*, N.W.P.

A straggling shrub, armed with axillary, straight or curved, spines; branchlets pubescent. Leaves subcoriaceous, glabrous, short-petiolate, 1-4 in. long, elliptic or elliptic-oblong, acuminate, acute or obtuse, entire, pinnate and reticulate, but veins not prominent. Flower-heads pubescent, globose, axillary, solitary or 2 together, short-pedunculate, the males  $\frac{1}{2}$  in. diam., the females smaller at first, but increasing, when mature, to  $\frac{1}{2}$  in. or more. Male flowers closely packed, perianth leaves 3-5 distinct, often unequal, cuneate, the upper part concave and hairy outside. Filaments short, not inflexed in bud, inserted round a glabrous, subulate rudimentary ovary, anthers oblong, 2-celled. Female flowers crowded, more or less immersed in the fleshy receptacle. Leaves of perianth 4, upper part thickened and velvety. Style one, short, barely exserted. Fruit a compound, irregularly-shaped berry as large as a small Custard apple (Madden), formed of the enlarged fleshy perianths and receptacle, each perianth enclosing a one-seeded nut.

Dehra Doon, Garhwal, Rohilkhand, Nepal, Oudh, Sikkim, Kasia, Burma, Ceylon, Eastern Africa, Indian Archipelago, Queensland, and New South Wales. Fl. April-June; fr. Aug.-Nov. Bark smooth, yellowish brown or blackish, marked with white oblong lenticels. Wood used as fuel.

## 10. ARTOCARPUS, Linn.

Evergreen trees with milky juice; leaves alternate. Flowers monoicous. Male and female in distinct, globose or cylindrical heads. Male flowers: perianth 2-3-4-phyllous, segments free or connate, concave, imbricate in aestivation. Stamen 1, exserted. Female flowers: perianth tubular, entire, with a minute mouth. Ovary free, 1-locular (rarely 2-3-locular), with a solitary pendulous ovule; style terminal or lateral, simple or 2-3-fid, stigma various. Nuts enclosed in the persistent perianths, which are consolidated in a large fleshy syncarpium. Seed exalbuminous.

Nearly glabrous; branchlets with annular scars . . . . . 1. *A. integrifolia*,  
Extremities and under side of leaves grey-tomentose; branchlets  
without annular scars . . . . . 2. *A. Lakoocha*.

1. *A. integrifolia*, Linn.; Roxb. Fl. Ind. iii. 522; Wight Ic. t. 678; Bot. Mag. t. 2833, 2834. *Jack-tree*.—Sans. *Panasa*. Vern. *Kanthal*, *katol*, *kathal*, N.W. India; *Phanās*, Bombay; *Pein nayben*, Burm.

A large tree, glabrous, only youngest shoots with short stiff hairs; branchlets with annular raised lines, the scars of the stipules. Leaves coriaceous, smooth, shining above, rough beneath, elliptic or obovate, obtuse, midrib prominent beneath, with 7-8 main lateral nerves on either

side of midrib; blade 4-8 in., petiole  $\frac{1}{2}$ -1 in. long, stipules large, with broad amplexicaul base, sheathing in bud, early caducous; leaves of young plants and of shoots from the root often lobed. Flower-heads ovoid elongated, on short lateral branchlets, generally on the trunk or larger branches. Fruit large, hanging on short stalks, oblong, fleshy, with thick cylindrical receptacle and a muricated rind 12-30 in. long and 6-12 in. diam. Seeds reniform, oily.

Cultivated in N.W. India (rare in the Panjab, and not beyond Lahore), in Oudh, Bengal, Central and South India, Burma, Ceylon, and the Indian Archipelago. Regarding its native home, there is yet some uncertainty. Rumphius (*Herbarium Amboinense*, i. 106) states that it grows in the forests of Ceylon, like other forest trees, but Thwaites, *Enum. Pl. Ceyl.* 262, is of opinion that it cannot be considered truly indigenous. In the Indian Archipelago the tree is believed to be cultivated only, and in Burma, though the Jack is often found in large and dense forests (*e. g.*, in the Attaran district), yet I have only found it in the vicinity of deserted settlements. According to Wight l. c. and Beddome (*Fl. Sylv. Manual*, p. 219), the tree is wild in the mountain forests of the western Ghats, ascending to 4000 ft. Fl. Dec.-Feb.; fr. May-July. Attains 40-50 ft. with a short erect trunk of great girth, and a dense shady crown. Bark thick, often with deep cracks, inner substance soft. Sapwood white, heartwood yellow when fresh cut, reddish brown when seasoned, the wood of old trees somewhat resembling mahogany in colour and appearance. Takes a beautiful polish. Medullary rays sharply defined, light-coloured, of moderate width, pores large, uniformly distributed, each pore in a patch of yellow tissue, often in concentrically arranged patches or interrupted bands. Weight between 42 and 45 lb. per cub. ft. Value of P. 788, Skinner; between 513 and 889, Puckle; fracture splintery. Warps and cracks unless well seasoned. Used for carpentry and furniture, and imported into England for cabinet-work, turning, and for brush-backs. A yellow dye is made of the wood. The leaves, bark, and the rind of the fruit abound in a tenacious white milk, used as bird-lime. The fruit is an important article of food in Burma, South India, and Ceylon, the seeds are roasted and eaten. Young trees bear fruit on the branches, older trees on the trunk, and very old trees often at the base of the trunk near the root.

Other species with amplexicaul stipules and annular scars on branchlets are: 1. *A. Chaplasha*, Roxb. l. c. 525; Wight l. c. t. 682.—Vern. *Chaplash*, Beng. *Tain peinnayben* (Mountain Jack), Burm., a gigantic timber-tree of East Bengal and Burma, wood prized for canoes, structure similar to that of *A. integrifolia*. Leaves of young plants pinnatifid, of old trees entire; flower-heads globose, long-pedunculate; fruit globose, the size of a large orange. 2. *A. hirsuta*, Linn. Roxb. l. c. 521; Bedd. *Fl. Sylv.* t. 308; *Angeli wood*. Vern. *Heb Halsu*, Canar., a most valuable timber-tree of the evergreen forests of the western Ghats, male fl. in long cylindrical spikes; fruit ovoid, size of a large lemon, the tops of perianths enlarging and forming numerous hispid spines. Wood strong, close-grained, of a yellowish brown colour, highly prized for ship-building and other purposes, weight per cub. ft. 36-40 lb., P.=744. 3. *A. incisa*, Linn.; *Bot. Mag.* t. 2869-71, the *Bread fruit-tree*, a native of the South Sea Islands, but now introduced into most tropical countries; bears fruit on the western coast, in Ceylon, and in Burma. Leaves pinnatifid, with a connate base 1-2 ft. long, male fl. in club-shaped spikes.

2. *A. Lakoocha*, Roxb. *Fl. Ind.* iii. 524; Wight l. c. t. 681.—Sansk. *Lakucha*. Vern. *Tinn, dheu, daheo*, Pb.; *Dhan, dahū*, Kamaon; *Barhal*, Banda, Behar; *Déphul*, Bengal; *Myauklouk*, Burm.

\* A large tree; branchlets and under side of leaves with soft grey tomentum. Leaves coriaceous, oval or ovate, obtuse or short-acuminate, entire, blade 6-10 in., petiole  $\frac{1}{2}$ -1 in. long, upper side glabrous, shining, under side soft-tomentose, 10-14 pair of prominent main lateral nerves; stipules lanceolate, with a narrow base, not sheathing, deciduous. Flower-heads globose, axillary, the male subsessile, the female short-pedunculate. Fruit acid, of an irregular roundish shape, 3-4 in. diam., velvety, yellow when ripe.

Outer hills of Kamaon, ascending to 4000 ft. Sikkin, East Bengal, Burma. Evergreen forests of the western Ghats, Ceylon. Occasionally planted in the Siwalik tract of the Panjab, rarely in the plains. Attains 50-60 ft., with a short trunk of great girth. Bark  $\frac{1}{2}$  in. thick, light- or dark-grey, rough, but without cracks or furrows. Sapwood large, whitish, heartwood yellowish or dark red-brown, structure similar to that of *A. integrifolia*. Weight 40 lb. per cub. ft., D.B., Burma List, 1862. Used for furniture, in Burma canoes are made of it. The male flower-heads are pickled, and the fruit is eaten.

*Antiaris innoxia*, Blume—Syn. *A. saccidora*, Dalz. & Gibs.; Bomb. Fl. 244; Wight Ic. t. 1958; Bedd. Fl. Sylv. t. 307,—is one of the largest, Beddome says the largest tree of the evergreen forests of the western Ghats, and the hills between them and the coast. Found as far north as Kandala, also in Ceylon. Leaves elliptic-oblong, rough, short-petiolate; female flowers solitary, enclosed in an involucre of connate imbricate bracts, sessile, with 2 styles; male fl. crowded on a thick flat receptacle; fruit fleshy, purple, 1-seeded. Sacks are made of the thick woolly fibrous inner bark, described as follows in Graham's Catalogue, 193: "A branch is cut corresponding to the length and diameter of the sack wanted, soaked a little, and then beaten with clubs until the liber separates from the wood. This done, the sack formed of the bark is turned inside out, and pulled down, until the wood is sawed off, with the exception of a small piece left to form the bottom of the sack, and which is carefully left untouched." In Ceylon rope is also made of the bark.

Another sp. of the same genus is found in the dense evergreen forests of the Thoungyeen valley in Tenasserim (*Myah seik*, Burm.), the juice is used by the Karens to poison arrows, but the poison does not seem equal in its effects to that of the famous Upas tree of the Indian Archipelago (*Antiaris toxicaria*, Lesch.; Blume Rumphia, i. t. 23). The largest-tree which I ever measured in Burma belonged to this species; it grew in the evergreen forest of the Thoungyeen, was 250 ft. high, and had a girth of 38 ft., the trees of the surrounding evergreen forest having an average height of 200 ft. (Attaran Forest Report, 1860, p. 55). Beddome states that *A. innoxia* attains a similar size on the western Ghats.

The Caoutchouc exported from Mexico, Central America, the West Indies, and Ecuador is the produce of the *Ule* tree, *Castilloa elastica*, Cervantes, and perhaps a second species of the same genus. It is a superior article, and the introduction of the tree into India seems desirable. *C. elastica* is a large tree, branchlets and under side of leaves with long soft rust-coloured tomentum; leaves short-petiolate, oblong. Flowers monoicous, female flowers numerous, on plane circular lateral receptacles (Collins' Report on Caoutchouc, 1872, 11).

The *Palo de Vaca* or *Cow tree* of Caracas (*Galactodendron utile*, Kunth; Bot. Mag. t. 3723-24), a gigantic tree with coriaceous shining leaves, has been referred to the genus *Brosimum*. From incisions made in the trunk it yields large quantities of thick glucy milk without any acidity, drunk extensively, and very wholesome and nourishing. *Brosimum* has one female flower inside

a subglobose receptacle, covered on the outside with numerous stamens and peltate bracteoles. The *snake* or *letter wood* of the West Indies, Guiana, and Mexico, a beautiful heavy dark-coloured wood with small pores and numerous very fine medullary rays, which on a vertical section appear like linear bands with sharply defined and exactly parallel sides, is the produce of a tree of this genus, *Piratinera guianensis* of Aublet, the *Bois de lettres*, a large tree of Guiana, identified by Pöppig with *Brosimum Aubletii* of the Huallaga river in North Peru, and by Miquel with *Brosimum discolor*, Schott, a small tree of Brazil. Another species, *B. Namagua*, Seemann, of New-Granada and Central America, has a thick woody fibrous inner bark, which is made into beds, garments, and ropes, and used as sails in the native canoes (Hooker's Journal, iii. (1851) 269).

### 11. *CELTIS*, Tournefort.

Trees or shrubs, with alternate stipulate leaves. Flowers polygamous, in axillary or lateral cymes. Perianth deciduous, of 4-5 segments, imbricate in bud. Stamens as many as, and shorter than, perianth-segments, in the male flowers surrounding a rudimentary ovary inserted on a hairy disc. Ovary on a hairy disc, stigmata 2, sessile, deciduous. Fruit an ovoid or globose drupe, with a hard, coriaceous or bony kernel.

1. *C. australis*, Linn.—Tab. L.—Reichenb. Ic. Fl. Germ. 1338, t. 667.—Syn. *C. tetrandra*, Roxb. Fl. Ind. ii. 63; *C. caucasica*, Willd.; *Micondier*, Fr.; *Perlaro*, bagolaro, It.; *Zürgelbaum*, Germ. Vern. *Tagho-takhum*, Afg.; *Brimlu*, *khirk*, *khalk*, *khark*, *khirg*, *kū*, *roku*, *choku*, *bramji*, *batkar*, *kāi*, *bigni*, *biāgli*, Pb.; *Kar*, Kunawar; *Tagha*, Sindh; *Kharak*, *khavika*, *khirk*, N.W.P.

A middle-sized deciduous tree, with bifarious branches; young leaves, branchlets, and petioles hairy. Leaves ovate or ovate-lanceolate, unequal-based, acuminate, more or less rough when full-grown, serrate, the lower third of the leaf often entire, 3 basal nerves, the midrib penniveined, blade 3-5 in., petiole  $\frac{1}{2}$  in. long; stipules subulate, caducous, shorter than petiole. Flowers yellowish-white, tetramerous or pentamerous, bisexual flowers axillary, pedicels more than twice the length of petiole, the male flowers on shorter pedicels, in lateral fascicles or short racemes, below the leaves, or in the axils of the youngest leaves. Drupe ovoid,  $\frac{1}{2}$  in. long, putamen reticulate-rugose, seeds oily.

Afghanistan, ascending to 8800 ft. Suliman range trans-Indus. Salt range. Himalaya, ascending to 8500 ft., from the Indus to Bhutan. Kasia hills. Also in western Asia and the Mediterranean region. Upper limit on the Sutlej: Jangi right, Morung left bank. Frequently planted in the Panjab plains and the N.W. Himalaya, in Sindh and Beluchistan. Fl. March-May, before the leaves appear, or with the first leaves; fr. July-Sept. Attains 30-40 ft.; trunk short, straight, 6-8 ft. girth, one noted 16 ft.; branches spreading. Bark  $\frac{1}{2}$  in. thick, bluish-grey, or brown, smooth or rough with brown and whitish, often raised specks, not furrowed, but frequently with numerous small cracks and circular wrinkles, the trunk often appearing as if constricted with cords. Growth generally slow. Wood light-coloured, close- and even-grained, hard and tough, a continuous belt of large pores in the spring wood, other pores smaller, uniformly distributed, joined by narrow undulating often zig-zag lines of whitish tissue. Hardy in England.



\* In the North-West Himalaya churn-sticks are made of it, and it is used as fuel and for charcoal. The wood of the European *Celtis* varies much in weight—sp. grav. 0.66-0.88 (41 to 54 lb.)—though not so much as the wood of the Ash, which also has a continuous belt of large pores in the spring wood. In the south of France it is cultivated extensively in coppice-woods; oars, hoops, whip-handles, and similar articles requiring tenacity and elasticity, are made of it. In the Himalaya it is chiefly planted for shade and fodder, and the winter supply of hay is often stored in its branches. The bark is used for sandals (Oleghorn). The fruit is insipidly sweet and has not much flesh. It is eaten: a larger, blackish or dark purple kind is called *roku* on the Sutlej; a smaller, yellow or orange kind, *choku*.

Aitchison (Cat. 139) notes *C. caucasica*, Willd., from the Jhelam, the Salt range, Kashmir, Kamaon, and (cultivated) Sindh. My opinion is that all the *Celtis* of North-West India with glabrous fruit belong to one species, which I identify with *C. australis*, L.

*C. eriocarpa*, Decaisne in Jacq. Voy. Bot. t. 152, from Kamaon, differs from *C. australis* by ovate-lanceolate leaves and a pubescent ovary and drupe, but it seems doubtful whether it is specifically distinct. Stewart identifies this with *C. Acata*, Hamilton, and gives its distribution and vernacular names as follows: Eastern skirts of the Suliman range trans-Indus. Salt range 2000-3000 ft. Himalaya from the Indus south-eastward, ascending to 4500 ft., Kamaon, Nepal, and Oudh. Vern. *Tagha*, Afg.; *Batkar*, *bat taman*, Pb.; *Akata* (whence the specific name), *katāia*, Hindi.

*C. Roxburghii*, Planch.—Syn. *C. trinervia*, Roxb. Fl. Ind. ii. 65 (not Lam., which is a West Indian species), has subcoriaceous, ovate, acuminate, almost glabrous leaves, entire or dentate near the apex, fertile flowers often in pairs (on slender axillary racemes, Dalz. Bomb. Fl. 238). South India, Bengal, Burma. Dr Stewart states that this species is found (rare) in the Siwalik tract of the Panjab and Kamaon, also (not common) in the Central Provinces, and gives the following vernacular names: *Kharak*, *batkar*, *brūmaj*, *brāndu*, Pb.; *Cheri chara*, *kathūniār*, C.P. I have not seen specimens from N.W. and Central India.

In the xvii. vol. of De Candolle's *Prodromus*, Planchon refers the *Celtis* of North-West India to the following species:—

1. *C. caucasica*, Willd. Leaves oblique- or rhomboid-oblong-ovate, acuminate, triplinerved. Stipules linear, longer than petioles of young leaves, ovary slightly pubescent at the base of the style; kernel slightly reticulate. Caucasus, North Persia, Cabul, Beluchistan, Salt range, Kashmir.

2. *C. eriocarpa*, Decaisne. Leaves lanceolate; drupes grey-tomentose. Panjab.

3. *C. tetrandra*, Roxb. Leaves subcoriaceous, ovate or ovate-oblong cuspidate, with an unequal-sided base, triplinerved, drupe wholly glabrous, kernel slightly rugose. Kamaon, Nepal, Silhet, Nilgiris ("common, vern. *Adona*"), and to this species he refers the following as synonymous: 1. *C. glabra*, Planch. Kamaon. 2. *C. serotina*, Planch., Wight Ic. t. 1970. 3. *C. Acata*, Hamilton in Trans. Soc. Linn. xvii. 201. Bengal, Behar. 4. *C. nepalensis*, Planchon. Kamaon, Tenasserim, Andamans. He does not say that he identifies with it 5. *C. Roxburghii*, Planch. Ann. Sc. Nat. iii. series x. 302 (*C. trinervia*, Roxb.), but seems to imply that it belongs to this species (*Prodr.* xvii. 179).

## 12. SPONIA, Comm.

Trees with alternate 3-nerved serrate leaves. Flowers monoicous, in axillary cymes. Perianth persistent, tube short, limb of 5 segments, concave, induplicate in bud, slightly overlapping, nearly valvate. Stamens



5, longer than perianth. Fruit a minute drupe, supported by the persistent perianth, and crowned, while half ripe, by 2 short stigmatose styles.

Leaves rough on both sides, oblong-lanceolate; male cymes compact, as long as petiole

1. *S. politoria*.

Leaves soft-tomentose beneath, ovate; cymes spreading, longer than petiole

2. *S. orientalis*.

1. *S. politoria*, Planch.; DC. Prodr. xvii. 202.—Syn. *Celtis politoria*, Wall. Vern. *Bantamman*, *Kanglu*, *Khūri*, Pb.; *Jāun*, *Khasuroa*, *mārnā*, *bātu*, N.W.P.; *Banharria*, Oudh; *Khāksi*, Nepal.

A small tree with short trunk and bifarious exceedingly rough leaves, branchlets rough with long hard white hairs. Leaves oblong-lanceolate, with almost equal-sided base, 2.5 in. long, penniveined, serrate, pale beneath, rough on both sides with scattered hairs and the raised base of numerous fallen hairs, main lateral nerves arcuate, 4-6 pair, the lowest pair from near the base of leaf, petiole  $\frac{1}{4}$  in. long; stipules deciduous, longer than petiole. Cymes of male flowers as long as petiole, of female flowers a little longer than petiole.

Salt range. Siwalik tract and outer hills from the Chenab to Nepal. Abundant in the Oudh forests in dry sandy or stony places. Sikkim, Central Provinces. The leaves are renewed in March and April. Fl. April-June. Attains 15 ft. and a girth of 12 in., with a few spreading branches. Bark  $\frac{1}{2}$  in. thick, greenish-white, or reddish-brown, smooth or with longitudinal wrinkles, inner bark red, viscid, fibrous. Wood reddish nut-brown, fibrous and elastic, with a moderately close-grain (R. T.) The leaves are as hard as sand-paper and are used to polish wood and horn.

2. *S. orientalis*, Planch.; DC. Prodr. xvii. 200.—Syn. *Celtis orientalis*, Linn.; Roxb. Fl. Ind. ii. 65. Probably not different from *Sponia Wightii*, Pl.; Wight Ic. t. 1971; Bedd. Fl. Sylv. t. 311. *Indian Nettle-tree*, *Charcoal-tree*. Vern. *Badu manu*, C.P.; *Gol*, Bombay.

A small rapidly growing and short-lived tree with pubescent branchlets. Leaves ovate, acuminate, 3-nerved, obtusely serrate, base unequal-sided, cordate, soft-tomentose beneath, and more or less rough on the upper side, midrib with 3-4 pairs of main lateral nerves; stipules deciduous, as long as petioles of young leaves. Cymes lax, spreading, considerably longer than petiole. Stigmas covered with long threads. Drupe black when ripe.

Nepal, Bengal, Satpura range (not common), South India, Ceylon. Forms part of the secondary growth where the evergreen forest has been cleared in Western Mysore and Coorg. Has been planted in Wynaad for shade in coffee plantations, where the original forest had been imprudently cleared away. Fl. April-June (the greater part of the year, Roxb.) Attains 30 ft. with an erect short trunk, 2-3 ft. girth. Bark dark grey or blackish, smooth. The inner bark is tough and strong.

*S. velutina*, Planch.; Benth. Fl. Hongkong. 324, branchlets and under side of leaves soft-pubescent. China, Indian Archipelago, Burma, Bengal; is probably not specifically distinct.

## 13. ULMUS, Linn.

Trees or shrubs with alternate, simple, more or less distichous, unequal-sided leaves and caducous stipules. Flowers bisexual, in lateral fascicles. Perianth campanulate, generally persistent, 4-5- or 8-9-fid, segments imbricate in bud. Stamens as many as perianth-lobes, adnate to the tube of perianth, and opposite to its segments; anthers fixed by the back. Ovary free, 1-2-celled; styles 2, papillose on the inner face, 1 ovule in each cell. Fruit an indehiscent flat samara, surrounded on all sides with a broad membranous wing, on an articulate pedicel. Seed pendulous, no albumen, embryo straight, radicle superior.

In the following synopsis I have included, besides the North Indian species, the more important of the European Elms, as some of them are closely allied to the North-West Himalayan species.

Leaves entire; perianth deciduous; ovary long-stipitate . . . 1. *U. integrifolia*.

Leaves serrate; perianth persistent; ovary subsessile.

Stamens and perianth-segments 5-8; flowers appear before the leaves.

Pedicels more than twice the length of perianth; stamens and perianth-segments 5-8.

Articulation of pedicel near its base, lower portion much shorter than upper; samara not fringed at edges . . . 2. *U. Wallichiana*.

Articulation of pedicel near the top; lower portion much longer than upper; samara fringed at the edge with long hairs . . . 3. *U. effusa*.

Pedicels less than twice the length of perianth; stamens and perianth-segments 5-6.

Seed in the middle of samara . . . 4. *U. montana*.

Seed near upper end of samara . . . 5. *U. campestris*.

Stamens and perianth-segments 4; flowers appear with the leaves . . . 6. *U. parvifolia*.

1. *U. integrifolia*, Roxb. Pl. Cor. t. 78; Fl. Ind. ii. 68; Bedd. Fl. Sylv. t. 310. — Syn. *Holoptelea integrifolia*, Planch. DC. Prodr. xvii. 164; Wight Ic. t. 1968. Vern. *Pāpri*, *khulen*, *arjān*, *rajāin*, *kāchām*, Pb.; *Pāpār*, *kanju*, Kamaon; *Pāpri*, Bhartpur; *Dhamna*, *kūnj*, Oudh; *Karānji*, *chilbil*, *chilmil*, *kūmba*, *kūnja nālī*, *begana*, Cent. Prov. & Chilla, Banda; *Wawali*, Mar.; *Navili chettu*, Tel.

A large deciduous tree, usually glabrous, only inflorescence pubescent. Leaves coriaceous, elliptic, acuminate, entire, those of seedlings and root-shoots sometimes serrate, blade 3-5, petiole  $\frac{1}{2}$  in. long, main lateral nerves 5-7 pair. Male and bisexual flowers mixed, in cymose lateral fascicles. Perianth hairy, nearly cleft to the base, segments 5. Stamens in bisexual flowers 5, in male flowers 8, anthers hairy, no rudiment of ovary in male flowers. Ovary stipitate, compressed, generally 1-celled. Samara oval or suborbicular, unequal-sided, 1 in. long, on a long slender articulate pedicel, the upper portion being the elongated stalk of the ovary, often with the remains of the perianth at its base. A variety with pubescent extremities and under side of leaves from Ceylon.

Sub-Himalayan tract, extending west to the Bias, but rare between Jumna and Bias. Common in Garhwal and Kamaon, ascending to 2000 ft. Abundant in

the Gonda and Baraich forests of Oudh, and in the Banda district, not uncommon in the Satpura range, Behar, South India, Ceylon, Burma. Often planted in North and Central India. Prefers a dry, sandy or shingly soil. The leaves are shed between Sept. and Jan., the fresh leaves appear in March and April, soon after the flowers, which come out in Feb.-March. The fruit ripens June-Aug., and remains long on the tree. A fast-growing tree, attains 60-70 ft., with a tall straight stem, 20-30 ft. clear, and 6-8 ft. girth, with short buttresses, furrowed and scooped out higher up. Bark thick, pale- or dark-grey or light-brown, with small tubercles in lines, and longitudinally rugose, not cut up by cracks or furrows, smelling unpleasantly when bruised. Wood yellow or light-brown, soft and open-grained, light but strong. Medullary rays very fine, pores moderate-sized, uniformly distributed, annual rings distinct. No distinct heartwood. Employed in building, for carts, carving, durability uncertain. Much used for fuel and charcoal. The leaves are lopped for cattle-fodder, and the tree is often used to stack fodder for winter supply.

2. *U. Wallichiana*, Planch.—Tab. LI.—DC. Prodr. xvii. 158. In Herb. Wall. as *U. erosa*, Roth, and *U. effusa*, Willd. Vern. *Kāin*, *khāi*, *brēn*, *brera*, *brān*, *brānkul*, *brori*, *amrāi*, *marāi*, *marāl*, *marrūn*, *marran*, *marazh*, *makshari*, *manderung*, *malbung*, *shko*, *kummār*, Pb.; *Himbareh*, Knllu, Cleghorn; *Mored*, *pabūna*, *chambar maya*, N.W.P.

A large deciduous tree, branchlets with rough pubescence. Leaves 4-8 in. long, elliptic, long-acuminate, main lateral nerves 15-20 pair, each terminating in a large serrature, the outer edge of which is serrulate, petiole  $\frac{1}{2}$  in. long; stipules membranous caducous. Flowers bisexual, fasciculate, in short lateral racemes, common peduncle pubescent, 1 in. long, pedicels fasciculate, 3-6 from one point, the portion below the articulation pubescent, much shorter than the upper glabrous portion. Perianth persistent, turbinate, glabrous, segments 5, obtuse, ciliate. Samara short-stipitate, obovate, pubescent, seed about the middle, wing reticulate. The indumentum of the leaves varies exceedingly, in some specimens the leaves are soft-pubescent or tomentose on both sides, in others they are rough, in others again they are glabrous above, and pubescent or rough beneath. Dr Stewart referred this sp. to *U. campestris*.

Not uncommon in the North-West Himalaya, from the Indus to Nepal at 3500 to 10,000 ft., often planted, also cultivated at Kabul. Fl. early in spring, while the tree is leafless; the fruit ripens May-June. Attains 80-90 ft., trunk erect, often of immense size, tapering from a broad base, 12-16 ft. girth, in cultivated and protected trees to 24 ft. Old stems mostly hollow. The branches are erect at times, which gives the tree a poplar-like appearance. Bark whitish, light- or dark-grey, or dark brown, very rough, with long diagonal cracks, cutting the outer bark into diamond-shaped exfoliating scales. Wood brown, not much valued in the Himalaya. The bark is tough and very strong; cordage, sandals, and slow-matches are made of it. The leaves are lopped extensively for cattle-fodder.

3. *U. effusa*, Willd.; Reichenb. Ic. Fl. Germ. 1337, t. 666.—Syn. *U. pedunculata*, Fougereux; DC. Prodr. xvii. 154.

A large tree, trunk often buttressed at the base, flowers drooping on long slender pedicels, in lateral fascicles on the previous year's wood. Samara

fringed at the edge with long hairs, on long slender pedicels, the lower portion below the articulation, 3-5 times the length of the upper portion.

Eastern Europe. Flowers in spring before the leaves. Wood not much valued. Specimens very similar to this found by T. Thomson in Kashmir at 5000 ft. (April 1848, at Ganderbal) are in the Kew herbarium, but flowers and young fruit are subsessile.

4. *U. montana*, Sm.; Hook. Stud. Fl. 334; Reichenb. Ic. Fl. Germ. 1332, t. 662. *Wych* or *Mountain Elm*. *Bergrüster*, Germ.

A large forest tree, with lax foliage and drooping branchlets, bark peeling off in linear or oblong scales. Leaves rough, ovate-oblong, long-acuminate, 3-6 in. long, base very unequal-sided. Flowers subsessile in lateral clusters on the previous year's wood. Seed in the centre of the samara.

Indigenous in Scotland, the north of England, Norway (to 65° N.L.), and in other parts of North Europe. Flowers in spring before the leaves. Not rarely mixed with Beech in the forests of France and Germany. Japan and North-Eastern Asia, not in Siberia. Wood highly prized, on the Harz it fetches a higher price than Oak. On a horizontal section the spring wood appears as a continuous belt of large pores, the outer parts of each annual ring having much smaller pores in narrow wavy concentric bands. On a vertical section the large pores of the spring wood are very prominent, and the medullary rays appear as straight horizontal bands with parallel sides.

5. *U. campestris*, Spach; Willk. Forstl. Fl. 476; Hook. Stud. Fl. 334; Reichenb. Fl. Germ. 1331, t. 661. *Common Elm*. *Feldrüster*, *ulme*, Germ.; *Orme*, Fr.; *Olmo*, It.

A large tree with stiff, often brittle branches, bark dark, nearly black, with deep longitudinal furrows, often corky, especially along the branches (*U. suberosa*, Ehrh.) Leaves rough, 2-3 in. long, base often nearly equal. Flowers subsessile, in lateral clusters on the previous year's wood. Seed above the centre of the samara.

Indigenous in Central and South Europe, naturalised, not indigenous in England, commonly planted in parks and avenues. North Asia, Turkestan, North China, Japan, Syria, Armenia, Caucasus, and probably Afghanistan. Flowers in spring before the leaves. In France the wood of this species is valued higher than that of *U. montana* for cart and machine building, and for many other purposes; but it requires long and careful seasoning (Mathieu, Fl. For. 207). In England the branches of this elm are exceedingly brittle. The structure of the wood resembles *U. montana*. Weight 35-55 lb.

To *U. campestris* I am inclined to refer (with Dr Cleghorn, Pb. Forests, 79) the small-leaved elm of the N.W. Himalaya. Leaves 2-3 in. long, base nearly equal-sided, glabrous, or slightly rough or pubescent, flowers and fruit unknown. Not common, and generally near villages, in the N.W. Himalaya, on the upper Jhelam, Chenab, Bias, Sutlej, and Indus, and in the Nubra valley, ascending to 10,500 ft.—Vern. *Yāmbok*, Ladak; *Brān*, *brahmi*, *kāi*, *morūn*, *marāl*, *māuru*, *mannu*, *māndu*, *manji*, *meru*, *merinu*, *bhannu*, Pb.; *chipāl*, in the Pb. plains. Some of the specimens resemble *U. pumila*, Linn., a small shrub of Siberia, with subsessile fasciculate flowers and glabrous campanulate perianth, which, however, Maximowicz considers as merely a variety of *U. campestris*, L. (Diagnoses plant. nov. Jap. Decas xiii. 22). In the inner Himalaya, it is generally found as a small shrub along the river-beds, but it is often planted near villages, and is then a middle-sized tree, with thick trunk, attaining a girth of 20-

30 ft. and more. Bark brown, surface whitish between deep dark-coloured longitudinal regular furrows, running diagonally into each other. Straight woody spines (the base of dead branches) often project from the wood into the bark. The wood is valued more than that of the large-leaved elm (*U. Wallichiana*.)

6. *U. parvifolia*, Jacq. Pl. Rar. Hort. Schœnbrunn. t. 262.—Syn. *U. virgata*, Roxb. Fl. Ind. ii. 67; Wall. Pl. As. rar. t. 290.

A slow-growing shrub or tree, branchlets pubescent. Leaves coriaceous, smooth, glabrous, oblong-lanceolate, short-petiolate, 2-4 in. long, serrate, main lateral nerves branching, 14-16 pair. Flowers reddish, appearing with the leaves, male and fertile mixed, in lateral scaly fascicles, lower part of pedicel pubescent, much longer than the glabrous upper part (above the articulation). Perianth campanulate, glabrous, segments 4, obtuse, ciliate. Stamens 4. Samara obliquely oval, glabrous, short-stipitate, seed in the middle, wings reticulate.

Kamaon, Sikkim, 4000-5000 ft., Bhutan, Burma, China, Japan. Introduced into the Bot. Garden, Calcutta, from China. The bark peels off like that of the Plane tree (C. Koch, Dendrol. ii. 423). Fl. Sept. (Nagasaki), Nov. (Calcutta), Sept., Oct. (Vienna), May, June (C. Koch). In Japan planted in hedges. Probably evergreen, or leafless only for a short time. *U. virgata*, Wall. Cat. No. 3548; DC. Prodr. xviii. 159, from Nepal, is a doubtful species.

### ORDER LXVIII. PLATANEE.

Trees with flaking bark, alternate palmatifid leaves, caducous stipules and monoicous achlamydeous flowers collected in unisexual globose pendulous heads, intermingled with squamiform bracteoles. Male heads: consisting of numerous closely congested short stamens and minute somewhat fleshy paleaceous scales; filaments very short; anthers 2-celled, dehiscing longitudinally. Female heads: of numerous ovaries approximated in pairs immersed in scales similar to those of the male heads; ovary 1-celled, with 1 (or 2) pendulous ovules; style subulate-filiform, laterally stigmatose. Fruit a small 1-seeded nut, crowned by the persistent style, and surrounded by rigid setæ. Albumen 0, or very thin.

#### 1. *PLATANUS*, Tourn.

(Only genus, the characters those of the Order.)

1. *P. orientalis*, Linn.; Sibth. Fl. Græc. t. 945. *Oriental Plane*.—Vern. *Chinâr* (the Persian name). Local names: *Bûin*, *bûna*, *boin*, Kashmir.

A large deciduous tree, with grey flexuose branches, woolly buds, young leaves and current year's shoots with soft, tawny, or ferruginous tomentum. Leaves glabrous, along nerves pubescent beneath, palminerved, deeply 3-5 lobed, lobes lanceolate, entire or dentate, 6-9 in. diam., petiole 3-5 in. long, pubescent, with a broad striated thickened base. On young luxuriant shoots the leaves often have a cuneate base, and the stipules are foliaceous and lobed. Fruit-heads globose, 1-1½ in. diam., on short pedicels, on drooping axillary peduncles 4-6 in. long.

Cultivated in Afghanistan and the North-West Himalaya, particularly in the Kashmir valley (5300 ft.), east to the Bias and Sutlej, ascending to 8300 ft. in

Western Ladak. It grows well at Peshawar, and at the foot of the North-West Himalaya—e.g., at Amb in the Hushiarpur district—and fairly well, without attaining any large size, at Amritsar and Lahore. Farther east it does not thrive, and in the Saharanpur garden trees do not live longer than a few years. The oriental Plane is indigenous in ravines and moist valleys of Greece, Macedonia, Armenia, and North Persia. Hehn (Culturpfl. 199) thinks that it was introduced from Asia Minor into Greece. Hardy in England. The foliage often gets reddish about October before it falls, the young leaves appear late in April, the flowers appear April, May, the fruit ripening soon afterwards and remaining long on the tree. Attains 75 ft. in Kashmir and Chamba, with a girth of 10-20 ft., the largest girth noted by Dr Stewart at Sirinagar being 28 ft. The branches spread wide; Stewart records two trees, one at Kishtwar (5500 ft.) on the Chenab, the other at Tikri in Chamba territory (same elevation), on a tributary of the Ravi, girth 19-20, extreme length of branches from trunk 37 and 44 ft. The Nasim Bagh on the border of the great Kashmir lake is a large grove planted by Akhbar the Great soon after he had taken Kashmir in 1588. Originally the grove, which is about 800 by 400 yards, contained 1200 trees, a large proportion of which are still standing. In 1838, Vigne found the average girth to be 13 ft., and supposed their age to be 248 years. The largest, close to the water, averaged 20 ft. in girth. Of two trees 170 years old at Brein in Kashmir, Vigne found one 16'22", the other 20'10" in girth, and the largest Plane he had seen was under the Elbûrg mountains near Teheran 66 ft. in girth. Near Vostitza in the Morea, a tree over 40 ft. in girth is recorded. Many renowned large Plane trees in Asia Minor.

The bark is  $\frac{1}{4}$  in. thick, light or dark grey, peeling off in large thin scales. Wood yellowish white, somewhat resembling Beech-wood, with numerous broad medullary rays showing on a vertical section as glossy shining plates, with irregularly wavy outline. Pores numerous, very fine, uniformly distributed. Annual rings distinctly marked. No distinct heartwood. It is compact, fine-grained but not strong, and is not valued in Kashmir except to make boxes, trays, pen-cases, and similar articles which are lacquered and painted. In Afghanistan, where timber is scarce, it is said to be used for gun-carriages; in Persia and in the Levant furniture, doors, and window-frames are made of it. It takes a beautiful polish, and the mottled grain recommends it for cabinet-work.

*P. occidentalis*, Linn., of North America, and more commonly cultivated in Western Europe than the oriental Plane, differs by less deeply lobed leaves, which are pubescent when full-grown, and by slightly smaller fruit-heads.

*Casuarina equisetifolia*, Forster—Syn. *C. muricata*, Roxb. Fl. Ind. iii. 519—of the Order of *Casuarineæ*, is a large tree with leafless drooping branches, thickly set at the ends with numerous approximate slender articulate branchlets, which are deciduous and fulfil the function of leaves. Flowers monoicous, the male flowers monandrous, in terminal cylindric spikes, the female flowers in small pedicellate globose heads. Fruit a subglobose cone, formed of the enlarged and thickened woody bracts; seeds with a membranous wing. Indigenous on the coast of Chittagong and Burma, in the islands of the Indian Archipelago, North Australia, and Queensland. The *Beefwood* of Australia. Cultivated throughout India, thrives at Amballa. Wood hard, heavy, brown, darker near the centre, medullary rays very fine, very numerous. Polishes well, but cracks and warps. Yields excellent fuel; plantations of it for that purpose have been made near Madras.

The wood of *C. stricta*, Aiton; Benth. Fl. Austr. vi. 195—Syn. *C. quadrivalvis*, Labill.,—the *She Oak* of Tasmania, South Australia, Victoria, and New South Wales, and of several other Australian species, is marked by broad medullary rays, and is used for cabinet-work.



## ORDER LXIX. EUPHORBIACEÆ.

Trees, shrubs, or herbs, often with acrid milky juice; leaves alternate or opposite, usually stipulate, rarely compound. Flowers always unisexual. Perianth very various; a calyx only or calyx and corolla, both present or both sometimes wanting. Stamens various. Ovary superior, 3-celled, rarely 2- or 1-celled, or with more than 3 cells; styles as many as carpels, free or connate, usually stigmatose on the ventral face; ovules 1 or 2 in each cell, pendulous. Fruit capsular, separating into its constituent carpels when ripe, or succulent and indehiscent. Seed oily, albuminous; embryo straight with a superior radicle and flat cotyledons in a fleshy albumen.—Royle III. 326.

This large Order (containing upwards of 3300 species) is distributed nearly over the entire globe. *Buxus* and *Sarcococca*, which are here included, are commonly classed under a separate Order, *Buxaceæ*, distinguished by styles distinct from the base and the absence of milky juice. The other genera here mentioned are classed under the following tribes by Joh. Müller in vol. xv. pt. ii. of De Candolle's *Prodromus*. They all belong to the series *Platylobæ* with broad plane cotyledons.

*Phyllanthææ*.—Ovary-cells with 2 ovules; lobes of male calyx imbricate—*Bischoffia*, *Antidesma*, *Putranjiva*, *Phyllanthus*, *Breynia*, *Melanthesopsis*, *Securinega*, *Andrachne*.

*Brideliææ*.—Ovary-cells with 2 ovules; lobes of male calyx valvate—*Bridelia*, *Lebidieropsis*, *Cleistanthus*.

*Crotonææ*.—Ovary-cells with 1 ovule; lobes of male calyx imbricate; stamens inflexed in bud—*Croton*.

*Acalypheææ*.—Ovary-cells with 1 ovule; lobes of male calyx valvate; stamens erect in bud—*Trewia*, *Mallotus*, *Homonoya*, *Ricinus*, *Hevea*.

*Hippomaneææ*.—Ovary-cells with 1 ovule; lobes of male calyx imbricate; stamens erect in bud—*Excoecaria*, *Jatropha*, *Givotia*, *Codiaeum*.

*Euphorbiææ*.—Ovary-cells with 1 ovule; flowers involucrate, involucre calyciform, enclosing male and female flowers—*Euphorbia*.

Flower-heads resembling single flowers, consisting of a calyx-like involucre, including several male flowers (single stamens) and 1 central female flower (a single pedicellate pistil).

Male and female flowers distinct, not united in heads.

Flowers monoicous or dioicous, in spikes racemes or panicles; ovary-cells 1-ovulate.

Male flowers with 5 petals alternating with calyx-segments; flowers monoicous.

Petals wanting; stamens free, or only connate at the base.

Calyx-segments 3-4, imbricate; stamens 3-4; flowers usually monoicous; male flowers in bracteate spicate clusters.

Calyx-segments 5, valvate; stamens numerous; male flowers in simple racemes or spikes.

Leaves opposite; flowers dioicous; fruit a fleshy drupe, not dehiscent.

Leaves alternate; flowers monoicous; fruit a dehiscent capsule.

Petals wanting; filaments connate into a many-branched central column.

## 1. EUPHORBIA.

## 2. CROTON.

## 3. EXCOECARIA.

## 4. TREWIA.

## 5. MALLOTUS.

## 6. HOMONOYA.

- Flowers dioicous, in panicles, catkins, or spikes; ovary-cells 2-ovulate.
- Leaves compound; flowers in axillary panicles . . . . . 7. BISCHOFFIA.
- Leaves simple; male flowers in catkins; female flowers in axillary spikes . . . . . 8. ANTIDFESMA.
- Flowers usually monoicous, in axillary clusters, fascicles, or solitary.
- Leaves opposite; styles free and distinct . . . . . 9. BUXUS.
- Leaves alternate, usually distichous; styles more or less united.
- Calyx 5-lobed, valvate; petals 5.
- Ovary 2-celled; styles 2; fruit a berry . . . . . 10. BRIEDELIA.
- Ovary 3-celled; styles 3; fruit a dehiscent capsule.
- Main lateral nerves prominent; petals obovate . . . . . 11. LEBIDIEROPSIS.
- Lateral nerves indistinct; petals minute . . . . . 12. CLEISTANTHUS.
- Calyx 4-6-lobed, imbricate; petals wanting.
- Stamens central; no rudiment of ovary.
- Fruit a drupe with a hard rugose 1-seeded putamen . . . . . 13. PUTRANJIVA.
- Fruit dehiscent, dry or fleshy.
- Calyx deep 5-6-cleft; segments not appendiculate
- Calyx turbinate, 6-lobed; the lobes appendiculate at the back (berries red) . . . . . 14. PHYLLANTHUS.
- Stamens surrounding a rudimentary ovary, as long as stamens.
- Small trees; fruit fasciculate, short-pedunculate; white dehiscent berries . . . . . 15. BREYNIA.
- Small shrubs or undershrubs; fruit capsular, solitary, axillary, on long slender peduncles . . . . . 16. SECURINEGA.
17. ANDRACHNE.

*African Oak or Teak*, a heavy wood (60-70 lb. per cub. ft.), stronger than English Oak or Indian Teak, which does not affect iron in contact with it, but is not otherwise as durable as Teak, is employed for certain purposes in ship-building. It is exported from the west coast of tropical Africa, and the tree yielding it is as yet imperfectly known. In Hooker's Journal of Botany, ii. (1850) t. 6, it is described as *Oldfieldia africana*, Benth. & Hook., with digitate leaves and a 3-celled loculicidal capsule, and is doubtfully classed under *Euphorbiaceæ*: Joh. Müller (Prodr. xv. ii. 1259) refers it to *Sapindaceæ*.

# 1. EUPHORBIA, Linn.

Herbs, shrubs, or small soft-wooded trees with fleshy branches abounding in milky juice. Leaves of the stem alternate, without stipules, or with stipular spines, in some species opposite and stipulate, those of the flowering branches opposite. Flower-heads resembling single flowers, consisting of a calyx-like cup-shaped involucre, with 4-5 teeth, alternating with as many large horizontal glands, which encloses 10-15 male and 1 central female flower. Male fl.: one 2-celled, often didymous anther on an articulated filament. Female fl.: a stipitate, 3-celled ovary, protruding from the involucre, style 3-cleft, the branches 2-lobed. Numerous fimbriate bracts often between the male flowers, the outer ones sometimes adnate to the involucre. Capsule separating into three 2-valved cocci.

Besides numerous annual and perennial herbs, this genus comprises in India a number of shrubs or small trees with fleshy stems, which should be noticed here. In the following the characters are given by which the species

are commonly distinguished. They demand, however, farther study on the spot, and it is not impossible that their number will eventually be reduced. The geographical distribution of some of them in India is as yet imperfectly known.

Armed with pairs of stipular spines.

- |   |                          |
|---|--------------------------|
| Branches with 5 sharp prominent angles . . . . .                          | 1. <i>E. Royleana</i> .  |
| Branches round, with 5 more or less spirally-twisted ribs . . . . .       | 2. <i>E. nerifolia</i> . |
| Branches round, not ribbed or angled . . . . .                            | 3. <i>E. Nivulia</i> .   |
| Unarmed; stems and branches cylindric; leaves linear-lanceolate . . . . . | 4. <i>E. Tirucalli</i> . |

1. *E. Royleana*, Boissier in DC. Prodr. xv. ii. 83.—Syn. *E. pentagona*, Royle Ill. t. 82 (not of Haworth).—Vern. *Thor*, North India. Local names in Panjab: *Sūli*, Jhelam; *Chūla*, Chenab; *Chūn*, Ravi; *Chū*, *chiū*, *chūnga*, *sūrs*, Bias; *Sūra*, *tsui*, Suttlej; *Sihūnd*, Kamaon.

Branches angular, generally pentagonous, angles sharp, undulate. Spines twin, short. Flower-heads yellow, in sessile clusters.

Common on the dry hills of the Siwalik tract from Kamaon to the Jhelam, entering some distance into the valleys, and ascending to 4000, occasionally to 6000 ft. According to Aitchison (Cat. 132), not on Mount Tilla or the Salt range, but Stewart (Pb. Pl. 194), gives *Tordanda*, *danda*, *tor* as the Salt range names. This is probably the species on the dry hills near Jeypur, which furnishes a great part of the fuel for that city. Attains 15-16 ft.; the stems have generally a girth of 2-3, but sometimes of 5-6 ft. In the outer hills it is often planted as a hedge; grows readily from cuttings, even in the driest soil. The wood is soft and useless. It is cultivated at places near the foot of the hills—e.g., at Sealkot, Jalandar, but does not thrive far out in the Panjab plains.

Besides *E. Royleana*, the following Indian species with angular branches have been described:—

a. *E. antiquorum*, Linn.; Roxb. Fl. Ind. ii. 468; Wight Ic. t. 897.—Sans. *Sihūnda*. Vern. *Nara sij*, *tekata sij*, Beng.; *Tidhāra*, *tidhāra sehnd*, Hindi. Branches with 3, rarely 5 angles, leaves minute or wanting. Peduncles solitary or in pairs, a little above the spines, usually with 3 flower-heads, the centre head fertile. Common on dry hills in Bengal and the peninsula. Wood white, light, soft, but even-grained.

b. *E. Cattimandoo*, Elliot in Wight Ic. t. 1993, *Katti mandu* (knife medicine), Tel. Branches with 5 sharp prominent angles which are deeply sinuate between the nodes, the furrows between the angles forming deep channels. The leaves are cuneate, mucronate. This species grows in great abundance in the Vizagapatnam district; it flowers from March to the beginning of June, after the leaves fall; the fresh leaves appear in July and August. Attains 8-14 ft., with a stem 3-4 ft. high. The milk flows freely when branches are cut; it is collected, boiled, formed into cakes or cylinders, and used as a cement for fixing knives into handles and for similar purposes. When dry it is resinous and brittle, and its properties are essentially different from those of Caoutchouc or Gutta-Percha.

c. *E. trigona*, Roxb. Fl. Ind. ii. 468; Wight Ic. t. 1863. Branches with 3 prominent angles, deeply sinuate between the nodes, and hollowed out between the angles; 2, sometimes 4 stout stipular spines, and large, deciduous, shining, cuneate leaves at the ends of branches. Peduncles from the sinuses on the angles of the branches, short, thick, generally with 3 flower-heads, the centre one sessile, with male flowers only, the lateral ones pedicelled, fertile. Fl. Feb.-April, after the leaves have fallen. Brought from the Molucca Islands to Cal-

cutta in 1798 (Roxb.) Rocky arid hills near Coimbatour (Wight), Andamans (S. Kurz).

*d. E. tortilis*, Rottler; Wight Ic. t. 898. Branches with 3 prominent angles, spirally twisted. Flower-heads numerous, fasciculate on the angles above the nodes. Dry hills near Madras and of the Coromandel coast.

2. *E. neriifolia*, Linn. (not Roxb.); DC. *Plantes Grasses*, t. 46.—Syn. *E. Ligularia*, Roxb. l. c. 465. Vern. *Thor*, Bombay; *Gāṅgūchū*, Pb.; *Munsu sij*, Beng.

A small tree. Stem cylindric, branches terete, but with 5, more or less spirally twisted ribs. Spines twin. Leaves near the ends of branches, cuneate or oblanceolate, 6-12 in. long, narrowed into petiole. Peduncles solitary, in the sinus between the nodes with dichotomous cymes of 3-15 flower-heads.

Common in the Konkan and Dekkan (Dalzell Bomb. Fl. 226). Cultivated near villages in most parts of India, also in the Siwalik tract of the N.W. Himalaya. Fl. Feb.-March. The leaves fall in autumn and appear again after flowering, in March or April. Attains 20 ft., stem often 12 in. diam. The milk is employed externally in native medicine, and the root, mixed with black pepper, for the cure of snake-bites.

3. *E. Nivulia*, Hamilton in Trans. Linn. Soc. xiv. 286; Wight Ic. t. 1862.—Syn. *E. neriifolia*, Roxb. l. c. 467. Vern. *Sij*, Beng.

A shrub, stems and branches round, without ribs or angles; branchlets in whorls of four. Spines in pairs, spirally arranged. Leaves cuneate or obovate, sessile, fleshy, mucronate, 4-6 in. long. Peduncles 3-flowered, from the nodes.

Dry hills Garhwal, Peninsula, Guzerat, and Sindh (Dalzell Bomb. Fl. 226). Leafless Jan.-March. Fl. March; fr. April-May. Grown in hedges.

4. *E. Tirucalli*, Linn.; Roxb. l. c. 470.—*Milk-bush*. Vern. *Lanka sij*, Beng.; *Sēhnd*, Hindi; *Tiru kalli*, Malayalam.

A small tree or shrub, with round stems and smooth green, terete branches, not angled and unarmed. Leaves linear-lanceolate. Flower-heads numerous, in clusters at the ends and in the forks of the branches.

Indigenous in Africa, introduced into India, and now naturalised in the Peninsula and Bengal, cultivated in North-West India as far as Hushiarpur. Often planted in hedges. Fl. during the rains. Attains 20 ft.; the wood is strong, and used for building. Milk extremely acrid and vesicant.

*Euphorbia pulcherrima*, Willd.—Syn. *Poinsettia pulcherrima*, Graham; *Lot. Mag.* t. 3493, is a well-known garden shrub, with large crimson floral leaves. Indigenous in Mexico and Central America, and now commonly grown in Indian gardens as far north as Saharunpur.

## 2. CROTON, Linn.

Trees, shrubs or herbs, with alternate, petiolate leaves, often with scales or stellate hairs. Flowers usually monoicous, in terminal spike-like racemes, the female flowers at the base of the spike. Calyx 5-parted. Petals, in the male flowers, alternating with calyx-segments, in the female flowers

often wanting. Disc of 5 glands, alternating with petals. Stamens central, numerous, filaments free, with the anthers inflected in bud. Ovary 2-4-, generally 3-celled, 1 ovule in each cell. Capsule dividing into 3, 2-valved cocci.

1. *C. oblongifolius*,\* Roxb. Fl. Ind. iii. 685; DC. Prodr. xv. ii. 573. —Syn. *C. levigatus*, Wall. Vern. *Arjunna*, Oudh; *Bara gach*, Bengal.

A middle-sized tree; extremities, inflorescence, calyx and ovary with small addressed circular silvery scales. Leaves pale green, glabrous, oblong-lanceolate, dentate, penniveined, blade 5-10, petiole 1-2 in. long, stipules small, caducous. Flowers pale yellowish-green, on short pedicels, in the axils of minute bracts, in long terminal racemes, female and male flowers generally mixed; the latter more numerous. Calyx of 5 ovate segments. Petals white, woolly, as long as calyx-segments. Stamens 12. Fruit subglobose, indistinctly 3-lobed, 6-furrowed,  $\frac{1}{4}$  in. diam.

Common in the central and eastern part of the Gonda district, Oudh, spreading in belts through miles of forests. Behar, Bengal, Burma, Ceylon. The leaves are shed early in March, and turn red before falling, the young foliage appears soon afterwards, forming a pleasant contrast with the leafless forest around. Fl. April (Oudh), Nov.-Feb. (Burma). Seed ripens April-May. Attains 30 ft., and a girth of about 3 ft. Trunk erect, short, often irregularly furrowed, bark 1 in. thick, grey or brownish, inner bark red, coarsely fibrous. Wood white, close-grained, moderately hard, cracks in seasoning, no distinct heartwood. Bark leaves and fruit are used externally in native medicine.

*C. Tiglimum*, Linn.; Roxb. Fl. Ind. iii. 682; Hayne Arzneigew. xiv. t. 3—the *Purging Croton*; Vern. *Jepāl*, *jamal gota*—is a small tree, glabrous, without scales, pedicels and ovary hairy. Leaves ovate, acuminate, serrate, with 3 basal nerves. Female fl. without petals. Capsule obtusely 3-cornered,  $\frac{3}{4}$  in. long. The seeds are a powerful drastic purgative, and the oil is a valuable medicine (Pharm. Ind. 200). Bengal, South India, Burma, Ceylon, Indian Archipelago.

### 3. *EXCÆCARIA*, Linn.

Trees or shrubs, mostly glabrous, with alternate, rarely opposite, stipulate and petiolate leaves. Flowers monoïcous, rarely dioïcous, in terminal or axillary spikes; female flowers generally few, at the base of the spike, sometimes in separate spikes. Male flowers fasciculate, sessile or short-pedicellate, the fascicles bracteate, generally with bracteoles between the flowers. Calyx membranous, sometimes cup-shaped, generally of 3 segments or distinct sepals. No disc or petals. Stamens 2-3, filaments generally free, central, anthers didymous, dehiscing longitudinally. Ovary 2-3-celled, 1 ovule in each cell; styles as many as cells more or less connate at the base, stigmatose inside. Fruit a dry capsule or a berry, 2-3-celled, and always opening loculicidally in 3 valves.

A few female flowers at the base of the male spikes.

Calyx of male flowers 3-fid, segments ovate; leaves rhomboid, long-petiolate entire

1. *E. sebifera*.

Calyx of male flowers of 3 distinct linear segments; leaves elliptic-lanceolate, short-petiolate, serrate

2. *E. acerifolia*.

\* Linneus made *Croton* neuter, but *Κρότων* is masculine.

Male and female flowers in distinct spikes; calyx of male flowers of 2 broad, nearly distinct, thinly membranous segments; leaves large, oblong-lanceolate, dentate . . . . .

3. *E. insignis*.

1. *E. sebifera*, Müll. Arg.; DC. Prodr. xv. ii. 1210.—Syn. *Croton sebiferum*, Linn. *Stillingia sebifera*, A. de Juss.; Benth. Fl. Hongk. 302. *Sapium sebiferum*, Roxb. Fl. Ind. iii. 693. The Chinese Tallow-tree.

A small and glabrous tree. Leaves rhomboid or broad-ovate, entire, long-acuminate, blade 2-3, petiole 1-2 in. long, main lateral nerves 6-8 pair. Flowers greenish-yellow, in terminal drooping spikes 3-5 in. long, with a few female flowers at the base of the spike. Male flowers unequally pedicellate, in bracteate fascicles, 2-3-androus; calyx 3-fid. Female flowers solitary, short-pedicellate; calyx 4-partite. Capsule dry, smooth, subglobose, acute,  $\frac{1}{2}$  in. long. Seeds 3, enclosed in a thick layer of white fatty substance, attached to a central column which splits into 3 slender divisions.

Indigenous and cultivated in China and Japan. Introduced into Bengal and the sub-Himalayan tract of North-West India, where it thrives luxuriantly. Fl. June; the seeds ripen in autumn. Bark grey. In Japan and China the tallow is separated from the seeds by boiling in water; it is harder than animal tallow, and candles are made of it, which are coloured and generally used in Chinese temples. The seeds (after the tallow is removed) yield oil, and a black dye is made of the leaves. The wood is light and soft but even-grained.

*E. baccata*, Müll. Arg.—Syn. *Sapium baccatum*, Roxb. l. c. 694; *S. populi-folium*, Wight Ic. t. 1950—is a large glabrous tree with ovate, entire, acuminate leaves, main lateral nerves 8-12 pair, flowers in panicle spikes, male and female flowers generally on distinct branches (dioicous, Roxb.) Male flowers in bracteate fascicles, calyx 4-dentate. Fruit a 2-celled more or less 2-lobed berry, purple when ripe. East Bengal (Billa, Silhet), Burma (Linhlan), Indian Archipelago.

2. *E. acerifolia*, F. Didrichs.—Syn. *Stillingia Himalayensis*, Klotzsch in Reise des Prinzen Waldemar, t. 21. Vern. *Pūtikia*, *phūtikia*, N.W.P.

A large glabrous milky shrub, with deep-green foliage. Leaves membranous, elliptic-lanceolate, serrate, short-petiolate, main lateral nerves prominent, 6-8 pair. Flowers monoicous, a few female flowers at the base of the spikes. Male flowers sessile, in bracteate fascicles; calyx of 3, sometimes 2 or 4, almost distinct linear segments. Stamens 3. Fruit a dry coriaceous, 2-3-lobed capsule,  $\frac{3}{8}$  in. across.

Kasia hills, Nepal, Kamaon, abundant in a few places. Fl. May; fr. Oct.-Nov. Attains 20 ft., bark brownish-grey, longitudinally wrinkled. The root when crushed has a disagreeable smell, and is used occasionally as a cathartic.

Nearly allied is *E. indica*, Müll. Arg.—Syn. *Sapium indicum*, Roxb. l. c. 692; Wight Ic. t. 1950 (*Hurūa*, Beng.)—a small tree with coriaceous oblong-lanceolate, serrulate leaves on short petioles. Spikes solitary, with a few female flowers at the base. Male flowers in short, bracteolate spikelets; calyx 3-cleft to near the base, segments broad-ovate. Fruit a large globose 3-seeded capsule, with thick woody valves. Bengal, Burma (evergreen forests), Ceylon. The seeds are used to intoxicate fish.