

or elliptic-lanceolate, long-acuminate, crenate, or with small sharp glandular teeth, petioles $\frac{1}{2}$ in. long; main lateral nerves 6-8 pair, prominent below, joined by reticulate veins and distinct intramarginal nerves. Flowers on pedicels as long as calyx, in short axillary and extra-axillary racemes not exceeding $1\frac{1}{2}$ in. in length, racemes generally on the previous year's wood, below the leaves; bracts ovate, ciliate, deciduous, 2 at the base of calyx, and 1 at the base of each pedicel. Calyx pubescent. Stamens indefinite; filaments flat, anthers didymous. Ovary 3-celled. Berries ovoid, $\frac{1}{2}$ in. long, on short pedicels, 1-4 together in short racemes.

Himalaya, ascending to 7500 ft., from the Jumna to Bhutan, Kasia hills. Fl. April-June; fr. July, Aug. Bark dark-red brown, with close longitudinal wrinkles. Wood greyish or reddish white, close-grained, hard and strong. In Sikkim the yellow silkworm is raised on its leaves.

3. *S. spicata*, Roxb. Fl. Ind. ii. 541.—Vern. *Lodh* (seeds *Bholia*), Kamaon (Madden, Journ. As. Soc. xvii. part i. p. 570).

A middle-sized tree; glabrous, inflorescence only pubescent. Leaves coriaceous, elliptic-oblong, serrulate, 3-6 in. long, on short petioles. Flowers white, turning yellow when dry, sessile or subsessile, in axillary, compressed, shortly pedunculate or sessile flower-spikes, 1-3 in. long, each flower supported by 3 ovate pubescent bracts. Calyx and ovary glabrous. Drupes dry, 3-12, sessile, ovoid or nearly globose, contracted at the top below the persistent calyx, olive-coloured, 12-ribbed, about the size of a pea, enclosing a hard 1-seeded nut; peduncles 1-3 in. long.

Common along the Western Ghats and the mountains in the vicinity of the Ghats, ascending to 7000 ft. Burma, Kasia hills, Assam, Sikkim. Outside India this tree is found in the Indian Archipelago, China, Queensland, and New South Wales. Fl. Sep.-Dec. The nuts, which resemble a small fluted pitcher (Roxb.), are strung like beads and hung round the necks of children to prevent evil.

In Herb. Kew and Herb. Univ. Edinb. are specimens collected by Madden in Eastern Kamaon at 4500 ft., which may perhaps belong to this species, with elliptic-oblong, serrate, pubescent, membranous leaves 6 in. long, flowers sessile, calyx pubescent, ovary glabrous, in paniculate, axillary spikes $\frac{1}{2}$ the length of leaf, the lateral spikes inserted near the base. They have been referred to *S. polystachya*, Wall., which is very near, if not identical with *S. spicata*.

4. *S. racemosa*, Roxb. Fl. Ind. ii. 539.—Sans. *Lodhra*, *savura lodhra*. Vern. *Lodh*, Beng.

A small tree, glabrous, only inflorescence pubescent. Leaves coriaceous, elliptic-oblong, serrulate, 3-6 in. long, on short petioles. Flowers yellow, fragrant, nearly sessile, on short axillary compound spikes 1-2 in. long, each flower supported by 3 ovate pubescent bracts. Calyx-lobes obtuse, ciliate. Filaments numerous, as long as the spreading corolla, inserted near its base; anthers didymous. Ovary hairy, 3-celled. Fruit oblong or cylindric, more or less distinctly ribbed, often slightly curved, nearly

$\frac{1}{2}$ in. long, purple when ripe, enclosing a hard 1-3-celled nut, with 1 or 2 seeds.

Burdwan, Midnapur, Kasia hills, Sikkim, Nepal, Western Ghats. Attains 20 ft. Bark rough, spongy, grey. Fl. Oct.-Dec.; fr. May. Bark used in dyeing.

There is a tree in the Babar of Kamaon and in the hill forests of Gonda and Baraich (R. Thompson), which has been referred to *S. Hamiltoniana*, Wall. It is closely allied to *S. racemosa*, but differs by longer flower-spikes, and the fruit distinctly ribbed and crowned by broad membranous calyx-lobes. *S. nervosa*, A. DC.; Wight Ic. t. 1235; a large tree on the Nilgiris, is near to *S. racemosa*.

ORDER LI. OLEINEÆ.

Trees or shrubs; leaves opposite, rarely alternate, entire or pinnate. No stipules. Flowers regular, generally in axillary or terminal cymose panicles. Calyx free, usually small, the limb of 4, 5, or more teeth or lobes, sometimes truncate. Corolla gamopetalous, with 4, 5, or more lobes, sometimes divided to the base, or wanting. Stamens 2, adnate to the corolla, alternating with the carpels; anthers 2-celled, opening in longitudinal slits; filaments usually short. Ovary superior, 2-celled, with 2, rarely 1, 3, or 4 ovules in each cell. Fruit succulent or dry, seeds with or without albumen, embryo straight.—Royle III. 266, 267 (*Jasminæ*), Wight III. ii. 151, 157.

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| Fruit an indehiscent, winged samara; leaves imparipinnate | 1. FRAXINUS. |
| Fruit a capsule, dehiscing loculicidally, the valves septiferous. | 2. SCHREBERA. |
| Leaves imparipinnate; capsule woody; no albumen | 3. SYRINGA. |
| Leaves simple or pinnatifid; capsule coriaceous; albumen fleshy | 4. OLEA. |
| Fruit a drupe, with a bony or coriaceous putamen; albumen fleshy; corolla rotate; leaves simple, coriaceous | 5. LIGUSTRUM. |
| Fruit a berry; albumen fleshy or cartilaginous; corolla-tube short; leaves simple | 6. JASMINUM. |
| Fruit a 2-lobed berry, 1 lobe sometimes wanting; seeds without albumen; leaves unifoliolate or imparipinnate; corolla-tube cylindrical | 7. NYCTANTHES. |
| Fruit flat, capsular, separating when ripe into 2 flat 1-seeded cells; leaves simple | |

The two principal sub-Orders of this Family, often regarded as distinct Orders, are *Jasminæ*, with imbricate corolla-lobes, and exalbuminous seeds (*Jasminum*, *Nyctanthus*); and *Oleineæ*, with corolla valvate, or wanting, and albuminous seeds (*Fraxinus*, *Syringa*, *Olea*, *Ligustrum*). *Olea fragrans*, however, and other species of that genus, have an imbricate corolla. *Schrebera* is somewhat anomalous, often associated with *Bignoniaceæ*, but in some respects closely allied to *Syringa*.

1. FRAXINUS, Tournef.

Trees or shrubs, with opposite, imparipinnate leaves. Flowers in racemes or panicles, polygamous or dioicous. Calyx 4-dentate, 4-cleft, or wanting. Petals 4 (Section *Ornus*), generally cohering at the base in pairs, or wanting (Section *Fraxinaster*). Stigma bifid. Fruit (samara) indehis-

cent, winged at the top, 1- or 2-celled, 1- or 2-seeded. Seed with a fleshy or somewhat horny albumen and a cylindrical embryo, radicle superior.

Lateral leaflets petiolulate; flowers and fruit in large terminal panicles; samara supported by the persistent calyx.

1. *F. floribunda*.

Lateral leaflets sessile; fruit in short lateral racemes; no trace of calyx at the base of samara.

2. *F. excelsior*.

Lateral leaflets subsessile; fruit in numerous short lateral umbelliform clusters; samara supported by the persistent calyx.

3. *F. Moorcroftiana*.

1. *F. floribunda*, Wall.—Tab. XXXVII.—Roxb. Fl. Ind., ed. Carey, i. 150; Pl. As. Rar. t. 277.—Vern. *Banūrish*, Afg.; *Sūm*, *sūmb*, *sūnnū*, *shūn*, *hūm*, *hamu*, Pb.; *Angan*, *angou*, *dakkūri*, N.W.P.; *Kangu*, *tahāsi*, Nepal.

A large tree, with compressed branchlets. Leaflets opposite, 3-4 pair, petiolulate, ovate-oblong, long-acuminate, serrate, serratures often falcate, 4-6 in. long, glabrous above, pilose along nerves beneath; main lateral nerves prominent, 10-15 pair, often branching, joined by prominent reticulate veins. Flowers white, often bisexual, inodorous, on slender pedicels as long as flowers, in large compound terminal panicles, the lower branches in the axils of pinnate or linear floral leaves. Calyx 4-dentate, teeth sometimes short. Petals 4, oblong, narrowed at both ends, 2-3 times the length of calyx. Stamens longer than petals. Samara oblanceolate, 1-1½ in. long, acute, narrowed below, seed-part cylindrical or four-sided, supported by the persistent and somewhat enlarged calyx. Style not persistent.

Afghanistan, wild and cultivated, Kandahar, Beluchistan, trans-Indus territory, on the east flank of the Suliman range. Himalaya, not common, occasionally planted from the Indus to Sikkim, between 5000-8500 ft., in Sikkim ascending to 11,000 ft. Found locally in groups in shady parts of mixed forests. Leafless during part of winter. Fl. at various times, usually April-May; fruit ripens Aug.-Sept. Growth moderate, 8 rings per in., Wall. A tree 30 years old, 40 ft. high, and 4 ft. girth, Stewart. Hardy in England.

The finest specimens in the N.W. Himalaya are those planted near villages and temples on the Chenab, some of which are exceedingly handsome large trees, 120 ft. high, with a thick-based, erect, tall trunk, attaining a girth of 12, at times 15 ft. Bark cinereous, smooth, but with deep longitudinal cracks and transverse furrows. Wood similar to English ash, tough and hard, valued much for ploughs, jampan-poles, and in Kashmir reckoned the best wood for oars. Coral-shaped galls not uncommon on the branches.

Closely allied to this species is the *Manna Ash* of the Mediterranean region, *F. Ornus*, Linn. Italian: *Avornello* (*Ornello*, Calabria; *Frascinū di manna*, *muddia*, *middia*, Sicily). The difference consists in long linear calyx-lobes, linear petals, many times longer than calyx, the samara not narrowed at the base, and often terminated by the base of the persistent style. The leaflets also are shorter and not long-acuminate, but vary in shape exceedingly, from narrowly lanceolate to almost orbicular. This variability has given rise to the erroneous supposition of two species or varieties, *F. Ornus* and *F. rotundifolia*. Manna is the sweet concrete juice, which exudes from cuts made in the bark. Small sticks are inserted in the wounds, round which the manna congeals like stalactites, and that which runs down to the roots is gathered on tiles or half-dry

cactus leaves. The gathering of the produce begins when the stems have a thickness of at least 3 inches. The cuts are nearly horizontal, $1\frac{1}{2}$ -2 in. long, and 1 in. apart. One cut is made daily, beginning at the base of the tree, the next directly above the first, and so on, while dry weather lasts. In wet weather, or when the sirocco blows, the manna dissolves and cannot be collected. The best time for notching is July and August, and the weather most favourable to produce is that in which there are steady north and north-west winds, dry air, moderate heats and calm nights. In the second year the cuts are made in the untouched part of the stem, and when after some years the tree has been all cut round, it is exhausted, and should be felled. The trees are replaced by coppice-shoots from the stool, and by planting. This is the procedure in Sicily, as described by Dr Cleghorn in Trans. Bot. Soc. Edinb. vol. x. 1870, p. 132.

F. retusa, Champ. of China, is also near to *F. floribunda*, but the calyx is larger and truncate, and the samara is always emarginate.

2. *F. excelsior*, Linn. ; Hook. Stud. Fl. 238.—Vern. *Sūm*, *kūm*, Pb.

A large glabrous tree. Leaflets 3-5 in. long, $1\frac{1}{2}$ -2 in. broad, 2-4 pair, elliptic, or elliptic-oblong, acuminate, serrate, membranous, the terminal petiolulate, the lateral sessile or subsessile, with grey or tawny floccose pubescence underneath along the midrib ; main lateral nerves 6-8 pair. Samaras on slender pedicels, in lateral drooping racemes, sometimes compound at the base ; linear, $1-1\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad, flat, with 5 or more longitudinal nerves from the base, branching and anastomosing above the seed-part ; base narrowed, without any trace of calyx, apex acute, obtuse or emarginate, often with the remains of style.

I have examined numerous specimens from N.W. India, but only in fruit. There is no doubt, however, that it belongs to the section *Frazinaster* without corolla. *F. syriaca*, Boiss., which is found in Afghanistan, has elliptic samaras, grey and subcoriaceous leaves ; the other allied species (or varieties) of Western Asia and South Europe (*F. oxyphylla*, Bieb., *F. rostrata*, Gussone, *F. australis*, Gay, and *F. angustifolia*, Vahl), have lanceolate and deeply serrate leaflets. It thus stands nearer to *F. excelsior* than to any other species known to me, the principal difference being in the number of leaflets, which are 4-6 pair in the common ash. But forms with 1-4 pair are not uncommon, and there is a well-known variety with unifoliate leaves (*F. heterophylla*, Vahl). However, until flowering specimens are examined, the identification of this tree with *F. excelsior*, which was first made by Dr Stewart, must be regarded as provisional.

N. W. Himalaya. Basin of the Jhelam, Chenab and Ravi rivers, between 4000 and 6000 ft. Europe, Caucasus, North Persia (Buhse). New leaves and flowers in April, May ; fr. June, July. A large, handsome tree in the N.W. Himalaya, 50-60 ft. high, with a straight tall trunk, attaining 7 ft. girth, branches erect or spreading, often with drooping branchlets, forming a lax, oval, pyramidal crown, in old trees rounded. Bark $\frac{1}{2}$ in. thick, or more, brownish-grey, or greyish- or yellowish-green, smooth between longitudinal cracks.

The wood of the European Ash is whitish, with brown, often mottled heartwood, the medullary rays are narrow and very numerous, the annual rings clearly marked, each ring consisting of an inner belt, which is very porous, the tissue between the medullary rays being mainly composed of numerous large pores, and an outer more compact belt with few pores. Its weight varies between wide limits ; slowly-grown wood, with narrow rings and a larger proportion of porous tissue, being sometimes lighter than wood which had grown more

rapidly. According to Nördlinger (Die technischen Eigenschaften der Hölzer, 520), the specific gravity is between 0.57 and 0.94. Tredgold (Principles of Carpentry) gives 0.690 to 0.811, or 43.1 to 50.7 lb. per cub. ft., but I have seen pieces of English Ash weighing as much as 55 lb. The wood is highly prized on account of its toughness and elasticity, it takes a beautiful polish, and is largely used for wheelwork, oars, handles of tools, and furniture.

The Ash in Europe requires much light, but grows with great rapidity when young, and with its powerful terminal shoots pierces readily through thickets of the Beech, with which it is often associated. In this respect it somewhat resembles the Teak, which, though it requires much light, will yet hold its own in a mixed forest, because the leaders of the young trees are able to pierce through thickets of Bamboos and other trees. Pure Ash forests are unsatisfactory, because the foliage of the older tree is light and does not cover the ground sufficiently; but, mixed with Beech, the tree grows well, and the stems attain great height and girth. In certain localities, and under certain circumstances, the Ash keeps ahead of the Beech to an advanced age, and in such places the green heads of the tree stand out from the mass of the more yellowish-green foliage of the Beech; in other places, the Beech is said to overtake the Ash when older. The study of this tree in the forests of Europe has a particular interest for Indian foresters, owing to the similarity of its growth to the Teak. The Beech forests of Buckinghamshire, the mixed forests (*Beech*, *Wyck* or *Mountain-elm*, *Ash*, *Sycamore*, and *Acer platanoides*) of Lanterberg on the Harz, and the forests on the Rauhe Alp near Urach in Würtemberg, are very instructive for the study of this interesting tree.

The Ash coppices well. The finest planted coppice-woods of Kent, for the production of hop-poles and hoops, consist of Ash and Sweet Chestnut. It is for farther inquiry whether the Himalayan tree here described possesses the numerous excellent qualities of the European Ash.

3. *F. Moorcroftiana*, Wall.—Syn. *F. zanthoxyloides*, Wall.; DC. Prodr. viii. 275. Vern. *Shang*, Afg.; *Hanūz*, *nūch*, *shūllī*, *chūj*, *sīju*, *chūm*, *thūm*, *sandal*, *shangal*, *būtru*, Pb.; *Auga*, *gaha*, N.W.P.

A large shrub, or small tree, with compressed branchlets. Leaves approximate at the ends of branchlets, often very unequal in size on the same tree; leaflets opposite, 3-5 pair, 1-2 in. long, obtusely dentate, sessile or subsessile, the terminal narrowed into a marginate petiolule; common petiole narrow-winged. Flowers appearing before the leaves, in compact, rounded, short lateral panicles with hirsute bracts. Calyx rusty pilose outside, cleft to one-fourth into 4 broad, rounded teeth. Petals 4, linear-oblong, connate in pairs at the base. Anthers subsessile, large, erect. Fruit on filiform pedicels, drooping, in numerous short umbelliform fascicles below the leaves. Samara linear-spathulate, 1-1½ in. long, seed-part thick, ribbed and furrowed, supported by the persistent calyx, top acute, with the base of the persistent style. Seed 1, compressed, linear, with longitudinal ridges and furrows.

Afghanistan and Beluchistan. Trans-Indus territory on eastern flank of Suliman range. N.W. Himalaya, mainly in the inner more arid districts, Jhelam basin (3500-5000 ft.), Chenab, very abundant in places (3000-9000 ft.), Kunawar and Piti (5000-8000 ft.), Kamaon (9000 ft.). Often gregarious, on bare arid slopes. Fl. April; fruit ripens June-Aug. Growth slow, 20 rings per in. of radius.

Attains at times 25 ft., with a short erect trunk 5-6 ft. girth, and stiff diver-

gent branches, forming a rounded crown. Generally a large shrub, 10-15 ft. high. Bark $\frac{1}{4}$ - $\frac{1}{2}$ in. thick, cinereous or brown, scabrous with light-coloured specks, smooth while young, with shallow wrinkles, dark and much cracked when old, resembling the bark of *Reptonia buxifolia*. Wood light brown, with a few white specks, heavy, hard, close-grained, strong, polishes well. Used for tool-handles, yields excellent fuel. The leaves are valued as fodder for sheep and goats, and the tree is much lopped.

2. SCHREBERA, Roxb.

Deciduous trees, with imparipinnate leaves; flowers in terminal trichotomous, corymbose, compound cymes. Calyx campanulate, with 5 unequal teeth, often splitting into 2 lips. Corolla hypocrateriform; tube longer than calyx, limb spreading, 5-7-lobed, the lobes imbricate in bud. Stamens 2, inserted in the corolla-tube; anthers ovate-oblong, cells parallel, contiguous. Ovary 2-celled, 4 ovules in each cell; stigma bifid. Fruit a large pear-shaped 2-valved capsule, thick, woody, dehiscent loculicidally, the valves septiferous. Seeds 8, pendulous from the top of the cell, ending below in a long, lanceolate wing; testa smooth, with a thick, spongy inner coating; albumen 0, radicle short, superior, cotyledons oblong, fleshy, longitudinally plaited.

1. *S. swietenoides*, Roxb. Cor. Pl. t. 101; Fl. Ind. i. 109; Wight Ill. t. 162.—Vern. *Mōka*, *mōkha*, *gōki*, *ghart*, *gautha* (*Thitsoayledu*, Burm.)

A moderate-sized tree, with grey branchlets and deciduous pubescent leaves, sometimes glabrate afterwards. Leaflets 3 or 4 pair, ovate, entire, sometimes ovate-lanceolate, obtusely acuminate, base often unequal-sided, blade 2-4 in. long, the lateral leaflets short petiolulate, the terminal on a petiolule half the length of blade; main lateral nerves 6-8 pair, with shorter intermediate ones. Flowers fragrant at night. Cymes regularly trichotomous, 3-6 in. long, and equally broad, ramifications and linear bracts pubescent. Calyx pubescent. Corolla $\frac{1}{2}$ in. long, white and brown, fragrant, the inside of lobes with elevated brown glandular dots. Capsule pendulous, rough with white elevated specks, 2 in. long.

Found here and there, common in places, but not gregarious, in South and Central India, and in Burma. In Western India I found it in Banswara, and in the Bassi forests of Meywar, N.E. of Chittor. Said to grow in Sindh, on the hills west of the Indus (Graham, Bombay Cat. 112). In the sub-Himalayan tract only known from the south-east corner of Kamaon. Bare for several months, the new leaves come out April-May; fl. Feb.-April.

A middle-sized tree, attaining 40 ft., but generally smaller. Trunk erect, straight, 4-5 ft. girth, with numerous branches. Bark ash-coloured, scabrous. Heartwood yellowish grey, close-grained, hard, 50 lb. per cub. ft., seasons well, without warping and splitting, works freely and is durable. Used for the beams of weavers' looms, for making combs, and in turning. Has some of the qualities of boxwood.

A second species is described by S. Kurz in Flora, 1872, p. 398, as *S. pubescens* from Jubbulpore, with subsessile leaflets. I have not seen specimens, and the matter requires farther inquiry on the spot.

3. SYRINGA, Linn.

Shrubs or small trees, with entire or pinnatifid deciduous leaves; flowers in a terminal thyrus, consisting of numerous compound trichotomous cymes. Calyx more or less persistent, campanulate, 4-toothed, teeth often small. Corolla hypocrateriform; tube longer than calyx, limb 4-lobed, the lobes valvate in bud. Stamens 2, inserted on the corolla-tube. Ovary 2-celled, 2 ovules in each cell; stigma bifid. Fruit a coriaceous capsule, more or less cylindrical, 2-celled, 2-valved, dehiscing loculicidally, the valves septiferous. Seeds pendulous in pairs from the top of each cell, with a narrow wing all round. Embryo straight in a fleshy albumen, cotyledons foliaceous, radicle superior.

Leaves elliptic-oblong, pale beneath, 3-5 in. long, young parts pubescent

1. *S. Emodi*.

Leaves lanceolate elliptic or pinnatifid, 1-2 in. long; wholly glabrous

2. *S. persica*.

1. *S. Emodi*, Wall.; Royle Ill. t. 65.—Vern. *Ban phünt*, *ban dākhūr*, *banchūr*, *razli*, *juari*, *rangkrūn*, *rangchūt*, *kchimu*, *lolti*, *leila*, *shāfri*, *shapri*, *dūden*, *chilanghati*, Pb.

A large deciduous shrub; glabrous, inflorescence only and young leaves pubescent. Leaves elliptic-oblong, entire, base acute, apex short-acuminate, pale beneath, blade 3-5 in., petiole 1 in. long; main lateral nerves 6-8 pair, arcuate. Flowers purplish lilac, scented; thyrus pyramidal, 3-5 in. long, with lanceolate deciduous bracts, the lower branches in the axils of leaves, flowers on short pedicels, crowded in short compact cymes. Calyx-teeth triangular, often very short. Corolla-lobes linear-oblong, generally with an inflexed point: tips of anthers exserted. Capsule cylindrical, acute at both ends, $\frac{3}{4}$ in. long, often curved.

Safedkoh, trans-Indus 9000 ft. Abundant in many parts of N.W. Himalaya, from the Indus to the Sarda, ascending to 11,000 ft., in the outer moister ranges, as well as in the inner more arid tracts (Lahoul). Hardy in England. A cultivated form raised from Himalayan seed, is described and figured in Bot. Reg. vol. 31, tab. 6, with white flowers, and a heavy unpleasant smell. Fl. May-Aug.; fr. Sept.-Oct. Attains 8-10 ft., the bark of branches is warted with large whitish lenticels. Wood white, even- and close-grained. Leaves used as fodder for goats.

2. *S. persica*, Linn. Bot. Mag. t. 486.—Vern. *Hāsmīn*, Kashmir.

A glabrous shrub. Leaves elliptic lanceolate or pinnatifid, 1-2 in. long. Flowers white or purplish lilac, scented, thyrus narrow pyramidal, 6-8 in. long, with linear bracts; flowers in regular, trichotomous, but often incomplete cymes, the terminal on pedicels $\frac{1}{2}$ - $\frac{1}{4}$ in. long, the lateral often subsessile. Limb of corolla spreading, lobes ovate or obovate, acute, edges thickened. Capsule cylindrical, $\frac{1}{2}$ in. long.

Cultivated in Kashmir and at Lahore. Found (apparently wild, with entire leaves) by Dr Stewart near Kānigorum, the chief village of Waziristan, on the eastern flank of the Suliman range, at 8000 ft. Believed to be indigenous in Persia, whence it has been introduced to Europe; hardy in England, and grown

everywhere in gardens with *Syringa vulgaris*, Linn., which is marked by broad-ovate or cordate leaves. Leafless in winter; fl. April-May.

4. OLEA, Linn.

Trees or shrubs, with opposite, coriaceous, persistent leaves. Flowers often unisexual. Calyx shortly campanulate, 4-dentate or truncate. Corolla with a short tube and 4 spreading lobes, valvate or imbricate in bud (in a species not Indian wanting). Stamens 2, exserted. Ovary 2-celled, 2 ovules in each cell; style short, stigma bifid, or capitate. Fruit a drupe, the endocarp usually hard, the exocarp fleshy. Seed solitary, rarely 2, albumen fleshy, its cells filled with oil. Embryo straight, nearly as long as the seed, cotyledons foliaceous, radicle superior.

Lateral nerves indistinct, leaves clothed beneath with a film of reddish scales 1. *O. cuspidata*.

Lateral nerves distinct, leaves without scales beneath.

Flowers in compound trichotomous cymes; corolla-lobes valvate 2. *O. glandulifera*.

Flowers in umbelliform fascicles; corolla-lobes imbricate 3. *O. fragrans*.

1. *O. cuspidata*, Wall.—Tab. XXXVIII.—Syn. *O. ferruginea*, Royle Ill. t. 65. Vern. *Khwan*, *shwan*, Trans-Indus; *Zaitūn*, Afghanistan (Griffith). *Ko*, *kohū*, *kāo*, *kāu*, Pb.; *Kāu*, N.W.P.; *Kahū*, *khāu*, Sindh.

A middle-sized unarmed tree. Branchlets, petioles, and inflorescence clothed with a white or grey film of minute scales. Leaves oblong-lanceolate, cuspidate, entire, 2-4 in. long, shining above, thickly clothed beneath with a dense ferruginous or red film of scales, the scales minute, orbicular, fixed in the centre, circumference minutely and irregularly dentate; midrib prominent; lateral nerves invisible beneath, indistinctly visible on the upper surface, anastomosing by intramarginal veins. Flowers whitish, bisexual, in axillary, more or less regularly trichotomous cymes, generally shorter than leaf, equalling about half its length. Bracts linear, caducous; the lateral flowers sessile or subsessile, the terminal pedicellate. Calyx short-campanulate, with 4 short teeth, nearly truncate. Corolla rotate, lobes ovate, acute with a distinct midrib, valvate in bud. Anthers oval, the cells contiguous on the outside, dehiscing laterally, separated on the inside by the broad elliptic connective; filaments short, affixed at the back, a little above the base, between the contiguous cells. Style short, stigma thickened, bifid. Drupe ovoid, about $\frac{1}{4}$ in. long, black when ripe, supported by the remains of calyx; pulp scanty, oily, putamen thick, hard, bony.

Abundant in the trans-Indus territory, one of the characteristic trees on the eastern flank of the Suliman range. In Afghanistan, Beluchistan, the hills of West Sindh, the Panjab Salt range, and in many parts of the outer ranges of the N.W. Himalaya, ascending to 6000 ft., and extending east to the Jumna river. Not uncommon on the Tonse river, near Bastil (D.B.)

I cannot follow Dr Stewart and others in identifying the Indian tree with *Olea europæa*, L. The distinguishing characters of the Indian tree are a more lax in-

florescence, the upper side of the leaves deep glossy green, not grey or dull green, * as in the Mediterranean tree, the under side red or ferruginous instead of white, smaller fruit, the absence of spines, and a more distinctly marked heartwood. These, it is true, are not characters to which systematic botanists commonly attach much value, but the appearance of the trees is different, and there is this important fact, that though the tree is common in Sindh and the hills of the Panjab, there is no trace of its ever having been cultivated, and the fruit turned to account on a large scale in those countries. Should eventually intermediate forms be discovered, and should botanists agree to regard the Indian and West Asiatic tree as one species, then the remarkable fact will have to be explained that the art of improving the tree by cultivation, and grafting it, was not practised in the Panjab at an early age. In Palestine the Olive tree has been cultivated from time immemorial for the sake of its oil, and in Greece also its cultivation is very old, for Solon (early in the sixth century, B.C.) enacted laws regarding the growth of the Fig and the Olive. The tree is indigenous in Syria, and probably in Greece also. Greek colonists carried the tree westward, to Italy, Istria, Spain, and the South of France, and thus the Olive has gradually become completely naturalised in the western Mediterranean region, for it spreads readily, and the self-sown or bird-sown seedlings revert more or less to the wild form. The eastward spread of the Olive has been much less marked. At the time of Herodotus, in the fifth century, B.C., the Olive was not known in Persia, and in India the attempts made to grow the Mediterranean Olive are of recent date, and have not hitherto been successful. The real Olive is called *Zaitūn* in Persian and Arabic; it has no Sanskrit name, and Olive oil is not mentioned by old Sanskrit writers. Few subjects are more interesting than the spread of the cultivation of this useful tree, and the interest is heightened by the close affinity of the West Asiatic and Indian species.

The Indian tree grows gregariously, the leaves are shed in January and February, and are renewed immediately afterwards. It flowers from April to May, sometimes in September; the fruit ripens Aug.-Nov. The growth is slow. The tree is often kept down by lopping, but when it gets fair play and some protection it attains a considerable size, 30-40, rarely 50 ft., with a short massive trunk, often gnarled and bent, girth 6, at times 10-12 ft. Branches stiff, crooked, widespreading, forming a broad depressed rounded crown. The foliage is deep glossy green. The branches are always unarmed, whereas they are often spinescent on the wild Olive of the Mediterranean region. Bark thin, smoothish, undulated while young, when old exfoliating in long irregular narrow strips. Heartwood with a well-defined outline, dark brown, often nearly black and beautifully mottled. Sapwood yellowish. The wood of the Mediterranean tree is yellowish brown, irregularly mottled and veined with dark blackish-brown veins. In weight and structure there seems to be no marked difference. Wood from Sindh weighs 65 lb., and this is about the weight of the Mediterranean wood. The medullary rays are fine and very close together; the wood is marked by numerous whitish dots generally arranged in wavy concentric lines. Annual rings not very distinct, often marked by a dark line without dots. The wood takes a beautiful polish, is very hard, is highly prized for turning, for crooked timbers of the Indus boats, and agricultural implements; combs are carved of it. It yields excellent fuel, and makes good charcoal. The fruit is a favourite food of crows, and ripe fruit is not often seen on the trees. The pericarp is oily, like that of the real Olive tree. In Afghanistan oil is extracted from the indigenous tree in a small way, and used medicinally (Irvine, Bellow), and about 1851 an experiment was made in Kohat to extract oil on a larger scale. The oil was excellent, but the quantity obtained was insufficient to repay an extension of the process. So much, however, is clear, that oil can be made from the fruit of the

Indian tree; and it seems probable, that by grafting or other means the yield may eventually be improved.

2. *O. glandulifera*, Wall.; Wight Ic. t. 1238; Bedd. Fl. Sylv. t. 238.—Syn. *O. paniculata*, Roxb. Fl. Ind. i. 105, not *paniculata*, R. Brown (an Australian species); *O. Roxburghiana*, Roem. et Schultes. Vern. *Gulili*, *rabān*, *sira*, *phalsh*, Pb.; *Gair*, *galdu*, *garūr*, Kamaon.

Wholly glabrous. Leaves ovate or elliptic, long-acuminate, entire, blade 4-5 in., petiole 1-1½ in. long; main lateral nerves 6-8 pair, on the under side with small oval, open hollow glands in their axils. Flowers white, in terminal and lateral pyramidal compound trichotomous cymes; bracts deciduous. Calyx 4-toothed. Corolla rotate, lobes valvate. Anthers like those of *O. cuspidata* and *europæa*. Fruit ovoid, shortly acuminate, putamen with a thin, crustaceous or woody shell.

Outer Himalayan ranges between 2500 and 6000 ft., from the Indus to Nepal. Mountains of South India. Scattered in mixed forests, in moist shady ravines, often associated with *Acer oblongum*. Fl. March-May, sometimes in August. The fruit ripens Nov.-Feb., and often remains long on the tree. A small or middle-sized tree, trunk short, straight, girth 5-6 ft., branches widespreading, forming a handsome, broad, rounded depressed, unbragous crown. A very large tree on the Nilgiris. Young branches tetragonal, light coloured, and warty with lenticels, bark of trunk ¼ in. thick, grey with elevated white specks, very uneven, exfoliating with brittle scales. Wood pale brown, with some white dots on transverse section, medullary rays and pores broader and larger than in *O. europæa* and *O. cuspidata*. Moderately hard, close, compact, not very dense, capable of a high polish, not touched by insects, durable. Employed in construction, carpentry and turnery, and for agricultural implements. Growth moderate. A section of a tree 43 years old (Hort. Calc.) showed 43 rings, on a radius of 10 in. The bark is medicinal, the leaves are used as fodder.

3. *O. fragrans*, Thunb.; Roxb. Fl. Ind. i. 105; Bot. Mag. t. 1552.—Syn. *O. acuminata*, Wall.; *Osmanthus fragrans*, Loureiro; DC. Prodr. viii. 291. Vern. *Shilling*, *silang*, Kamaon.

A small tree, wholly glabrous. Leaves lanceolate- or elliptic-oblong, blade 4-5 in. long, acuminate, narrowed into petiole ½-¾ in. long, entire (in cultivated trees often serrate); lateral nerves numerous, anastomosing by prominent reticulate and intramarginal veins. Flowers dioicous, white, exceedingly fragrant, on long slender pedicels, in axillary, rarely terminal umbelliform fascicles. Male flowers: corolla-lobes oblong, imbricate, many times longer than the small 4-toothed calyx; anthers like those of *O. cuspidata* and *europæa*. Rudiment of ovary of 2 white falcate lobes. Fruit a blue, glaucous ovoid drupe, ¾ in. long; putamen with a hard woody shell. Embryo cylindrical, radicle longer than cotyledons.

I follow Benth., Fl. Hongkongensis, 215, and Miquel, Ann. Mus. Lugd. Bot. ii. 264, in replacing this species under *Olea*. There are other species with imbricate corolla-lobes; the fertile specimens from Kamaon are in fruit only.

In Simore and Kamaon planted by temples and villages, and at passes, between 2800 and 6800 ft. At one place, near Kapkot, it covers a considerable

area as a shrub; but it is uncertain whether it is originally indigenous in the North-West Himalaya. Apparently wild in Eastern Bengal and on the Island of Nipon (Japan), Miguel l. c. Cultivated in Japan, China, and most tropical countries. In May, June, sometimes in Sept., the tree is covered with an abundance of white or light-yellow flowers with an exquisite fragrance, which the least breath of wind carries a distance of several hundred yards. Growth slow, 13 rings per in. radius. In Japan often a large tree (fl. in Oct.), in Kamaon a small tree or shrub; bark $\frac{1}{2}$ in. thick, dark or light-grey, irregularly longitudinally rugose, and scabrous with elevated tubercles. Wood whitish, mottled with brown. In Kamaon the flowers are placed among clothes to keep off insects, in China they are used to flavour tea.

5. *LIGUSTRUM*, Linn.

Shrubs or small trees, with opposite, entire leaves. Flowers bisexual, in terminal trichotomous panicles. Calyx small, 4-toothed. Corolla with a short tube and 4 lobes, valvate or slightly imbricate in the bud. Ovary 2-celled, 2 ovules in each cell; style short. Fruit a berry. Seeds 4 or fewer; albumen copious, fleshy or almost cartilaginous; cotyledons foliaceous, radicle superior.

1. *L. robustum*, H.f. & Th.—Syn. *Phillyrea robusta*, Roxb. Fl. Ind. i. 101. *Olea robusta*, Wall.; Wight Ic. t. 1242. *Visiania robusta*, DC. Prodr. viii. 289. Vern. *Keri*, *banpatāra*, N.W.P.

A moderate-sized tree, nearly glabrous. Branchlets dotted with small elevated white specks. Leaves ovate or ovate-lanceolate, coriaceous, glabrous on both sides, shining above. Flowers white, subsessile; bracts linear, deciduous. Ramifications of panicle pubescent, with long soft hairs. Calyx cup-shaped, truncate or 4-dentate. Corolla-tube short; lobes oblong, valvate in bud. Anthers on short filaments. Berry cylindrical, often curved, $\frac{1}{2}$ – $\frac{1}{2}$ in. long.

Mountains on the west side of the peninsula. Bengal, Nepal, and Kamaon, 2500–8000 ft. Fl. April–June; fr. Nov.–Feb. In mixed forests, scattered, a handsome, middle-sized tree, 40 ft. high, trunk erect, 4–5 ft. girth, branches ascending, forming an oval crown. Bark cinereous, scabrous with numerous warts. Wood light-brown, often with white dots, fairly close and durable, said to be somewhat brittle. In South India the bark is put into the toddy of *Caryota urens*, to cause immediate fermentation. Closely allied are the following trees:—

1. *L. compactum*, H.f. & Th. (*Olea compacta*, Wall.) Branchlets without elevated specks; panicles compact, perfectly glabrous; berries ovoid or subglobose, $\frac{1}{2}$ in. long. North-West Himalaya, Sarda to the Bias, at 3500–6000 ft. (Karama peak, Deoban range, D.B., June 1863). Fl. May–July.

2. *L. nepalense*, Wall. in Roxb. Fl. Ind., ed. Carey, i. 151; Pl. As. rar. t. 270.—Syn. *L. spicatum*, Don Prodr. Fl. Nep. 107. *The Nepal Privet*. Vern. *Gum-gacha*, Nepal. Branchlets dotted with callous spots. Flowers white, subsessile, in compact villous panicles; bracts minute, deciduous. Calyx truncate or indistinctly 4-toothed. Berries ovoid, dark blue, with a beautiful bloom on them. Nepal. Fl. April–June.

3. *L. bracteolatum*, Don l. c. 107, differs by linear-lanceolate bracts and more spreading panicles. Berries (always?) subglobose. Garhwal, Kamaon, 2500–7000 ft. Nepal.

These species of *Ligustrum* require farther study.

6. JASMINUM, Linn.

Shrubs or climbers, with opposite, rarely alternate, imparipinnate, or unifoliolate leaves. Flowers white or yellow, in axillary or terminal trichotomous cymes. Calyx-lobes 5-10. Corolla-tube cylindrical or clavate, the limb spreading, 5-12-lobed, the lobes imbricate, often contorted in the bud. Stamens included in the tube. Ovary 2-celled, 1, 2, rarely 3 ovules in each cell; style minutely 2-lobed at the tip. Berry 2-lobed almost to the base, or entire by the failure of 1 carpel. Seed usually 1 in each lobe, erect, without albumen; cotyledons thick and fleshy, radicle inferior.

Leaves opposite, simple, unifoliolate, the petiole articulate below the middle.

Flowers pedicellate, solitary or in lax trichotomous cymes.

Pubescent; calyx-segments 5-9, longer than calyx-tube
Pubescent; calyx-segments 5-6, as long as tube or twice its length.

Erect, not climbing

Climbing

Glabrous; calyx-segments 5-6, as long as tube

Flowers subsessile, in compact corymbose cymes

Leaves opposite, imparipinnate, leaflets 1 or 2 pair; or leaves unifoliolate

Leaves opposite, all imparipinnate, leaflets 1-3 pair, the terminal largest; calyx-segments nearly as long as corolla-tube

Leaves opposite, all imparipinnate, leaflets 3-5 pair, the lowest larger, the upper 1 or 2 pair confluent with the terminal leaflet

Leaves alternate, imparipinnate, leaflets 1-5 pair

1. *J. Sambac*.

2. *J. arborescens*.

3. *J. latifolium*.

4. *J. glandulosum*.

5. *J. leirsutum*.

6. *J. dispernum*.

7. *J. officinale*.

8. *J. grandiflorum*.

9. *J. revolutum*.

There are other species within the range of this Flora; a selection has been made of the more common kinds.

1. *J. Sambac*, Aiton; Roxb. Fl. Ind. i. 88; Wight Ic. t. 704.—Sans. *Mallika*, *āspota*, *saptala*; Pers. *Zambac*. Vern. *Chamba*, *mūgra*, *bēl*.

A shrub, generally climbing, pubescent. Leaves glabrate, opposite, 2-3 in. long, on short petioles, elliptic or rotundate, entire, shortly and obtusely acuminate; main lateral nerves 4-6 pair. Flowers white, fragrant, solitary, or in 3, 5- or 7-flowered terminal cymes. Calyx-segments 5-9, linear; hairy, longer than calyx-tube, and half the length of corolla-tube or more. Berry-lobes subglobose, 1 or 2.

Cultivated, on account of its delightfully fragrant flowers, in numerous varieties, erect and climbing, with larger and smaller, double and single flowers, throughout India, and in most tropical countries. Believed to be indigenous in the peninsula. Fl. H.S.

2. *J. arborescens*, Roxb. Fl. Ind. i. 95; Wight Ic. t. 699; a tall shrub: and 3. *J. latifolium*, Roxb. Fl. Ind. i. 95; Wight Ic. t. 703; a climber,—are in all other respects so much alike, that with abundant specimens before me, from Oudh, the Central Provinces, the North-West Himalaya, and other parts of India, I find it impossible to draw up distinct

descriptions. Farther researches on the spot must decide whether these species should not, as suggested in Wight Ic. t. 703, be regarded as one.

More or less pubescent. Leaves opposite, ovate from a broadly rounded, rarely cordate base, acuminate, entire, soft-tomentose on both sides when young, more or less glabrous afterwards, blade 3-5 in. long, 2-3 in. broad, petiole $\frac{1}{2}$ - $\frac{3}{4}$ in. long; main lateral nerves 6-8 pair, 3 or 4 pair approximate, from the lowest third of the midrib. Flowers white, fragrant, in lax terminal trichotomous, more or less compound cymes, with linear bracts; pedicels as long as calyx, or twice, rarely 3 times its length. Calyx-lobes 5 or 6, linear, as long as calyx-tube, or twice its length, always shorter than corolla-tube. Corolla-lobes 10 or 12, linear, acute or cuspidate. Berries 1 or 2, ovoid or oblong, often oblique, $\frac{1}{3}$ - $\frac{1}{2}$ in. long, longer than calyx-segments.

Common in most parts of India, except in the arid region and the northern Panjab. In the outer Himalaya extends to the Jumna, and ascends to 4000 ft. Often cultivated in gardens, also in the Panjab. Fl. H.S. Branches with smooth, greyish bark.

4. *J. glandulosum*, Wall.; Royle Ill. p. 268.

A climbing shrub, wholly glabrous. Leaves shining, lanceolate or ovate-lanceolate, blade 3-4 in., petiole $\frac{1}{4}$ in. long. Flowers on long filiform pedicels many times longer than calyx, generally bibracteolate about the middle, solitary, or in few-flowered lax terminal cymes. Calyx-lobes 5 or 6, linear, as long as tube. Corolla-tube slender, 1-1 $\frac{1}{4}$ in. long; lobes 6-8, linear, a little shorter than tube.

Kamaon, ascending to 4500 ft., Sikkim, Kasia. Fl. June, July (yellow, Royle; white, Don Syst. iv. 61).

5. *J. hirsutum*, Willd.; Wight Ic. t. 702.—Syn. *J. pubescens*, Roxb. Fl. Ind. i. 91. Sans. *Kunda*. Vern. *Kunda*, *kundo*.

A large tomentose shrub. Leaves ovate from a rounded or cordate base, shortly acuminate, entire, blade 1-2 $\frac{1}{2}$ in. long, and about $\frac{3}{4}$ -1 $\frac{1}{2}$ in. broad, petioles $\frac{1}{4}$ in. long. Flowers white, fragrant, sessile or on pedicels shorter than calyx-tube, crowded in compact, terminal, short-pedunculate corymbose cymes. Calyx-lobes 8-10, linear, hairy, many times longer than tube, nearly as long as corolla-tube. Corolla-lobes 6-9, lanceolate-oblong, cuspidate, shorter than tube.

Common in the peninsula, Burma, Bengal, Oudh, and the Central Provinces, and extends in the sub-Himalayan tract to the Jumna river. Cultivated in gardens. Fl. rains and C.S. Branches grey-tomentose.

6. *J. dispernum*, Wall. Roxb. Fl. Ind., ed. Carey, i. 99; Pl. As. rar. t. 274.—Vern. *Surmali*, Kamaon.

A scandent shrub, wholly glabrous; branches slender, 4-sided, divari-

cate. Leaves opposite, unifoliolate, or imparipinnate, leaflets lanceolate, or ovate-lanceolate, with 3 or 5 basal nerves, the terminal 2-4 in. long, on a petiolule $\frac{1}{2}$ - $\frac{3}{4}$ in., the lateral 1 or 2 pair, 1-1 $\frac{1}{2}$ in. long, nearly sessile. Flowers yellowish white, fragrant, in axillary pedunculate, few-flowered cymes. Calyx with 5 short teeth. Corolla-tube clavate, $\frac{3}{4}$ in. long, segments 5, ovate, shorter than tube. Berries twin, 2-seeded, dark purple.

Kamaon, ascending to 5000 ft., Nepal, Bhutan, Kasia. Fl. H.S.

7. **J. officinale**, Linn. — Vern. *Chamba*, *chirichog*, *kiri*, Kashmir; *Bansu*, *kiver*, *dūnni*, Chenab; *Dassi*, *samsem*, Ravi.

A large twining shrub, extremities slightly pubescent. Leaves opposite, imparipinnate, 2-3 in. long, leaflets lanceolate, the terminal largest, petiolulate, lateral 1-3 pair, subsessile; common petiole marginate. Flowers white, fragrant, on pedicels longer than calyx, in terminal few-flowered corymbose cymes. Calyx-segments 5, subulate, 3 or 4 times longer than tube, nearly as long as corolla-tube. Corolla-lobes 5, acute. Berries didymous, globose.

Afghanistan, Waziristan. On top of Mount Tillah, Salt range at 3000 ft. Himalaya from Indus to the Sarda, between 3000 and 9000 ft. Fl. May, June. Cultivated in Europe. Hardy in England.

8. **J. grandiflorum**, Linn.; Roxb. Fl. Ind. i. 100; Wight Ic. t. 1257. — Vern. *Chambel*, *jati*. (*Jahi*, *chambeli*, Kamaon.)

A large scandent glabrous shrub. Leaves 3-4 in. long, imparipinnate, leaflets 3-5 pair, the lowest generally larger than those of the uppermost pair; lateral leaflets sessile, the upper 1 or 2 pair confluent with the petiole and with the terminal leaflet; common petiole marginate. Flowers white, tinged with purple outside, peculiarly sweet-scented, on slender pedicels, in terminal, lax divaricate cymes. Calyx-segments subulate, 3 or 4 times longer than tube, $\frac{1}{2}$ the length of corolla-tube. Corolla-lobes 5, elliptic, obtuse or acute. Berries didymous, ovoid.

Cultivated with single and double flowers in gardens throughout India; the flowers are made into garlands. Fl. March-Aug. Wild in Nepal and Kamaon, ascending to 5000 ft.

9. **J. revolutum**, Sims.; Wight Ic. t. 1258. — Vern. *Chamba*, *jūārī*, Pb.

An erect shrub, wholly glabrous. Branches angled. Leaves alternate, imparipinnate, leaflets 1-5 pair, ovate, or ovate-lanceolate, the terminal largest. Flowers yellow, fragrant, in short, terminal, corymbose panicles. Calyx with 5 short subulate teeth. Corolla-tube $\frac{1}{2}$ - $\frac{3}{4}$ in. long, lobes 5, broad-ovate, obtuse. Fruit didymous, berries globose.

Afghanistan. Waziristan and hills round the Peshawar valley. Salt range (on Sakasar 3000-5000 ft.), Himalaya, Indus to Nepal, between 2000 and 9000 ft.; also in some of the drier tracts (Kunawar). Bhutan (Griff.) On the Nilgiris and the hills of Ceylon. Fl. April-June; fr. Sept.

7. **NYCTANTHES**, Linn.

Deciduous, with quadrangular branches and scabrous ovate opposite leaves. Calyx campanulate, truncate, with 5-6 inconspicuous teeth. Corolla-tube cylindrical, limb spreading, lobes 5-8, emarginate or bifid, contorted in bud. Anthers 2, sessile near the mouth of the corolla. Stigma capitate. Capsule chartaceous, compressed, 2-celled, splitting into 2 flat 1-seeded cells. Seeds erect, without albumen, radicle inferior.

1. **N. Arbor-tristis**, Linn.; Roxb. Fl. Ind. i. 86; Bedd. Fl. Sylv. t. 240.—Sans. *Sephali*. Vern. *Har*, *sihāru*, *saihiāri*, *harsinghar*, *harin-gār*, *saherwa*. Local names: *Pakūra*, *ladūri*, *kūri*, Pb., N.W.P.; *Shāli*, Bassi in Meywar; *Khersāri*, *kirsāru*, Gonds, C.P.

A large shrub or small tree, rough all over with an uneven epidermis and stiff, whitish hairs. Leaves petiolate, entire or with a few large distant teeth. Flowers sessile, in bracteate fascicles of 3; bracts obovate, the fascicles pedunculate and arranged in short terminal trichotomous cymes. Corolla-tube orange, limb white.

Cultivated throughout India on account of its fragrant flowers, which open in the evening and drop at sunrise. Indigenous in the sub-Himalayan forests from the Chenab to the Sarda river, and in Assam. Common in the Baraith and Gonda forests of Oudh, and in Central India from the Jumna to the Godavery. The old leaves shed Feb., the fresh foliage appears April, May. Flowers more or less throughout the year, generally during the rains. Seed ripe autumn, C.S. Often gregarious in dry places, 15-20 ft. high, with a short erect trunk, 3 ft. girth. Bark $\frac{1}{4}$ in. thick, light or dark grey, greenish white or pale brown, slightly wrinkled. Coppices vigorously. R. Thompson describes a large coppice-wood of it, near Ramnuggur in Kamaon, so dense as to be almost impenetrable, from which the neighbouring villages drew their supply of fuel. Easily raised from seed. Wood brown, close-grained, but splits when drying. Only used as fuel, merits attention in that respect. The leaves are used in polishing wood. The flowers are made into garlands, and a fine but transient buff or orange-colour for cloth is made from them.

ORDER LII. **SALVADORACEÆ.**

Glabrous shrubs or trees. Leaves opposite, petioled, entire, with minute stipules. Flowers small, regular, tetramerous, in paniculate spikes or racemes. Calyx small, 4-lobed. Corolla hypogynous, membranous, more or less deeply 4-cleft, lobes imbricate. Stamens 4, filaments short, inserted at the base of the corolla, and alternating with its lobes; anthers 2-celled, introrse. Disc hypogynous, 4-lobed. Ovary free, 2-celled; stigma subsessile, 2-lobed, ovules geminate, ascending. Seeds 1-4, albumen none; embryo with fleshy, plano-convex cotyledons.—Royle Ill. 319 (under *Chenopodiaceæ*); Wight Ill. ii. 227.

1. **SALVADORA.**

Leaves subcoriaceous, main lateral nerves anastomosing by intramarginal

veins. Flowers bisexual, in the axils of deciduous bracts. Fruit a 1-seeded berry, supported by the persistent calyx.

Flowers pedicellate, in lax, axillary and terminal, often nodding panicles; calyx small, open, lobes less than half the length of the reflexed petals

1. *S. persica*.

Flowers sessile, in compact erect axillary panicles, shorter than leaves; calyx cup-shaped, lobes nearly as long as the erect petals

2. *S. oleoides*.

1. *S. persica*, Linn.; Roxb. Cor. Pl. t. 26; Fl. Ind. i. 389; Wight Ic. 1621.—Syn. *S. Indica*, Wight Ill. t. 181. *S. Stocksii*, Wight Ic. 1621 B. Arab. *Arāk*, *irak*. Vern. *Kauri vān*, *kauri jāl*, *jhār*, *jīt*, *jhit*, Pb.; *Kabbar*, *pīlu*, Sindh; *Jāl*, *kharjāl*, N.W.P.; *Jhāl*, Rajputana.

A large evergreen shrub or small tree, with white branches, drooping branchlets, and glaucous foliage, but much clearer and brighter green than the foliage of *S. oleoides*. Leaves varying in shape from ovate to narrow-lanceolate, blade 1-2 in. long. Flowers greenish-white, pedicellate, pedicels slender, generally $\frac{1}{8}$ in. long, but often much shorter. Panicles axillary and terminal, lax, often nodding, longer than leaves; branches racemose, divaricate. Calyx open, cleft half-way into short, broad, rounded, ciliate lobes. Corolla cleft nearly to the base into 4 oblong lobes, twice the length of calyx, and generally reflexed. Fruit globose or subglobose, $2\frac{1}{2}$ lines long, fleshy, greenish-yellow, red when ripe, supported by the persistent yellowish cup of the calyx.

Planted, particularly near Mussalman tombs, in many parts of India. Wild in the southern part of the Multan and Dera Ghazi Khan districts, in Bhawalpur and Sindh. Plentiful in lower Sindh and on the Beluchistan hills. Doubtfully wild on rocky ground near the Kutab Minār (Delhi). "On the Ganges banks all over down to near Patna" (Madden in Hb. Kew). Wild on low ground, particularly on saline soils in Rajputana (Bhurtpur, Kishengarh, associated with *Capparis aphylla*, *Prosopis spicigera*, and often with *Salv. oleoides*), near the coast in Guzerat, the Konkan (the Habshi's country), in the Circars and the northern part of Ceylon. In Syria, Arabia, Egypt, Abyssinia, and in Western Africa. The old leaves are shed in April, the new foliage coming out simultaneously. Fl. Nov.-May; in the Panjab the fruit ripens in June, in Sindh in Jan., Feb. Gregarious, usually in compact clumps and masses, generally a large shrub or a small scrubby tree, but under favourable circumstances attains 30-40 ft., with a short trunk, often crooked and fluted, 8-10 ft. long and 4-5 ft. girth. Girths of 6-8 ft. are not rare in Sindh, and Edgeworth notes one tree at Pakpattan, north of Multan, 14 ft. 9 in. girth. Branches numerous, spreading, extremities drooping, like those of the weeping-willow. Bark of branches shining, almost white, light ash-grey, or darker. Bark of trunk thin, grey or brownish, irregularly rugose. Wood whitish yellow, soft, the cub. ft. (of Sindh wood) weighs 40½ lb. (Dalzell), 46 lb. (Fenner). Medullary rays numerous, fine, pores large, in concentric belts of white tissue, alternating with darker-coloured belts of nearly the same width. Easy to work, and takes a beautiful polish. White ants do not attack it, nevertheless it is but little used. It is a poor fuel, and is considered useless for building. Grows readily from seed and coppices well, but its growth is slow.

The root-bark is very acrid, and when bruised and applied to the skin acts like a blister (Pharm. Ind. 170); the twigs are used as tooth-cleaners (*miswāk*).

Shoots and leaves are a favourite fodder of camels; they are pungent, eaten as salad, and are celebrated as antidotes against poison. The fruit (*pālu*, Pb.; *pīru*, Sindh) is pungent, bitter, and aromatic; it is used medicinally. *Salvadora persica* has been identified with the Mustard-tree of Scripture.

2. *S. oleoides*, Dne.—Tab. XXXIX.—Jacq. Voy. Bot. t. 144.—Syn. *S. indica*, Royle Ill. p. 319. *S. persica*, T. Anderson in Linn. Soc. Journal, v. Suppl. i. 29. Persian, *Irak-hīndī* (Royle). Vern. *Jāl, vān, vāni, mīthī vān*, Pb.; *Kabbar, khabbar, jhār, diār, mīthī diār*, Sindh; *Jhal*, N.W.P.

A shrub or small tree, with stiff branches, ash-coloured or reddish grey branchlets, and dull cinereous persistent foliage. Leaves glaucous, linear-lanceolate or ovate-lanceolate, blade $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, membranous when young, coriaceous and somewhat fleshy when full-grown; main lateral nerves often indistinct. Flowers greenish-white, sessile, in erect compact axillary paniculate spikes, often clustered and shorter than leaves. Calyx cup-shaped, divided half-way or nearly half-way into 4 rounded, obtuse lobes. Corolla as long as or a little longer than calyx. Fruit globose, $2\frac{1}{2}$ lines diam., yellow when ripe, dark brown or red when dry, supported by the persistent calyx and marcescent corolla.

Abundant in the driest and most desert parts of the Panjab, trans and cis-Indus, often forming great part of the vegetation for miles, ascending to 3000 ft. trans-Indus, to 2400 in the Salt range. Less common north of the Salt range. In North and Central Sindh (often associated with *S. persica*), not common generally, but in one place (near Khairpur) more common than *S. persica*. In Harriana, Bikanir, near Delhi, Agra, Bhurtpur, farther east probably planted; also at Aden. The leaves are renewed about April, the young foliage is often dark greenish-grey, but dull grey when full-grown. Fl. generally March, April; fr. about June.

In arid and saline soil a stunted scrub, but attains 20-25 ft. under favourable conditions. Trunk short, often twisted or bent, girth 5-6 ft., 2 trees 11 ft. 4 in. and 12 ft. girth near Multan, noted by Edgeworth. Large trees generally hollow. Branches numerous, stiff, divergent, twisted, often swollen at forks. Branches stiffer and crown narrower than *S. persica*. Branchlets ash-coloured or reddish grey. Bark $\frac{1}{4}$ in. thick, whitish grey, or dark grey, cleft into small plates by irregular shallow cracks, mostly longitudinal, and fewer cross-cracks. Inner substance hard compact. Wood whitish, compact, soft, weight 49 lb. per cub. ft. (Sindh). Structure similar to that of *S. persica*. Not touched by white ants in Sindh. In the South Panjab, where timber is scarce, it is often employed for building, and for agricultural implements; Persian wheels are made of it, and (in Sindh) knee-timbers of boats. A poor fuel, requires 9-12 months to dry, gives no heat, but mixed with scraps of pine-wood is useful for brick-burning. Leaves a great deal of ash, and blocks the fire-places speedily. Shoots and leaves are much browsed by camels. The fruit (*Pil, pālu, pinju*, Pb.; *Pīru*, Sindh) is sweet, and is eaten largely. When dried it forms an article of trade, and tastes somewhat like currants.

Ovoid cinereous galls are often formed on petioles and flower-stalks, and small clustered, deformed leaves grow frequently in large numbers among the flowers. The tree grows readily from seed, and coppices fairly well. Its growth is believed to be more rapid than that of *S. persica*, but the annual rings are very indistinct, and obscured by the numerous concentric belts of alternating white and darker tissue (often 15-16 on 1 in. of radius).

ORDER LIII. LOGANIACEÆ.

Trees, shrubs, often climbing, or herbs. Leaves opposite, generally connected by interpetiolar stipules or by a raised line. Flowers regular, 4-5-merous. Corolla hypogynous, regular or irregular. Stamens epipetalous, usually alternating with the corolla-segments. Ovary free, 2-celled; style simple, stigma often 2-lobed. Seeds albuminous.—Wight Ill. ii. 170; Benth in Journ. Linn. Soc. i. 52.

Fruit indehiscent, with a shell-like rind; flowers pentamerous, corolla valvate in bud

1. STRYCHNOS.

Fruit a capsule, dehiscent septicidally; flowers tetramerous, corolla imbricate in bud

2. BUDDLEIA.

1. STRYCHNOS, Linn.

Trees or climbing shrubs, with entire 3-5-nerved leaves. Flowers pentamerous, bisexual. Corolla tubular or funnel-shaped, lobes valvate. Stamens inserted in the throat, filaments short. Style filiform, stigma capitate, or indistinctly 2-lobed; ovules numerous, placentas fleshy, adnate to both sides of the dissepiment. Fruit a berry with a shell-like rind, the seeds large, compressed, embedded in a fleshy pulp. Embryo short straight eccentric, in a cartilaginous albumen.

Corolla campanulate, throat bearded; fruit black when ripe, $\frac{3}{4}$ in. diam., 1-seeded

1. *S. potatorum*.

Corolla-tube cylindric, many times longer than calyx; fruit orange when ripe, 3-4 in. diam., many-seeded

2. *S. Nux-vomica*.

1. *S. potatorum*, Linn. fil.; Roxb. Cor. Pl. t. 5; Fl. Ind. i. 576; Wight Ill. t. 156.—*The clearing-nut tree*. Sans. *Kataka*. Vern. *Nermali*, *nirmali*, *nel-mal*.

A middle-sized tree, evergreen, wholly glabrous; trunk often irregularly fluted. Leaves coriaceous, ovate or rotundate, subsessile, or very shortly petiolate, 2-3 in. long. Flowers white, fragrant, in short pedunculate glabrous cymes, on the previous year's wood, at the base of this year's branchlets. Corolla-tube campanulate, with tufts of white hair at the base of the segments between the stamens. Style cylindric, from a conical base, stigma indistinctly 2-lobed. Berry subglobose, black when ripe, 1-seeded, $\frac{3}{4}$ in. diam. Seeds compressed, nearly circular.

South India, Bengal, Behar, Bijoragoghur forests, and probably elsewhere in the Centr. Prov. Bark dark-coloured, deeply cracked. Fl. H.S. Wood durable, hard and close-grained. Medullary rays numerous, whitish in darker tissue. Pores in large, irregularly ramified patches of whitish tissue. Pulp of the fruit eaten. The ripe seeds are used to clear muddy water.

2. *S. Nux-vomica*, Linn.; Roxb. Cor. Pl. t. 4; Fl. Ind. i. 575; Bedd. Fl. Sylv. t. 243; Benth. l. c. 103.—Vern. *Kuchla*, *kajra*; *Khabaung*, *Burm*.

A small, slow-growing, evergreen, glabrous tree. Leaves ovate or rotundate, coriaceous, shining, blade 4-5 in., petiole $\frac{1}{2}$ in. long. Flowers greenish white, on terminal pubescent pedunculate, corymbose cymes. Corolla-

tube cylindric, 4-5 times longer than calyx, throat glabrous. Style filiform; stigma undivided. Berry as large as an orange, and of the same colour. Seeds flat, grey, shining, circular or reniform.

South India, Burma, Bengal, Gorakhpur forests (D.B.), and probably also in the Centr. Prov. Bark smooth, ash-coloured, young shoots shining, deep green. Wood hard, durable, of a bitter taste. Structure similar to that of *S. potatorum*, but the whitish patches more in concentric lines. Weight 48.75 lb. (D.B. exp. 1864), 56 lb. (Skinner). Value of P. 623 (D.B.), 1120 (Sk.) The seeds contain 0.28-0.53% of Strychnia, an extremely bitter and most poisonous alkaloid, mixed with Brucia, another alkaloid closely related to it. These substances are also found in the bark of *S. Nux-vomica*, and in the bark and root of several other species of the genus. They seem to constitute the poisonous principle in the *Upas Radja* or *Tieute*, the arrow-poison of the Moluccas, prepared from the root-bark of a climber (*S. Tieute*, Lesch.; Miq. Fl. Ind. Bat. ii. 380). Igasuric acid (similar to Malic acid) is associated with these alkaloids. The orange-coloured pulp of the fruit is eaten by birds.

2. BUDDLEIA, Linn.

Shrubs, with a mealy or woolly tomentum, rarely glabrous. Flowers tetramerous. Corolla-lobes imbricate in bud. Stamens 4, anthers nearly sessile. Capsule opening septicidally in 2 entire or bifid valves, leaving the dissepiment free in the centre. Seeds small, numerous.

Flowers in dense cylindrical leafless spikes; tomentum white or yellowish

1. *B. asiatica*.

Flowers in leafy panicles; tomentum tawny or rust-coloured

2. *B. paniculata*.

1. *B. asiatica*, Lour.—Syn. *B. discolor*, Roth; Wight Ic. t. 894. *B. Neemda*, Roxb. Fl. Ind. i. 396. Vern. *Bhati*, *dhaula*, *shiuntra*, Kamaon.

A large shrub; branches, inflorescence and under side of leaves covered with a white or yellowish soft tomentum either dense and thick, or more or less mealy. Leaves lanceolate, 3-6 in. long, on a short petiole, entire or serrulate, usually glabrous above. Flowers white, odorous, nearly sessile, in dense cylindrical bracteate erect spikes, often interrupted at the base, either solitary and terminal, or several together at the ends of branches. Corolla-tube pubescent outside, less than twice the length of calyx, lobes rounded, obtuse. Valves of capsule bifid.

A common shrub in South India, Burma, Bengal, Oudh, along banks of nallahs and ravines. In the sub-Himalayan tract extends as far west as the Indus, ascending to 4000 ft. China. Indian Archipelago. Fl. Feb.-April. In most parts of Burma, this and *Blumea* are common shrubs on deserted hill-clearings (Toungyas).

2. *B. paniculata*, Wall.; Roxb. Fl. Ind., ed. Carey, i. 412.—Syn. *B. crispa*, Benth.; DC. Prodr. x. 444. Vern. *Spera wuna*, Afg.; *Dholtu*, *Ghattia*, N.W. Him. Also known by the names of the preceding species.

A shrub or small tree, with a gnarled and crooked stem; branches woody, bark peeling off in long shreds; branchlets, leaves, and inflorescence densely clothed with soft rust-coloured or tawny tomentum. Leaves extremely variable, from lanceolate, entire, to ovate-triangular,

dentate and deeply cut; blade 4-6 in., petiole $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long. Flowers subsessile, white, fragrant, in bracteate, generally pedunculate clusters, forming irregular terminal, leaf-bearing panicles. Bracts linear, generally longer than flowers. Corolla densely tomentose outside, tube cylindrical, twice the length of calyx, lobes rounded, obtuse.

Himalaya, Indus to Bhutan, ascending to 7000 ft. Afghanistan. Beluchistan.

ORDER LIV. APOCYNÆÆ.

Trees, shrubs, twiners, rarely perennial herbs, the juice frequently milky. Leaves entire, opposite or whorled, very rarely alternate, without stipules, or with small glandlike intrapetiole or interpetiole stipules. Flowers regular, usually cymose. Calyx free, divided nearly or quite to the base into 5 segments or sepals, generally imbricate in bud. Corolla hypogynous, gamopetalous, with 5 spreading lobes, contorted, rarely valvate in bud, the throat hairy inside, or closed with a corona of scales. Stamens 5, inserted in the tube, alternating with the corolla-lobes; anthers erect, 2-celled, the cells opening inward in longitudinal slits, the pollen not collected in masses. Pistil dicarpellary; the carpels either distinct below, or united in a 2-celled ovary with axile placentas, or in a 1-celled ovary with parietal placentas; ovules few or more generally numerous; style single or 2 distinct styles; stigma usually thickened. Seeds often bearing a coma or tuft of long hairs, usually albuminous, embryo straight. —Royle III. 269; Wight III. ii. 160.

Fruit a fleshy indehiscent berry, generally 1-4-seeded;
leaves opposite; spines axillary

1. CARISSA.

Fruit a large subglobose drupe, with hard fibrous endocarp;
leaves alternate, crowded at the ends of branches

2. CERBERA.

Fruit of 2 many-seeded follicles, distinct from the beginning, or separating when ripe.

Seeds naked, angular, embedded in pulp; leaves opposite

3. TABERNÆMONTANA.

Seeds naked, winged; leaves alternate, sessile

4. RHAZYA.

Seeds naked, winged; leaves alternate, petiolate, crowded at the ends of branches

5. PLUMERIA.

Seeds with a tuft of hairs at the lower end—that is, the end opposite the hilum; leaves opposite; stamens exserted

6. WRIGHTIA.

Seeds flat, attached in the middle, with a fringe of hairs all round; and prominent tufts at the ends; leaves whorled

7. ALSTONIA.

Seeds with a tuft of hairs at the hilum—that is, at the upper end; corolla without appendices.

8. HOLARRHENA.

A small tree, not climbing; fruit of 2 distinct follicles

9. ICHNOCARPUS.

Climbers; fruit of 2 distinct follicles

Climbers; fruit a long cylindrical, 2-valved capsule, separating into 2 follicles when ripe.

Glabrous; corolla-tube short cylindrical; limb $\frac{3}{4}$ in. across

10. VALLARIS.

Tomentose; corolla hypocrateriform, limb 2-3 in. across

11. CHONEMORPHA.

Seeds pubescent all over, and with a tuft of hairs at the hilum; a corona of 5 lacinated appendices opposite to the corolla-lobes

12. NERIUM.

Several plants of this family yield caoutchouc. *Vahea gummifera*, Lam., of Madagascar, and other species of the same genus, produce an excellent article, second only in quality to the Para caoutchouc. They are large climbing shrubs, with huge subglobose fruit. The African caoutchouc, a much inferior article, is likewise produced by large climbing shrubs, which belong to the genus *Landolphia*, with large subglobose fruit containing an acidulous pulp in a hard woody rind. *Urceola elastica*, Roxb.; Wight Ic. t. 473, a gigantic climber (fruit of 2 large globose, many-seeded coriaceous follicles, the seeds embedded in fleshy eatable pulp) of the Indian Archipelago, yields the Borneo rubber, and small quantities of caoutchouc are collected in India from *Willughbeia edulis*, Roxb. Cor. Pl. t. 280, and *W. Martabanica*, Wall. Pl. As. rar. t. 272, two large climbers of Burma and Eastern Bengal.—(Collins' Report on Caoutchouc, 1872.)

Vahea belongs to the sub-Order of *Carisseeæ*, with a single 2-celled ovary. *Landolphia* and *Willughbeia* are somewhat anomalous genera with 1-celled ovary, and fleshy fruit. *Urceola* belongs to the sub-Order *Euapocynææ* (fruit of 2 many-seeded follicles), which comprises all genera described below, except *Carissa* and *Cerbera*.

1. CARISSA, Linn.

Shrubs or trees, often armed with opposite axillary spines. Leaves opposite. Calyx without glands. Corolla-tube cylindrical, slightly swollen round the anthers, lobes spreading, contorted in the bud, the throat without scales. Anthers oblong or lanceolate, included in the corolla-tube. Ovary single, 2-celled; ovules several in each cell; style filiform, stigma thickened. Fruit succulent, indehiscent. Seeds 1-4, rarely more, without hairs, albuminous.

Leaves and branchlets always glabrous; fruit $\frac{1}{2}$ -1 in. long, sometimes more than 4-seeded.

Leaves and branchlets often pubescent; fruit $\frac{1}{4}$ in. long, 4-seeded.

1. *C. Carandas*.

2. *C. diffusa*.

1. *C. Carandas*, Linn.; Roxb. Cor. Pl. t. 77; Fl. i. 687; Wight Ic. t. 426.—Syn. *C. congesta*, Wight Ic. t. 1289. Sans. *Karamarda* (the tree), *avigna* (the fruit). Vern. *Karaunda*, *karavn*, *karūnda*, *korinda*, *garinga*. Local n. *Timukhia*, N.W.P.; *Gotho*, C.P.

A large evergreen shrub with a short stem, glabrous, only inflorescence pubescent. Branchlets generally alternate, with twin stout, sharp, often forked, glabrous, shining spines at their base, 1-1½ in. long; branches exceptionally opposite, generally without spines. Leaves coriaceous, generally penninerved, wholly glabrous, and shining on both sides, elliptic ovate or obovate, rarely elliptic-oblong, obtuse or mucronate, 1½-3 in. long, 1-2 in. broad, subsessile or on short petioles. Flowers white, inodorous, on short pedicels in sessile or pedunculate pubescent cymose corymbs of 10-20 flowers at the ends of branches. Bracts linear, pubescent. Calyx pubescent, cleft half-way or deeper into lanceolate ciliate segments. Corolla-lobes lanceolate, shorter than tube, but more than half its length. Ovules 4 in each cell of ovary. Berry ovoid or globose, ½-1 in. long, 4- or more-seeded, shining, first red, black when ripe.

Cultivated in most parts of India, not much in the Panjab; is wild on dry sandy and rocky soil in the Gonda and Baraich divisions of the Oudh forests.

* Bingah Sāl forests (R. Thompson), in the Gorakhpur district, in Bengal and South India. Foliage generally renewed in March. FL Jan.-April; fruit ripens July-Aug. Grows rapidly, and coppices freely.

Stem 3-4 ft. high, 2 ft. girth, sometimes more, branches rigid, divergent, forming a scanty rounded crown. Branchlets reddish-brown, smooth, spreading. Bark $\frac{1}{2}$ in. thick, grey or white with pale-orange streaks, smoothish between longitudinal wrinkles, with brown exfoliating scales. Wood white, close-grained and hard, is an excellent fuel, and has been recommended for turning. Makes excellent fences. The red, half-ripe fruit is made into tarts jellies and pickle. When ripe, it is sold in bazaars and eaten largely.

2. *C. diffusa*, Roxb. Fl. Ind. i. 689; Wight Ic. t. 427.—Vern. *Karaunda*. Local n. *Gān*, *garna*, *garinda*, Ph.

A small evergreen shrub, with rigid, spreading branches; young leaves, branchlets and inflorescence pubescent. Branchlets opposite and single, spines $\frac{1}{2}$ -1 in. long, often pubescent and forked, generally at the base of the single branches. Leaves coriaceous, glabrate or pubescent beneath, ovate, acute, mucronate, 1-1 $\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, generally with 1 or 2 pairs of arching basal nerves. Flowers pure white to delicate pink, finely odorless, on short pedicels in sessile or pedunculate cymose corymbs of 2-10 flowers, at the ends of branches. Bracts linear, pubescent. Calyx pubescent, cleft nearly to the base into lanceolate ciliate segments. Corolla-lobes lanceolate, shorter than tube, but more than half its length. Ovules 2 in each cell of the ovary. Berry subglobose, $\frac{1}{4}$ in. long, 4-seeded, shining, black when ripe, seeds 4.

Abundant wild in most parts of India, in the plains of the Panjab, the sub-Himalayan tract, ascending to 4000 ft., and in the trans-Indus territory, generally gregarious, here and there forming underwood in forests of Bamboo in the Siwalik tract, of *Pinus longifolia* (Kangra), of Teak (Sangor district). Useful by keeping the ground moist and cool under trees with light foliage which do not throw heavy shade; may be employed in the same way as Beech underwood under Oak or Scotch Fir in Europe. Spreads readily where clearings have been made, and may in such cases impede the reproduction and growth of the forest. Fl. March-May; fruit ripens Oct.-Feb. Very hardy, coppices freely. The wood, though always small, is used for turning and for making combs; it is an excellent fuel. Very old wood is said (in Kangra) to be black and fragrant. The leaves are greedily eaten by goats and sheep, but the chief use of the shrub is to furnish material for dry fences.

The characters available for the distinction of these two species are unsatisfactory and variable, and farther inquiries may possibly show *C. Carandas* to be nothing but the cultivated form of *C. diffusa*.

2. CERBERA, Linn.

Shrubs or trees, with alternate leaves, crowded on the young branches. Flowers large, in terminal corymbose cymes. Calyx without glands. Corolla-tube cylindrical, without scales, lobes spreading, angular, contorted in bud. Anthers included in the corolla-tube, inserted about the middle. Ovary of 2 distinct carpels, united by a single style, each carpel incompletely divided by a very prominent placenta, bearing 2 superposed ovules on each side; stigma conical, often 2-lobed at the tip. Fruit (from the

abortion of one carpel) a single drupe, flattened on one side, with a woody or fibrous endocarp, usually 1-seeded. Seeds without hairs.

1. *C. Odollam*, Gärtn. ; Roxb. Fl. Ind. i. 692 ; Wight Ic. t. 441.

A large tree or a shrub, wholly glabrous, with thick branches. Leaves 6-12 in. long, shining, oblong lanceolate or oblanceolate, acuminate, narrowed into petiole 1-1½ in. long ; main lateral nerves numerous, parallel, at right angles to midrib, joined by indistinct intramarginal veins. Flowers white, sweet-scented, in a corymbose pedunculate cyme. Calyx-segments linear, reflexed, deciduous. Bracts coloured, ½-1 in. long, caducous. Drupe ovoid, 2-4 in. long, endocarp thick, fibrous.

Common in salt swamps on the coast of Bengal, the peninsula and probably of Sindh. A widely spread tree, on the coasts of China, the Indian Archipelago, Queensland, and the Pacific islands. In flower and fruit throughout the year. Wood white, soft, and spongy.

3. *TABERNÆMONTANA*, Plum.

1. *T. coronaria*, Willd. ; Roxb. Fl. Ind. ii. 23 ; Wight Ic. t. 477 ; Bot. Reg. t. 1064.—Vern. *Chāndui*, *taggai*, *taggar*.

A shrub, 6-8 ft., glabrous, branches dichotomous. Leaves opposite, elliptic-oblong, acuminate. Flowers white ; calyx glandulose inside ; corolla-tube cylindrical, slender ; ovaries 2 with many ovules, style 1. Fruit of 2 distinct recurved cylindrical follicles, 1-3 in. long. Seeds 3-6, embedded in red fleshy pulp ; embryo in a fleshy albumen.

Cultivated in gardens throughout India, with single and double flowers ; exceedingly fragrant at night. Wild in Eastern Bengal, Nepal, Kamaon, and in the Konkan. Fl. in the hot and rainy season.

T. utilis, Arnott in Edinb. New Phil. Journ. 1830, i. 318, is a tree in British Guiana, which yields a thick sweet nutritious milk, called Hya-hya by the Indians.

4. *RHAZYA*, Decaisne.

1. *R. stricta*, Decaisne in Jacquem. Voy. Bot. t. 111.—Vern. *Vena*, Salt range ; *Gandera*, Trans-Indus ; *Sewar*, *sihar*, *ishwarg*. Sindh.

A small glabrous shrub. Leaves alternate, linear-oblanceolate, mucronate, sessile. Flowers white, odorous, corolla-tube cylindrical, much longer than lobes ; ovary 2-celled, with numerous ovules. Fruit of 2 distinct erect cylindrical follicles. Seeds numerous, flat, with membranous wings at the two extremities ; embryo straight, in a fleshy albumen.

Abundant in the trans-Indus territory, between Indus and Jhelam, and in Sindh. Afghanistan, Beluchistan, and Arabia. Fl. April. Used as fuel. The leaves, after steeping for some days, are fodder for goats. The fruit (*Sarwār*) and the leaves are used in native medicine.

5. PLUMERIA, Tourn.

Shrubs or trees, with alternate leaves, crowded at the ends of branches. Flowers large, in terminal corymbose cymes. Calyx small, without glands. Corolla-tube cylindrical, without scales, lobes spreading, contorted in bud. Anthers inserted at the base of the corolla-tube, round the ovary. Ovary of 2 distinct carpels, united by a single style, ovules numerous; style short, thick, with a 2-lobed stigma. Fruit of 2 follicles with numerous compressed, winged, hairless, albuminous seeds. Cotyledons flat, foliaceous.

1. *P. acutifolia*, Poir. — Syn. *P. acuminata*, Roxb. Fl. Ind. ii. 20; Wight Ic. t. 471. Vern. *Gula chin*, Hind.; *Khair champa*, Bomb.

A small tree, wholly glabrous, with thick branches, and rough bark, full of tenacious, white juice. Leaves lanceolate or oblanceolate, 6-15 in. long, narrowed into a petiole 1-2 in. long; main lateral nerves numerous, transverse, parallel, joined by prominent intramarginal veins. Flowers in large compound, pedunculate cymes, white, fragrant, pale yellow in the centre. Follicles divaricate, rigid, drooping, 6 in. long.

Cultivated throughout India and Burma, near villages, temples, and in gardens, but not indigenous. Cultivated in Siam, China, Cochin China, and the Indian Archipelago (Rumph. Amb. iv. t. 38). Its home is not known. It grows in New Grenada and other parts of tropical America, but whether indigenous, is uncertain. (The other *Plumerias* inhabit tropical America, and *P. loranthifolia*, Müll.; Mart. Flora Brasiliensis, vi. p. 42, a closely allied species, is found in Para and Matto-Grosso.) Fl. H. and R. S. Ripens its fruit very rarely. Attempts have been made to make caoutchouc of the milk, but without success.

6. WRIGHTIA, R. Brown.

Trees or shrubs, with opposite leaves. Flowers in terminal corymbose cymes. Calyx with 5-10 broad scales inside at the base. Corolla-tube cylindrical, generally short; lobes spreading, before expansion twisted towards the right, the throat with a corona of 5 or 10 erect scales, either distinct or united in a ring. Stamens inserted in the throat, filaments short and broad, continued into a broad, tapering connective; anthers exserted, sagittate, connivent in a cone round the stigma, and often adhering laterally. Ovary of 2 carpels, distinct or connate, with numerous ovules in each, multiseriate, on axile placentas. Fruit long-cylindrical, separating into two follicles dehiscing on the inner face, filled with numerous oblong pendulous seeds, each with a tuft of long silky hairs at the lower end. Albumen none, embryo cylindrical, cotyledons convolute, longer than superior radicle.

Follicles connate into a long cylindrical capsule, separating and dehiscing at the same time; leaves soft tomentose . . .

Follicles distinct, cohering at the apex only; leaves rough . . .

1. *W. tomentosa*.

2. *W. tinctoria*.

1. *W. tomentosa*, Roem. et Schultes; Wight Ic. t. 443. — Syn. *W. mollissima*, Wall. Pl. As. rar. t. 146; Wight Ill. t. 154. *Nerium tomentosum*, Roxb. Fl. Ind. ii. 6. Vern. *Keor*, *kilāwa*, Pb. *Dhūdi*, N.W.P.,

Oudh. Local names: *Dharauli*, *darhela*, *daira*, Garhw.; *Lettaukthein*,¹ Burma.

A small tree, branchlets and leaves clothed with soft tomentum. Leaves elliptic, acuminate, narrowed into a short petiole, 3-4 in. long; main lateral nerves parallel, 8-12 pair. Flowers 1 in. across, in subsessile, stiff, erect, corymbose and tomentose cymes, with oval deciduous bracts. Corolla-tube twice the length of calyx, lobes oblong, yellowish, corona fleshy, orange-coloured, cleft into unequal oblong lobes. Anthers white. Fruit subcylindrical, laterally compressed, 8-12 in. long, $\frac{1}{2}$ in. across, rough with numerous white elevated specks, with two shallow black furrows at the junction of the carpels, the carpels separating when ripe; hairs of seed pure white.

Sub-Himalayan tract and outer ranges, ascending to 3500 ft. or more (Benārgāh, Jaunsar Bawar, D.B.), as far west as the Bias, and very rare beyond it to the Indus. Oudh, Bengal, Central and South India. Ceylon and Burma. Often associated with *Säl*, but more commonly in mixed forests. The leaves are shed Feb.-March, the new foliage appears April-May. Fl. April-June; fr. Nov.-Jan.

Attains 20-25 ft., with a short irregular trunk 3, rarely 4 ft. girth. Branches scabrous, with small light-coloured specks. Bark $\frac{1}{4}$ in. thick, light or dark cinereous, corky, inner substance whitish, compact. Wood yellowish white, even- and fine-grained, not hard, easy to work, heartwood not distinct. Weight 33.7 lb., value of P. 523 (Kyd). Used in turning, carved into bowls, plates, and combs (Saharunpur). The bark of stem and root are administered against snake-bites and the sting of scorpions. Abundant yellow milky juice flows from incisions, containing a yellow colouring matter (Roxb.)

There is some uncertainty regarding the colour of the corolla. Wallich (Nepal, Oudh, Kamaon) and Wight describe and figure *W. mollissima* with yellow flowers tinged with red, and Thwaites (Enum. Zeyl. 193) describes *W. tomentosa* in the same manner. Roxburgh says—flowers white, nectary (corona) orange-coloured; Voigt (Hort. p. 525)—yellowish-white, with an orange-coloured throat; and Graham (Bombay Plants, 114)—white. Do the flowers change colour during the day? According to Wallich, the flowers of *mollissima* are inodorous; Voigt describes them as faintly smelling of rhubarb; and J. L. Stewart "as scenting the forest." It is not impossible that a distinct species with white flowers may yet be discovered; and it should be added that *W. Wallichii*, A. DC., Wight l.c. t. 1296, which is otherwise exceedingly like *W. tomentosa*, is described with white flowers.

2. *W. tinctoria*, R. Br.; Bedd. Fl. Sylv. t. 241.—Syn. *W. Rothii*, G. Don; Wight l.c. t. 1319. *Nerium tinctorum*, Roxb. Fl. Ind. ii. 4. Vern. *Dhūdi*, Banda; *Khirmi*, Meywar. (Seeds *Indarjau*, *indrujan*.)

A small tree; branchlets yellow or light brown, extremities and leaves glabrous or pubescent. Leaves elliptic-oblong, 3-4 in. long, acuminate, base rounded, petiole very short; main lateral nerves 8-10, arching, joined by intramarginal veins. Flowers white, in lax terminal cymes with slender spreading branches. Corolla-tube twice the length of calyx. Corona of numerous linear scales, varying in length, some inserted with the filaments, others on the corolla-lobes. Fruit of 2 distinct pendu-

lous, slender follicles, 10-20 in. long, cohering at the top only, with elevated longitudinal lines, otherwise smooth. Var. *α. tinctoria*; glabrous. *β. Rothii*; pubescent, leaves rough when old.

Common in the Peninsula, ascending to 4000 ft. (*α* and *β*). From Central India *β* only, with rough leaves, is known. Bassi forests in Meywar, Nagpahar between Ajmir and Pokur (D.B.); Banda, Edgeworth. Leaves are shed Feb., reappear in March-April, with the flowers. Fruit ripens ensuing C.S. Wood pure white, close- and even-grained, valued highly for turning and carving. The leaves yield Indigo (Roxb.) The seeds are sold as the sweet (*mitha*) *indarjau* in the bazaars; they are not bitter.

W. coccinea, Sims. Bot. Mag. t. 2696; Wight Ic. t. 442; a large tree with dark-crimson flowers, 2 in. across, solitary 3 or 6 together, from the Kasia hills, is occasionally grown in gardens in Northern India. Wood white, light, but firm, used for palkees.

7. ALSTONIA, R. Brown.

Trees, rarely shrubs; leaves entire, verticillate or opposite. Calyx without scales or glands. Corolla-tube cylindrical, lobes spreading, shorter than tube, twisted towards the right before expansion. Corona wanting. Stamens included, inserted half-way up the tube, or higher. Ovary of 2 distinct carpels, united by the style; stigma thickened; ovules numerous. Fruit of 2 distinct long linear follicles. Seed oblong, compressed, peltate, the edge with a dense fringe of long hairs all round; albumen scanty, radicle superior, cotyledons oblong, flat.

1. *A. scholaris*, R. Brown; Wight Ic. t. 422; Bedd. Fl. Sylv. t. 242. —Syn. *A. cuneata*, Wall. Sans. *Ayugma*, *chhada*, *ayuk chhada*. Vern. *Chatiun*, *satiun*, *chutian*, *satwin*, *satni* (*Taunmayoben*, Burm.)

A large tree, with bitter milky juice; glabrous, inflorescence only pubescent. Leaves coriaceous, shining above, opaque and pale underneath, in whorls of 5-7, oblong or obovate-oblong, obtuse, rarely acute, 4-8 in. long, narrowed into a short petiole; main lateral nerves numerous, parallel, transverse. Flowers greenish-white, sessile or shortly pedicellate, in compact many-flowered pedunculate cymes. Peduncles 1-2 in. long; cymes 8-12 arranged in a pedunculate umbel, and the umbels forming whorls in the axils of the terminal whorl of leaves. Calyx and corolla pubescent. Follicles slender, numerous, in hanging clusters.

Sub-Himalayan tract, extending west to the Jumna, and ascending to 3000 ft. Scarce in the Oudh forests. Bengal, western side of the Peninsula, Burma, Ceylon, Indian Archipelago, Queensland, tropical Africa. Fl. Dec.-March; fruit June. Growth apparently rapid.

Attains 40-60, at times 80-90 ft., with a tall stem, often with a fluted or buttressed base, and spreading branches in tiers of whorls. Bark dark grey, rough, but not cracked. Wood whitish, even-grained, somewhat porous and open, soft and light, 40 lb. per cub. ft. Easily worked; used for furniture, boxes, scabbards, school-boards, and for beams in Assam. Wood and bark are bitter; the bark is officinal as an astringent tonic, anthelmintic, and antiperiodic (Pharm. Ind. 137).

8. **HOLARRHENA**, R. Brown.

Shrubs or trees with opposite entire leaves. Calyx-lobes lanceolate, with glands inside at their base. Corolla-tube cylindrical, more or less swollen above its base round the anthers, lobes spreading, twisted to the left before expansion. Corona wanting. Stamens included, inserted below the middle of the tube. Ovary of 2 distinct carpels, united by the style; stigma oblong, not thickened; ovules numerous. Fruit of 2 distinct long slender follicles. Seeds numerous, pendulous, with a tuft of long hairs at the hilum; radicle superior, shorter than the auriculate, plaited and involute cotyledons; albumen none.

1. *H. antidysenterica*, Wall.—Tab. XL.—Syn. *H. pubescens*, Wall. *H. Codaga*, G. Don; Wight Ic. t. 1297. *Echites antidysenterica*, Roxb. *Chonemorpha antidysenterica*, G. Don; Wight Ic. t. 439. Vern. *Karra*, *kaura*, *kora*, *kūra*, *kūar*, *keor*, *kūer*, *kari*, *dhūdi*, *dhōdi*. Local names: *Kogar*, *hiam*, Pb.; *Kachri*, Oudh; *Samōka marra*, Gonds of Seoni; *Ankria*, Bheels of Banswara. (Seeds: *Karwa* (bitter) *indarjau*.) *Lettau*, Burm.

A small tree, glabrous or pubescent. Leaves 6-12 in. long, subsessile, elliptic-oblong, short-acuminate, base obtuse; main lateral nerves 10-14 pair, joined by prominent transverse veins. Flowers white, inodorous, 1-1½ in. across, on slender pedicels, in sessile terminal corymbose cymes, with small lanceolate, ciliate bracts. Corolla-tube slender, many times longer than calyx, lobes nearly as long as tube. Follicles smooth, 8-15 in. long, ½ in. diam. Seeds narrow-oblong, ½ in. long, brown, bitter, hairs silky, twice the length of seed. Var. *α. glabra*; leaves glabrous on both sides. Var. *β. pubescens*; leaves soft tomentose beneath.

Sub-Himalayan tract, ascending to 3500 ft., and extending westward to the Chenab. Oudh, Bengal, Central and South India. Banswara forests, but not found in the more arid parts of Rajputana. Often associated with *Sal*, in Burma in the *Ein* forest of *Dipterocarpus tuberculatus*, Roxb. Old leaves shed Feb., the new foliage appears April-May. Fl. April-June; fruit ripe in the cold season, generally bursting in March or April.

Attains 20-30 ft., trunk short, straight, rigid and furrowed, 3-4 ft. girth. Bark ½ in. thick, brownish-grey or blackish, warty, with some longitudinal cracks, and exfoliating in thick woody scales. Foliage bright pea-green. Wood white, tinged with yellow or pink, even-fine- and smooth-grained, soft and light, heartwood not distinct. Weight 37-38 lb. Value of P. 417 (Kyd), 562 (Skinner), 811 (*Lettau*, Benson). Easy to work, carved into tobacco-boxes, toys, combs, spoons, forks, and platters. In Assam, where the tree grows to a larger size, furniture is made of it. The bark (*conessi*, formerly an article of trade), leaves, fruit, and seeds, are used medicinally (Pharm. Ind. 137); the flowers are gathered for ornaments at marriages, and the leaves are employed as fodder or litter.

9. **ICHNOCARPUS**, R. Brown.

Climbers with opposite leaves. Calyx 5-cleft, with small glands inside at the base of the lobes. Corolla hypocrateriform, without appendices; lobes hairy inside, convolute in bud. Fruit of 2 distinct, many-seeded, slender follicles. Seeds not rostrate, with a tuft of hair at the hilum.

Flowers in compact cymes, forming elongated panicles; corolla-tube barely $\frac{1}{2}$ in. long

1. *I. frutescens*.

Flowers in lax pedunculate corymbose cymes; corolla-tube $\frac{1}{2}$ in. long

2. *I. fragrans*.

1. *I. frutescens*, R. Brown; Wight Ic. t. 430.—Syn. *Echites frutescens*, Roxb. Fl. Ind. ii. 12. Vern. *Dudhi*, Kamaon.

A twining shrub; branchlets, inflorescence and under side of leaves with rust-coloured pubescence. Leaves opposite, petiolate, ovate-lanceolate, acuminate. Flowers small (white, inodorous, Roxb., greenish white, sweet-scented, Voigt Hortus, 523), on short pedicels, in compact short, trichotomous, pedunculate cymes, forming elongated leafy panicles. Calyx with small basal glands. Corolla hypocrateriform, tube barely $\frac{1}{2}$ in. long, lobes lanceolate, twisted, hairy along the upper face. Ovaries distinct, surrounded by 5 distinct hypogynous scales, as long as ovaries; style 1. Fruit of 2 distinct linear, slender follicles, 2-3 in. long. Seeds numerous, pendulous, a long tuft of hairs at the hilum.

South and Central India, Bengal, Burma. In north-west India known to extend as far west as Delhi in the plains, and to the Sutlej in the sub-Himalayan tract. Indian Archipelago and Queensland. The root has been used as a substitute for sarsaparilla.

2. *I. fragrans*, Wall.; DC. Prodr. viii. 435.—Syn. (probably) *Blabe-ropus lucidus*, A. DC.; *Alstonia lucida*, Don Fl. Nep. 131. Vern. *Dudhi*, Kamaon.

A climbing shrub; glabrous, but branchlets, petioles and under side of leaves often hairy. Leaves opposite, subcoriaceous, shining above, elliptic-oblong, acuminate, blade 4-5 in., petiole $\frac{1}{4}$ in. long. Flowers on slender pedicels, in lax compound trichotomous pedunculate glabrous corymbose terminal and axillary cymes. Corolla-tube $\frac{1}{2}$ in. long, 2-thirds of its length narrow-tubular, suddenly widened above into a campanulate mouth; lobes oblong, nearly as long as tube, hairy on the upper side near the base. Fruit of 2 distinct linear follicles, about 6 in. long, with numerous pendulous seeds, not rostrate, a tuft of hairs at the hilum.

North-West Himalaya, Kashmir to Nepal, ascending to 6000 ft. Bhutan, Assam. Fl. April-June. Somewhat similar to *Parechites Thunbergii*, A. Gray (*Rhynchospermum jasminoides*, Lindl.), from Japan and China.

10. VALLARIS, Burm.

1. *V. dichotoma*, Wall.; Wight Ic. t. 438.—Syn. *Echites dichotoma*, Roxb. Fl. Ind. ii. 19. Vern. *Dudhi*, Kamaon.

A large twining shrub; bark ash-coloured, glabrous, inflorescence only pubescent. Leaves opposite, petiolate, elliptic-oblong, acuminate; a circle of small cylindric glands at the insertion of the leaves. Flowers white, fragrant, on slender pedicels, in axillary, 3-10-flowered cymes. Corolla-tube short, cylindrical, limb large, spreading, $\frac{3}{4}$ in. across. Ovary

1, 2-celled, surrounded at the base by a 5-fid ciliate, cup-shaped nectary; style filiform pubescent; ovules numerous. Fruit large, oblong, 2-celled, valves thick fibrous. Seeds numerous pendulous, with a tuft of hairs at the hilum, radicle superior; albumen scanty.

South India, Bengal, and Central India. Burma and Ceylon. In the sub-Himalayan tract west to the Ganges. Cultivated in gardens. Fl. Dec.-April.

11. *CHONEMORPHA*, G. Don.

1. *C. macrophylla*, G. Don; Wight Ic. t. 432.—Syn. *Echites macrophylla*, Roxb. Fl. Ind. ii. 13. Vern. *Gar badero*, Kamaon.

A large climbing milky shrub. Leaves opposite, large, rotundate or obovate, 8-12 in. long, 6-9 in. broad, tomentose beneath. Flowers large, white, fragrant, coriaceous, in terminal corymbose pedunculate cymes; bracts large ovate, deciduous. Calyx with glands inside at the base. Corolla hypocrateriform, limb 2-3 in. across. Ovaries two distinct, surrounded by a cup-shaped thick nectary, style 1. Capsule long, pendulous, 12 in. long, quadrangular, 2-valved. Seeds numerous compressed pendulous, narrowed into a short beak above, and bearing a tuft of long white silky hairs; albumen scanty, radicle superior.

South India, Bengal, Nepal and Kamaon, Burma, Ceylon, and Indian Archipelago. Fl. April-Sept. The milk is said to yield a kind of caoutchouc.

12. *NERIUM*, Linn.

Shrubs with white milk. Leaves entire, coriaceous, opposite or whorled. Flowers large, in terminal cymes. Calyx-lobes with numerous fleshy linear glands at their base inside. Corolla-tube short, turbinate or campanulate, lobes spreading, unequal-sided; corona of lacinated appendices opposite to the lobes. Anthers sagittate, on short broad filaments, continued beyond the anthers into a long hairy tail-like appendix, thickened and contorted at the top. Ovary of 2 carpels, more or less cohering, style 1, stigma shaped like a truncate cone. Fruit a cylindrical capsule when ripe, dehiscing septicidally into 2 many-seeded follicles. Seeds pendulous, tomentose all over and with a tuft of hairs at the hilum; albuminous, radicle superior.

1. *N. odorum*, Solander; Roxb. Fl. Ind. ii. 2; Bot. Mag. t. 2032.—Sans. *Karavira*; Pers. *Kharzura*. Vern. *Kanira*, *kaner*, *ganira*, *gan*¹_{re}. Pb.; *Kaniyūr*, Kamaon.

A large glabrous shrub. Leaves in whorls of 3, linear-lanceolate, 4-6 in. long, narrowed into a short petiole, under surface uneven and irregularly pitted, midrib very prominent, main lateral nerves numerous, parallel, transverse. Flowers scented, rose-coloured white or red; appendices of corona cleft into numerous filiform segments, or trifid, the lateral segments linear, the centre one short-triangular. Fruit linear, 6-9 in. long.

Common in North-West and Central India, Sindh, Beluchistan and Afghanistan.

ten. Ascends to 5500 ft. in the outer Himalaya. Generally along the sides of rocky stream-beds or in ravines and river-beds which are dry in winter. Cultivated in gardens throughout India, with single and double flowers. Fl. April-June, often nearly throughout the year. Bark and root are poisonous; the leaves are used in native medicine (Pharm. Ind. 139).

N. Oleander, Linn., a common shrub in the Mediterranean region and Syria, grows abundantly in similar localities, and under similar conditions, with this difference, that round the Mediterranean the ravines are filled by the winter rains, and are dry in summer. The flowers are inodorous, the segments of the corolla appendices are short, irregular, and not linear or filiform, and the fruit is only 3-6 in. long. The shape of the corolla varies, and does not afford reliable distinctive characters. Other differences I am unable to indicate. Linnæus united them under *N. Oleander*. I am inclined to think that there are intermediate forms, and that the Indian shrub will eventually be replaced under that species.

ORDER LV. ASCLEPIADEÆ.

Perennial herbs or shrubs, often climbing, with opposite entire leaves, and regular pentamerous flowers. Calyx free, divided nearly or quite to the base into 5 segments or sepals, imbricate in bud. Corolla-tube generally short, the lobes contorted or valvate in bud. Stamens 5, inserted at the base of the corolla, and alternating with the corolla-lobes, the filaments short, connate or rarely free, the anthers always connate into a tube, enclosing the style, and the connective more or less prolonged. A corona of variously shaped distinct or connate appendages alternating with the corolla-lobes is usually inserted upon the corolla-tube, or upon the back of the filaments or wanting. Stamens 5, alternating with the corolla-lobes, inserted at the base of its tube; filaments usually connate, anthers 2-nearly 4-celled; pollen granular or usually cohering in masses, the masses pendulous erect or horizontal, sessile or stipitate, united in pairs to the stigma. Pistil dicarpellary; carpels distinct below; ovules attached to the inner angle; styles united above the ovaries, and thickened within the staminal-tube into an angular body. Fruit of 2 follicles, or of 1 only, by the abortion of the second carpel. Seeds usually pendulous, with a long silky tuft of hairs at the hilum; albumen thin, embryo straight, cotyledons foliaceous, radicle short, superior.—Royle Ill. 272; Wight Ill. ii. 164.

Filaments free; appendages of corona short, fleshy, not aristate
Filaments free; appendages of corona long-aristate
Filaments connate in a staminal tube; pollen-masses 10, stipi-

1. CRYPTOLEPIS.
2. PERIPLOCA.

Appendages of corona laterally compressed; follicles broad, semiovate

Appendages of corona flat; flowers in axillary cymes

Appendages of corona flat; flowers in interpetiolar cymes

Appendages of corona wanting; a leafless shrub

3. CALOTROPIS.
4. MARSDENIA.
5. PERGULARIA.
6. ORTHANTHERA.

1. CRYPTOLEPIS, R. Brown.

Corolla-lobes linear, contorted in bud, longer than the tube. Corona of 5 fleshy oblong obtuse appendages included within the tube. Stamens

included; filaments short, free, anthers broad-sagittate, with a tuft of hairs at the back, adhering at the base to the edge of the stigma, otherwise free; pollen granular. Fruit of 2 divaricate, ovoid-lanceolate follicles.

1. **C. Buchanani**, Roem. & Schult.; Falconer in Linn. Trans. xix. p. 53, t. 5.—Syn. *Nerium reticulatum*, Roxb. Fl. Ind. ii. 8. Vern. *Karanta*.

A large twining shrub, abounding with milky juice. Leaves oblong or obovate-oblong, pale beneath, obtuse and mucronate, or suddenly acuminate, blade 3-6 in., petiole $\frac{1}{4}$ in. long; main lateral nerves numerous, transverse, parallel, alternating with shorter ones, with anastomosing intramarginal veins. Flowers small yellow, on short pedicels, in pedunculate axillary cymes, shorter than leaves. Bracts ovate-lanceolate. Follicles 2-3 in. long.

North-West India, plains and sub-Himalayan tract (ascending to 4000 ft.), not known west of the Sutlej. Nepal, Behar, Bengal, South India and Ceylon. Fl. May-June.

2. PERIPLOCA, Linn.

Corolla rotate, lobes ovate, longer than the tube, generally hairy on the upper surface. Corona of 5 short thick appendages, each terminating in a long filiform arista. Filaments short, free, anthers oblong, cohering laterally, with a tuft of hairs at the back; pollen-grains cohering in fours. Follicles divaricate.

Leaves minute or wanting	1. <i>P. aphylla</i> .
Leaves lanceolate, long acuminate, 2-3 in. long	2. <i>P. calophylla</i> .

1. **P. aphylla**, Dne. in Jacq. Voy. t. 116.—Vern. *Barrarra*, *barre*, Trans-Indus and Sibsagar Doab; *Bāta*, Jhelam and Chenab.

A shrub, with erect leafless stems, glabrous or extremities pubescent, now and then with a few small thick ovate leaves. Flowers small, dark purple, sweet-scented, in short lateral rounded cymes, the corolla-lobes hairy above. Follicles on short thick peduncles, divaricate, cylindrical, gradually tapering, 3 in. long.

Common in many places trans-Indus and Sindh. Salt range, outer Himalaya, eastward to the Chenab, ascending occasionally to 3500 ft. Afghanistan, South Persia, Arabia, Egypt. Eaten by goats, used as fuel; the flower-buds are sweet, and are eaten, raw or cooked, as a vegetable. Fl. March, April.

2. **P. calophylla**, Falconer; DC. Prodr. viii. 498.

A small shrub, wholly glabrous. Leaves shining, lanceolate, long-acuminate, 2-3 in. long, on short petioles; main lateral nerves numerous, parallel, transverse, anastomosing by oblique veins. Flowers small, red, in short axillary, generally opposite rounded cymes; appendages hairy; corolla-segments ciliate. Follicles drooping, parallel, 3-6 in. long.

Outer ranges of the Himalaya westward to the Jumna, and ascending to 5000 ft. Kasia hills. Fl. March, April.

3. CALOTROPIS, R. Brown.

Corolla-tube broad-campanulate, lobes ovate. Stamens connate. Corona of 5 laterally compressed fleshy appendages, adnate to the back of the staminal tube, the lower end free and incurved. Anthers continued into a broad membranous appendix, incumbent on the stigma; pollen-masses 10, pendulous, in pairs, flat, stipitate. Stigma pentagonous. Follicles broad, semiovate.

Corolla somewhat saccate at base, segments spreading, appendages of corona truncate at apex; flower-buds ovoid

Corolla-segments erect; appendages of corona acute at apex; flower-buds hemispherical

1. *C. gigantea*.2. *C. procera*.

1. *C. gigantea*, R. Br.; Wight Ill. t. 155—Syn. *Asclepias gigantea*, Roxb. Fl. Ind. ii. 30. Sans. *Arka*. Vern. *Madār*, *safed-ak*, N.W.P.

Young shoots, inflorescence, and under side of leaves covered with soft white adpressed woolly tomentum. Leaves 4-8 in. long, obovate or obovate-oblong, short-acuminate, sessile or subsessile, with a narrow, cordate, often amplexicaul base. Flowers purplish-lilac or white, inodorous, with a grey down outside, on pedicels twice their length, in axillary pedunculate corymbs; flower-buds ovoid; corolla-lobes spreading or reflexed. Appendages of corona elongated, longer than staminal column, their length twice or more than twice their breadth, always hairy.

Common in South and Central India, Burma and Bengal. Gorakhpur, Oudh, and in great profusion in an isolated locality in the Siwalik tract near Kalidungi, below Naini Tal. Ceylon and Indian Archipelago. One of the most common plants in dry waste places. Fl. nearly throughout the year. A large shrub, with thick herbaceous branches, stem 12-18 in. girth, bark thick, soft, ash-coloured, wrinkled.

A fine strong silky flax from the inner bark was formerly made into cloth for princes and nobles. Used for bow-strings, fishing lines and nets; does not easily rot in water. The hair of the seeds is said to be made into thread in Borneo; attempts to weave it have been made in Madras. Gunpowder charcoal is made of the young branches in Kattiawar and in the Dekkan. All parts of the plant are full of acrid milk, which has powerful medicinal qualities.

2. *C. procera*, R. Br.; Ham. in Linn. Soc. Trans. xiv. 246.—Vern. *Spahakka*, Afg.; *Ak*, *āk*, *mudār*, North India.

Young leaves hoary, glabrous when full-grown, inflorescence clothed with white woolly tomentum. Leaves 4-9 in. long, thick, subcoriaceous, ovate obovate or obovate-oblong, acute, sessile or subsessile, with a cordate base. Flowers purplish red, pale silvery outside, with a strong, not unpleasant smell, on pedicels twice their length, in terminal and axillary corymbose cymes. Flower-buds hemispherical; corolla campanulate, lobes erect. Appendages of corona broad, not longer than staminal column, nearly as broad as long, glabrous, rarely pubescent.

Common in the Panjab, Sindh (in places), the trans-Indus territory, ascending to 3500 ft., in the sub-Himalayan tract to the Sardah river, between Indus

and Jhelam, ascending to 2400 ft., Oudh, Central India, and the Dekkan. Syria, Arabia, Egypt, Abyssinia, Persia, Afghanistan, and Beluchistan. In a general way it may be said that *C. gigantea* belongs to the moister, *C. procera* to the more dry districts. Often gregarious in dry sandy places. Never quite bare of leaves. Fl. Feb.-May; fruit ripens in the ensuing cold season. Near this plant, and growing on its roots, is frequently seen, pushing through the sand, *Phelipæa Calotropidis*, Walp., a beautiful Orobanchaceous parasite with leafless succulent stems, 2-3 ft. high, terminating in purple flower-spikes.

Generally a shrub 6-7 ft. high, but in the most arid parts of the Panjab may be seen in close clumps 12-15 ft. high, with stems 12-18 in. girth. In Sindh stems 4-5 ft. girth have been observed (Stewart Pb. Pl. 144). Bark $\frac{1}{2}$ in. thick, soft, corky, spongy. Wood white and light, charcoal is made from it, the roots are employed as tooth-brushes. In Sindh the bark is stripped off green, and made into halters, lines, and nets. In Arabia a soft rope is made of the fibre. The silky hair of the seeds is excellent for stuffing pillows and quilts. The plant abounds in acrid milk; mixed with salt, it is used to remove the hair from hides. The dried and powdered root-bark is official under the name of *Mudār*, as an alterative tonic, diaphoretic, and in large doses emetic (Pharm. Ind. 141); the supposed active principle has been called Mudarine, a bitter, not crystalline substance, soluble in water, the solution coagulates when heated, composition unknown.

4. MARSDENIA, R. Brown.

Corolla generally campanulate, limb spreading, divided into 5 lobes, contorted in the bud. Corona of 5 appendages, generally flat, sometimes auriculate, adnate to the back of the staminal column, sometimes 10 appendages in 2 rows. Anthers terminating in a membrane, free, or only adhering laterally; pollen-masses 10, erect, in pairs, stipitate. Style obtuse or rostrate.

Appendages of corona in one series, lanceolate or linear, as long as or longer than stamens. Style obtuse, not rostrate.

Corolla quite glabrous, except a ring of erect hairs which closes the throat; corolla-lobes shorter than tube; leaves drying with a blue colour

1. *M. tinctoria*.

Corolla hairy outside; lobes longer than tube.

Corolla-lobes glabrous inside; appendage of corona lanceolate, as long as stamens

2. *M. tenacissima*.

Corolla-lobes hirsute inside; appendage of corona linear, longer than stamens

3. *M. Roylei*.

Appendages of corona biseriate, the outer fleshy, attached to the base of staminal column, and shorter than anthers, the inner attached half-way up, membranous, obtuse, shorter than anthers; style terminating in a long filiform beak, as long as corolla

4. *M. lucida*.

1. *M. tinctoria*, R. Br.; Wight Ic. t. 589.—Syn. *Asclepias tinctoria*, Roxb. Fl. Ind. ii. 43.

A large twining shrub; branches, petioles and peduncles clothed with short down. Leaves pubescent when young, afterwards glabrate, turning blue when dry, ovate, with rounded or cordate base, acuminate, pinnately-nerved, blade 4-9 in. long, petioles $\frac{1}{2}$ -2 in. Flowers numerous, small, yellow, $\frac{1}{2}$ in. long; pedicels slender, twice the length of flower, in dense

umbellate clusters, forming cylindrical, pedunculate, axillary racemes, interrupted at the base. Calyx ciliate. Corolla glabrous, save a ring of hairs in the throat, lobes shorter than tube; appendages of corona lanceolate, as long as stamens. Follicles lanceolate, covered with long soft hairs, reflexed, in racemes of 4-8.

East Bengal, Sikkim, ascending to 3000 ft. Burma. Banda district (Edgew.) Fl. hot and rainy season. The leaves yield a kind of Indigo.

2. *M. tenacissima*, Wight et Arn.; Wight Ic. t. 590.—Syn. *Asclepias tenacissima*, Roxb. Fl. Ind. ii. 51; Cor. Pl. t. 240.

A large twining shrub; branches, leaves and inflorescence soft-tomentose. Leaves cordate, acuminate, 4-6 in. long and 3-4 in. broad, petiole 2-4 in. long, basal nerves 3-5. Flowers greenish-yellow, $\frac{1}{2}$ in. long, on slender pedicels, somewhat longer than flowers, in axillary drooping pedunculate compound cymes. Calyx and corolla hairy outside; corolla-lobes longer than tube, glabrous inside. Appendages of corona lanceolate, as long as stamens. Follicles ovate-lanceolate, 4-6 in. long, downy.

Behar, Baraith forests of Oudh, Kamaon, ascending to 4500 ft. Banda district. Ceylon. Fl. April; fr. in the ensuing cold season. The bark of young luxuriant shoots yields a large quantity of beautiful fine silky fibre, with which the mountaineers of Rajmahal make their bow-strings, on account of its great strength and durability. The following comparative experiments are recorded by Roxburgh:—

A line of common hemp broke with 158 lb. when dry, and 190 lb. when wet.					
<i>Boehmeria tenacissima</i>	240	"	"	278	"
<i>Marsd. tenacissima</i>	248	"	"	342	"

A milky juice exudes from wounds, thickening into an elastic substance very much like caoutchouc, which rubs out black pencil-marks.

3. *M. Roylei*, Wight.—Vern. *Pathor*, Chenab; *Tar, veri*, Salt range; *Murkila*, Kamaon.

A large twining shrub; branches, under side of leaves, and inflorescence soft-tomentose. Leaves ovate from cordate base, acuminate, 3-5 in. long, petiole 1-2 in. Flowers orange, $\frac{1}{2}$ in. long, in compact, rounded, pedunculate axillary cymes. Calyx hairy outside; corolla-lobes longer than tube, hirsute inside. Appendages of corona linear, longer than stamens.

Salt range, Panjab, and outer ranges of N.W. Himalaya, ascending to 7000 ft. Simla, Mussoori, Kamaon. Fl. May, June. The fibre is made into fishing-lines.

4. *M. lucida*, Edgew. MS. in Hb. Kew; Madden in Journ. As. Soc. xvii. pt. i. 370.—Vern. *Dudhi*, Kamaon.

A large evergreen climber; glabrous, only extremities and inflorescence pubescent. Leaves ovate, pale beneath, penniveined, 4-5 in. long, petiole 1-1½ in. Flowers purple, sweet-scented, $\frac{1}{2}$ in. long, on pedicels somewhat longer than flower, in short-pedunculate umbelliform cymes. Calyx hairy outside, corolla-lobes longer than tube, hairy. Appendages of cor-

ona 10, in a double series, the outer inserted at the base of the staminal tube, thick, fleshy, the inner half-way up, obtuse, membranous, both shorter than anthers. Style prolonged into a filiform beak as long as corolla. Follicles lanceolate, smooth, 5 in. long.

East Bengal, Baraich forests of Oudh, Kamaon (in shady valleys), ascending to 7500 ft. Fl. Oct.-Nov.

5. *PERGULARIA*, Linn.

Flowers in interpetiolar cymes. Corolla hypocrateriform, limb spreading, lobes contorted in bud. Corona of 5 flat, membranous appendages, adnate to the base of the staminal column, with a small ligula inside below the apex. Anthers connate, terminating in a membrane. Pollen-masses 10, stipitate, erect, in pairs. Style not rostrate.

Leaves ovate; corolla-tube glabrous inside 1. *P. pallida*.
Leaves cordate; corolla-tube hairy inside to the throat 2. *P. odoratissima*.

1. *P. pallida*, W. et A.; Wight Ic. t. 585.—Syn. *Asclepias pallida*, Roxb. Fl. Ind. ii. 48. Vern. *Surkūla*, Kamaon.

A large twining shrub; young leaves and young shoots pubescent with soft, curved hairs. Leaves ovate from a cordate base, acuminate, 2-4 in. long, petiole about 1 in. Flowers pale yellow, inodorous, $\frac{1}{2}$ in. long to tip of corolla-lobes, on pedicels as long as flowers or longer, in many-flowered, short pedunculate, umbelliform cymes; peduncles shorter than pedicels, both hairy. Calyx almost glabrous, the segments ciliate at the edges, nearly as long as the corolla-tube. Corolla-lobes linear, twice the length of tube; throat and inside of tube glabrous, except near its base. Follicles lanceolate, glabrous, 3 in. long.

Bengal, Behar, Burma, plains of N.W. India and the Panjab. Fl. June-Oct.

2. *P. odoratissima*, Linn.; Wight Ic. t. 414; Bot. Reg. t. 412.—The West Coast or Primrose-Creeper, *Kanja-lūta*, Beng.

A large twining shrub; bark deeply cracked and spongy, young shoots and inflorescence pubescent. Leaves deep-cordate, acuminate, about 4 in. long and nearly as broad, pubescent along the nerves on both sides, and with a few scattered hairs between the nerves, petiole 1 in. long. Inflorescence similar to that of *P. pallida*. Flowers $\frac{3}{4}$ in. long, greenish yellow or orange, exceedingly fragrant. Calyx pubescent and ciliate, shorter than corolla-tube. Corolla-tube hairy inside to the throat, broad, nearly as long as the oblong lobes. Follicles ovate-lanceolate.

Cultivated generally in gardens in India and China. Indigenous in Bengal, Burma, and the N.W. Himalaya, where it ascends to 4000 ft. Has been found as far west as Jaunsar Bawar. Fl. May-July.

6. *ORTHANTHERA*, Wight.

A glabrous leafless shrub, with minute subulate scales in the place of the leaves. Flowers $\frac{1}{4}$ in. long, green, on short pedicels, in short pedun-

ulate axillary umbelliform cymes of 3-6 flowers. Peduncles, pedicels, calyx, and corolla villous with long soft hairs. Calyx parted nearly to the base into 5 linear-lanceolate segments, as long as corolla-tube. Corolla campanulate, tube cylindric, longer than the oblong, erect segments, which are valvate in bud. No corona, but the staminal tube girt at the base by an undulate ring. Pollen-masses 10, stipitate, erect. Follicles compressed, linear, glabrous, erect, 4-5 in. long.

1. *O. viminea*, Wight; Jacq. Voy. Bot. t. 115.—Vern. *Mowca*, *lanebār*, Trans-Indus; *Matti*, Bias; *Khip*, Delhi; *Kip*, Sindh; *Chapkia*, Kamaon; *Māhūr*, Baraich, Gonda.

Grows 3-6 ft. high, with erect branches. Fl. March, April. Trans-Indus, Sindh, Panjab, the Doab, sub-Himalayan tract, ascending to 2000 ft., eastwards known as far as the Baraich and Gonda forests in Oudh, where it is abundant in the beds of streams, and where the flower-buds are eaten as a vegetable, cooked or raw (R. Th.) Rope is made of the fibre, after 4 or 5 days' steeping.

ORDER LVI. BORAGINÆÆ.

Herbs, usually with rough hairy leaves, or trees and shrubs, glabrous or hairy. Leaves alternate, rarely opposite, usually undivided, without stipules. Inflorescence definite; flowers in 1-sided (scorpioid) spikes or racemes, rolled back when young, and often forked or dichotomous, or in more or less compound, often irregular cymes. Calyx free, persistent, lobes or teeth 5, rarely 4 or 6, valvate in bud. Corolla gamopetalous, hypogynous, segments as many as those of the calyx, imbricate or induplicate in the bud. Stamens inserted in the corolla-tube, as many as corolla-lobes, and alternate with them; anthers 2-celled, the cells usually opening in longitudinal slits. Ovary free, of 2 carpels, entire or 4- rarely 2-lobed, 2-celled, with 1 or 2 ovules in each cell, or 4-8-celled, with 1 ovule in each; style simple or 2-4-fid, terminal or inserted between the lobes. Fruit a drupe or dry, and separating into 4, rarely 2, 1-seeded nuts. Seed with a thin testa, albumen none or scanty, embryo straight, radicle short.—Royle III. 303, 306 (*Cordiaceæ*); Wight III. ii. 208.

Style twice forked; drupe with 1 kernel	1. <i>Cordia</i> .
Style bifid; drupe with 2-4 kernels	2. <i>Ehretia</i> .
Style undivided; berry with 4 kernels	3. <i>Rhabdia</i> .

This Order is here accepted in its wider sense, including *Cordiaceæ*, which is often regarded as a separate Order. It is divided into four great tribes: 1. *Cordiæ*, 2. *Ehretiæ*, with undivided ovary, terminal style, and indehiscent, often fleshy 4-seeded fruit. In *Cordiæ* the style is twice forked, in *Ehretiæ* 2-lobed (*Ehretia*), rarely undivided (*Rhabdia*). 3. *Heliotropiæ*, ovary often lobed, but style terminal, fruit dry, often separating into several 1-seeded cocci. To this group belongs the sweet-scented Heliotrope (*H. peruvianum*, Linn.), from the Andes of South America, which thrives so luxuriantly on the Nilgiris and in South Europe. 4. *Boragææ*, the ovary of 2, generally 4, distinct lobes, the style in the middle between them. To this group belong numerous annual or perennial herbaceous plants of Europe and Central Asia, of which the *Borage*, *Bugloss*, and the *Forget-me-not* are well-known examples.

I. *CORDIA*, Linn.

Trees or shrubs; flowers often polygamous, in terminal or leaf-opposed cymes, bracts small or none. Calyx tubular turbinate or campanulate, 4- or 5-toothed or irregularly toothed or lobed. Corolla-tube cylindrical or funnel-shaped, limb 4-5, sometimes more, lobed. Ovary entire, 4-celled, 1 ovule in each cell; style terminal, twice forked. Fruit a drupe, endocarp hard, often perforated at the apex, cells 4 or fewer by abortion. Albumen none, cotyledons plaited lengthwise.

Leaves generally alternate, ovate or cordate; flowers generally pentandrous.

Leaves broad-ovate or rotundate, base rounded or cuneate; calyx not ribbed.

Leaves cordate; branchlets with dense grey or tawny tomentum; calyx ribbed.

Leaves broad-elliptic, or rotundate, dense tufts of rust-coloured hairs at the axils; calyx ribbed.

Leaves generally subopposite, oblanceolate; flowers generally tetrandrous.

1. *C. Myxa*.2. *C. Macleodii*.3. *C. vestita*.4. *C. Rothii*.

1. *C. Myxa*, Linn.; Roxb. Fl. Ind. i. 590; Wight Ill. t. 169.—Syn. *C. obliqua*, Willd.; Wight Ic. t. 1378. *C. latifolia*, Roxb. l. c. 588. *C. polygama*, Roxb. l. c. 594. Sans. *Selu*. Vern. *Lasōra*, *lassōra*, *lesūra*, *bhokar*, Hindi; *Laswāra*, *lasiāra*, Pb.; *Lesūri*, *gidūri*, Sindh; *Borla*, *bairala*, *baurala*, Kamaon; *Gondhun*, *khātu*, Satpura range, C.P.; *Bar-günd*, *vargünd*, Mar.; *Sepistan*, *pistan*, Guz.; *Thanatben*, Burm.

A middle-sized tree; young leaves soft-pubescent beneath, more or less rough when full-grown, broad-ovate or rotundate, base rounded or short-cuneate, blade 3-6 in. long, petiole 1-2 in.; main lateral nerves 4-6 pair, 1 or 2 pair from the base of the leaf. Flowers white, polygamous, pentandrous, on short pedicels, in loose terminal and lateral pedunculate cymes, without bracts. Calyx without prominent ribs, entire and closed over the corolla in the bud, splitting irregularly, when the flower expands, into 5 short lobes, nearly glabrous outside, lobes hairy inside. Corolla-tube nearly as long as calyx, with 5 narrow, recurved lobes, as long as the tube. Stamens exserted, filaments hairy. Drupe supported by the enlarged and hardened calyx, its limb irregularly and broadly toothed, ovoid or nearly globose, $\frac{3}{4}$ -1 $\frac{1}{4}$ in. long, puberulous when young; when ripe, minutely rugose, but shining, yellowish brown, pink or nearly black. Kernel very hard, rugose, 1- or 2-celled, in a rough viscid sweetish almost transparent pulp.

Cultivated throughout India, wild in the Panjab Salt range, the outer Himalaya and Siwalik tract, from the Chenab to Assam, ascending to 5000 ft. Kasia hills. Gonda forests in Oudh, Satpura range, C.P. Also South India, Ceylon, Burma, Indian Archipelago, and Queensland. Leaves are shed in April, and renewed soon after; fl. March, April; fr. May-July. Growth moderately quick, 3-6 rings per in. A very hardy tree. 30-40 ft. high, trunk short, erect or somewhat crooked, 4-5, at times 6 ft. girth, branches numerous, spreading, then ascending, forming a handsome rounded crown with dense bright-green foliage. Branchlets reddish grey, glabrous, bark $\frac{1}{2}$ -1 in. thick, light- or dark-cinereous.

brown, sometimes blackish, rough with shallow longitudinal wrinkles and furrows, inner substance fibrous. Wood olive-coloured, greyish, or light brown. No distinct heartwood. The horizontal section shows numerous broad medullary rays and large pores, as well as concentric bands of whitish tissue, alternating with narrow bands of darker tissue. Pores and medullary rays prominent on a vertical section. Soft and somewhat porous, but fairly strong, weight 33-49 lb. per cub. ft. Seasons well, but does not stand exposure, and is apt to be attacked by insects. Employed in boat-building, for gun-stocks, well-curbs, and agricultural implements. Excellent fuel. The bark is made into ropes and fuses; the fibre is also used in caulking boats. The leaves are used as plates, and in Pegu for the covering leaf of the Burma cheroots. The tender young fruit is eaten as a vegetable, and is pickled; the ripe fruit is eaten, and is greedily devoured by birds. The adhesive viscid pulp is used as bird-lime. Its juice is employed instead of that of the marking-nut (*Semecarpus Anacardium*), but the colour is transient. The kernel is eaten, tastes somewhat like a filbert; that of the cultivated tree is better.

C. Wallichii, G. Don; Bedd. Fl. Sylv. t. 245; is allied to this species, but the leaves are more cordate, and clothed beneath with dense grey tomentum. Forests of the western coast and Mysore.

2. *C. Macleodii*, H. f. & Th.—Tab. XLI.—Linn. Soc. Journ. ii. 128.—Syn. *Hemigymnia Macleodii*, Griff. Vern. *Deughan*, *dhāian*, *dahi*, *deingan*, *dhāman*, *dewan*, C.P.; *Dhaivan*, Sattara.

A middle-sized tree; branchlets, under side of leaves, inflorescence, and calyx clothed with dense grey or tawny tomentum. Leaves alternate or subopposite, cordate, pubescent above, membranous when young, afterwards firm and hard, upper surface rough, uneven, but somewhat shining; blade 5-7 in. long and nearly as broad, petiole 2-3 in.; three prominent basal nerves, each of the 2 outer with 4-5 main lateral nerves on the outside, the middle nerve with 4-5 main lateral nerves on either side, all joined by prominent parallel transverse veins. Flowers polygamous, white, on subsessile, compound, axillary and terminal cymes. Bracts none. Calyx at the time of flowering cylindrical, wider above, almost clavate, $\frac{1}{2}$ in. long, ribbed and furrowed, splitting into 3-5, usually 5 unequal teeth. Corolla-tube shorter than calyx, lobes obovate-oblong, as long as tube, undulate, spreading or reflexed. Stamens exserted, filaments hairy at the base. Male flowers with a rudimentary ovary, without style or stigma. Drupe $\frac{1}{2}$ in. long, ovoid, cuspidate with the persistent base of style, and girt by the enlarged and hardened cup-shaped calyx, with a ribbed, crenate and denticulate edge.

Central India, from the Mahanadi river in Bijoragogarh (D.B.), (probably also in Behar), to the Nagpahar near Ajmir (D.B.), West Dekkan as far south as Belgaum (Dr Ritchie, D.B.), and probably (specimens imperfect) on dry hills near Chikmagalur in Mysore, D.B. First brought to notice by the late Sir D. F. Macleod, who sent specimens from Jubbulpur (in 1842) to Dr Griffith. Attains 30-40 ft., with short trunk, 3-4 ft. girth, and strong spreading boughs, forming a close, rounded crown. Bark thick, soft, corky, grey. Fl. April, May; fruit C.S. Heartwood light brown, beautifully mottled with darker veins and whitish lines. Weight 40-50 lb. per cub. ft. Even-grained, hard, strong, tough and elastic, seasons well and works easily. Used for furniture, picture-frames, and other ornamental work. Excellent fishing-rods are made of it.

3. *C. vestita*, H. f. & Th. ; Linn. Soc. Journ. ii. 128.—Syn. *C. incana*, Royle ; *Gynaion vestitum*, A. DC. Vern. *Kūmbi*, *karūk*, Pb. ; *Kūm pāiman*, *pīn*, *īndak*, N.W.P. ; *Chinta*, *ajānta*, Oudh.

A small or middle-sized tree ; branchlets, under side of leaves and inflorescence clothed with soft grey pubescence ; leaf-buds and base of petioles enveloped in dense tufts of long tawny or rust-coloured hairs. Leaves alternate, broad-elliptic or rotundate, upper side very rough, blade 3-4 in. long, 2-3 in. broad, petiole 1-1½ in. long ; main lateral nerves 3-5 pair, the lowest pair proceeding from the base. Flowers yellowish-white, polygamous, in compound cymes, often several together on short peduncles at the ends of branches ; cymes of male flowers often composed of unilateral racemes. Calyx at the time of flowering clavate, ½-½ in. long, ribbed and furrowed, splitting into a number of unequal teeth. Corolla-tube as long as calyx, lobes obovate-oblong, as long as tube, undulate, spreading. Stamens exserted, filaments hairy at the base. A rudimentary ovary without style or stigma in the male flowers. Drupe ¾ in. long cuspidate with the persistent base of style, and girt at base with the enlarged, hardened, flat cup-shaped calyx, ¾-1 in. across, with a ribbed, crenate and denticulate edge.

Sub-Himalayan tract and outer ranges from near the Jhelam to the Sarda river, ascending to 4000 ft. Hill forests of Baraich and Gonda in Oudh. Nowhere common, rare west of the Jumna. The flowers appear with or shortly before the young leaves in March, April ; the fruit ripens Oct., Nov. Often only 15-20 ft. high, and 3-4 ft. girth. A planted tree on Mount Tilla in the Panjab Salt range 8 ft. girth, and 25-30 ft. high. Branchlets marked by the scars of the fallen petioles. Bark ½ in. thick, dark grey or blackish, rugose and longitudinally furrowed, when old exfoliating in large woody scales, showing the smooth silvery grey inner bark. The dark-green foliage is clustered near the ends of branches. Sapwood whitish, heartwood distinct, of a chocolate-brown colour, with conspicuous medullary rays. Close-grained, hard, heavy and strong. Employed for wheel- and well-work. The fruit is filled with a gelatinous pulp, which is eaten, and is preferred to that of *C. Myxa*.

4. *C. Rothii*, Roem. & Schultes ; Wight Ic. t. 1379.—Syn. *C. angustifolia*, Roxb. Fl. Ind. i. 595. Vern. *Gondi*, *gondni*, *gundi*. Local : *Liār*, *liāi*, Sindh.

A small or moderate-sized tree. Leaves rough and pubescent beneath while young, generally subopposite, oblanceolate or cuneate-oblong, blade 3-4 in. long, and 1-1½ in. broad, petiole ½ in. long. Flowers small, white, generally tetrandrous, in loose, terminal or axillary pedunculate cymes ; peduncles and pedicels slender, glabrous or slightly pubescent, bracts none. Calyx at the time of flowering turbinate. Corolla-tube somewhat shorter than calyx, lobes 4 or 5 oblong, reflexed. Stamens 4 or 5 exserted. Drupe ovoid, acute, mucronate, ½ in. long, yellow or reddish brown when ripe, glabrous, longitudinally striate, fleshy, with yellow, gelatinous pellucid pulp ; generally 1-seeded.

Planted and self-sown near villages in the Panjab south of the Salt range, Sindh, N.W.P., Rajputana, Guzerat, and Dekkan. Wild in the Kishengurh

forests north-east of Ajmir (D.B.) ; in Mysore, and probably in other parts of the peninsula. Also in Arabia and Abyssinia. Leaves are renewed in Feb., March. Fl. April-June ; fruit ripens in the ensuing cold season. Coppices well. Attains 30-40 ft., trunk short, 3-5 ft. girth, branches spreading, extremities often drooping, forming a somewhat lax, rounded crown. Twigs cinereous, bark of stem thick, light or dark grey, or brownish, longitudinally furrowed, not much cracked. Heartwood light yellow or light brown, tough, 42-52 lb. per cub. ft. Used as fuel, in Sindh for building, and in Cutch for agricultural implements. A gum issues from wounds in the bark. Ropes are made of the bark. The pulp of the drupe is adhesive, hence its name (*gond*, gum), and is eaten, though insipid.

2. EHRETIA, Linn.

Trees or shrubs, often glabrous ; leaves alternate. Flowers in terminal or axillary cymes, with small bracts. Calyx deeply divided into 5 segments, persistent, but not enlarged in fruit. Corolla-tube short or cylindrical, limb of 5 spreading lobes, imbricate in bud. Stamens generally exserted. Ovary 2-celled with 2 ovules in each cell, or 4-celled, 1 ovule in each cell ; style terminal bifid. Fruit a drupe, the endocarp forming two 2-seeded, or four 1-seeded pyrenes. Albumen scanty, cotyledons ovate, not plaited.

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| Leaves serrate ; flowers in terminal panicles, pyrenes 2 . . . | 1. <i>E. serrata</i> . |
| Leaves entire ; flowers in terminal and axillary compound corymbose cymes ; pyrenes 4. | |
| Leaves elliptic ; flowers sessile ; corolla not much longer than calyx . . . | 2. <i>E. laevis</i> . |
| Leaves spatulate ; flowers pedicellate ; corolla twice the length of calyx . . . | 3. <i>E. obtusifolia</i> . |

1. *E. serrata*, Roxb. Fl. Ind. i. 596 ; Bot. Reg. t. 1097.—Vern. *Pūna*, N.W. India ; *Puran*, *kalthāun*, Pb. ; *Pūnyan*, *pūnjāwāi*, *panden*, *koda*, N.W.P. ; *Kurkūria*, *arjūn*, Oudh ; *Nalshūna*, Nepal.

A middle-sized tree ; glabrous, only leaves and branches of inflorescence with scattered, short, generally adpressed hairs. Leaves elliptic-oblong, acuminate, sharp-serrate, blade 4-6 in., petiole $\frac{3}{4}$ in. long ; main lateral nerves arching, 8-10 on either side of midrib. Flowers numerous, white, small, fragrant, sessile, in clusters of 3-5, in large terminal pyramidal panicles. Corolla rotate. Drupe with two 1- or 2-seeded pyrenes, red orange or nearly black when ripe, as large as a small pea.

Sub-Himalayan tract and outer ranges from near the Indus to Sikkim, ascending to 4000, occasionally to 5500 ft. Cultivated in India, China, the Mauritius, and elsewhere. (*E. acuminata*, R. Br., Benth. Fl. Austr. iv. 387, of Queensland and N.S. Wales, is nearly allied to this species.) Fl. Feb.-April, occasionally July-Dec. ; fr. Nov.-Dec., remains long on the tree. Attains 40 ft., with a short straight trunk 4-5 ft. girth, numerous branches, forming a handsome, shady oval crown, resembling *Cordia Myxa* in appearance. Bark dark grey or brown, even, with longitudinal furrows ; when old, with many small ragged, mostly longitudinal cracks, inner substance brown, leathery, fibrous. Wood

light brown, with white specks, fairly even and compact, soft, not heavy, easily worked, made into scabbards, sword-hilts, gun-stocks, and employed in building and for agricultural implements. Weight 37 lb.; value of P. 530 (Kyð). Not durable. The unripe fruit is pickled; ripe it is insipidly sweet, and is eaten.

2. *E. laevis*, Roxb.—Tab. XLII.—Cor. Pl. t. 56; Fl. Ind. i. 597; Wight Ic. t. 1382.—Vern. *Chamrôr*, *chamrûr*, *chamraud*, N.W. India; *Chambul*, *gîn*, Pb.; *Kôda*, *darar*, N.W.P.; *Datranga*, Oudh; *Tambôli*, Banda; *Tambolia*, Banswara; *Dotti mara*, Gonds, C.P.

A middle-sized tree; glabrous or more or less pubescent and ciliate. Leaves membranous when young, firm and nearly coriaceous when full-grown, entire, elliptic, obtuse or acuminate, blade 3-8 in., petiole $\frac{1}{2}$ in. long; main lateral nerves 6-10 on either side of midrib, arcuate, joined by more or less prominent intramarginal veins. Flowers small, white, sessile or subsessile, in loose, terminal and lateral cymes, composed of unilateral spikes; bracts none. Calyx hairy, lobes ovate, obtuse. Corolla rotate or broad-campanulate, tube a little longer than calyx, lobes twice the length of tube. Anthers not apiculate. Drupe nearly 2-lobed, somewhat broader than long, $\frac{1}{4}$ in. across, red, afterwards black, wrinkled, a scanty pulp enclosing 3-4 triquetrous, 1-seeded pyrenes.

Trans-Indus, on eastern skirts of Suliman range, ascending to 2500 ft., Panjab, Siwalik tract, ascending to 2000 ft., occasionally in the Panjab plains. Gangetic plain, and sub-Himalayan tract, ascending to 2500 ft. Oudh forests, Central India, Behar, Guzerat, and the Konkan. The old leaves are shed Jan., Feb.; the new foliage issues Feb., March, and is light-green, somewhat viscid. Fl. Jan., Feb., before the leaves are quite out, occasionally up to May, or later; fruit April-June. Hard vesiculose galls not rare on inflorescence. Attains 30, at times 40 ft., trunk erect, short, irregularly scooped, 3-4, at times 5-6 ft. girth. Many large branches, ascending and spreading into a rounded, lax crown. Branchlets light grey, or with a reddish tinge, smooth. Bark $\frac{1}{2}$ -1 in. thick, light-yellowish grey with dark specks. Foliage dark green. Wood dirty-white or yellowish brown, compact, even- and fine-grained, tough, easily worked, used for agricultural implements, and for building. The inner bark, in times of famine, is mixed with flour and eaten. The leaves are given as cattle-fodder. The fruit is tasteless, but is eaten.

E. floribunda, Royle; Benth. in Royle Ill. p. 306, from the Dehra Doon, also found by Stocks at Shah Bilawal in Sindh, seems to me to be merely a variety with acuminate, soft-pubescent and ciliate leaves.

E. aspera, Roxb. Cor. Pl. t. 55; Fl. Ind. i. 598, with smaller elliptic or oblong-elliptic leaves, tomentose beneath, scabrous and pubescent above, terminal corymbose cymes and small globose drupes has not been found within the range of this Flora. It is closely allied to *E. ovalifolia*, Wight Ic. t. 1383, of South India and Ceylon.

3. *E. obtusifolia*, Hochstetter; DC. Prodr. ix. 507.

A small shrub, with grey branches. Leaves rough and hairy, spatulate or obovate, entire, 1-2 in. long. Flowers $\frac{1}{4}$ in. long, in short, lax, hairy cymes at the top of small branchlets, pedicels as long as calyx, or

longer. Calyx-lobes lanceolate. Corolla campanulate, twice the length of calyx, lobes ovate, as long as tube. Drupe $\frac{1}{4}$ in. across, with four 1-seeded pyrenes.

Sindh. Salt range, Panjab. Abyssinia. Fl. March, April.

3. RHABDIA, Martius.

Shrubs with alternate leaves. Calyx deeply divided into 5 segments, persistent. Corolla-tube short, limb 5-lobed. Ovary 2-celled, style undivided. Fruit a dry berry with 4 pyrenes; seeds albuminous, radicle superior.

1. *R. viminea*, Dalzell in Hooker Ic. Plant. ix. t. 823.—Syn. *Ehretia viminea*, Wall.; *E. cuneata*, Wight Ic. t. 1385.

A small much-branched shrub, branches twiggy. Leaves spatulate, entire, narrowed into a short petiole, about 1 in. long, more or less hairy with stiff adpressed white hairs, at times densely hispid or nearly glabrous. Flowers pink, on short pedicels, 2 or 3 at the ends of short lateral branchlets. Calyx hispid, longer than corolla-tube, somewhat enlarged in fruit, which is the size of a small pea, and orange-red when ripe.

Rocky, sandy and shingly beds of streams, Kamaon, ascending to 2500 ft., East Bengal, Banda, Konkan, Mysore, Burma. Fl. Oct., Nov.; branches frequently creeping and rooting.

ORDER LVII. CONVULVULACEÆ.

Herbs, rarely shrubs, often twining. Leaves alternate, without stipules. Flowers regular, pentamerous, bisexual, usually large and showy. Calyx free, persistent, often enlarged in fruit, of 5 distinct sepals, much imbricate in bud. Corolla generally campanulate or funnel-shaped, the limb usually spreading, 5-angled or 5-lobed, folded in the bud, rarely imbricate. Stamens 5, often of unequal length, inserted in the corolla-tube or at its base, and alternating with the lobes or angles of the limb; anthers with 2 parallel cells dehiscing longitudinally. Ovary free, 2- 3- or 4-celled, 1 or 2 ovules in each cell, or 1-celled with 2 or 4 ovules. Fruit a capsule or succulent and indehiscent. Seeds with scanty mucilaginous albumen.—Royle III. 307; Wight III. ii. 200.

Style filiform; limb of corolla 5-angled or 5-lobed.

Flowers small, ovary 1-celled; sepals much enlarged in fruit, forming long, veined membranous wings; fruit a 1-seeded capsule.

Flowers large, ovary 2- or 4-celled; sepals enlarged, but not membranous in fruit; fruit a dry or succulent berry.

Stigma sessile; limb of corolla of 5 deeply 2-lobed divisions; fruit a berry, supported by the slightly increased calyx; leaves coriaceous, evergreen.

1. PORANA.

2. ARGYREIA.

3. ERYCIBE.

1. PORANA, Linn.

Large twiners. Leaves entire. Flowers usually small, paniculate in the Indian species. Sepals enlarged after flowering into long membranous

wings, horizontally spreading under the fruit. Ovary 1-celled, with 2 or 4 ovules. Capsule usually 1-seeded by abortion.

1. *P. paniculata*, Roxb. Cor. Pl. t. 235; Fl. Ind. i. 464.

A large twining shrub; branches, panicles and under side of leaves with grey or brownish pubescence. Leaves cordate, acuminate, 2-4 in. long, petiole less than $\frac{1}{3}$ the length of leaf, basal nerves 5-7. Flowers numerous, small, white, on pedicels longer than calyx, in large axillary and terminal drooping panicles; bracts shortly tomentose. Corolla $\frac{1}{4}$ in. long or less. Calyx half the length of corolla, sepals 3-5, enlarged after flowering, into ovate-oblong, membranous, shortly petiolate, reticulate wings, $\frac{3}{4}$ -1 in. long, surrounding the globose brittle villous capsule, which is about the size of a small pea.

Bengal, sub-Himalayan tract to the Ganges, ascending to 4500 ft., Burma. Fl. Nov.-Feb.; fr. March, April.

2. *ARGYREIA*, Loureiro.

Large, often woody climbers. Leaves entire, rarely lobed, clothed beneath with silky, often silvery white hairs. Flowers large, in axillary cymes, rarely solitary; corolla funnel-shaped or campanulate. Ovary 2-celled, with 2 ovules in each cell, or 4-celled by a spurious dissepiment between the ovules; style filiform, stigma capitate, entire or 2-lobed. Fruit indehiscent, a dry or succulent berry, 2-4-seeded; cotyledons folded.—This genus was divided into 2 by Choisy in DC. Prodr. ix. 325, *Rivea* with a 4-celled and *Argyreia* with a 2-celled ovary. I follow Bentham, Fl. Hongkong. 236, in uniting them.

Leaves cordate or broad-ovate, breadth equal to the length or nearly so.

Flowers white, corolla funnel-shaped; leaves with 5-7 prominent basal nerves, midrib penniveined.

Peduncles 1-2-flowered

Flowers in corymbose or paniced pedunculate cymes

Flowers rose-coloured or purple, corolla campanulate; leaves penniveined.

Branches and under side of leaves white-tomentose.

Branches and under side of leaves hairy.

Flowers sessile in compact pedunculate heads with long, lanceolate bracts

Flowers pedicellate in corymbose cymes with short bracts

Leaves cuneate-oblong, much longer than broad

1. *A. uniflora*.

2. *A. ornata*.

3. *A. speciosa*.

4. *A. capitata*.

5. *A. setosa*.

6. *A. cuneata*.

The geographical distribution in India of several of the species here described is imperfectly known. I have selected those most likely to be met with in the forests of North and Central India.

1. *A. uniflora*, Sweet.—Syn. *Rivea hypocrateriformis*, Choisy in DC. Prodr. ix. 326. *Lettsomia uniflora*, Roxb. Fl. Ind. i. 495.

A woody climber; branchlets and under side of leaves hoary or white

silky-tomentose. Leaves broad-cordate, obtuse, emarginate or apiculate, 3-6 in. broad, basal nerves 5-7, petiole about as long as leaf. Flowers large, pure white, peduncles 1-3-flowered, pedicels (shorter than peduncles) in the axils of linear, deciduous bracts. Corolla-tube 2-3 in. long, slender, cylindrical, limb 1-2 in. diam.

Sindh, common on dry hills. Panjab, Central India, South India. Fl. May-Aug. The flowers open at sunset, and close at sunrise.

A. bona-nox, Sweet.—Syn. *Lettsomia bona-nox*, Roxb. Fl. Ind. i. 494. *The Midnapur creeper*. A gigantic climber with spongy cracked ash-coloured bark, has larger flowers; very fragrant. Roxburgh calls it the prince of Convolvulaceæ. Bengal (Serampur, Midnapur), Guzerat, the Konkan. Fl. R.S.

2. *A. ornata*, Sweet.—Syn. *Rivea ornata*, Choisy; DC. Prodr. ix. 326; Wight Ic. t. 1356. *Lettsomia ornata*, Roxb. Fl. Ind. i. 496.

Differs from *A. uniflora* mainly by having the flowers in large spreading corymbose or paniced pedunculate cymes, peduncle generally longer than petiole. This, as well as the preceding species, demand critical study on the spot.

Oudh forests, Nepal, Panjab (Aitchison), and probably widely spread in North-West India. Ceylon. Fl. R.S.

3. *A. speciosa*, Sweet; DC. Prodr. 328.—Syn. *Ipomœa speciosa*, Bot. Mag. t. 2446. *Lettsomia nervosa*, Roxb. Fl. Ind. i. 488. *The Elephant Creeper*.

A large woody climber running up the highest trees. Branches and under side of leaves white with a dense tomentum of soft silky hairs. Leaves cordate, acuminate, penniveined, 4-12 in. long, and nearly as broad, petiole shorter than leaf or nearly as long; main lateral nerves numerous, prominent, parallel. Flowers deep rose-coloured in axillary corymbose cymes, peduncles longer than petiole, and sometimes longer than leaf, pedicels as long as calyx; bracts large, foliaceous, ovate, acuminate, deciduous. Corolla campanulate, tube $1\frac{1}{2}$ in. long, limb 2 in. diam.

South India, Bengal, North-West India (Dehra Doon, Voigt. Hort. Suburb. 351). Fl. R.S.

4. *A. capitata*, Choisy; DC. Prodr. ix. 332.—Syn. *Lettsomia strigosa*, Roxb. Fl. Ind. i. 491.

A large woody climber; branchlets, inflorescence and leaves strigose with long harsh brown hairs. Leaves ovate from a cordate base, acuminate, penniveined, blade 3-5 in. long. Flowers rose-coloured or lilac, sessile in pedunculate bracteate heads, supported by numerous ovate bracts, with long rust-coloured hairs, peduncles longer than petioles. Corolla campanulate.

Eastern Bengal, Burma. Fl. Oct., Nov. *A. barbiger*, Choisy—syn. *Convolvulus barbiger*, Wall., is closely allied, if specifically distinct. Burma. Java. Eastern Bengal. N.W. Himalaya.

5. *A. setosa*, Choisy l. c. 332.—Syn. *Lettsomia setosa*, Roxb. Fl. Ind. i. 490; Wight l. c. t. 1360.

A large woody climber; young shoots and under side of leaves strigose with adpressed hairs. Leaves broad-ovate from a cordate base, pinniveined, blade 3-5 in. long. Flowers pink, shortly pedicellate, in compound corymbose pedunculate cymes. Bracts broad-ovate, deciduous. Corolla campanulate.

Northern Circars, Dekkan. Fl. Nov.-Jan. This sp. is closely allied to *A. capitata*. They require farther examination on the spot.

6. *A. cuneata*, Bot. Reg. t. 661; DC. Prodr. ix. 330.—Syn. *Lettsomia cuneata*, Roxb. Fl. Ind. i. 491.

A large woody climber with smooth dark grey bark, young shoots and leaves with adpressed silky hairs. Leaves deep green, cuneate-oblong 3-4 in. long, petiole $\frac{1}{2}$ in. long or less. Flowers large, bright deep purple, on slender pedicels, in short axillary 3-flowered pedunculate cymes; bracts linear. Corolla campanulate.

Nilgiris, Pulneys, Western Ghats as far north as Bombay, cultivated in gardens. Fl. Aug.-Sept.

3. *ERYCIBE*, Roxb.

Large climbing shrubs with entire, evergreen, coriaceous leaves. Corolla-tube short, lobes bifid, middle part firm coriaceous, hairy outside, segments folded in bud. Stamens at the base of the corolla-tube, filaments short. Ovary 1-celled, with 4 erect ovules; stigma thick sessile, lobed. Fruit an indehiscent 1-seeded berry; cotyledons folded.

1. *E. paniculata*, Roxb. Cor. Pl. t. 159; Fl. Ind. i. 585; Wight Ill. t. 180.

A large climbing shrub; young shoots and inflorescence covered with rust-coloured pubescence. Leaves elliptic-oblong, abruptly acuminate (caudate), 3-5 in. long, narrowed into a short petiole; main lateral nerves arcuate, 4-6 on either side of midrib. Flowers yellow, in long terminal leafy panicles. Calyx and middle part of corolla-lobes with dense rust-coloured hairs, appendices (segments of corolla-lobes) rounded, glabrous, membranous. Connective prolonged beyond anthers, apiculate. Berry subglobose, $\frac{1}{2}$ in. diam., supported by the persistent calyx, pulpy, black when ripe.

South India, Ceylon, Burma, Bengal, Oudh forests. Fl. June-Nov. Indian Archipelago, Queensland.

E. Wightiana, Graham Cat. Bombay Plants, 137; scandent, with rigid stems, and white, fragrant flowers, may possibly only be a variety of *E. paniculata*.—Western Ghats, Bombay to Belgaum.

ORDER LVIII. SOLANÆÆ.

Herbs, shrubs or soft-wooded trees. Leaves alternate, without stipules. Flowers regular, bisexual, usually pentamerous. Calyx free, usually gamosepalous. Corolla gamopetalous, lobes 5, rarely 4, induplicate-plicate, rarely imbricate in bud. Stamens epipetalous, as many as corolla-lobes, alternating with them. Ovary free, generally 2-celled, multiovulate; style simple, terminal, with an entire or lobed stigma. Fruit an indehiscent berry, rarely a capsule, with several seeds. Embryo usually curved or spiral, albumen fleshy.—Royle Ill. 279; Wight Ill. ii. 194.

1. LYCIUM, Linn.

Shrubs, branchlets often spinescent. Leaves entire, usually small, often clustered. Calyx with 5, rarely 4 teeth, often splitting into 3-5 lobes. Corolla funnel-shaped, limb 5- rarely 4-lobed, the lobes imbricate in bud. Stamens usually unequal; anthers 2-celled, dehiscing longitudinally. Ovary 2-celled. Fruit an ovoid or globose berry.

Leaves lanceolate or oblanceolate; corolla-tube subcylindrical, more than twice the length of the lobes; calyx 5-dentate . . . 1. *L. europæum*.
 Leaves linear; corolla funnel-shaped, tube somewhat longer than segments, but not twice their length; calyx with 3-4 unequal lobes 2. *L. ruthenicum*.

1. *L. europæum*, Linn.; Sibthorp Fl. Græc. t. 236.—Syn. *L. indicum*, Wight Ic. t. 1403; *L. mediterraneum*, Dunal; Prodr. xiii. i. 523. Vern. Ganger, kangu, kango, kūngu, kūnga būti, Pb.; Chirchitta, niral, Delhi and Harriana.

A thorny shrub, with lanceolate or oblanceolate leaves, sometimes pubescent when young, $\frac{1}{2}$ -1 in. long, alternate or fasciculate; branches grey. Flowers white, $\frac{1}{2}$ in. long, solitary, on slender pedicels shorter than flower. Calyx campanulate, longer than broad, with 5 equal teeth. Corolla-tube cylindrical, gradually widening upwards, somewhat curved; segments of limb short, rounded or ovate. Filaments glabrous, anthers nearly included in the mouth of the tube. Berry globose, yellow, or red, $\frac{1}{2}$ in. diam. The specimens of South Europe and Western Asia have larger leaves, light purple (or white) flowers, and a broader calyx.

Common in the plains of the Panjab, Sindh, and Guzerat.—Western Asia and South Europe. Fl. Oct.-March. The fruit is eaten, camels and goats feed on the branches. It is used as fuel, and jhamps (wattled frames) for the walls of huts are made of it. Hardy in England.

L. barbarum, Linn.; Miers Illustr. of South American Plants, t. 69, with pedicels as long as flowers, corolla-segments nearly as long as tube, stamens exserted, and berry ovoid, grows in Western Asia, Afghanistan, and Beluchistan (naturalised in Europe), and will probably be found in Sindh and the Panjab. *L. Edgeworthii*, Dunal; Prodr. xiii. 525, from Sirhind, seems to belong to this sp.

2. *L. ruthenicum*, Murray; Prodr. xiii. i. 514; Miers l. t. 70.—Vern. *Khichar*, *khitsar*, *kitserma*, Ladak.

A small thorny shrub, wholly glabrous. Branchlets nearly white, spines at right angles. Leaves fleshy, linear, 1-2 in. long. Flowers solitary, $\frac{1}{2}$ in. long, on pedicels half the length of flower. Calyx white, transparent, with 3-4 unequal lobes. Corolla funnel-shaped, segments longer than half the length of tube. Anthers long exserted. Berry globose, $\frac{1}{4}$ in. diam.

Siberia, Caucasus, Western Tibet. Common in the Nubra valley and Ladak at 10,000-13,500 ft. Fl. Aug.-Sept. Fruit sweet, but without flavour, eaten. Hardy in England.

ORDER LIX. BIGNONIACEÆ.

Trees, shrubs or woody climbers. Leaves opposite, rarely alternate, compound, rarely simple, without stipules. Flowers bisexual, often irregular. Calyx free, tubular or campanulate, truncate toothed or split, lobes valvate in bud. Corolla tubular or campanulate, often bilabiate, lobes 5 spreading, generally unequal, imbricate, rarely valvate in bud. Stamens 2 or 4, rarely 5, in pairs, in the place of the fifth stamen generally a short staminodium; anthers 2-celled, rarely 1-celled, the cells opening longitudinally. Ovary free, supported by an annular disc, 2-celled, placentas two distinct in each cell attached to the dissepiment; ovules numerous; style filiform, with 2 short stigmatic lobes. Fruit often elongated, dehiscent, or indehiscent (*Crescentiæ*). Seeds numerous, usually flat and bordered by a membranous wing, albumen none. The following genera have all a dehiscent capsule, the 2 valves separating from the dissepiment, along the edges of which the seeds are attached.—Royle III. 294; Wight III. ii. 182; E. Bureau, Monographie des Bignoniacées (première partie), Paris, 1864.

Capsule flat, dehiscing septically, the dissepiment parallel to the valves, wings surrounding the seed on three sides; leaves bipinnate, opposite.

Corolla campanulate; stamens 5, inserted above the base; anthers 2-celled.

Corolla funnel-shaped; stamens 4, inserted at the mouth of the long cylindric tube; anthers 1-celled.

Capsule flat convex or cylindrical, dehiscing loculicidally, the dissepiment transverse to the valves, and attached to their median line before dehiscence.

Seeds with long, bilateral wings; leaves pinnate or bipinnate.

Dissepiment continuous, cylindrical flat or (on a horizontal section) cross-shaped; seeds flat.

Dissepiment jointed, cylindrical; nucleus of seeds wedge-shaped, embryo doubled up.

Seeds winged on three sides; leaves simple (digitate in extra Indian species).

1. CALOSANTHER.

2. MILLINGTONIA.

3. SPATHODEA.

4. STEREOSPERMUM.

5. TECOMA.

1. CALOSANTHES, Blume.

A soft-wooded tree, with large, opposite, bipinnate leaves. Calyx large, coriaceous, persistent, indistinctly toothed. Corolla campanulate, limb oblique, of 5, nearly equal, toothed or incised lobes. Stamens 5, inserted above the base of the corolla-tube, all fertile, and nearly equal; anthers 2-celled, cells parallel. Ovary on a thick fleshy cylindrical, somewhat pentagonal disc; 4 rows of ovules on each placenta. Capsule large, flat, linear, dehiscing at the edges, the dissepiment parallel to the valves. Seeds imbricate, surrounded on 3 sides by a broad transparent wing.

1. *C. indica*, Blume; Wight Ic. t. 1337/8; Bureau l. c. t. 9.—Syn. *Bignonia indica*, Linn.; Roxb. Fl. Ind. iii. 110. Sans. *Syonaka*, *parna*. Vern. *Mulin*, *sori*, *tātpalang*, *tātmorang*, Pb.; *Ullu*, *ulla*, *arlu*, *kharkuth*, N.W.P.; *Pharkath*, Kamaon; *Sauna*, *assar sauna*, Oudh; *Tattunūa*, C.P.

Glabrous. Leaves 4-6 ft. long, pinnae 3 pair, the lowest pair bipinnate, pinnules broad-ovate, acuminate, petiolulate, 4-8 in. long. Flowers large, fleshy, dark red, with an unpleasant smell, in erect terminal, somewhat unilateral racemes, on long rough hollow peduncles. Pedicels 1 in.; corolla 2-3 in. long, and nearly as broad at the mouth. Capsule shortly stipitate, 15-30 in. long and 2-3½ in. broad. Wings of seeds 2-2½ in. across.

Bengal, Burma, South and Central India. Sub-Himalayan tract, common as far as the Jumna, ascending to 3500 ft., rare between Jumna and Chenab. Ceylon and Java. The leaves are shed Feb., March, and renewed April, May. Fl. May-July. The great sword-like fruit ripens Dec.-Feb., and often remains hanging on the tree for months.

Often several stems together, 15-20 ft. high, 12 in. girth, bark ¼ in. thick, whitish brown, corky, wood white, open-grained, light and soft, no heartwood, pith large, chambered. The bark and fruit are used in tanning and dyeing, the seeds are used to line hats, and, placed between two layers of wickerwork, to make umbrellas. Root, bark, leaves, and seeds are used in native medicine.

2. MILLINGTONIA, Linn. fil.

A large tree, with opposite bipinnate leaves. Calyx with 5 short, truncate, recurved teeth. Corolla-tube long, slender, cylindrical, widened into a funnel-shaped, oblique mouth, at the base of which the stamens are inserted, and which is cleft half-way into 5, nearly equal, ovate-oblong slightly imbricate lobes, nearly valvate in bud. Stamens 4, didynamous, exserted, with a 5th staminode; anthers 1-celled, a short appendix in the place of the second cell. Ovules in 4 rows on each placenta. Capsule flat, linear, dehiscing at the edges, the dissepiment parallel to the valves; seeds imbricate, surrounded on 3 sides by a fine transparent wing.

1. *M. hortensis*, Linn. f.; Bedd. Fl. Sylv. t. 249; Bureau l. c. t. 8.—Syn. *Bignonia ruberosa*, Roxb. Cor. Pl. t. 214; Fl. Ind. iii. 111.

Young leaves and inflorescence slightly pubescent. Leaves 12-24 in. long, pinnae 3 pair, the lowest pair bipinnate at base, pinnules ovate, acu-

minate, petiolulate, the blade 1-2 in. long. Flowers numerous, fragrant, pure white, in large terminal panicles; bracts minute, ciliate. Corolla 3-4 in. long. Capsule 12 in. long.

Cultivated in avenues and gardens in most parts of India, believed to be indigenous in Burma and the Indian Archipelago. In North India the cultivated tree seeds very rarely. Attains 50-60 ft., bark corky, deeply cracked. Fl. C.S. Wood whitish, firm and close-grained. Weight 42 lb.; value of P. 610.

3. SPATHODEA, Beauv.

Trees with opposite (rarely alternate) imparipinnate or bipinnate leaves. Flowers in racemes or in terminal trichotomous, cymose panicles. Calyx truncate lobed or spathaceous. Corolla funnel-shaped, limb oblique, the lower cylindrical part of the tube varying in length, the stamens inserted at its upper end, so that when it is very short, their insertion is at the base of the corolla. Stamens 4, didynamous, with a 5th staminodium; anthers 2-celled, cells divergent or parallel. Ovary 2-celled, ovules in more than 2 rows in each cell. Capsule cylindrical, valves woody or coriaceous, opening loculicidally in 2 valves, the dissepiment free at the time of dehiscence, transverse with relation to the valves, and before dehiscence attached to their median line. Seeds numerous, flat, with long lateral wings, attached (2 rows in each cell) along two prominent lines (the lines of attachment to the valves) of the dissepiment; embryo flat, cotyledons broad-rotundate, auriculate at the base, radicle short.

Leaves bipinnate; stamens inserted near the base of corolla.

Pubescent; calyx campanulate, 5-dentate; pod hard, woody, tuberculate, more than 1 in. diam.

1. *S. xylocarpa*.

Glabrous; calyx split into 2 lips; pod slender, coriaceous, ½ in. diam.

2. *S. amona*.

Leaves pinnate.

Calyx spathaceous; stamens inserted near the throat of the corolla.

Leaflets rotundate, 1 in. long, the lateral short-petiolulate; corolla-lobes oblong, flat; capsule flat, smooth

3. *S. falcata*.

Leaflets ovate-oblong, 2 in. long, the lateral long-petiolulate; corolla-lobes rounded, curled; capsule convex, rough

4. *S. crispa*.

Calyx bilabiate; stamens inserted near the base of the corolla

5. *S. Roxburghii*.

The genus *Spathodea*, as here defined, will certainly not remain undivided, and should be confined to the species with pinnate leaves, racemose flowers, spathaceous calyx, and stamens inserted at the top of a long cylindrical corolla-tube. Whether *S. xylocarpa* and *S. amona* should be referred to *Radermachera*, Zollinger, to which they approach by their cylindrical dissepiment, I do not venture to decide with the materials before me. In that case *Radermachera* would include a very heterogeneous group with pinnate (*R. stricta*, Zoll.) and bipinnate leaves, with the calyx truncate (*stricta*), split into 2 lips (*gigantea*, Miq., *amona*), and 5-dentate (*xylocarpa*), not to mention the difference between the thick woody valves of *R. xylocarpa* and the membranous or coriaceous valves of most other species. Another question to be decided is, whether *Heterophragma* is to remain, or, as proposed by Bureau l. c. 50, to be merged in *Spathodea*, from which it differs by the bilabiate calyx and the stamens inserted

near the base of the corolla. These considerations have induced me, as a provisional arrangement, to keep the species described below united under the genus *Spathodea*, although they differ in habit and essential characters, and though the name *Spathodea* is not appropriate for all of them.

1. *S. xylocarpa*, T. Anderson.—Tab. XLIII.—Syn. *Bignonia xylocarpa*, Roxb. Fl. Ind. iii. 108; Wight. Ill. t. 1336; Bedd. Fl. Sylv. t. 70. Vern. *Kharsing*, *kharsingi*, Bombay; *Bairsingi*, Khandeish Dangs; *Jaimangal*, *sondar-pādal*, Mandla, Balaghat, C.P.; *Dhōta mara*, Gonds, Satpura range.

A middle-sized tree. Leaves bipinnate, 1-4 ft. long, glabrous, hard and somewhat rough when full-grown; pinnae 4-6 pair, pinnules 3-5 pair, short-petiolulate, ovate or ovate-lanceolate, entire. Flowers white, with a tinge of yellow, fragrant, appearing before the leaves expand; pedicels as long as calyx or longer, clustered in bracteate umbellate fascicles, these in terminal, compound trichotomous cymes; bracts oblong, shorter than pedicels, as well as ramifications of inflorescence and calyx soft-pubescent. Calyx campanulate, coloured, with 5 short and unequal teeth. Corolla 2 in. long, oblique, segments nearly equal, curled, cylindrical part of tube very short, stamens inserted near the base, filaments hairy below. Capsule 1-3 ft. long, a little curved, hard, woody, very rough, with numerous large, irregular, hard tubercles, somewhat compressed, valves $1\frac{1}{4}$ - $1\frac{1}{2}$ in. broad, convex, $\frac{1}{2}$ in. thick, inside smooth and shining; dissepiment cylindric, grey, shining, attached before dehiscence to the median line of the valves. Seeds numerous, in 4 rows (2 in each cell), flat, slightly curved, $\frac{1}{4}$ in. long, and equally broad, wings delicate, transparent, oblong, 1- $1\frac{1}{2}$ in. long from end to end; hilum $\frac{1}{4}$ in. long, arching.

Common in South India. Khandeish Dangs. Satpura range, Mandla and Balaghat (not common). Fl. April, May, when nearly leafless. The new foliage appears about the commencement of the rains. Fruit takes a year to ripen. Growth said to be rapid.

Attains 30-35 ft. in the Satpura range, but grows into a large tree in the moister forests along the western Ghats. Foliage pale green, resembling that of *Schrebera swietenoides*. Bark light grey, $\frac{1}{4}$ in. thick.

Heartwood light brown, reddish or reddish-brown, close-grained tough and elastic, medullary rays numerous, fine pores in groups, each group in a roundish patch of white tissue.

2. *S. amœna*, A. DC. Prodr. ix. 208.—Syn. *Radermachera amœna*, Seem. Journal of Botany, viii. p. 146; *Bignonia amœna*, Wall. Pl. As. rar. t. 183.

A large tree. Leaves opposite, bipinnate; leaflets ovate-lanceolate, entire, acuminate, glabrous, shining. Flowers large, fragrant, white, orange inside. Calyx bilabiate. Stamens inserted near the base of corolla-tube, anther-cells divergent. Pods rust-coloured, pendulous, slender, linear, 12-18 in. long, valves coriaceous, $\frac{1}{4}$ in. broad. Seeds (including wings) $\frac{1}{2}$ in. long.

Malay peninsula and Burma, not seldom cultivated in gardens. Fl. Nov.-May.

3. *S. falcata*, Wall. ; Bedd. Fl. Sylv. t. 71.—Syn. *Bignonia spathacea*, Roxb. Cor. Pl. t. 144 ; Fl. Ind. iii. 103. *Dolichandrone falcata*, Seem. Journ. Bot. viii. 340. Vern. *Hāwar*, Oudh ; *Kansēri*, Meywar ; *Mendal*, *manehingi*, Banswara ; *Mersingi*, Bomb.

A small or middle-sized tree, glabrous or pubescent. Leaves generally opposite, 3-6 in. long, leaflets 2-3 pair, short-petioluled, with a terminal leaflet on petiolule $\frac{1}{2}$ in. long, all rotundate, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long, obtuse or short acuminate. Flowers white, in few-flowered racemes at the ends of small branchlets. Calyx $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Corolla 1 $\frac{1}{2}$ in. long ; limb deeply cleft into 5 subequal, oblong lobes. Capsule flat, curved, smooth, somewhat shining, with wavy longitudinal lines, 10-14 in. long, and $\frac{3}{4}$ in. broad. Wings of seeds oblong, half the breadth of capsule, and 1 $\frac{1}{4}$ in. long.

Oudh. Meywar (Bassi, Santolah, D.B.), Banswara, South India. Fl. May, June ; fruit Dec., Jan. Wood light-coloured.

4. *S. crispa*, Wall. ; Bureau l. c. t. 27.—Syn. *Bignonia crispa*, Roxb. Fl. Ind. iii. 103 ; *Dolichandrone crispa*, Seem. Journ. Bot. viii. 340.

A middle-sized tree ; glabrous, young shoots pubescent. Leaves opposite, 8-12 in. long, leaflets 5-7, ovate-oblong, acute, petiolules of the lateral 1 in., of the terminal 2 in. long, blade 2-4 in. long. Flowers pure white, fragrant, in terminal, few-flowered racemes. Calyx 1 in. long. Corolla 2 $\frac{1}{2}$ -3 in. long, limb with 5 broad-ovate lobes with curled edges. Capsule 12-15 in. long, $\frac{1}{2}$ in. broad, valves convex, hard, coriaceous, brown, rough with paler specks.

South India, will probably be found in the Central Provinces. Fl. May-June ; fruit ripe Dec. The timber is esteemed in South India for building and other purposes, it is light-coloured and heavy.

5. *S. Roxburghii*, Sprengel.—Syn. *Heterophragma Roxburghii*, DC. *Bignonia quadrilocularis*, Roxb. Cor. Pl. t. 145 ; Fl. Ind. iii. 107. Vern. *Warras*, Bombay.

A large tree, with a tall stem, and grey bark. Leaves tomentose while young, glabrous afterwards, opposite, but generally approximate near the ends of branches, 1-2 ft. long, lateral leaflets 3-4 pair, serrate, short, the terminal leaflet long petioluled. Flowers light rose-coloured, fragrant, in large terminal erect panicles, ramifications and calyx densely clothed with soft, tawny tomentum. Calyx bilabiate. Corolla campanulate, the stamens inserted at the base of the tube. Capsule erect, straight, 12 in. long, 2 in. broad, $\frac{1}{2}$ in. thick, divided into 4 spurious cells by a 4-winged dissepiment, with a cross-shaped horizontal section.

Godavery forests (Beddome). Western forests from Khandeish to Canara. Fl. March, April.

5. STEREOSPERMUM, Chamisso.

Trees, with opposite, imparipinnate leaves. Flowers in terminal panicles. Calyx 5-dentate or 2-5-lobed. Corolla campanulate, limb oblique, lobes equal or bilabiate. Stamens inserted near the base of corolla-tube, didynamous, anther-cells divergent. Ovary 2-celled; ovules in 1 series on each placenta. Capsule linear cylindrical or tetragonous, generally contorted, opening loculicidally in 2 valves, the valves coriaceous, the dissepiment thick, spongy, jointed, entirely filling the capsule, transverse with relation to the valves, and attached before dehiscence to their median line. Seeds wedge-shaped, with a rounded back, the nucleus doubled up between the joints of the dissepiments, radicle and plumula lying along the sharp edge of the wedge, the cotyledons being doubled up outwards; testa spongy or crustaceous, having the appearance of projecting into the seed and dividing it into 2 incomplete cells; wings oblong delicate membranous on 2 sides, attached to the rounded back of the seed.

Pubescent; capsule cylindrical, valves hard thick crustaceous, rough, $\frac{3}{4}$ in. diameter

1. *S. suaveolens*.

Glabrous; capsule compressed, valves thin coriaceous, smooth, $\frac{1}{4}$ in. broad

2. *S. chelonoides*.

1. *S. suaveolens*, DC.; Wight Ic. t. 1342.—Syn. *Bignonia suaveolens*, Roxb. Fl. Ind. iii. 104. Sans. *Pātali*. Vern. *Pāral*, *pādal*, *padiāla*, *padaria*, *parur*. Local names: *Pandri*, *phāndri*, C.P.

A large tree; pubescent, young parts soft and viscous-tomentose. Leaves 12-24 in. long, leaflets 2-3, rarely 4 pair, shortly, the terminal leaflet longer petiolulate, oval, acuminate, 3-6 in. long, often serrate, with 6-8 pairs of prominent main lateral nerves, joined by obliquely transverse veins. Flowers of a dark, dull-crimson colour, exquisitely fragrant, $1\frac{1}{2}$ in. long, in large, lax, trichotomous viscid panicles. Calyx campanulate, 4-cleft, the 2 upper divisions each with 2 minute teeth. Corolla pubescent, funnel-shaped, limb oblique, bilabiate, the 3 inferior lobes longer, and the edges of all much curled. Capsule cylindrical, dark grey, rough, with elevated white specks, valves thick, hard, crustaceous; 18-24 in. long, and $\frac{3}{4}$ in. diameter; dissepiment cylindrical, brown, $\frac{1}{2}$ in. diameter. Seeds $\frac{1}{2}$ - $1\frac{1}{4}$ in. apart, wedged into narrow notches of the dissepiment.

A common tree in South-, Central-India, Bengal, and Burma. In the sub-Himalayan tract and outer hills ascends to 4000 ft., extends north-west to the Jhelam, and is common as far as the Jumna. Often associated with *Sāl*. The old leaves are shed in April, the young foliage appearing by the end of that month or early in May. The flowers issue with or before the new leaves, the fruit ripens Nov., Dec., and remains long on the tree. Attains 70-80 ft. in Kamaon, with a tall, fairly straight trunk, to 6 ft. girth, and 30 ft. to the first branch, much smaller in the drier climate of Central India. Bark $\frac{1}{2}$ - $\frac{3}{4}$ in. thick, dark grey or brown, the outer soft corky and darker-coloured layer flaking off in pieces, leaving a fresh smooth light-cinereous surface. "Leaves of young plants harsh and serrated, those of the mature tree soft villous and entire" (R.

Thompson). Sapwood white or yellowish, heartwood with irregular outline, brown or reddish-brown, often mottled with white. 44 lb. per cub. ft., fairly durable, and easy to work. Much valued for building, and generally commands a ready sale. Makes excellent charcoal. Root and bark used in native medicine.

2. *S. chelonoides*, DC.; Wight Ic. t. 1341; Bedd. Fl. Sylv. t. 72.—Syn. *Bignonia chelonoides*, L.; Roxb. Fl. Ind. iii. 106. Vern. *Pader*, *padel*, *parral*, *padri*.

A large glabrous tree. Leaves 12-18 in. long, leaflets 3-5 pair, elliptic, sometimes serrate, long-acuminate, blade 4-6 in., acumen often 1 in., petiole $\frac{1}{3}$ - $\frac{1}{2}$ in. long; main lateral nerves 8-10 pair. Flowers yellow, fragrant, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, in large, loose, trichotomous glabrous panicles. Calyx campanulate, 5-dentate. Corolla campanulate, limb spreading, oblique, lobes nearly equal. Capsule linear, compressed, curved, 12-24 in. long, $\frac{1}{4}$ in. broad, valves convex, coriaceous, smooth. Dissepiment subcylindrical, grey or light brown, with wide open notches for the seeds, which are $\frac{1}{4}$ - $\frac{1}{2}$ in. apart.

Common South India, Ceylon, Burma, and Bengal. Gonda forests Oudh, rare, on the driest spurs. The leaves are shed Feb., March, and renewed in April. Flowers appear after the leaves, April-July. Fruit Aug.-Jan., remaining long on the tree. In Oudh a small, elsewhere a large tree, with a tall straight trunk. Bark $\frac{1}{2}$ in. thick, light-cinereous or brown, furrowed longitudinally. Heartwood reddish-brown, orange (Skinner), close-, even-grained, hard, elastic, easy to work, said to be durable. Weight 45 lb. (Kyd), 48 lb. (Sk.), value of P. 710 (Kyd), 642 (Sk.) Used for building, and is a good furniture-wood. Bark, leaves, flowers, and fruit used in native medicine. Flowers used in Hindu temples.

6. *TECOMA*, Juss.

Trees or shrubs, with opposite, simple or digitate leaves. Calyx campanulate, 5-dentate. Corolla campanulate, limb oblique. Stamens inserted in the lower part of the corolla-tube; anthers 2-celled, the cells parallel at first, diverging afterwards. Ovary 2-celled, supported or surrounded by a fleshy annular disc; numerous series of ovules in each cell. Capsule linear, dissepiment transverse, thin, flat, attached before dehiscence to the median line of the valves. Seeds numerous, flat, imbricate, on 3 sides with a thin, white, membranous wing.

1. *T. undulata*, G. Don.—Syn. *Tecomella undulata*, Seem. Journal of Botany, i. 18; *Bignonia undulata*, Roxb. Fl. Ind. iii. 101; *Bignonia glauca*, Decaisne in Jacq. Voy. Bot. t. 142. Vern. *Reodāna*, *rebdān*, Trans-Indus; *Lahūra*, *lūar*, *roūr*, *rahūra*, Pb.; *Lohūri*, *lohēro*, Sindh; *Roira*, Mairwara.

A shrub or small tree, glabrous, extremities and young leaves often pubescent with very minute, fasciculate hairs. Leaves generally opposite, subcoriaceous, grey, somewhat rough when old, oblong, linear-oblong.

sometimes obovate-oblong, entire, blade 2-4 in., petiole 1 in. long. Flowers very large, bright orange-coloured, inodorous, 5-10, in short corymbs at the ends of short lateral branchlets. Corolla campanulate, 2 in. across. Ovary surrounded by a cup-shaped disc. Capsule curved, 6-8 in. long. (Seemann separates *Tecomella* from *Tecoma* by simple leaves, and Bureau, l. c. 53, agrees with him. The cup-shaped disc is a remarkable character of this species.)

Low hills of Sindh and Beluchistan. Trans-Indus territory, ascending in the Suliman range to 3000, at times to 4600 ft. Panjab Salt range, Siwalik tract, extending eastward to the Jumna. Occasionally in the plains of the Panjab, near Delhi, Cawnpore, in Bandelkhand, Rajputana, Guzerat, and in one place in Khandeish (Graham Bombay, 124).—Arabia. Grown in gardens in Calcutta and Bombay. Evergreen or nearly so in North India, the leaves being renewed in Jan. and Feb. The leaves vary exceedingly in size and shape. In full bloom in March, April, when the tree is a most beautiful sight, especially on the north-west Panjab frontier. Easily raised from seed and cuttings. Coppices well. Fruit ripens May-July. Where protected grows into a handsome tree, 30-40 ft. high, with a stem 12-15 ft. clear, and 5-8 ft. girth, with a fine, rounded, rather open crown, extremities of branches drooping. Generally only a stiff shrub, 8-10 ft. high. Twigs grey, bark of stem $\frac{1}{4}$ - $\frac{1}{2}$ in. thick, reddish brown, or dark grey, corky, rough with shallow longitudinal furrows, and ridges between, crossed by short, shallow, transverse cracks, becoming scurfy by age and peeling off. Heartwood dark greyish-brown, often mottled with white. Medullary rays fine, whitish, pores surrounded by patches of whitish tissue. Close- and fine-grained, hard, 44 lb. per cub. ft. Works easily, takes a beautiful polish, tough, strong and durable. Highly prized for furniture, carving-work, and agricultural implements. The leaves are greedily browsed by cattle.

ORDER LX. VERBENACEÆ.

Herbs, shrubs or trees. Leaves simple or digitate, opposite, whorled or rarely alternate, without stipules. Flowers irregular, rarely regular. Calyx persistent, gamosepalous, often enlarged in fruit. Corolla hypogynous, gamopetalous, lobes usually 4 or 5, more or less 2-lipped, imbricate in bud. Stamens inserted in the corolla-tube, usually 4, nearly equal or one pair longer, and when the corolla is regular, as many as lobes and alternating with them; anthers 2-celled, the cells usually parallel and opening longitudinally. Ovary not lobed, or but slightly 4-lobed, 2- or 4-celled, 1 ovule in each cell; style terminal, usually with 2 short stigmatic lobes. Fruit dry or fleshy, indehiscent, or separating into 2 or 4 segments nuts or pyrenes: seeds few, in the Indian species without albumen; embryo straight with thick cotyledons and an inferior radicle.—Royle III. 298; Wight III. ii. 212.

Fruit a hard bony 1-4-celled endocarp, surrounded by a spongy pericarp, enclosed in an enlarged and inflated calyx; corolla-tube short; leaves entire

Fruit a dry or fleshy drupe, the entire fruit separating into 2 or 4 pyrenes, supported by an enlarged and often succulent calyx; corolla-tube slender, cylindric; leaves simple

1. TECTONA.

2. CLERODENDRON.

- Fruit a fleshy drupe; calyx not much enlarged; leaves simple.
 Flowers in terminal racemiform panicles composed of lateral
 cymes; corolla-tube short, with a wide open mouth;
 style unequally 2-lobed 3. GMEIINA.
 Flowers in terminal trichotomous panicles, or in a spike-like
 thyrsus; corolla-tube short, campanulate or cylindrical,
 lobes unequal; style with 2 short acute stigmatic lobes 4. PREMNA.
 Flowers in axillary cymes; corolla campanulate, regular;
 style dilated and truncate, or shortly 2-lobed 5. CALLICARPA.
 Flowers in bracteate heads or spikes 6. LANTANA.
 Fruit a fleshy drupe; calyx not enlarged; leaves digitate 7. VITEX.
 Fruit dry, dehiscent into 4 one-seeded segments.
 Calyx campanulate; corolla-tube short, limb bilabiate 8. CARYOPTERIS.
 Calyx with a large spreading circular limb; corolla-tube cy-
 lindric, curved 9. HOLMSKIOLDIA.
 Fruit a 2-valved capsule; calyx 5-sepalous, supported by
 bracts 10. AVICENNIA.

1. TECTONA, Linn. fil.

Trees with four-sided branchlets; young shoots and leaves clothed with stellate tomentum. Leaves large, opposite, entire. Flowers in trichotomous panicles. Calyx campanulate, lobes 5-6, imbricate in bud. Corolla infundibuliform, tube short, about as long as calyx, lobes 5 or 6, spreading, nearly equal. Stamens as many as corolla-lobes, exserted. Ovary 4-celled, 1 ovule in each cell; stigma bifid. Fruit an indehiscent, hard, bony 4-celled nut, enclosed in a thick spongy covering, which is surrounded by the enlarged and inflated membranous calyx. Albumen 0; embryo straight, with fleshy, oily cotyledons, and an inferior radicle.

1. *T. grandis*, Linn. fil.—Tab. XLIV.—Roxb. Cor. Pl. t. 6; Fl. Ind. i. 600; Bedd. Fl. Sylv. t. 250. *The Teak tree*.—Sans. *Sāka*; Arab. *Sāj*; Pers. *Sāj*, *sāl*. Vern. *Sāgun*, Hind.; *Sāj*, *sāguan*, Mar.; *Tēkku*, Tamil and Malayalam; *Tēku*, Telugu; *Tēgu*, Tulu and Canarese; *Kyūn*, Burm.; *Jāti*, Java.

A large deciduous tree; branchlets four-sided and channelled, with large quadrangular pith. Leaves oval or obovate, blade 1-2 ft. long, 6-12 in. broad, petiole 1-1½ in. long, in seedlings and coppice-shoots the leaves much larger, 2-3 ft. long; upper side rough, under side clothed with dense stellate, grey or tawny tomentum; main lateral nerves prominent, 8-10 pair, with 2 or 3 large branches near the edge of leaf, joined by numerous parallel transverse veins. Flowers white, on short pedicels, in large erect terminal cross-branched cymose panicles 1-3 ft. long, with short lanceolate bracts. Fruit subglobose, more or less indistinctly 4-lobed, ½ in. diam., the thick spongy pericarp consisting of a dense felt of branched hairs; the nut uneven, with 1, 2, 3, rarely 4 seeds, and a central cavity having the appearance of a 5th cell. When the seed germinates, the outer wall of each cell comes off bodily like a round, concave cap. The inflated calyx, enclosing the fruit like a bladder, is generally ovoid, sometimes depressed, reticulate, and more or less crumpled or irregularly plaited, 1-1½ in. diam.

The Teak tree is indigenous in both peninsulas of India, in the eastern drier part of Java, in Sumatra, and in some of the other islands of the Indian Archipelago. In Western India it does not extend far beyond the Mhye. In Feb. 1870 I found it in the Sadri or Santola forests a few miles north of that river, about 20 miles south-west of Neemuch. In Central India it attains its northernmost point in the Jhansi district at lat. $25^{\circ} 30'$, and from that point the line of its northern limit continues in a south-easterly direction to the Mahanadi river in Orissa. In Burma proper, Teak is known to extend to the 25th degree N.L., and it is reported from Manipur at about the same latitude. There is no proof of its being indigenous in Bengal, though there is a report of its having formerly been found wild in Assam, between Tezpur and Bishnath. It is, however, cultivated throughout Bengal, Assam and Sikkim, and in north-west India, without difficulty, as far as Saharanpur. In the Panjab it is difficult to raise, and it has not been grown west of Lahore. As regards moisture, Teak seems to require a rainfall of 30, but to thrive best under a mean annual fall of 50 to 120 inches.

The temperature of the Teak-producing districts may be illustrated by the following statement of the mean temperature during the four seasons at the following stations,—four of which, Cannanore, Bombay, Rangoon, Toungoo, represent a climate where the tree thrives to perfection; and three, viz., Baitul, Nursingpur, and Sagar, being situated near the northern limit of its area.

		Cannanore.	Bombay.	Rangoon.	Toungoo.	Baitul.	Nura.	Sagar.
Dec., Jan., Feb.,	mean,	80°0	75°7	75°6	72°4	60°8	62°4	64°5
March, April, May,	"	84.4	83.0	80.7	84.3	80.0	80.6	83.5
June, July, Aug.,	"	78.9	81.8	80.1	80.4	77.6	82.5	86.4
Sept., Oct., Nov.,	"	79.0	80.7	80.9	75.6	71.8	75.9	72.8
Year,	"	80.8	80.3	79.3	78.9	72.5	75.4	76.8

Thus it may be said that the Teak tree thrives with a mean temperature during the cold season between 60° and 80° , during the hot season between 80° and 85° , during the rains between 77° and 87° , during autumn between 71° and 81° , and that the mean annual temperature which suits it best lies between 72° and 81° . The absolute extremes of the Teak districts are illustrated by the following statement of maximum and minimum temperatures observed at three of the above-named stations during the 12 months of the year :—

	NURSINGPUR.		RANGOON.		BOMBAY.	
	Min.	Max.	Min.	Max.	Min.	Max.
Jan.,	39°	84°	62°	92°	60°	85°2
Feb.,	48	92	59	97	68.8	87.2
March,	58	96	64	100	67.2	93.3
April,	65	102	75	100	74	93.2
May,	74	104	73	95	79.3	94.2
June,	77	106	75.5	90	76	95.3
July,	73	99	75	89	75.8	89.4
Aug.,	73	91	76	88.5	74.4	89.2
Sept.,	67	91	76	96	75	88.3
Oct.,	60	92	74	92	73	92.5
Nov.,	60	79	69.5	90.5	71.6	91.5
Dec.,	47	75	62	90	66.2	90.8

Teak, however, can bear temperatures considerably lower than those indicated by these figures. In the valleys of the Satpura range and on the Mhye river in Western India frost is not uncommon in the Teak-producing districts. In Burma, Teak ascends to 3000 ft. in the hills east of Toungoo, and in a few other places, but does not attain large size at that elevation; and in the Pegu Yoma hills, a different description of forest, composed partly of evergreen trees with a great deal of *Xylia dolabriformis*, takes the place of Teak at elevations above 2000 ft. On the Anamallay mountains it grows to perfection at about

2500 ft. (Beddome Fl. Sylv.), and many of the best Teak forests of Western India above Ghat in Wynaad, Coorg, and North Canara, are above 2000 ft. Beddome states that on the mountains of the peninsula it rises to a little above 4000 ft., but at any elevation above 3000 it is of poor growth.

Teak grows on a great variety of soils, but shows a decided preference for certain descriptions. In Burma it thrives best on the sandstone of the Pegu Yoma; there it forms tall, straight, and regularly-shaped stems, and natural reproduction from self-sown seedlings is fairly good. But it thrives equally well on the granite of the eastern Sitang forests, and the splendid forests of North Canara have granite as the underlying rock. Again, some of the finest Teak localities in the Thoungyeen district of Tenasserim are upon limestone, and in some of the dells and valleys of the Khandeish Dangs the tree grows to great perfection on soil produced by the disintegration of basaltic rocks. Thus we find Teak on light and sandy soils, as well as on those which are binding and heavy. But under all circumstances there is one indispensable condition, perfect drainage and a dry subsoil. To the absence of perfect drainage I ascribe the circumstance that Teak does not seem to thrive on level ground with alluvial soil. Instances of natural Teak forests in such localities are found on the headwaters of the Beeling and Domdamee rivers in Martaban, in the lower Bonee forests, and in some other places in the plains of Pegu. In such soil the Teak grows freely and rapidly—more rapidly than on the hills—but the trunks are irregular, fluted, and ill-shapen; while on the adjoining hills the tree habitually forms tall, clean cylindrical stems.

It is remarkable that the only pure or nearly pure natural Teak forests which are known are found on alluvial soil. Otherwise, the tree, though gregarious, is always associated with Bamboos and trees of other kinds, often forming a small proportion only of the forest. Thus in the better Teak localities of Burma, Teak is estimated to form about one-tenth; but the proportion of Teak to the trees of other kinds fluctuates exceedingly: sometimes it equals their number; in other instances, again, it does not form one-hundredth part of the trees in the forest. The associates of Teak are, besides Bamboos, the ordinary trees of the dry forest. To a certain extent these vary in different parts of India, but the following kinds may be regarded as the usual companions of Teak: *Schleichera trijuga*, *Dalbergia latifolia*, *Ougeinia dalbergioides*, *Cassia Fistula*, *Pterocarpus Marsupium*, *Terminalia tomentosa*, *bellerica*, *Anogeissus latifolia*, *Lagerstræmia parviflora*, *Diospyros Melanozylon*, *Gmelina arborea*, *Briedelia retusa*, and to these must be added, in Burma and in some forests of the peninsula, *Pterocarpus indicus*, *Xylia dolabrifformis*, *Anogeissus acuminata*, several species of *Sterculia*, *Eriolæna*, *Premna*, and *Cordia*. On alluvial soil in the plains Teak is often associated with *Careya arborea*, *Adina cordifolia*, *Stephegyne parvifolia*, and (in Burma) with *Lagerstræmia Reginal.* Teak is hardly ever found in Sâl forests, and but rarely in the Ein forest of Burma (*Dipterocarpus tuberculatus*). Nor is it a denizen of the evergreen forest of Burma and the Western Ghats, though there are a few instances on record (in the Attaran and Thoungyeen forests of Tenasserim) where the evergreen forest has, probably owing to a cessation for a series of years of the annual forest-fires, extended itself into a Teak locality, and in such cases the Teak has been drawn up to a great height by the rapid growth of the surrounding evergreen trees, being fed at the same time by the constantly increasing fertility of the soil. For there is a vast difference between the moist and loose black soil of the evergreen forest, which is enriched year after year by the products of the gradual decomposition of leaves, branches, and other debris of the forest, and the barren soil of the dry forest, where the whole of the annual fall of leaves and branchlets is annually consumed by the jungle-fires, and the ashes, instead of affording nourishment to the trees, are washed away by the first rush of the

rains. Seedlings, however, are wanting where Teak grows up under such conditions. For the Teak is eminently a light-requiring tree, analogous in that respect to the Oak and Scotch Fir—light overhead and free circulation of air being two conditions indispensable for the development of Teak seedlings.

In dry and hot situations, the Teak loses its leaves in November, December, or early in January; but where the ground is moist, the tree often remains green until Feb. or March. The new foliage comes out in May.

Teak flowers during the rains, in July and August, and ripens its seed between November and January. In summer it is readily recognised at a considerable distance by the whitish flower-panicles, which overtop the green foliage; and in winter, the feathery erect fruit-panicles distinguish it at the first glance from all other trees. One of the greatest obstacles to the spread of the Teak is the circumstance, that the seed ripens and falls to the ground at the commencement of the hot season, before the annual fires pass through the forest. The tree produces seed at an early age, and generally seeds freely and regularly every year; but a large proportion of the seeds are destroyed by the fires, and of those which escape numbers are washed away, in the hills at least, by the first torrents of the monsoon. The germination of the seed is slow and somewhat uncertain; a large amount of moisture is required to saturate the spongy covering, and for this reason it has been found useful, where Teak is cultivated, to soak the seeds in water for some time before sowing them. At the time of germination, the expanding embryo bursts open the caps or valves of the fruit, and two or three plants not rarely spring from one nut. When the seed is sown in nurseries, it generally takes about a fortnight before the first seedlings show themselves above ground, and they continue coming up successively for a considerable period, numerous seedlings appearing during the second and third year, and a large proportion not germinating at all. The seedlings have a long taproot, which during the first two or three years is often as long as the stem above ground. The root is soft, almost fleshy, and seedlings are very sensitive to any injury of their roots, differing in this respect entirely from Oak seedlings, which are in no way injured by the shortening of their taproot. Teak seedlings, therefore, are as a rule best transplanted the same season in which they are raised.

During the early period of its life the growth of Teak is exceedingly rapid. As an instance, I may mention the Thinganneennoung plantation on the Upper Winyeo river (Attaran) in Tenasserim. Here a large nursery was established on rich soil (the site of an old evergreen forest) in March and April 1856, and in July 1858 I counted on a plot (28 ft. wide and 66 ft. long, or 1848 sq. ft.) 841 plants,—of which 17 were 27-32 ft. high, with a girth, at 1 ft. above the ground, between 9 and 13 in.; 70 were 20-27 ft. high, with a girth of 6-9 in.; and the rest, viz., 754 plants, were less than 20 ft., with a girth under 6 in., the large number of small and oppressed plants being due to the circumstance that seedlings had neither been taken out for transplanting nor had they been thinned. Under favourable circumstances, trees attain a girth of 18 in. (at 6 ft. from the ground) in 10-15 years; after that the growth slackens, and a girth of 6 ft. is not generally attained under 100 years. The following figures illustrate the average rate of growth at the Nelambur plantation in Malabar, on favourable soil and in a moist, hot, forcing climate. From a survey made of it in 1868 by Captain W. Seaton, Conservator of Forests, British Burma, the circumference was measured at 6 ft. from the ground.

870 trees per acre,	6 years old,	37 ft. high;	average girth 12 in.,	maximum 20 in.
476	12	45	16	31
195	24	65	29	60

This is the oldest large Teak plantation in India; it was commenced in 1844 by the late Mr Conolly, collector of Malabar. These results are borne out by the

experience of Teak planting in Burma, which, however, does not go farther back than 1856. Thus the average girth of trees in plantations 4 years old (580-660 trees per acre), in the Rangoon, Toungoo, and Tharawaddee district, has been found to vary from 5 to 9 in., the maximum being 14 in., while their average height was between 15 and 27 ft. Plantations 10 years old show an average girth of 15 in., and a height of 40-45 ft.; and trees 15 years old at Promé have attained a girth of 23 in., the largest measuring 32 in. In order to obtain a basis for regulating the working of the Teak forests in Burma in 1856, I collected all data which were available at that time, and based upon them the following estimate, which is placed side by side with a modified estimate, framed in 1868, to serve as the basis of a revised working plan of those forests.

Girth at 6 ft. from ground.	Age, estimated in 1856.	In 1868.
18 in.	10 years.	19 years.
36 "	22 "	46 "
54 "	37 "	88 "
72 "	62 "	160 "

The first of these estimates was mainly based upon the growth of trees planted in gardens of Calcutta and Moulmein, and upon information obtained from Bombay and Java (Report on the Teak Forests of Pegu for 1856, p. 75, 76); and the revised estimate was based upon additional data obtained by periodical measurements of trees in the Thounzay and Thoukyeghat forests of Pegu, and by the examination of the annual rings. The plantations of Burma and Malabar, on good soil and under otherwise favourable circumstances, may possibly attain the rate of growth of the first estimate; but in the natural forests, where the soil, instead of being enriched by the decomposition of leaves and branchlets, is impoverished by the annual fires, the rate of growth will probably be found to approach more nearly to the later estimate. These remarks relate to the Teak in Burma and South India; regarding the rate of growth in the dry and hot hills of Central India, within the range of this Flora very little is known. The experience hitherto gained in the plantations made since 1867 in the Satpura hills of the Central Provinces seems, however, to show that with care and water the plants make fair progress during the first 5 years, the difficulty being that frost and drought kill a large proportion. In the Teak forests of Java the growth is stated to be very rapid; the trees are generally felled at the age of 40-50, and at 100 years they are said to attain a diameter of 4 ft.

Teak has a powerful terminal shoot, and this is an important point in its favour, as the young Teak is thus able to pierce through the thicket of other trees and Bamboos, and to seek the light which it absolutely requires for its development. In this respect there is considerable analogy between the Teak and the Ash (see p. 304). Teak, like many other trees, attains nearly its full height during the early part of its life. It is probable that, as a rule, the tree attains half its length with a girth of 2-3 ft., and that it does not considerably increase in height after it has attained a girth beyond 5 or 6 ft. 120-150 ft. is probably the greatest height which a Teak tree in its natural home, the dry deciduous forest, ever attains, and stems more than 100 ft. long to the first branch are not often found. The largest number of tall stems which I have ever seen were in the Gwaythay forests, east of the Sitang river above Toungoo, on granite rock. The following is an abstract of the measurements taken by me there in March 1861:—

Girth at 6 ft. from ground,	8 ft. ;	length of stem to first branch,	72 ft.
"	"	7 "	106 "
"	"	8 "	106 "
"	"	16 "	114 "
"	"	9 "	78 "

On the Anamallays Beddome records trees with a girth of about 22 ft., and a straight trunk of some 80 or 90 ft. to the first bough. In the North Canara forests clear stems 70-80 ft. long are not rare; in the Ahiri forests, lat. 19° 30', Col. Pearson reports stems 60-70 ft. high; and even considerably farther north in the Khandeish Dangs, lat. 20° 45', I have measured clear stems 60-70 ft. long to the first branch. Teak attains a large diameter, girths of 10-15 ft. are not uncommon, and numerous instances of 20-25 ft. are on record. The forest tracts, however, in India which now contain Teak of such dimensions, are neither numerous nor extensive. The Teak forests richest in large timber on the west side of the Peninsula are the Travancore, Anamallay, Wynad, South-West Mysore, and North Canara forests. The Dangs at the foot of the Khandeish Ghats also have a considerable quantity of large timber. In the centre of the Peninsula are the Godavery forests, of which Ahiri, east of the Pranrita river, near the foot of the third barrier, is the most compact and valuable.

In British Burma, the sandstone hills of the Pegu Yomah, the outer valleys on both sides of the mountain-range which separates the Sitang and Salween rivers, and the Thoungyeen valley, contain the best Teak localities. Teak, however, is far more abundant beyond the frontier, in Burma proper on the tributaries of the Irawaddi, and the headwaters of the Sitang river, in the Karenee country, the Shan States tributary to Burma, and in Siam on the feeders of the Salween, Thoungyeen, and Meinam rivers.

It is estimated that the Teak plantations of Burma, when mature, will contain at the age of 80 years about 60 trees per acre, measuring on an average 6 ft. in girth, and yielding 3000 cub. ft. of marketable timber, which, with the thinnings, is expected to amount to a mean annual yield of 47 cub. ft. per acre (Report on the revised plan of working the Burma forests of Feb. 1868). The natural Teak forests, not being pure or compact, do not distantly approach to this yield. As an instance of a particularly rich forest, I may quote Col. Pearson's survey of a sample acre in Ahiri, stocked with 18 large trees, containing an aggregate of 22 tons, or 1100 cub. ft. of timber. Most of these trees, however, were probably more than two centuries old. The following figures, taken from official reports, illustrate the average quantity of Teak standing on the ground in forest tracts which are fairly well stocked:—

AREA SURVEYED.		TREES COUNTED ON 100 ACRES.				
		Above 6'g. 4'6" to 6'g. Below 4'6"g.		Total.		
1860-70.	Ahiri (Bemaram) 10 sq. m.	{ 482	373	1332	2187	Teak.
		{ 20	58	389	467	Blackwood.
"	" (Mirkulla) 13 "	{ 185	229	644	1658	Teak.
		{ 26	43	208	277	Blackwood.
1856-67.	British Burma 93 "	170	112	512	794	Teak.
1868.	Pegu 2 "	149	120	1419	1688	Teak.
1870-71.	Pegu (Promé dis.) 17 "	384	302	2158	2824	Teak.
1871-72.	" (Tharawaddi) 8 "	137	162	610	899	Teak.

A portion of the Ahiri forests (on the hills) contains Teak, Blackwood (*Dalbergia latifolia*) and Bamboos only; the forests in Burma contain a variety of trees besides Teak and Bamboo.

A great proportion of the Teak on the Kymore and Satpura ranges consists only of coppice-wood. The same may be said of most Teak forests on the dry hills of the Dekkan, and of the Konkan Teak forests a great portion consists of coppice-woods. Teak has great powers of reproduction, it coppices vigorously, and the shoots grow with great rapidity, much more rapidly at first than seedlings. This great power of reproduction is another point which favours Teak in its struggle of existence against other trees, for most Teak seedlings which come up naturally are cut down to the ground by the jungle-fires of the hot season; some are killed, but many sprout again during the rains; and though they are cut down repeatedly by the fires of successive seasons, yet meanwhile the root

stock increases in size every year by the action of the shoots which come up, and at last, often after the lapse of many years, it produces a shoot strong enough to outlive the fire. Thus in many cases what appears a seedling plant of Teak is really a coppice-shoot from a thick gnarled root-stock, bearing the scars of successive generations of shoots, which were burnt down by the annual fires. The coppice-shoots of Teak attain a large size, and form good serviceable timber.

The bark of the stem is about $\frac{1}{2}$ in. thick, grey or brownish-grey, with shallow longitudinal wrinkles or furrows, peeling off in long narrow thin pieces. The sapwood is white, narrow; the heartwood, when a green tree is cut, has a pleasant and strong aromatic fragrance, and a beautiful dark golden-yellow colour, which on seasoning soon darkens into brown, mottled with darker streaks. The timber retains its aromatic fragrance to a great age, whenever a fresh cut is made. It is marked by large pores, mostly single, rarely in groups of 2-3, unequal in size, and unequally distributed, more numerous and larger in the inner part of each annual ring (the spring wood), less numerous and smaller in the outer belt; the medullary rays are fine. On a vertical section the pores are distinctly marked. The annual rings of Teak are fairly distinct. When collecting the data in 1856 for the first regular plan for working the British Burma forests, I was doubtful whether the concentric rings visible in the wood corresponded with the annual increment of the tree. This question has now been set at rest by the examination of sections of numerous trees of known age, grown in gardens and plantations, and they may now be taken as a safe guide for determining the rate of growth of the tree. The average weight of seasoned Teak fluctuates between 38 and 45 lb., and the value of P. between 500 and 700. The experiments on record tend to show that the Burma wood is somewhat lighter than the wood from the Anamallays, Malabar, and other forests on the west side of India; but the weight of timber depends so much upon the degree of seasoning, that in order fully to establish a difference in the weight of the wood produced in different forest tracts, fresh comparative experiments with timber, dried artificially in the same manner, will have to be made. The following is a brief abstract of the results of the experiments at present available, omitting those where one or two experiments only are on record:—

Burma,	94 exper. by various authors,	weight 42.63 lb.,	value of P. 651
Western coast,	14 "	" 44.41 "	" 665
Nagpore,	4 " Capt. Fowke,	" 41.10 "	" 472
Half-seasoned timber from different sources,	4 exp.	46.81 "	" 591

The first item includes 18 exp. made by me in 1864 at Calcutta, with the assistance of Mr Clifford and Baboo Tincowry Ghose, giving an average weight of 40.24 lb., and value of P. = 567, as well as 46 exp. made by us in 1865, giving 37.71 lb., and 654 as the average value of P. A series of interesting experiments made by Capt. Simpson with different descriptions of Teak imported at Moulemein, is recorded in Balfour's Timber Trees, 2d edit., p. 276, of which the following is an abstract:—

Good timber, killed (by girdling),	13 exp.,	weight 43.5 lb.,	value of P. 478
Young timber, "	4 "	41.8 "	" 660
Large (old), "	8 "	38.0 "	" 591
Dead timber (nathat), not killed,	5 "	39.5 "	" 631

The difference in these results may to a certain extent be accidental, for the variations in different specimens of timber from the same source are very great; but the fact that the timber of old trees, and of trees which had died naturally, is lighter than that of younger trees, seems not unlikely. In conclusion, the result of Skinner's experiments should be mentioned:—

Malabar Teak, weight 45 lb., value of P.	814
Moulmein " " 43 " " "	809
Pegu " " 37 " " "	736

Unseasoned wood he makes 55-60 lb., but the weight of green Teak is considerably higher. The transverse strength of Teak is nearly the same as that of British Oak, but considerably less than that of either Säl or Sissoo; compared with these, Teak may be called brittle. Its weight is moderate as compared with most of the more useful Indian woods, the Conifers of course excepted. It does not, however, float unless thoroughly seasoned, and for that reason a peculiar mode of seasoning by girdling is practised in many Teak-producing tracts from which the timber is exported by floating.

Girdling consists in making a deep circular cut through the bark and sap into the heartwood, so as completely to sever the communication between the bark and sapwood above and below the cut. The girdled tree dies after a few days if the operation has been effectually performed; but if even the smallest band of sapwood is left, connecting the outer layers of wood above and below the girdle, the tree is not killed, and often recovers completely, one side of the trunk being clothed again with fresh bark. The girdled tree is allowed to stand one or two years, and often longer if a large tree, and being exposed to the wind and to the action of the sun, seasons more rapidly and more completely than a tree that has been felled green. Girdling is an old custom in Burma and Travancore, and it was formerly practised further north in some of the forests below Ghat on the western coast. Timber seasoned in this manner is generally drier, and lighter than timber felled green. Girdling is not now practised in the Anamallay, Wynaad, Mysore, and Canara forests, whence most of the Teak commonly known as Malabar Teak is obtained; and this circumstance may account for the greater weight of Teak from the western coast as compared with Burma Teak. It may here be mentioned that most trees with a distinctly marked heartwood may be killed by girdling, but that the effect is very slow upon trees which have no distinct heartwood, such as the species of *Naucllea*, *Hymenodictyum*, *Ficus*, &c.

One of the most valuable qualities of Teak timber is, that once seasoned it does not split, crack, shrink, warp, or alter its shape. In this respect it is far superior to Säl, works easily and takes a fine polish, the wood of stems which have grown up isolated with strong and numerous side branches being often beautifully mottled. But its principal value is its great durability, which is greater than that of most Indian woods. In contact with iron, neither the iron nor the Teak suffers, and in this respect it is far superior to Oak. White ants eat the sapwood, but rarely attack the heartwood of Teak. It does not, however, resist the attacks of the *Teredo navalis*. The great durability of Teak is, probably with justice, ascribed to the circumstance that the wood contains an aromatic oil, which gives it a peculiarly pleasant smell and an oily surface when fresh cut. In Burma this oil is manufactured on a small scale, to be used medicinally, by filling an earthen pot, which is placed inverted upon another, with chips of wood, and putting fire round it, upon which an oily substance trickles down into the lower vessel. Shipbuilders in English dockyards are of opinion that the Teak which was brought to England in former years was more oily than that now imported, and that pieces of Teak taken out from old ships are more oily when cut than the Teak which is imported at the present time. As nearly all the Teak now comes from Rangoon and Moulmein, and as a considerable proportion of the Teak imported in former years came from the western coast of India, it is not improbable that the circumstance mentioned above has something to do with this difference—viz., that the Burma Teak is killed by girdling, whereas the Teak imported formerly from Malabar

had for the most part been felled green. This supposition is confirmed by the circumstance that a considerable portion of the timber formerly exported from Rangoon consisted of large planks (Shinbyin) not sawn, but split from green trees. It has even been asserted that the Teak trees in Burma are tapped for oil, but this is not the case; and the idea probably originated in the circumstance that wood-oil is largely obtained in Burma by the tapping of several species of *Dipterocarpus*. It will, however, require direct experiments to establish the fact that the wood of girdled trees contains less oil than the wood of trees felled green.

The great drawback of Teak is, that the centre of the heart is rarely sound, but that a more or less irregular hollow, often surrounded by unsound wood, runs along the axis of the tree. This peculiarity Teak has in common with other Indian woods, but perhaps to a somewhat greater extent. The mischief is probably mainly caused by the annual fires, which scorch and often burn the bark of young trees, for it is well known that all such external injuries are apt to induce decay in the heart of the tree. An additional cause in the case of Teak may be the large mass of pith in the centre of young stems, and particularly in coppice-shoots, which, as explained above, are the beginning of most Teak trees in the natural forests of India. This supposition, however, requires confirmation by further researches; at present it is nothing but a surmise which appears to have some probability. So much appears certain, that a very rapid growth of the tree during its first few years in Teak plantations is no matter for congratulation, for in such luxuriant shoots the pith is often $\frac{1}{2}$ in. square or more, and it is often inhabited by insects, which bore through from the outside, admitting air and foreign substances, and thus facilitate decay. The comparative value of rapidly and slow grown Teak has not yet been determined in a satisfactory manner. It is well known that the rapidly-grown Oak produced on alluvial soil in South and Central Europe is for many purposes considered equal, if not superior, in value to the slow-grown timber of Northern France and Germany, or of England. It seems, however, to be a fact, established by experience at the Bombay dockyard, that the fast-grown saplings of the Malabar plantations are less valuable for oars than the slow-grown poles produced in the coppice-woods of Severndroog and Colaba.

The various uses of Teak are well known. In India, Teak is prized for construction and shipbuilding beyond any other timber, though for certain purposes other woods are preferred. In Europe it is used for railway-carriages, for the decks of ships, and the backing of ironclads; and the demand for this excellent timber has in no way been diminished by the circumstance that iron has superseded timber for the building of ships generally. Rangoon and Moulmein are at present the principal places whence Teak is exported, and the following statement shows the quantities of Teak timber, in loads or tons of 50 cub. ft., brought to those two ports from the interior during the last five years for which data are available:—

	From British Forests.	Foreign.	Total.
	Tons.	Tons.	Tons.
1867-68,	33,104.	88,018.	121,122.
1868-69,	52,258.	76,903.	129,161.
1869-70,	39,843.	52,157.	92,000.
1870-71,	57,036.	82,484.	139,520.
1871-72,	52,125.	98,409.	150,534.

The leaves of Teak are used as plates, to wrap up parcels, and for thatching; they contain a red dye. The wood rubbed with water on a stone to the consistence of a thin paste, allays the pain and inflammation caused by handling the black varnish (*Thit-si*) of *Melanorrhœa usitatissima*. Flowers and the young fruit are believed to be diuretic (Pharm. Ind. 164).

2. CLERODENDRON, Linn.

Shrubs or small trees, rarely herbs. Leaves simple, opposite or in whorls. Calyx 5-toothed or 5-lobed, enlarged, often enclosing the fruit. Corolla-tube slender, limb spreading, lobes 5, equal. Stamens 4, exserted, often very long. Ovary 4-celled, 1 ovule in each cell; style filiform, with 2 short acute stigmatic lobes. Fruit a more or less succulent or almost dry drupe, the endocarp or the entire fruit separating into four 1-celled, or two 2-celled pyrenes. Albumen none, radicle inferior.

Leaves broad, the length not twice their breadth, petioles more than quarter the length of blade.

Calyx cleft half-way; fruit dry; leaves small, rhomboid . . . 1. *C. phlomoides*.

Calyx cleft nearly to the base; fruit fleshy; leaves large, cordate . . . 2. *C. infortunatum*.

Leaves ovate or oblong, petioles short; calyx truncate or with short teeth.

Corolla white, tube 1 in. long, many times longer than calyx . . . 3. *C. inerme*.

Corolla blue, tube short, not more than twice the length of calyx . . . 4. *C. serratum*.

Leaves linear-lanceolate, subsessile; calyx cleft half-way, corolla-tube 2-3 in. long . . . 5. *C. Siphonanthus*.

1. *C. phlomoides*, Linn.; Wight Ic. t. 1473; Roxb. Fl. Ind. iii. 57. — Vern. *Urni*, North India; *Irun, arni*, Guzerat.

A tall pubescent shrub, branches cinereous. Leaves rhomboid, 1-2 in. long, petiole 1 in. Flowers white, fragrant, on slender pedicels, as long as calyx, in a terminal leafy rounded panicle, composed of axillary 3-9-flowered cymes. Calyx campanulate, cleft half-way down. Corolla-tube 1 in. long. Fruit black, nearly dry, with 4 kernels.

Common in many parts of India, principally in the drier regions. Panjab, Sindh, Mairwara, the Dekkan, Behar, Bengal. Oudh and the Central Provinces. Ceylon. Fl. nearly throughout the year.

2. *C. infortunatum*, Linn.; Wight Ic. t. 1471. — Syn. *Volkameria infortunata*, Roxb. Fl. Ind. iii. 59. Vern. *Bhānt, bhat*.

A small shrub, branches and under side of leaves soft-tomentose. Leaves cordate or ovate-cordate, entire or dentate, 6-9 in. long, petiole 1-3 in. Flowers white, tinged with red, on short pedicels, in terminal rounded trichotomous panicles, bracts minute. Calyx cup-shaped, cleft to near the base, lobes lanceolate. Corolla-tube $\frac{3}{4}$ in. long. Berry fleshy, slightly 4-lobed, subglobose, somewhat depressed, $\frac{1}{2}$ in. diam., black, shining when ripe, and enclosed in the enlarged, red leathery calyx.

Common as underwood in forests, and under the shade of isolated large trees throughout South and Central India, Bengal, and Burma. Oudh forests, very abundant in the Sāl forests of Kheree, where it attains 12 ft. Sāl forests of Kamaon and Garhwal. Fl. Dec.-April.

3. *C. inerme*, Gärtn. de Fruct. et Sem. i. t. 57; Roxb. Fl. Ind. iii. 58; DC. Prodr. xi. 660.

A large, often scandent, glabrous shrub. Leaves opposite ovate or

elliptic, entire, acuminate, subcoriaceous, shining; blade 2-3 in., petiole $\frac{1}{2}$ in. long. Flowers white, in axillary, pedunculate, 3-9-flowered cymes. Calyx campanulate, nearly truncate, with 5 short acute teeth. Corolla-tube 1 in. long. Fruit dry, pear-shaped, 1 in. long, separating when ripe into four 1-seeded segments.

Common along the sea-coast of Bengal and the peninsula, probably also in Sindh. A widely-spread sea-coast plant. Ind. Archip., Australia, China. Fl. nearly throughout the year. Often planted as a hedge in gardens.

4. *C. serratum*, Spreng.; Wight Ic. t. 1472.—Syn. *C. ternifolium*, D. Don. *Volkameria serrata*, Linn.; Roxb. Fl. Ind. iii. 62. *V. farinosa*, Roxb. ibid. 64. Vern. *Barangi*.

A large shrub, youngest shoots and inflorescence pubescent. Leaves glabrous, opposite, or in whorls of three, oblong, elliptic-oblong, oblanceolate, serrate, shortly petiolate, 4-8 in. long. Flowers blue, in a terminal thyrsus, cylindrical in flower, pyramidal in fruit, composed of short lateral trichotomous cymes. Bracts ovate, bractlets lanceolate. Calyx campanulate, truncate or with 5 short teeth. Corolla-tube short, not more than twice the length of calyx, mouth oblique. Berry succulent, $\frac{1}{2}$ in. across, shining black when ripe, lobed, with 1-4 lobes.

Himalaya from the Sutlej to Assam ascending to 5000 ft. Kasia hills, Nilgiris and Western Ghats. Fl. May-Aug.

5. *C. Siphonanthus*, R. Brown; Wight Ill. t. 173.—Syn. *Siphonanthus indica*, Linn.; Roxb. Fl. Ind. iii. 67. Vern. *Barangi*.

A large glabrous shrub, branches herbaceous, hollow, channelled. Leaves in whorls of 3-5, linear-lanceolate, subsessile, pale beneath, 6-9 in. long. Flowers white when first opening, gradually changing into cream colour, in a large terminal loose thyrsus, composed of pedunculate cymes in the axils of leaves. Calyx campanulate, cleft half-way into 5 ovate segments. Corolla-tube slender, 2-3 in. long, curved. Berries 1-4, ovoid, dark blue, joined at the base, and supported by the enlarged, spreading red calyx.

Cultivated in gardens throughout India. Wild in Kamaon, Bengal, Burma, and the Dekkan. Fl. hot season and autumn. Root and leaves used in native medicine.

3. GMELINA, Linn.

Trees or shrubs with undivided leaves. Calyx 4- or 5-toothed. Corolla-tube short, widening gradually into a wide open mouth, limb oblique, with 4 or 5 spreading unequal lobes. Ovary 4-celled, 1 ovule in each cell; style filiform, unequally 2-lobed. Fruit a succulent drupe, with a hard 1-4-celled kernel. Seeds solitary in each cell, exalbuminous.

An unarmed tree, with cordate leaves 1. *G. arborea*.
A spinescent shrub, with ovate leaves 2. *G. asiatica*.

1. *G. arborea*, Roxb. Cor. Pl. t. 246; Fl. Ind. iii. 84; Wight Ic. t.

1470; Bedd. Fl. Sylv. t. 253.—Vern. *Gumhār, khammāra, kambhār, kūmār, gambārī*. In Western and Central India: *Sēwan, shewan*.

A middle-sized or large tree, pubescent. Leaves tawny tomentose underneath while young, cordate or broad-ovate, acuminate, with a rounded or cordate base, blade 4-8 in. long, 3-6 in. broad, petiole more than half the length of leaf. Flowers pentamerous, yellow, tinged with brown, in terminal and axillary racemiform panicles composed of lateral cymes; inflorescence, calyx and corolla clothed with dense soft tawny tomentum. Corolla 5-lobed, 2-lipped. Drupe ovoid, smooth, yellow when ripe, 1 in. long.

A widely-spread tree through the greater part of India, Burma, and Ceylon. In the sub-Himalayan tract it extends to the Chenab, ascending to 3000 ft. and even higher, but is scarce in the Panjab. Grows on the dry hills of the Aravalli range near Ajmir. Not gregarious, and nowhere abundant. The leaves are shed Feb.-April, the new foliage appears April-May. Fl. generally before the leaves, Feb.-April. Fruit ripens May-June. Readily raised from seed, growth rapid, 3 rings per in.

Attains 60 ft. and 6 ft. girth in Oudh and Central India, but grows to be a much larger tree in Bengal and Burma. Stem erect, attaining 30 ft. to the first branch, not very regularly shaped. Bark grey, or greyish brown, smooth, or scurfy, at last exfoliating in broad, irregular, thick, scurfy flakes, leaving exposed the fresh, light-coloured, smooth surface. Branchlets ash-coloured, smooth, with white specks. Wood whitish or pale-yellow, strong and close-grained, but not heavy. 30-40 lb. per cub. ft. Does not crack, warp, or shrink in seasoning, is easily worked, takes paint and varnish readily. Lasts well under water, also in tidal streams, better than Teak (Roxb.) Highly esteemed for planking, furniture, the panels of doors, carriages and palankins, well-work, for decks of boats, for toys, lacquered boxes, and all kinds of ornamental work. The fruit is eaten by the Gonds of the Satpura, who protect this tree near villages; deer feed on it. Fruit, root, and bark are used in native medicine.

2. *G. asiatica*, Linn.; Roxb. l. c. 87; Wight III. t. 174.

A large branching shrub, with spinescent branchlets. Leaves ovate, pubescent when young, glabrous afterwards. Flowers yellow, tetramerous, in racemiform panicles at the ends of branches. Calyx and corolla strigose with adpressed hairs. Corolla curved, infundibuliform, $1\frac{1}{2}$ in. long. Drupe obovate, $\frac{1}{2}$ in. long.

South India, Ceylon, and Indian Archipelago. Probably in the Central Provinces. Fl. nearly throughout the year. An excellent hedge-plant.

4. *PREMNA*, Linn.

Shrubs or trees with opposite, undivided leaves. Flowers in a bracteate terminal trichotomous panicle or thyrsus. Calyx persistent, truncate, or with 2-5 short obtuse teeth, sometimes 2-lipped. Corolla tubular, short, limb cleft into 5 or more, commonly 4, lobes, either nearly equal, or 2-lipped, upper lip consisting of 1 (the largest and outer) lobe, sometimes emarginate or nearly bifid, lower lip 3-lobed. Stamens 4, didynamous or nearly equal; anthers rounded, inserted on the back, the cells diverging at the base. Ovary 4-celled, 1 ovule in each cell; style fili-

form, stigma bifid, sometimes nearly entire. Fruit a fleshy drupe with a hard, rugose or tuberculate 2-4-celled kernel. Albumen none; radicle inferior. The leaves and twigs of most species have an unpleasant smell when bruised.

Trees or shrubs, pubescent or glabrate; stigma bifid, corolla 4-lobed.

Flowers in trichotomous corymbose panicles.

Leaves ovate or obovate, acute or short-acuminate; main lateral nerves 2-4 pair

Leaves ovate or ovate-oblong, long-acuminate; main lateral nerves 4-6 pair

Flowers in a terminal, cylindrical thyrsus

A tree, densely stellate-tomentose; stigma indistinctly bifid, corolla 5-lobed; calyx in fruit cup-shaped enclosing the base of drupe

A climber; leaves glabrous, shining

An herbaceous undershrub

1. *P. integrifolia*.

2. *P. mucronata*.

3. *P. interrupta*.

4. *P. tomentosa*.

5. *P. scandens*.

6. *P. herbacea*.

1. *P. integrifolia*, Linn.; Wight Ic. t. 1469.—Syn. *P. serratifolia*, Linn.; Roxb. Fl. Ind. iii. 77; *P. spinosa*, Roxb. ib. Vern. *Bakarcha*, Garhwal; *Ganniari*, Oudh.

A large shrub or middle-sized tree; stem and older branches often armed with strong opposite spines, branchlets unarmed. Leaves pubescent when young, ovate or obovate, entire or dentate, blade 2-3 in., petiole $\frac{1}{2}$ -1 in. long; main lateral nerves 2-4 pair. Flowers greenish white, somewhat viscid, exhaling an unpleasant smell, in terminal corymbose panicles. Calyx 2-lipped or irregularly 5-toothed. Corolla twice the length of calyx, the outer lobe much larger than the others. Drupe black, globose, $\frac{1}{4}$ in. diam.

South India, Ceylon, Bengal. (Oudh forests, Garhwal, R. Thompson and J. L. Stewart. I have not seen specimens). Indian Archipelago, China, and North Australia. The leaves are shed in Feb., and are renewed between Feb. and April, earlier in moist places, later on poor dry ground. The flowers appear soon after the leaves; they resemble Elder flowers. Attains 30 ft. with stiff branches. Stem 5 ft. girth, with spines and excrescences. Often a shrub only. Bark cinereous. Branchlets foetid when bruised. Wood white, moderately close-grained, no heartwood. The fresh-felled wood frequently exudes a green-coloured sap.

Closely allied, and perhaps not specifically distinct, is *P. latifolia*, Roxb. Fl. Ind. iii. 76; Wight Ic. t. 869, from South India, said to have been found in Kamaon.

2. *P. mucronata*, Roxb. Fl. Ind. iii. 80.—Vern. *Bankhar*, *gān*, Pb.; *Bakar*, *bakarcha*, *basota* (*bās*, smell), *āgniūn* (*āg*, fire), *tumari*, *jhatela*, N.W.P.

A small tree, extremities and under side of leaves pubescent or soft tomentose. Leaves ovate or ovate-oblong, long-acuminate, base rounded or cordate, entire or irregularly dentate; main lateral nerves 4-6, on either side of midrib; blade 3-6, petiole 1 in. long. Flowers in terminal corymbose trichotomous panicles. Calyx with 4 or 5 rounded, nearly equal teeth. Corolla-lobes equal or bilabiate, upper lip retuse or

emarginate, lower lip of 3 equal lobes, throat closed with white hairs. Drupe globose, $\frac{1}{4}$ in. diam.

Sub-Himalayan tract and outer ranges, extending north-west as far as the Chenab, and ascending to 3500 ft. Oudh forests, Sikkim, Bhutan, Silhet. The leaves are shed Jan., Feb. Fl. April-June. Attains 25 ft., trunk short, erect, 3 ft. girth, branches divergent, twigs pubescent. Bark light-dark- or reddish-grey, even, with longitudinal wrinkles. Wood hard, a good fuel, used for lighting fires by friction.

Closely allied, and perhaps not specifically distinct, is *P. barbata*, Wall.—Vern. *Ganhila*, Pb.; *Lammar*, N.W.P. Outer Himalaya from the Jhelam to Assam, ascending to 5500 ft., said to differ by a 4-cleft calyx and a less conspicuous beard in the throat of the corolla. A moderate-sized tree, bark cinereous. Fl. April-June. The twigs have a strong unpleasant smell.

P. glaberrima, Wight Ic. t. 1484, from South India, and *P. micrantha*, Schauer, DC. Prodr. xi. 635, are also closely allied to *P. mucronata*. *P. cordifolia*, Roxb. Fl. Ind. iii. 78; Wight Ic. t. 1483, a shrub from South and Western India, resembles it in the shape of the leaves, but differs by a truncate or bilabiate calyx.

3. *P. interrupta*, Wall.; DC. Prodr. xi. 633.

A small tree, inflorescence and under side of leaves pubescent. Leaves oblanceolate or obovate, 4-8 in. long, narrowed into a short petiole, acuminate, entire, or indistinctly dentate. Flowers greenish, sessile, in compact sessile or shortly pedunculate cymose clusters supported by foliaceous lanceolate bracts, and forming a cylindrical, terminal thyrsus, often interrupted at the base. Calyx bifid. Corolla-lobes 4, nearly equal. Anthers and style exserted. Drupe globose, $\frac{1}{4}$ - $\frac{1}{2}$ in. diam.

Kamaon, 6000-7000 ft. Nepal. Sikkim, 6000-8000 ft. Fl. May-Aug. A purple gum exudes from wounds in the bark. Wood 43 lb. per cub. ft., Wall.

P. racemosa, Wall.; DC. Prodr. xi. 633, Kasia, Sikkim, Nepal, is closely allied to this species.

4. *P. tomentosa*, Willd.; Roxb. Fl. Ind. iii. 76; Bedd. Fl. Sylv. t. 251.

A moderate-sized tree; branchlets, leaves, and inflorescence densely clothed with soft tawny tomentum of stellate hairs. Leaves triangular-ovate, acuminate, entire, 4-6 in. long, 3-4 in. broad, on petiole 1 in. long. Flowers pale greenish-white, shortly pedicellate, in loose terminal, rounded trichotomous panicles. Calyx truncate or indistinctly bilabiate at the time of flowering, clothed with stellate hairs. Corolla 5-lobed, the lobes nearly equal. Style exserted, minutely, and indistinctly bifid. Ovary densely tomentose. Drupe ribbed, indistinctly lobed, globose, $\frac{1}{4}$ - $\frac{1}{2}$ in. diam., the lower half enclosed in the somewhat enlarged, cup-shaped, membranous calyx.

South India, Java, Ceylon, and probably in the Godavery forest of the Central Provinces. Wood yellow, hard, close-grained, takes a beautiful polish.

5. *P. scandens*, Roxb. Fl. Ind. iii. 82; Dalz. Bomb. Fl. 199, is a large climber.

ing shrub in Eastern Bengal and Western India, with glabrous, shining, ovate, long-acuminate leaves, and greenish-white flowers in a terminal corymbose panicle. 6. *P. herbacea*, Roxb. l. c. 80, is a small undershrub, common in the grass lands of the sub-Himalayan tract, from Garhwal to Assam, Oudh forests, Tirhoot. A woody perennial root produces annually, after the jungle-fires, a cluster of sessile, cuneate or obovate, pubescent leaves, edge with large triangular serratures, and a terminal, pedunculate, corymbose cyme, shorter than the leaves, with pale-yellow flowers, which open Feb.-April.

5. *CALLICARPA*, Linn.

Shrubs, generally clothed with soft stellate tomentum. Leaves opposite, simple. Flowers in axillary dichotomous cymes, with divaricate branches and small tomentose bracts. Calyx truncate, 4- rarely 5-dentate. Corolla-tube short, limb spreading, lobes 4, rarely 5, nearly equal. Stamens as many as corolla-lobes, exserted. Ovary 4-celled, 1 ovule in each cell; style filiform, dilated and truncate, or shortly 2-lobed. Fruit a small succulent drupe, the endocarp of 4 distinct 1-seeded pyrenes.

Clothed with dense woolly tomentum; leaves crenate . . . 1. *C. macrophylla*.
Hoary with short stellate hairs; leaves entire . . . 2. *C. arborea*.

1. *C. macrophylla*, Vahl; DC. Prodr. xi. 644; Roxb. Fl. Ind. i. 393.—Syn. *C. incana*, Roxb. l. c. Vern. *Pāttharman*, *bā-pattra*, *baunu*, Jhelam; *Sūmāli*, Chenab; *Denthar*, *drüss*, Ravi; *Daya*, Kamaon; *Mathara*, *mat-tranja*, Beng.

A tall shrub, branches, petioles, and peduncles thickly clothed with tawny or grey woolly tomentum. Leaves lanceolate or oblong-lanceolate, rarely ovate-lanceolate, acuminate, crenate, 6-10 in. long, petiole $\frac{1}{2}$ in., wrinkled, soft pubescent above, floccose-woolly or cottony underneath; main lateral nerves 12-15 pair. Cymes much branched, with numerous, distinct, small rose-coloured flowers, common peduncle as long as petiole. Corolla-tube barely twice the length of calyx. Stamens much exserted.

Bengal, Gorakhpur, Oudh, Rohilkhand, extending as far west as Hazara in the sub-Himalayan tract. Ascends to 6000 ft. Burma. China. Fl. May-Jan. In Hazara the heated leaves are applied to rheumatic joints.

C. tomentosa, Willd.—Syn. *Roxburghii*, Schauer; DC. Prodr. xi. 640; China, differs by long hairs intermixed with the tawny tomentum; the flowers are in compact globose hirsute heads on the ramifications of the cymes. Has not yet been found in Northern India.

C. lanata, Linn. Mant. Plant. 331; Vahl Symbolæ Bot. iii. 13.—Syn. *C. Wallichiana*, Walpers; DC. Prodr. xi. 641; Wight Ic. t. 1480, of Ceylon, South and Western India, white woolly tomentose, has ovate, acuminate leaves, matted underneath with dense white tomentum, 6-12 in. long, entire or slightly crenate, petiole 1-2½ in. long; flowers pink or pale lilac, peduncle shorter than petiole, corolla more than twice the length of calyx. Will probably be found in the Centr. Prov.

2. *C. arborea*, Roxb. Fl. Ind. i. 390; DC. Prodr. xi. 641.—Syn. *C. lanata*, Hook. in Hb. Kew. Vern. *Ghiwata*, *dera*, Kamaon.

A tree; branches, petioles, peduncles, and under side of leaves hoary

with short soft stellate hairs. Leaves ovate or ovate-lanceolate, acuminate, entire, glabrous above, blade 6-12, petiole 1-2 in. long; main lateral nerves 8-12 pair. Flowers lilac or light purple, with an unpleasant smell; cymes large, spreading, twice the length of petiole, common peduncle as long as petiole or longer.

Burma (common on deserted toungyas on the hills between Sitang and Salween). Hills of eastern Bengal, Nepal. Baraith forests of Oudh. Kamaon, ascending to 4000 ft. A small tree in Oudh, 25 ft. high, stem 18 in. girth. Fl. May, June. Bark soft, grey. Wood whitish, hard, close-grained, polishes beautifully.

C. longifolia, Lam.—Syn. *C. lanceolaria*, Roxb. l. c. 395; East Bengal, Burma, Indian Archipelago, Queensland; pubescent, often glabrate, has serrate, lanceolate, membranous leaves, flowers in loose cymes with slender branches. Will probably be found in the Gorakhpur forests.

6. LANTANA, Linn.

1. *L. alba*, Miller.—Syn. *L. indica*, Roxb. Fl. Ind. iii. 89; Wight Ic. t. 1464. *L. collina*, Dene. in Jacq. Voy. Bot. t. 141. *L. dubia*, Royle III. t. 73.

A shrub; branches 4-sided, hoary or pubescent. Leaves opposite, ovate, crenate, pubescent or hirsute, blade 1-3 in., petiole $\frac{1}{2}$ in. long. Flowers white light purple or yellow, scentless, in pedunculate axillary bracteate heads or short spikes, peduncles as long as leaf, bracts ovate, hirsute or villous. Calyx minute. Corolla-tube curved, $\frac{1}{2}$ in. long, limb oblique, spreading horizontally, divided into 4 unequal lobes. Drupe smooth, globose, dark violet, as large as a pea, enclosed by the enlarged but thin transparent calyx; nut 2-celled.

Plains of North India. Sub-Himalayan tract, ascending to 3000 ft. Sindh, Dekkan, Nilgiris, Ceylon. Fl. April-June.

7. VITEX, Linn.

Trees or shrubs. Leaves opposite, digitate, usually of 3 or 5 leaflets. Calyx 5-toothed or -lobed. Corolla-tube short, limb spreading, 5-lobed, lowest lobe larger than the others. Stamens 4, in pairs, ascending and exserted. Ovary 2- or 4-celled, 1 ovule in each cell; style filiform, shortly and acutely 2-lobed. Fruit a succulent drupe, putamen separating into 4 hard 1-seeded pyrenes.

1. *V. Negundo*, Linn.; Wight Ic. t. 519; Roxb. Fl. Ind. iii. 70.—Syn. *V. bicolor*, Willd. *V. incisa*, Lam. Vern. Marican, morāun, māura, mora, wana, banna, bana, torbana, biuna, Ph.; Shwāri, shucāri, shawālī, mewri, N.W.P.; Nirgunda, Bombay.

A small tree or large shrub; branchlets, under side of leaves or inflorescence hoary with short grey pubescence. Leaflets 3 or 5, lanceolate, shortly petiolate, entire toothed or pinnatifid, the central one 3-4 in. long, the lateral ones usually smaller; common petiole 1 in. long.