

globose, tomentose, long-pedunculate flower-heads, 1 in. diam. Petals linear, valvate, slightly cohering at the base. Stamens 10, free; anthers basifixed, with deciduous stipitate glands. Pod thick, woody, flat, falcate, 4-6 in. long, 2-2½ in. broad at the broadest part. Seeds 8-10, oval, compressed, shining, ½ in. long.

Burma, South India, extending to the Godavery forests on the east side, and (as far as known at present) to the Colaba district on the west side. (Included in Forsyth's List of Central Prov. timber-trees.) Leafless during part of the dry season. Fl. March-April; fr. autumn. Bark grey. Trunk tall, of great girth. Heartwood dark red, very hard; weight between 58 and 70 lb. Aver. of P. 800.

7. LEUCÆNA, Benth.

1. *L. glauca*, Benth. in Hook. Journ. Bot. iv. (1842) 416.—Syn. *Acacia frondosa*, Willd.; W. & A. Prodr. 275.

A shrub or small tree, unarmed, with large bipinnate leaves, linear leaflets, white flowers in globose, axillary heads, forming short terminal leafy panicles. Petals 5, free, linear, valvate. Stamens 10, anthers versatile, without glands. Pods clustered in umbels of 3-6, linear, stipitate, thin, flat, shining, 4-6 in. long, 2-valved, with numerous prominent seeds.

Indigenous or naturalised in most tropical countries, commonly cultivated in gardens in India; not uncommon in the outer valleys of Garhwal and Kamaon. Fl. June-Aug.; fr. autumn.

8. MIMOSA, Linn.

Herbs, shrubs, or trees, with bipinnate, often sensitive leaves, generally without petiolar glands, but with stipels at the base of pinnae. Flowers in globose heads or cylindrical spikes, tetramerous or pentamerous, rarely tri- or hexamerous. Calyx minute, pappiform, rarely campanulate. Petals more or less connate, valvate. Stamens definite, generally twice the number of petals, and more than twice their length. Anthers small, without glands. Ovary with 2 or many ovules, style filiform, with a small terminal stigma. Pod oblong or linear, the valves membranous or coriaceous, separating entire or in transverse joints from the persistent sutural frame.

1. *M. rubicaulis*, Lam.; Hooker Ic. Plant, ii. t. 156; W. & A. Prodr. 268.—Syn. *M. octandra*, Roxb. Cor. Pl. t. 200; *M. mutabilis*, Roxb. Fl. Ind. ii. 564. Vern. *Rāl*, *khair*, *didriār*, Pb.; *Agla*, Kamaon; *Kingli*, *kingrei*, Rohilkhand; *Kacheyta*, Gorakhpur; *Hajeru*, Sindh.

A large, straggling, prickly shrub, 10 ft. high. Pubescent; branches, petioles, and peduncles armed with short, curved, sharp prickles. Pinnae 3-10 pair; leaflets 6-15 pair, unequal-sided, linear-oblong, obtuse. Flower-heads on peduncles 1-1½ in. long, solitary or fasciculate, forming racemes near the ends of branches. Flowers tetramerous; calyx short-campanulate, 3 or 4 times shorter than the funnel-shaped corolla. Stamens 8. Pods stipitate, glabrous, armed or unarmed, 3-5 in. long, ½ in. broad, curved, separating from the sutural frame in square joints.

Common in open or thin jungles throughout the greater part of India, in the plains extending to the Ganges, and in the hills as far as the Indus (ascending to 4000 ft. in Kamaon); in the Panjab, abundant in the outer hills and the Siwalik tract, and found at times on the banks of rivers or canals, some way into the plains. Fl. Aug.-Sept.; fr. Nov.-Jan. Gunpowder is made of the charcoal.

9. PITHECOLOBIUM, Martius.

Shrubs or trees, with bipinnate leaves, generally with glands at the base of pinnae and leaflets. Flowers generally white, in globose heads or cylindrical spikes; pentamerous, rarely hexamerous, generally bisexual. Calyx campanulate or tubular, with short teeth. Corolla tubular or funnel-shaped, segments valvate. Stamens indefinite, much longer than corolla, more or less connate; anthers small. Ovary with numerous ovules; style filiform, with a small terminal stigma. Pod compressed or flat, variously contorted, coriaceous, 2-valved. Seeds included in a scanty pulp.

Leaflets 1 pair; pod turgid, twisted *P. dulce*.
 Leaflets 2-4 pair; pod flat, spirally contorted *P. bigeminum*.

1. *P. dulce*, Benth. in Hooker's Journal of Botany, iii. (1844) 199; Bedd. Fl. Sylv. t. 188.—Syn. *Mimosa dulcis*, Roxb. Fl. Ind. ii. 556; Pl. Cor. t. 99. *Inga dulcis*, Willd.; W. & A. Prodr. 268. *Manilla Tamarind*. Vern. *Vilāyati* (foreign) *imli*, *dakhani* (southern) *babool*.

A large tree, armed with short, straight, stipulary thorns. Glabrous or lightly pubescent. Pinnae and leaflets 1 pair each; leaflets unequal-sided, oblong or obovate, obtuse, 1-1½ in. long. Common and partial petioles terminate in short bristles; small cup-shaped glands at the base of pinnae and leaflets. Flowers white, in small globose, sessile or short-pedunculate, canescent heads, on long racemose panicles. Pod turgid, twisted, linear, ½ in. broad. Seeds embedded in a firm sweetish pulp.

Indigenous in the hot regions of Mexico, introduced into the Philippine Islands, and thence into India. Cultivated commonly in South India, and here and there in Central and North-West India.

A large tree, with a straight stem, and drooping branchlets. Bark ½-¾ in. thick, ash-coloured, smoothish, irregularly rugose. Fl. Jan.-March; fr. ripens April-June. Sapwood small, heartwood reddish brown, not heavy, 40 lb. per cub. ft., smells unpleasantly when fresh-sawn, used for various purposes. A good avenue-tree. Coppices well in South India, grown for fuel. Extensively cultivated as a hedge-plant. In Manilla it is grown on account of the fruit, which is eaten. From the seeds oil is pressed in Madura and Tinnevely.

2. *P. bigeminum*, Martius; Benth. l. c. 206.—Syn. *Inga bigemina*, Willd.; W. & A. Prodr. 269. Vern. *Kachlora*, Kamaon.

A large, unarmed, glabrous tree, extremities inflorescence, and pods with short, dark, ferruginous pubescence. Common petiole short, 1-3 in. long, with a raised oval gland, bearing 1, rarely 2 pairs of pinnae, with 2-4 pairs of large, shining, ovate or elliptic-oblong, acuminate leaflets, 3-6 in. long. Heads with 6-12 subsessile flowers, in axillary panicles. Peduncles fasciculate, but generally superposed, in a vertical line, one

above the other. Pods flat, linear, $\frac{3}{4}$ in. broad, curved, generally spirally contorted, dark brown outside, reddish brown inside.

Forests of the western coast, Eastern Bengal, Nepal, and Kamaon, Ceylon, Indian Archipelago. Fl. March-May. Heartwood dark-coloured; it is sometimes called Ironwood.

10. *ALBIZZIA*, Durazzini.

Unarmed trees or shrubs, with bipinnate leaves and large (in the Indian sp.) globose flower-heads. Flowers white, yellow, or rose-coloured, usually pentamerous. Calyx tubular to campanulate, toothed. Petals 4-5, united half their length or more, valvate. Stamens indefinite, exserted, generally exceeding $\frac{1}{2}$ in.; filaments united at the base, or in a long exserted sheath; anthers minute, pollen cohering in 3-4 masses in each coll. Legume straight, flat, oblong or broadly linear, indehiscent or 2-valved, valves usually thin, continuous or sinuous from abortion of seeds. Seeds compressed.

Pinnæ 1-2 pair; leaflets 1-3 pair, penniveined, 3-5 in. long . . . 1. *A. lucida*.

Pinnæ 2-8 pair; leaflets $\frac{1}{2}$ -2 in. long, broad-oblong, main nerves in the middle or nearly so.

Extremities rusty- or grey-tomentose; pinnæ 3-8 pair; leaflets 10-25 pair . . . 2. *A. odoratissima*.

Extremities glabrous or pubescent; pinnæ 2-4 pair; leaflets 3-9 pair.

Leaflets with 6-10 prominent lateral nerves; flowers $\frac{1}{2}$ in. long, sessile, the flower-heads in large terminal panicles; pods brown, 1 in. broad . . . 3. *A. procera*.

Leaflets with reticulate veins; flowers $1\frac{1}{2}$ in. long, pedicellate, the flower-heads in short corymbose racemes; pods straw-coloured, 2 in. broad . . . 4. *A. Lebbeck*.

Pinnæ 6-15 pair; leaflets $\frac{1}{2}$ - $\frac{3}{4}$ in. long, falcate; main nerves lateral.

Flowers rose-coloured; stipules linear; leaflets 10-30 pair . . . 5. *A. Julibrissin*.

Flowers yellow; stipules broad-cordate; leaflets 20-40 pair . . . 6. *A. stipulata*.

Pinnæ 6-15 pair; leaflets $\frac{1}{2}$ in. long, linear; midrib in the middle; flowers yellow, fragrant; branchlets with soft yellow down . . . 7. *A. amara*.

A. lophantha, Benth. Fl. Austral. ii. 421, of Western Australia, introduced on the Nilgiris and now quite naturalised, is a rapidly growing small tree, with 8-10 pairs of pinnæ; leaflets 20-30 pair; flowers in axillary pedunculate spikes.

1. *A. lucida*, Benth.; Lond. Jour. of Bot. iii. (1844) 86.—Syn. *Mimosa lucida*, Roxb. Fl. Ind. ii. 544; *Inga lucida*, Wall.

A large tree; glabrous, peduncles and calyx only slightly pubescent. Common petiole 3-5 in. long, pinnæ 1-2 pair; leaflets 1-3 pair, subcoriaceous, shining, elliptic-oblong, acuminate, penniveined, 3-5 in. long. Peduncles fasciculate, paniculate, bearing heads of 6-10 sessile flowers. Corolla 4 times the length of calyx. Pod linear, straight, 8-10 in. long, $1\frac{1}{2}$ in. broad. The foliage somewhat resembles that of *Pithecolobium bigeminum*, but the tree is easily distinguished by the straight pod, and the fasciculate, not superposed, peduncles.

Burma, hills of East Bengal, Nepal, and probably also in the Oudh and Gorakhpur forests, and in Kamaon. Fl. April, May.

2. *A. odoratissima*, Benth. l. c. 88.—Syn. *Acacia odoratissima*, Willd.; W. & A. Prodr. 275; *Mimosa odoratissima*, Roxb. Cor. Pl. t. 120; Fl. Ind. ii. 546; Bedd. Fl. Sylv. t. 54. Vern. *Lasrîn*, *karâmbru*, *polach*, Pb.; *Siris*, *siran*, *bhandîr*, N.W.P.; *Bersa*, *bâs*, *bâsein*, C.P.; *Chichea*, Fonds, Satpura range; *Serissia*, Bassi, Meywar; *Kali Harreri*, Panch Mehals; *Thitmagyi*, Burm.

A large tree, with dark-green foliage. Branchlets, petioles, inflorescence and under side of leaves rusty- or grey-tomentose. Common petiole 6-12 in. long; pinnæ 3-8 pair, 4-6 in. long. Leaflets 10-25 pair, 1 in. long or less, linear-oblong, unequal-sided, pubescent above, pale and tomentose beneath. Flower-heads fasciculate, on peduncles $\frac{1}{2}$ - $\frac{3}{4}$ in. long, in compact corymbs, these arranged in lax, terminal panicles. Flowers sessile, pale yellow, fragrant, 1 in. long to extremity of stamens, calyx and corolla hairy. Calyx small, campanulate, 4-5 times shorter than corolla. Legumes broad-linear, 6-8 in. long, 1 in. broad, of a red-brown colour, tomentose when young, glabrous when old, with 10-15 seeds.

South India, Burma, Bengal, Maikal and Satpura range in Central India. Panch Mehals in Guzerat. Bassi forests in Meywar, sub-Himalayan tract west to the Indus, ascending to 3000, and at times to 5000 ft. Fl. April-June; pods ripen Jan., Feb., and remain long on the tree. Never quite leafless, fresh foliage in spring.

Attains a large size in Burma and Western India, in North and Central India 30-45 ft. high, with a tall, nearly straight trunk 5-6 ft. girth. Bark $\frac{1}{4}$ in. thick, light or dark grey, marked with numerous, narrow, horizontal wrinkles, nearly encircling the trunk.

Sapwood less than $\frac{1}{4}$ of radius, whitish. Heartwood of a rich dark-brown colour, tough and strong. The cub. ft. weighs 38-53 lb. Seasons well, works freely, takes a fine polish, and is fairly durable when kept dry. Used for masts, spokes, fellies, oil-mills, and furniture. A dark-brown gum exudes from wounds in the bark. Leaves and twigs are lopped for cattle-fodder.

3. *A. procera*, Benth.—Tab. XXVI.—Lond. Jour. of Bot. iii. 89.—Syn. *Acacia procera*, Willd.; W. & A. Prodr. 275; *Mimosa elata*, Roxb. Cor. Pl. t. 121; Fl. Ind. ii. 548. Vern. *Safed-Siris*, *Gurâr*, *Karra*, *karo*, *ghorar*, *kharanji*, *karinji*, *gurbâri*, *gurkar*, *bako*, North and Central India; *Karallu*, *kinye*, *ilai*, *kili*, *tihiri*, Bombay; *Sitben*, Burm.

A large tree, with yellowish or greenish white bark. Glabrous, young leaves pubescent. Leaves nearly as broad as long; common petiole 6-12 in. long, with a large, brown, oblong gland near its base; pinnæ 3-4 pair, spreading, the upper pinnæ 6-9 in. long. Leaflets 6-8 pair, 1-2 in. long, obliquely-ovate, or oblong-ovate, with 6-10 prominent lateral nerves on either side of midrib. Flower-heads with 15-20 flowers, on peduncles 1 in. long or less, in fascicles of 2-5, forming large, lax, terminal panicles. Flowers yellowish white, sessile, $\frac{1}{2}$ in. long to extremities of filaments; calyx tubular, half the length of corolla; segments of corolla oblong, hairy at the end. Legumes linear, 6-9 in. long, $\frac{1}{4}$ -1 in. broad, with 8-12 prominent seeds.

Common near river-banks, on alluvial soil and in moist places, in Burma, Bengal, Gorakhpur, Oudh, South India, and in the sub-Himalayan tract west to

the Jumna. Ravines of the Maikal and Satpura range, of the Rewah hills, and of the Barrea hills east of Guzerat. Never quite leafless; the new foliage comes out in April, May. Fl. May, June; fr. Jan., Feb.

Attains 60-80, and at times 100 ft.; trunk large, erect, not regularly shaped, girth 6-9 ft., at times much more. R. Thompson records specimens in the Gonda forests of Oudh 100 ft. high and 19 ft. girth. Bark $\frac{1}{2}$ in. thick or less, yellowish, or greenish white or grey, smooth, with narrow horizontal lines, shallowly and distantly pitted by the falling of thin irregular scales.

Sapwood large, often $\frac{1}{2}$ of radius, yellowish white, not durable. Heartwood light or dark brown, with broad wavy belts and patches of a darker colour, annual rings very indistinct. Pores numerous, large, equally distributed. Straight and even-grained, seasons well, works freely, and is durable. Weight of cub. ft. 40-55 lb. seasoned, 70-80 lb. green, so that it loses nearly half its weight in drying. Largely used for sugar-cane crushers, rice-pounders, wheels, agricultural implements, bridges, and house-posts. It takes a beautiful polish, and, not being heavy, would make a good furniture-wood. In times of scarcity the bark, mixed with flour, has been used as food. The bark is also used for tanning.

Easily raised from seed, and grows readily from cuttings. Growth very rapid, more rapid than of *Siris*. In 12 years attains 3-4, and in 30 years 4-6 ft. (North India).

4. **A. Lebbek**, Benth. l. c. 87; Bedd. Fl. Sylv. t. 53; Boissier Fl. Orient. ii. 639.—Syn. *Acacia Lebbek*, Willd.; *A. speciosa*, Willd.; W. & Prodr. 275; *Mimosa Sirissa*, Roxb. Fl. Ind. ii. 544. *Siris*. Sans. *Sirisha*. Vern. *Siris*, *sirisha*, *shirish*, *sirīn*, *sirij*, *sirāi*, *kalsis*, *tantia*, North and Central India; *Serla*, *sirla*, Banswara; *Harrēri*, Panch Mehals.

A large tree with dark-grey bark. Extremities and leaves glabrous or pubescent. Common petiole 3-12 in., a large gland near the base, and 1 or more interjugal glands; pinnæ 2-4 pair; leaflets 3-9 pair, unequal-sided, oblong, obtuse, subsessile, lateral nerves not prominent, veins reticulate. Peduncles 2-4 in. long, in fascicles of 2-4 from the upper axils, forming a short corymbose raceme. Flowers white, fragrant, glabrous or pubescent, $1\frac{1}{2}$ in. long to the extremities of stamens, on pedicels $\frac{1}{2}$ in. long. Calyx campanulate, less than half the length of corolla, with short deltoid teeth. United base of filaments included. Legume 8-12 in. long, linear-oblong, 2 in. at the broadest, of a straw-yellow colour, thin, with 8-12 large, distant, prominent seeds.

Indigenous in the forests of South India, the Satpura range, Bengal, and the sub-Himalayan tract, extending west to the Indus, and ascending to 5000 ft. Cultivated throughout the drier parts of India, in Egypt (avenues of Cairo), Mesopotamia, in Afghanistan near Jellalabad, in tropical Africa, America, and in Australia. Partially leafless for some time in the hot season, the leaves are renewed in March, April, and sometimes there is a second flush in autumn. The flowers chiefly appear in April, May, but often at other times. The pods ripen in Sept., and remain hanging on the tree throughout the cold and hot season.

Attains 40-60 ft., with a girth of 6-8, and at times 10-12 ft. When planted far apart as an avenue-tree, its trunk is short; but, when drawn up by Bamboos and other trees in the forest, it has a long straight stem. Bark $\frac{1}{2}$ in. thick, dark or brownish grey, rough with numerous, short, irregular cracks, and elevated horizontal lines. Sapwood large, often occupying half the radius, whitish. Heartwood dark reddish brown, darker, nearly black bands alternating with

bands of lighter colour. Tough, seasons well, works freely, and takes a fine polish; weight of cub. ft. 50-55 lb. Fairly durable. Much valued for sugarcane crushers, oil-pestles and mortars, furniture, well-curbs, naves, spokes, and other wheel-work. A mild pellucid gum exudes from cracks in the bark. The leaves and twigs are a favourite fodder for camels.

Easily raised from seed; its growth during the first few years is exceedingly rapid. Young plants suffer from frost severely in the Panjab. Trees 12 years old in the Panjab have 2½ ft. in girth, 30 years 4½ ft., and at Sakkar in Sindh, on low alluvial soil, trees 17 years old have attained 5-6 ft. in girth. In Sindh and the South Panjab it is often grown from cuttings, which strike root readily, even large sticks and posts put in the ground shooting vigorously. The roots spread widely, but are shallow, and the tree is apt to be blown down. In Central and North-West India it is commonly grown in avenues, but it is an unsightly tree during the hot season with the large, dry, yellow pods hanging on the bare branches. In the Antilles it is called Fry-wood, the sound of the pods in the wind resembling that of frying meat.

The structure of the wood of this and the two preceding species of *Albizia* is similar; in all three the sap is large; on a longitudinal section the pores are prominently marked, and on a cross-section the heartwood shows darker concentric lines or irregular concentric bands, often interrupted (segments of the circle only). These darker lines or patches probably coincide, in most cases, with the lines separating the wood formed in successive seasons; nevertheless it can by no means be said that these woods have clearly-marked annual rings. The pores are largest in *A. procera*; they are often in groups of 2, and always surrounded by small rounded patches of white tissue; these patches are not generally connected with each other, but, being arranged in more or less concentric lines, they give the appearance of wavy, lighter-coloured bands. *A. Lebbeck* has smaller pores, frequently in groups of 2, each pore or group of pores in a patch of lighter tissue, but these patches are always distinct. The medullary rays are somewhat larger in *A. procera* than in *Lebbeck*.

5. *A. Julibrissin*, Boivin; Benth. l. c. 91; Boissier Fl. Orient. ii. 639, —Syn. *Acacia Julibrissin*, Willd.; *A. mollis*, Wall. *Pink Siris*. Vern. *Sirīn*, *kūrmrū*, *sūrangrū*, *shirsh*, *būna*, *tandāi*, *mathārshī*, *brind*, Pb.; *Siris*, *barat*, *baraulia*, *bhokra*, N.W.P. The specific name is a corruption of *Gulāb-resham*, the rose-silk.

A large shrub or moderate-sized tree, extremities and leaves pubescent or tomentose, rarely glabrous. Common petiole 6-12 in. long, a large gland on the naked part, and smaller interjugal glands above. Pinnæ 6-12 pair, leaflets 10-30 pair, unequal-sided, the middle nerve near the upper edge, from a broad and obtuse base oblong-falcate, acute, ½-¾ in. long, ¼ in. broad at base. Flowers light rose-coloured, 1-1½ in. long to the extremity of stamens; peduncles 2-3 in. long, in fascicles of 2-3 from the upper axils, forming short corymbose racemes; pedicels short. Calyx and corolla pubescent, with white silky hairs. Calyx funnel-shaped, half the length of corolla. Filaments irregularly connate at the base, tube included. Legume linear, 4 in. long, ¾ in. broad, pubescent; seeds 4-6.

Outer Himalaya from the Indus to Sikkim, ascending to 5000, and at times to 6000 ft. North Persia, China, Japan. Generally on rocky but moist ground. Fl. April-June; the pods ripen in autumn and remain long on the tree. Cultivated in the Mediterranean region, and in America.

Trunk 5 ft. girth, with a large spreading head, growth rapid. Branchlets dark grey, stiff, flexuose, sulcate. Bark $\frac{1}{4}$ in. thick, dark grey, with long horizontal wrinkles, and whitish, elevated, oval spots; foliage bright green; growth fairly rapid, 3-4 rings in 1 in. of radius. Sapwood large, yellowish, with numerous white specks; heartwood dark, almost black in old trees, beautifully mottled with lighter and darker shades of colour apparently coinciding with the annual rings. Pores in small detached patches of whitish tissue. Medullary rays conspicuous, shining, very numerous. The wood is hard, strong, moderately heavy, and takes a good polish. Furniture is made of it.

6. *A. stipulata*, Boivin; Benth. l. c. 92; Bedd. Fl. Sylv. t. 55.—Syn. *Acacia stipulata*, DC.; W. & A. Prodr. 274. *A. Smithiana*, Wall.; *A. Kangraensis*, Hort. Sahar.; *Mimosa stipulacea*, Roxb. Fl. Ind. ii. 549. Vern. Oï, Oë, Sirin, shirsha, kasir, Pb.; Siran, kannjeria, N.W.P.; Pattia, samsundra, Oudh; Bummaizah, Burma.

A large tree, branchlets, petioles, and inflorescence tomentose or pubescent. Stipules large, semi-cordate, membranous, deciduous. Common petiole 6-12 in. long, with a large gland near the base; pinnæ 6-15 pair, 4-5 in. long; leaflets 20-40 pair, $\frac{1}{2}$ - $\frac{1}{4}$ in. long, from a broad base oblong-linear, the middle nerve near the upper edge, acute, pubescent. Flowers yellowish, inodorous, $\frac{1}{2}$ in. to 1 in. long to extremity of filaments; stamens slightly tinged with red. Calyx and corolla pubescent; calyx tubular, half the length of corolla, or somewhat less. Segments of corolla ovate. Flower-heads fasciculate in racemes, on peduncles 1 in. long, supported by broad bract-like ovate stipules, deciduous, and covered with ferruginous tomentum. Legumes 6 in. long, $\frac{3}{4}$ in. broad, with 8-12 seeds.

South India, Ceylon, Burma, Bengal. Oudh, sub-Himalayan tract west to the Indus, ascending to 4000 ft. Abundant in the Kangra valley, overtopping the coppice-wood of *Quercus annulata*. Young leaves Feb.-March; fl. April-June; pods ripen in autumn.

Attains 50 ft. in North India, trunk not very straight, dividing into large spreading limbs, which support a broad depressed crown, somewhat resembling that of *Poinciana regia*. Extremities of branchlets velvety, branches furrowed. Bark $\frac{1}{4}$ in. thick, dark grey, with numerous small vertical wrinkles, and a few larger horizontal furrows with prominent edges extending half-way round the trunk, which has the appearance as if it were constricted with cords, smooth pieces flaking off between the furrows. Sapwood large, white, readily attacked by insects; heartwood reddish brown. Pores large, prominently marked on a longitudinal section; weight of cub. ft. 48-56 lb. Not much valued in the Panjab Himalaya. (The wood of Bummaizah from Burma is beautifully mottled.) The branches are lopped for cattle-fodder.

7. *A. amara*, Boivin; Benth. l. c. iii. 90.—Syn. *Acacia amara*, Willd. *A. Wightii*, Grah.; W. & A. Prodr. 274. *Mimosa amara*, Roxb. Cor. Pl. t. 122; Fl. Ind. ii. 548. *M. pulchella*, Roxb. ib. Vern. Lullei, lallye, Dekkan.

An unarmed tree; branchlets, petioles, and inflorescence downy, with soft yellowish tomentum. Common petiole 2-4 in. long, pinnæ 6-15 pair. A circular gland on the petiole, and at the insertion of the uppermost pair. Leaflets small, numerous, linear, $\frac{1}{4}$ in. long, the midrib nearly in the middle of the leaflet. Peduncles fasciculate in the axils of the upper-

most leaves bearing yellow fragrant flower-heads of 12-20 sessile pubescent flowers. Corolla three times the length of calyx. Pod linear-oblong, with wavy edges, 4-6 in. long and 1 in. broad.

South India, the Dekkan, and near Mundlasyr (Mandleswar), north of the Nerbudda river (Jacquemont). Fl. April-June. Bark smooth, greenish. Skinner describes it as follows: "The wood is strong, fibrous, and stiff, close-grained, hard and durable, of a dark-brown colour, superior to Säl and Teak in transverse strength and direct cohesive power. Weight 70 lb. per cub. ft. seasoned, P.=1284. Used for beams of native houses, and in the construction of carts; the wood of the crooked branches is used for ploughs."

11. ACACIA, Willd.

Trees or shrubs (the Indian species) armed with prickles or stipular spines. Flowers small, yellow or white, in globose heads or cylindrical spikes, with numerous scaly paleæ between the flowers. Leaves bipinnate (the Indian species). Calyx and corolla usually 4-5-merous; calyx campanulate or cup-shaped, toothed or lobed. Petals valvate in bud, more or less connate or cohering. Stamens indefinite, free, generally very numerous, not exceeding $\frac{1}{2}$ inch in length; anthers minute. Pod dehiscent or indehiscent, seeds compressed.

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| Stipules spinescent, generally straight, more or less connate at base; trees or shrubs, not climbing. | |
| Flowers in lax spikes; pods thin, broadly falcate | 1. <i>A. Latronum</i> . |
| Flowers in globose heads; peduncles axillary, fasciculate. | |
| Bracts at the base of flower-head | 2. <i>A. Farnesiana</i> . |
| Bracts in the middle of peduncle. | |
| A tree; pods convex, moniliform, contracted between seeds | 3. <i>A. arabica</i> . |
| A shrub; pods flat, linear-oblong, $\frac{1}{2}$ in. broad; flowers sweet-scented | 4. <i>A. Jacquemonti</i> . |
| A shrub or small tree; pods flat, linear, $\frac{1}{2}$ in. broad; smell of flowers unpleasant | 5. <i>A. eburnea</i> . |
| Flowers in globose heads; peduncles paniculate | 6. <i>A. leucophlœa</i> . |
| Stipules not spinescent; two or three infra-stipular, generally recurved, prickles below the insertion of each leaf; flowers in cylindrical spikes; trees or shrubs, not climbing. | |
| Pods indehiscent or imperfectly dehiscent. | |
| Three infra-stipular prickles; common petiole 1-2 in. long | 7. <i>A. rupestris</i> . |
| Two infra-stipular prickles; common petiole 1-2 in. long | 8. <i>A. modesta</i> . |
| Two infra-stipular prickles; common petiole 3-6 in. long. | |
| Leaflets 15-30 pair, oblong-linear, $\frac{1}{2}$ in. long | 9. <i>A. ferruginea</i> . |
| Leaflets 6-8 pair, obovate or oblong, 1 in. long | 10. <i>A. lenticularis</i> . |
| Pods two-valved, dehiscent. | |
| Bark dark-coloured; petals 2-3 times longer than calyx | 11. <i>A. Catechu</i> . |
| Bark white; petals less than twice the length of calyx | 12. <i>A. Suma</i> . |
| Stipules not spinescent, prickles not infra-stipular, but scattered; flowers in globose heads; climbing shrubs. | |
| Pods thick, fleshy, imperfectly dehiscent | 13. <i>A. concinna</i> . |
| Pods thin, flat, dehiscent. | |
| Leaflets subfalcate, subcoriaceous, pale or rust-coloured beneath | 14. <i>A. casia</i> . |
| Leaflets narrow-linear, membranous, not pale beneath | 15. <i>A. pennata</i> . |

Several Australian species of this genus have been naturalised on the N

and elsewhere in India, the most important of which are : *A. dealbata*, Link. ; Benth. Fl. Austr. ii. 415. *The Silver Wattle* ; N.S. Wales, Victoria, and Tasmania ; a tree spreading rapidly by numberless root-suckers, with grey bipinnate hoary leaves, linear leaflets, and small yellow flower-heads in axillary and terminal panicles. *A. melanoxylon*, Australian Blackwood, R. Brown ; Benth. l. c. 388 ; N.S. Wales, Victoria, Tasmania, and South Australia ; a large tree with hard and durable wood, coriaceous phyllodia (vertically dilated leaf-stalks) instead of leaves, except on young trees which have partially bipinnate leaves. Flowers in globose compact heads on short axillary racemes. Sapwood small, heartwood dark brown, often beautifully feathered and mottled, strong and tough, used for axe-handles, other implements, and cabinet-work.

1. *A. Latronum*, Willd. ; Benth. in Lond. Jour. of Bot. i. (1842) 506 ; W. & A. Prodr. 273.—Syn. *Mimosa Latronum*, Roxb. Fl. Ind. ii. 559.

A shrub or small tree, armed with numerous stout stipular spines, connate at the base, generally of two kinds, the smaller $\frac{1}{2}$ -1 in. long, the larger 2 in. long, conical, ivory-white and hollow inside. Leaves often fasciculate, common petiole 1-1 $\frac{1}{2}$ in. long, a gland on the naked part ; pinnae 3-5 pair, 1 in. long or less ; leaflets 10-12 pair, small, linear, glabrous or pubescent. Spikes lax, subsessile, often fasciculate, 1-1 $\frac{1}{2}$ in. long, flowers white at first, turning yellow afterwards, fragrant. Pods thin, subcoriaceous, dehiscent, broadly falcate, 1-1 $\frac{1}{2}$ in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, 3-4-seeded.

South India, Dekkan. Fl. Jan.-March. Often gregarious, forms formidable thorny thickets. Bark dark brown, dotted with white.

Madden, l. c. 448, speaks of a "very beautiful and exceedingly bushy Acacia" in hot valleys of East Kamaon (vern. *Bhes*), "either *A. dumosa* or *Latronum*."

2. *A. Farnesiana*, Willd. ; Bedd. Fl. Sylv. t. 52.—Syn. *Mimosa Farnesiana*, Linn. ; Roxb. Fl. Ind. ii. 557. *Vachellia Farnesiana*, W. & A. Prodr. 272. Vern. *Vilāyati kīkar*, *vīlāyati babul*, *Gū-kīkar*.

A thorny shrub, glabrous or pubescent, armed with straight stipular spines. Common petiole 1 $\frac{1}{2}$ -2 in. long, pinnae 4-8 pair, cup-shaped glands below the lowest, and often at the base of the uppermost pair ; leaflets linear, ciliate or nearly glabrous, 10-20 pair. Flowers in globose heads, deep yellow, sweet-scented, supported by broad membranous bracts at the base of the head. Peduncles slender, 3-5, fasciculate. Calyx 5-toothed ; corolla tubular, 5-toothed. Pod 2-3 in. long, glabrous, with elevated, nearly parallel, reticulate lines, turgid, nearly cylindrical, scarcely dehiscent, filled with dry spongy tissue and a double row of seeds.

Cultivated all over India, indigenous in America, from New Orleans, Texas, Mexico, to Buenos Ayres and Chili. Fl. Feb., March. Exudes gum, which is collected in Sindh.

3. *A. arabica*, Willd. ; W. & A. Prodr. 277 ; Bedd. Fl. Sylv. t. 47.—Syn. *Mimosa arabica*, Lam. ; Roxb. Cor. Pl. t. 149 ; Fl. Ind. ii. 557. Vern. *Kīkar*, Pb. ; *Babbar*, Sindh ; *Babul*, *babūr*, N.W.P., Central India.

A tree, with thorny branches. Petioles, peduncles, and branchlets pubescent, leaves glabrous. Stipular spines spreading, generally straight, in length $\frac{1}{2}$ -2 in. long, smooth, generally whitish, with sharp, often

shining brown points. Pinnæ generally 3-6 pair; common petiole 1-2 in. long, cup-shaped glands at the base of the lowest, and generally also of the uppermost pair; leaflets linear, 10-20 pair. Peduncles slender, 3-5, fasciculate, with 2 opposite scaly bracts in the middle of the peduncle. Flowers golden yellow, in globose heads. Corolla campanulate. Pod stalked, compressed, 6 in. long, moniliform, much contracted at both sutures between the seeds, whitish-tomentose, rarely glabrous.

Cultivated or self-sown throughout the greater part of India, save in the most humid regions on the coast, and in the extreme North-West, beyond the Jhelam, where the winter-frost is too severe. Stunted trees are occasionally found as high as 3000-4000 ft. in the North-West Himalaya. In Sindh, near Delhi, in the Ghunna forest near Bhartpur, in Guzerat, and the Koruns of the Northern Dekkan, the tree forms extensive and generally pure forests; the pure Babul forests of Lower and Middle Sindh cover upwards of 27,000 acres. In North Sindh, Babul trees are found in small numbers as standards over underwood of Tamarisk. The tree is probably indigenous in Sindh, and perhaps also in the Northern Dekkan. In the Panjab it is not indigenous. Outside India it is found in Africa, Arabia (*A. nilotica*, Del. Boiss. Fl. Or. ii. 635), with glabrous pods, and (cultivated) in Persia and Afghanistan. The tree is never leafless; the young foliage comes out in Feb. and April. Fl. July-Sept. (Panjab).

Attains 50-60 ft., with a short, not very straight or regularly shaped trunk 10-15 ft. long, and 5-6 ft. girth, attaining 10-12 ft. under favourable conditions, the largest girth recorded being 16½ ft. near Multan (Edgeworth). Branches spreading, forming a fine broad shady crown. Bark thick, dark brown, nearly black, with deep narrow, regular longitudinal fissures, joined by short cross-cracks. Inner bark reddish brown, very fibrous. The sapwood is large, and generally occupies the fifth or sixth part of the radius; it is whitish, coarse-grained, and soft. The heartwood is pale red, nearly colourless when fresh-cut, but on exposure to the air turns red or dark reddish brown, often with blackish streaks. Pores numerous, uniformly distributed, generally surrounded by a small rounded patch of lighter-coloured tissue, often close together in the inner belt of each annual ring, the outer belt having fewer pores, and appearing on that account of a darker colour. Medullary rays numerous; on a longitudinal section the pores and the shining plates or bands of the medullary rays are very prominent. The green wood weighs between 69 and 72 lb. (Stewart), the weight of seasoned wood in the Panjab is 48 (Stewart), in Gwalior 53.7 (Cunningham), and Skinner gives the average (for wood from South India) at 54 lb. The value of P. is 884 (Skinner) and 875, extremes 743 and 1201 (Cunningham). The wood is tough and close-grained, very durable if water-seasoned. It is used extensively for naves, spokes, and felloes of wheels, for well-curbs, sugar-rollers, oil-presses, and rice-pounders, agricultural implements, mallets, axe-handles, and tent-pegs. In Sindh it is much employed in boat-building, particularly for knees and crooked timbers. For construction it is rarely possible to get pieces sufficiently long, but in Sindh it is often used for rafters. It is also used for railway-sleepers. It is an excellent fuel, and has greater heating powers than either *Prosopis* *spicigera* or the *Tamarisk*.

A gum, similar to gum-arabic, exudes in large quantities from wounds in bark; it is collected and used in native medicine, by dyers and cloth-printers, and with the gum of other trees it forms part of the East Indian gum-resin. In Sindh and Guzerat much Lakh is produced on the tree, particularly on small half-dry branches. When once the insect attacks a tree, it kills rapidly, killing the small branches as it proceeds, and it is said that the trees were not the twigs cut off with the Lakh. Good crop

however, occur only after one or two dry years, and are said to foretell an unhealthy season. The bark is used for tanning and dyeing, and a decoction of it is used to wash the hair. It is a powerful astringent (Pharm. Ind. 77). In times of scarcity it is ground and mixed with flour. The bark of the root is much used in the preparation of native spirits. The unripe pod, which is very astringent, makes (with an iron-salt) excellent ink; in Africa the pods are used for tanning. Camels, cattle, goats, and sheep delight in the green pods with the tender shoots and leaves; and to obtain the pods and leaves, the trees are often extensively lopped and mutilated.

The Kikar has been cultivated on a large scale in the plantations of the Panjab plains. North-west of the Sutlej river, however, the result has hitherto been unsatisfactory. With sufficient moisture the seed springs up readily, and at first the growth is most rapid and luxuriant. But the plants are mostly cut down by the frosts of December and January; and though they generally shoot up again, the fresh shoots are cut back by the cold of successive seasons, and young trees 10-15 ft. high may often be seen killed by frost to the root. The end is, that a large proportion of trees perish; and thus it has come to pass, that in many places where Sissoo and Kikar had been sown in equal proportions, or where even a larger proportion of the Acacia had been sown, the result has been a forest almost exclusively composed of Sissoo. There are, however, numerous exceptions; successful and thriving Kikar plantations are in existence in the Northern Panjab, between the Chenab and Jhelam rivers, and self-sown Kikar springs up abundantly in fields. Young Beech and silver Fir frequently suffer from frost in their native home in the midst of self-sown forests of their own kind. The latest experience in the Panjab seems to show that Kikar interspersed among other trees escaped the frost, but died when sown by itself in lines. South-east of the Sutlej river, the tree suffers less. Besides frost, the Kikar in its young state has many enemies. The roots are sweetish, and are eaten greedily by rats; pigs also are fond of them, and often dig up young plants; in Sindh the porcupine gnaws the bark round the base of the trunk, and the leaves are often eaten by insects. Young Kikar sends down its tap-root much deeper than Sissoo; in older trees, however, the side-roots develop more than the tap-root, and old Kikar is shallow-rooted and easily blown over. The rate of growth is less rapid than of Sissoo, but more rapid than of *Zizyphus Jujuba*. In the Panjab it attains a girth of 2½ ft. in about twelve, and of 5 ft. in about thirty years. In the forests of Lower and Middle Sindh the average growth has been ascertained to be—

At 35 years 4 ft. girth, measured 4 ft. from the ground.

„ 55 „ 6 „ „ „ „

These are averages; under favourable circumstances a much more rapid growth has been noticed. Thus at Jacobabad in Sindh, the Kikar, planted when the station was established in 1844, has attained, in common with the Sissoo and other trees, in less than thirty years 50-60 ft., with girths of 6-8 ft.

The Kikar is not very long-lived, and old trees are generally hollow. It thrives on light and heavy soils, and will even live on Kankar, if the bed is not too thick. It demands a great amount of light, and while young thrives best in a loose soil, ploughed or otherwise, where the air has free access to the roots. The tree coppices fairly well, and may be grown from cuttings. It forms a good firewood when trimmed. Several varieties of this important tree have been described, the most important is var. *cupressiformis*—vern. *Kabuli-kikar*, *kabuli-kikari*. A tall broom-like tree, with close ascending branches, somewhat like a Cypress, common in parts of the Panjab, particularly in the Jech between Jhelam and Chenab, near the station of Jhelam, and about Jhang; also in Sindh, Rajputana (*Bauli*, at Nibahera), near Delhi, and in the

Dekkan. (*Rām kanta*, *rām babūl*.) This variety is easily raised from seed, the seedlings showing at once their peculiar character; in poor soil and with little moisture it is as hardy as the ordinary kind, but its growth appears to be slower. Trees are occasionally found with the branches on one side bent over, while those on the other are erect and ascending. Edgeworth states that near Multan the cupressiform variety and the ordinary form may at times be seen on the same tree.

The variety called *spina albida* is probably no variety at all. All strong young shoots from stumps of felled trees, or from a browsed or mutilated young tree, or luxuriantly growing young plants, have generally very long, strong, white spines, and this has probably given rise to the idea of a variety with white spines.

4. **A. Jacquemonti**, Benth. in London Journ. of Botany, i. (1842) 499. —Vern. *Hanza*, Afg.; *Kikar*, *babūl*, *bamūl*, *babbūl*, Pb.; *Ratabauli*, Guzerat.

A small bushy shrub, with stiff flexuose smooth brown branches. Glabrous, stipular spines straight, 1-1½ in. long, ivory-white, connate at base. Pinnae generally 2-4 pair; common petiole 1-2 in. long; glands small and indistinct; leaflets 5-10 pair, oblong-linear, somewhat fleshy. Peduncles fascicled, 5-10 from each axil, with 2 opposite scaly bracts about the middle of the peduncle. Flowers capitate, yellow, sweet-scented. Legume stipitate, 2-3 in. long, flat, glabrous, broad-linear, ½ in. broad.

East flank of Suliman range, ascending to 2500, and at times to 3200 ft. Outer Himalaya near the Jhelam, to about the same elevation. Panjab plains, Sindh, banks of the Nerbudda (Jacquemont). Common in ravines and dry water-courses in Rajputana and North Guzerat. Fl. Feb.-May. Bark dark-red brown, rarely cinereous, somewhat sulcate, but smooth and never speckled. The bark of the root is used in the distillation of spirits; the branches are cut, and leaves thrashed out with sticks to be used as fodder.

5. **A. eburnea**, Willd.; W. & A. Prodr. 276. —Syn. *Mimosa eburnea*, Roxb. Pl. Cor. t. 199; Fl. Ind. ii. 558. Vern. *Marmat*, Dekkan.

A large shrub or small tree. Branchlets hairy or glabrous, armed with straight spines, often ivory-white, and 1-2 in. long. Pinnae 2-4 pair; common petiole ½-1 in. long, with a large cup-shaped gland at the insertion of the uppermost pair, and often another gland below the lowest pair. Leaflets 6-8 pair, small, oblong; petioles and leaflets often ciliate with long hairs. Peduncles axillary, solitary or several, bearing globose, golden-yellow flower-heads, with a pair of membranous bracts below the middle. Corolla tubulose; paleæ cuneate, ciliate. Flowers with a somewhat unpleasant smell. Pods generally 2-4 at the apex of the peduncle, from or flower-head, narrow-linear, 2-5 in. long, ¼ in. broad, slightly contract between the seeds. Seeds 8-12.

East flank of Suliman range, ascending to 3000 ft., rarely to 5000 ft., the Salt range. Outer Himalaya, as far east as Kamaon. Rocky beds of in Oudh (R. Th.) Sindh, Oujein, the Dekkan, and South India. Afghanistan, and at Aden. Generally found in dry, barren places. Jan.; fr. May, June. Generally a shrub, at times a small tree 14-15 ft. with erect trunk, stiff divaricate, scrubby branches, and sparse grey bark dark grey or reddish brown.

6. *A. leucophlœa*, Willd.—Tab. XXVII.—W. & A. Prodr. 277; Bedd. Fl. Sylv. t. 48.—Syn. *Mimosa leucophlœa*, Roxb. Cor. Pl. t. 150; Fl. Ind. ii. 558. Vern. *Reru*, *raunj*, *karir*, *nimbar*, North India; *Ringa*, *rinj*, *reunja*, *rohani*, *jhind*, C.P.; *Arinj*, *areinj* (*Khejra* in South Meywar, near Bassi and Sadri), Rajputana; *Raundra*, *runjra*, Banswara; *Jhand*, Jallander Doab, and about Delhi; *Hewar*, South. Mar. country.

A thorny tree, branchlets, petioles, leaves, and branches of inflorescence grey-tomentose. Armed with strong, straight stipular spines. Common petiole 1-2½ in. long; pinnae 5-12 pair; small, circular, cup-shaped glands generally at the insertion of each pair. Leaflets 12-30 pair, linear. Flowers pale yellow, nearly white, in globose heads, on short peduncles, arranged in large terminal, leafless panicles; two membranous bracts on the peduncle. Pods linear, 4-6 in. long, ½ in. broad, solitary, or 2-3 on one peduncle, clothed with short brown tomentum. Seeds 8-12.

Plains of the Panjab from Lahore to Delhi. Siwalik hills, between the Jumna and Ravi. Bandelkhand, Rajputana, the Satpura range, Khandeish, and South India. Ceylon, Burma, and Java. Young leaves in April. Fl. Aug.-Nov., sometimes as early as May; fr. Nov.-April.

Attains in places a considerable size, 6 ft. girth, with a crooked, gnarled trunk. Near Amritsar a specimen 15 ft. girth, and 80 ft. high, is said to have been found. Trunk generally taller than that of *A. arabica*, branches ascending, less numerous. On the dry hills of Mairwara, near Todgarh (normal rainfall about 12 in.), this is a thorny shrub or small tree, with 2-4 pair of pinnae, and 8-10 pair of leaflets.

Bark thin, cinereous, yellowish, or light brown, with few deep narrow, longitudinal fissures, and short shallow cross-cracks, smooth between. Inner substance dark brown. Sapwood whitish, open, porous, and coarse-grained; heartwood small, reddish or dark purple, with darker wavy, concentric streaks, close- and fine-grained. Seasons well, and takes a fine polish, but is somewhat brittle. Strong and tough, but often eaten by insects. Skinner gives the weight of seasoned wood 55, of green wood 62 lb., and the value of P. 860. An excellent fuel for locomotives.

The bark is ground and mixed with flour during times of scarcity. In South India the bark is largely used in the preparation of spirits from sugar and palm-juice, and it is added on account of the tannin it contains, in order to precipitate the albuminous substances of the juice. The right of collecting the bark is often farmed out. By steeping the bark in water for 4-5 days, and beating it, a tough fibre is made, used for making nets and coarse cordage.

Large woody excrescences are often formed on the branches, somewhat resembling those of *Prosopis spicigera*, but more spongy in structure. Young pods are used as vegetables, and the seeds are ground and mixed with flour.

7. *A. rupestris*, Stocks; Boissier Fl. Orient. ii. 638.—Vern. *Khor*, *Kh*; *Kumta*, Rajputana.

Small thorny tree, 6-12 ft. high, branchlets and petioles pubescent. Armed with 3 infra-stipular prickles, the 2 lateral straight, the third curved, all shining brown, compressed, and decurrent. Leaves 1-2 in. long, 3-5 pair; petiole armed with numerous whitish prickles, and below the lowest pair, and between the end pair of pinnae. Pods linear, ciliate. Spikes lax, 3-5 in. long, on short peduncles.

Flowers fragrant. Calyx green, teeth short, triangular, corolla and filaments white. Anthers lemon-yellow. Pod thin, flexible, pubescent when young, brown when ripe, sub-dehiscent, thickened at the edges, veined on the surface, linear-oblong, 3 in. long, $\frac{3}{4}$ in. broad. (The specimens collected in Rajputana are without prickles on the petioles.)

Dry rocky hills of Sindh, Northern Aravalli hills, near Kishengarh, Todgarh, and Bednor. In flower and fruit in Dec. 1869 (D.B.) Bark smooth, yellowish grey, wood light yellow, heavy and hard, with small irregular masses of black heartwood in the centre. Takes a beautiful polish. Used for weavers' shuttles. Exudes gum, which is collected in Sindh, and sold with that of *A. arabica*.

Another species, with 3 infra-stipular prickles and an armed petiole, but with a short broad pod 2 in. long, is *A. hamulosa*, Benth. l. c. 509. Aden and Arabia.

8. *A. modesta*,* Wall. Pl. As. rar. t. 130; Jacqu. Voy. Bot. t. 56; Boissier Fl. Orient. ii. 638.—Syn. *A. dumosa*, W. & A. Prodr. 274. *Mimosa dumosa*, Roxb. Fl. Ind. ii. 559, and probably *M. obovata*, Roxb. ib. 561. Vern. Palosa, Afg.; Phala, phalāi, phulāhi, Ph.

A thorny, moderate-sized tree, rarely unarmed, with grey foliage. Glabrous, a few scattered hairs on petiole and peduncle. Armed with twin, strong, shining dark-brown conical infra-stipular prickles. Leaves pale grey or glaucous; pinnae 2-3 pair; leaflets 3-5 pair, obliquely oblong or obovate. Common petiole 1-2 in. long, a small round gland below the lowest pair of pinnae. Stipules minute, deciduous. Flowers white or pale yellow, sweet-scented, nearly sessile, in lax, cylindrical, drooping spikes, the spikes solitary or 2-3 together, 1-2 in. long, on slender peduncles. Petals connate beyond the middle. Pod stalked, flat, indehiscent, linear-oblong, 2-3 in. long, $\frac{1}{2}$ in. broad. Seeds 3-5, compressed.

Trans-Indus, in places abundant, in the plains and on the east flank of the Suliman range, ascending to 4000, and at times to 4500 ft. Common in the Salt range, and in the northern part of the Panjab plains, extending to Saharanpur and Delhi. Sub-Himalayan tract and outer hills between Indus and Sutlej, ascending to 3000 ft. Afghanistan. Leaves change in March. Fl. March, April, the white flower-spikes contrasting elegantly with the delicate green colour of the young foliage; but the flowers fade soon, and the leaves turn into an ash-grey colour. Fr. autumn; the pods remain on the tree for months.

25-30 ft. high, trunk short, at times 10-12 ft. girth; branches stiff, divaric forming a bushy, rounded crown. Branchlets drooping. Bark rough, wit multitude of irregular narrow cracks. Sapwood large, coarse-grained, somewhat glossy on a longitudinal section. Heartwood dark brown, nearly black, cl grained, compact and heavy. Stewart found the cub. ft. of seasoned wood weigh 53.4 to 56 lb., and of green wood 69.5 to 76 lb. Strong and durable, fit for cart-wheels, sugar-cane crushers, ploughs, teeth of harrows, and P water-wheels. A tasteless gum exudes from wounds in the bark. The and fallen blossoms are collected for cattle-fodder.

The tree is readily raised from seed, and answers admirably for hed growth is slow, much slower than that of Sissoo or Kikar.

9. *A. ferruginea*, DC.; Bedd. Fl. Sylv. t. 51; W. & A. Pr

* I retain Wallich's as the safer name, being supported by his excellent description, for the identity of the tree with *A. dumosa*, W. & A., is doubted.

Syn. *Mimosa ferruginea*, Roxb. Fl. Ind. ii. 561. Vern. *Kaiger*, Panch Mehals.

A large tree, with rough, dark-coloured bark; glabrous, armed with twin, short, infra-stipular prickles, rarely unarmed. Common petiole 3-6 in. long, common and secondary petioles with thickened base; glands small, circular or linear at the base of the upper pairs of pinnæ, and 1 below the pinnæ; leaflets oblong-linear, grey or glaucous, 15-30 pair; pinnæ 4-6 pair, 2-3 in. long. Flowers pale yellow, in lax, axillary spikes, 4-5 in. long, the spikes often numerous, and sub-paniculate near the ends of branches. Calyx about $\frac{1}{2}$ the length of corolla, with short triangular teeth. Pods glabrous, light or dark brown, 3-4 in. long, flat, thin, indehiscent, nearly 1 in. broad.

South India, the Konkan, Mundlaisir, and forests of the Panch Mehals in Guzerat. Fr. Jan., Feb. Bark strongly astringent, used, like that of *leucophaea*, in the distillation of arrack (Bedd.) Heartwood reddish brown.

The tree in the Panch Mehals was identified by Mr Dalzell, in his list of the P.M. trees, April 1863, with *A. Verek*, Guillemin et Perrotet, Fl. Senegambie, t. 56, a tree, which forms large forests north of the Senegal river, extending to the edge of the desert; is also found in Nubia and Kordofan, and yields some of the best kinds of gum-arabic. But *A. Verek* has (generally) a third infra-stipular prickle. The prickles have a broad decurrent base, and the leaves are smaller and hairy.

10. *A. lenticularis*, Hamilton; Benth. l. c. 508.

A small tree; perfectly glabrous, armed with twin infra-stipular prickles, or unarmed; leaves large glaucous; common petiole 3-6 in. long; pinnæ 2-3 pair; leaflets 6-8 pair, about 1 in. long, obovate or oblong, obtuse. Flowers sessile, in axillary spikes, 3-5 in. long; corolla more than twice the length of calyx. Legume linear, flat, membranous, indehiscent, 6-9 in. long, 1 in. broad.

Siwaliks of Kamaon, Rajmahal hills. Reported from the Central Provinces, but I have not seen specimens. This is probably "*Khyr*" of Madden, Journ. As. Soc. xvii. I. 570, "an armed tree with the blossoms of the *Khyr* and the fruit of the *Siris*; wood excellent. Forests about Burmdeo and Punagiri."

11. *A. Catechu*, Willd.—Syn. *Mimosa Catechu*, Linn. Suppl. 439; xb. Cor. Pl. t. 175. *M. Sundra*, Roxb. l. c. t. 225. *Acacia catechu*, Benth. *A. Sundra*, DC.; Benth. l. c. 510. *A. Sandra*, Bedd. Fl. v. t. 50. Vern. *Khair*, *kheir*, *Kher*. (*Shaben*, Burm.)

A moderate-sized tree, with thorny branches and rough dark-coloured bark. Branchlets and petioles generally dark-brown or purple, glabrous, unarmed; below the insertion of each leaf a pair of compressed, sharp, shining, infra-stipular prickles. Common petiole 3-4 in. long, armed with scattered prickles, a gland below the lowest pair of glands and at the insertion of the 3-4 uppermost pairs. Pinnæ 10-20 pair, leaflets numerous, linear, imbricate, glabrous or pubescent, less than 1 in. long, generally turning brown in drying. Spikes lax, axillary, pedunculate, 2-4 in. long, solitary or fascicled, flowers pale yellow. Petals linear, connate at the base, 2-3 times longer

than calyx. Pods stipitate, thin, brown, shining, 2-3 in. long, $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, seeds 3-10.

Common in most parts of India and Burma. Apparently not indigenous in Sindh, but common in the Aravalli hills, and in the sub-Himalayan tract, extending west to the Indus, and ascending to 3000 ft. in the valleys. Ceylon, and Eastern Africa. Generally gregarious in the sub-Himalayan tract, on islands, and the banks of rivers near their entrance into the plains. Fl. May-July; fr. autumn; the pods remain long on the tree. The old leaves are shed in Feb.-March; the new foliage appears March-April.

30-40 ft. high, trunk short, not very straight, 4-6 ft. girth, attaining 10 ft. Branches straggling, thorny; foliage light, feathery. When cut or lopped it is often reduced to a low-tangled shrub, with long, thorny branches. Bark $\frac{1}{2}$ - $\frac{3}{4}$ in. thick, dark grey, or greyish brown, in old trees nearly black, rough and exfoliating in long narrow strips or scales. Inner bark reddish, fibrous. Sapwood large, yellowish white; heartwood dark red, extremely hard, annual rings indistinct. Medullary rays numerous; pores uniformly distributed, each surrounded by a patch of lighter-coloured tissue. Cunningham determined the weight of wood grown in Gwalior at 70.2 lb., the value of P. resulting from his experiments is 779. Of wood grown in the Central Provinces, the weight is given as 75.4 (R. Th.), (76.5 unseasoned), and 79.2 (Centr. Prov. List). These last figures are high, and the question naturally arises whether the woods were really seasoned. From Burma two varieties are mentioned in my list of Burma woods (1862), Nos. 29 and 30, weighing 56 and 70 lb. respectively. There is thus still some uncertainty regarding the weight of the wood of this tree, and this uncertainty is increased by the confusion which has hitherto existed in the nomenclature of this and the allied species. Skinner's list does not contain *A. Catechu*, but he describes two woods which he calls *Acacia Suma* (*Tella Sundra*, Telugu), weight 77, P.=801, and *Acacia Sundra* (*Nulla Sundra*, Telugu), weight 81, P.=915. R. Thompson gives the weight of *A. Sundra* (from the Centr. Prov.) at 60 lb. seasoned, and 81 lb. green. I do not venture to decide to which of the species here described these specimens belonged. The wood seasons well, takes a fine polish; the sap is apt to be eaten by insects; the heartwood is exceedingly durable, even more so than Teak. It is not attacked by white ants, and not touched by *Teredo navalis*. It is used for rice-pestles, sugar-cane and oil-seed crushers, cotton-rollers, wheel-wright's work, ploughs bows, spear- and sword-handles. In Burma it is preferred to all other wood for house-posts. In North India it is considered to yield the best charcoal for house-posts. The bark is very astringent, rather bitter, in places for blacksmith's work. The most valuable product of the tree, however, is *Catechu* (*Katha*). The heartwood is cut into chips, which are boiled in water in earthen pots, the red solution is poured off, and boiled again over fresh water, and after this has been repeated several times, it is boiled down in large flat iron bowls to the thickness of a black paste, which, when dry, is the *Catechu* of commerce, a heavy compact mass, with a shining dark-brown fracture. In this manner Cutch is manufactured in Pegu, and the value of it in India is similar. Pale Catechu is a more earthy substance of a reddish colour. Madden (l. c. 565) describes the *Katha* made in Kachin, consisting of leaves and twigs thrown into the concentrated liquor. Catechu is a most valuable article, extensively consumed in the East, for Betel-leaf, and largely exported to Europe for dyeing and tanning, and very astringent, and is used medicinally (Pharm. Ind. 62).

12. *A. Suma*, Kurz. MSS.—Syn. *Mimosa Suma*, Roxb. Ill. in Herb. Kew, t. 1867; *Acacia Catechu*, Benth. l.

Sylv. t. 49. Vern. *Sai-kanta*, Beng.; *Kumtia*, Pertabgarh; *Dhaula khejra* (white Acacia), Banswara. *Gorādo*, Mandevi; *Son kairi*, Dangs.

A large tree with white bark. Branches flexuose, branchlets and petioles downy with whitish or grey soft pubescence. Below the insertion of each leaf a pair of sharp conical infra-stipular prickles, downy while young, brown shining afterwards. Common petiole 4-10 in. long, unarmed, a large cup-shaped gland, oval, and often $\frac{1}{10}$ in. long near the base, or half-way between the base and the first pair of pinnæ; smaller circular glands at the insertion of the upper 3-10 pair; pinnæ 10-20 pair; leaflets numerous, linear, $\frac{1}{4}$ in. long, imbricate or approximate, pubescent and ciliate, grey or greyish green when dry. Flowers pale yellow, sessile, in lax, axillary, cylindrical, pedunculate spikes, often interrupted at the base. Petals more or less cohering beyond the middle, less than twice the length of calyx. Peduncles and calyx downy with soft grey pubescence. Spikes 2-4 in. long, generally fasciculate, and paniculate at the ends of branches. Pods stipitate, thin, 2-4 in. long.

South India (common in Mysore, between Shemoga and Bangalur), Bengal, Guzerat, extending north to Banswara and Pertabgarh (D.B., 1870). Fl. May-Aug. Large conical thorns on the white bark. Heartwood red, catechu made of it. Bark (in Pertabgarh) peeled off and used for tanning.

There is considerable confusion in the synonyms of these two species. For the first, which is the most generally distributed Catechu-yielding Acacia, and is readily distinguished by the dark-coloured bark, I maintain Willdenow's name, *Acacia Catechu*, as he quotes (iv. 1079), t. 175, of the Corom. Plants, and I unite with it *A. catechuoides*, Benth., which does not appear to me to be specifically distinct. For the second species, with white-coloured bark, Mr Sulpiz Kurz has, I understand, adopted Roxburgh's name *Suma*, which to me also seems the most appropriate. The excellent description of the Flora Indica is supported by the admirable manuscript-drawing quoted above. This species I do not know from North India. Mr R. Thompson notes, besides *A. Catechu*, *A. Sundra*, from Oudh and the Central Provinces; this may be *Suma*, but unfortunately I have not seen his specimens. I do not venture to identify Willdenow's *A. polyacantha* with *Suma*, nor do I feel sure which species are meant by *A. Catechu* and *Sundra* of Wight and Arnott's Prodrômus. In Beddome's Sylv. t. 49, *A. Catechu* (*Suma*) is said to have a dark-brown bark, but error is corrected in p. xcv of the Manual.

A. concinna, DC. ; W. & A. Prodr. 277.—Syn. *Mimosa concinna*, Roxb. Fl. Ind. ii. 565. Vern. *Ailah*, *rassaul*, Oudh; *Ban-ritha* (pap-nut), Beng.; *Sikikāi*, *sikekāi*, Dekkan.

climbing and prickly shrub; branchlets, petioles, and peduncles tose or pubescent, and armed with numerous scattered sharp prickles. Common petiole 3-4 in. long, with a gland below of pinnæ, and 1 or 2 glands at the insertion of the upper. Pinnæ 4-6 pair; leaflets 12-20 pair, linear, from a rounded base, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, glabrous or ciliate when full grown. emicordate, striate. Flower-buds purple; flowers yellow. s. Calyx and corolla thinly membranous, pubescent. ll over, or with a few isolated hairs. Flower-heads on $\frac{1}{2}$ in. long, fasciculate, forming racemose panicles at

the ends of branches. Pods thick, fleshy, imperfectly dehiscent, somewhat contracted between seeds, 4-5 in. long, 1 in. broad.

South India, Bengal, Burma, Indian Archipelago. Abundant in the Oudh forests. Fl. March-July; the fr. ripens in the ensuing cold season. The pods (and in Oudh the pounded leaves also) are used for washing the hair. The leaves are acid, and are eaten.

A. rugata, Ham.; Benth. l. c. 514 (ovary villose), does not in my opinion differ from *A. concinna*. In the specimens of both *concinna* and *rugata* examined by me, the ovaries are always more or less hairy, and this is the main character given. I follow Wight and Arnott in maintaining the name *A. concinna* for the united species.

14. *A. cæsia*, W. & A. Prodr. 278.—Syn. *Mimosa cæsia*, Linn.; Roxb. ii. 565. *Acacia Intsia*, Willd.; W. & A. Prodr. l. c.; Benth. l. c. 515. Vern. *Katrar*, Kamaon.

A large climbing and prickly shrub; branchlets, petioles, and peduncles pubescent, and armed with short, conical, sharp, scattered prickles. Branchlets and petioles angled and sulcate. Common petiole 3-12 in. long, with oblong, raised convex glands, one above its base, and 2 or 3 smaller glands at the base of the uppermost pinna; pinnae 4-15 pair; leaflets 10-30 pair, subcoriaceous, pubescent, shining above, pale or rust-coloured beneath, subfalcate or from an oblique base linear-oblong, acute. Stipules deciduous, linear or lanceolate, striate. Flower-buds brown or greenish white; flowers pale yellow, in globose pedunculate heads. Peduncles fasciculate, in large terminal panicles. Pods thin, flat, dehiscent, 4-6 in. long, 1 in. broad; rusty, or brown-tomentose when young, glabrous afterwards.

Common in most parts of India and Burma. In the sub-Himalayan tract to the Chenab, ascending to 4000 ft. in Kamaon. Fl. April-Aug.; the pods ripen in autumn.

15. *A. pennata*, Willd.; W. & A. Prodr. 277.—Syn. *Mim. pennata*, Roxb. Fl. Ind. ii. 565. Vern. *Agla*, *areal*, Kamaon.

Differs from *A. cæsia* by narrow linear leaflets, not pale beneath, and a flat raised oval gland half-way between the base of the common petiole and the first pair of pinnae, and glabrous pods. else-
the fruit
red dark-

South India, Bengal, Burma, Indian Archipelago. Nepal, Kamaon, and ern. Tāra,
forests. Fl. June-Aug.

ORDER XXXII. ROSACEÆ.

Herbs, shrubs, or trees, with alternate, rarely opposite, simple or compound, stipulate leaves, and regular flowers. Calyx superior, without glands. Gamosepalous; lobes 5, the 5th next the axis, imbricate, persistent or glabrous annular, or lining the calyx-tube. Petals 5, rarely more, or subglobose, $\frac{1}{3}$ in. often orbicular and concave, deciduous, imbricate, clawed. Stamens numerous, rarely 1 or few, inserted with the disc, 1- to multiseriate, incurved in bud; anthers $\frac{1}{2}$ to 1 ft. Common in the Himalayas (5000-7000 ft.), Chenab (500 ft.), Sutlej (8000 ft.).

styles as many, free or connate; ovules 1 or 2, usually collateral in each carpel, rarely more. Fruit various, a pome, or one or many drupe-achenes or follicles, rarely a berry or capsule. Albumen scanty or none, cotyledons plano-convex, radicle short.—Gen. Pl. i. 600; Royle III. 201; Wight III. i. 199.

Ripe carpels not enclosed within the calyx-tube.

Carpel 1. Fruit a drupe.

- | | |
|---|---------------|
| Style terminal; drupe with a hard, bony stone . . . | 1. PRUNUS. |
| Style basal; drupe with a coriaceous endocarp . . . | 2. PRINSEPIA. |
| Carpels many, fruit of many small drupes . . . | 3. RUBUS. |

Ripe carpels enclosed within the calyx-tube.

Carpels many, 1 pendulous ovule in each. Fruit of many free achenes enclosed in the fleshy calyx-tube . . . 4. ROSA.

Carpels 1-5; ovules 2 collateral in each carpel; fruit fleshy, 1-2- or 5-celled.

- | | |
|--|-----------------|
| Fruit 2-5-celled; cells with cartilaginous walls . . . | 5. PYRUS. |
| Fruit a drupe, with 1-5 included stones . . . | 6. CRATÆGUS. |
| Fruit a drupe, with 3-5 bony half-exserted stones . . . | 7. COTONEASTER. |
| Fruit a drupe, including a 5-celled, dehiscent capsule with crustaceous valves . . . | 8. STRANVÆSIA. |

1. PRUNUS, Linn.

Shrubs or trees with alternate, simple, glandular-serrate leaves; petioles with 2 glands. Flowers white or red, solitary, corymbose or racemose. Calyx deciduous. Petals 5. Stamens 15-39, perigynous; filaments free. Carpel 1; style terminal; ovules 2, collateral, pendulous. Drupe with an indehiscent or 2-valved, 1-seeded, smooth or rugged stone. Seed pendulous; testa membranous; albumen scanty or none.

Flowers fasciculate, umbellate, or solitary.

Pericarp tough, dry, fibrous; flowers before the leaves . . . 1. *P. Amygdalus*.

Pericarp a soft fleshy pulp.

Flowers solitary or twin, appearing before or with the leaves.

- | | |
|--|--------------------------|
| Leaves oblong-lanceolate, conduplicate in bud . . . | 2. <i>P. persica</i> . |
| other Leaves cordate or ovate, convolute in bud . . . | 3. <i>P. armeniaca</i> . |
| in the Leaves ovate or ovate-lanceolate, convolute in bud . . . | 4. <i>P. communis</i> . |
| rapori Flowers fasciculate or umbellate, appearing after the leaves. | |
| grey bud Calyx turbinate; leaves glabrous . . . | 5. <i>P. Cerasus</i> . |
| and after Calyx long-tubular; leaves white-tomentose beneath . . . | 6. <i>P. prostrata</i> . |
| arid parts Flowers umbellate, appearing before the leaves . . . | 7. <i>P. Puddum</i> . |
| North China in racemes or corymbs. | |
| several varieties oblong; flowers in long drooping racemes . . . | 8. <i>P. Padus</i> . |
| white or pinkish ovate; flowers in pedunculate corymbs . . . | 9. <i>P. Mahaleb</i> . |

mir by T. Th. *nygdalus*, Baillon Histoire des plantes, i. 415.—Syn. *Amygd* softly-tomentous, Linn.; Roxb. Fl. Ind. ii. 500; Boissier Fl. Orient. ii. is similar to *P. lmond-tree*. Vern. *Badām*.

and cultivated in small-sized, deciduous, glabrous tree, with light-green foliage, as a remedy again

all grown. Leaves oblong-lanceolate, conduplicate in bud, 8. *P. Padus*, L., glandular, as long as the greatest width of leaf, or longer. sler Fl. Orient. ii. fimbriate. Flowers white, tinged with red, appearing Bird Cherry. Vern. on short peduncles, twin or solitary, from scaly buds *jamu*, *jamui*, *chûle*, &c. Calyx campanulate. Drupe velvety, pericarp dry,

* The honeydew is possible when ripe. Stone compressed, with shallow

wrinkles and minute holes. Cotyledons large, plano-convex, filled with oil; albumen none.

Cultivated in Afghanistan and Persia, whence large quantities of (sweet and some bitter) almonds are brought to India. Also in Kashmir and the plains of the Panjab. Indigenous on the Anti-Lebanon, in Kurdistan, the Caucasus (doubtfully), and in Turkestan. Naturalised in Greece and North Africa. Hardy in England, where it flowers in February. In the Panjab the fruit is scanty, and not good. The Almond was known to Theophrastus and other classical writers.

2. *P. persica*, Benth. & Hook. fil.—Syn. *Amygdalus Persica*, Linn.; Roxb. Fl. Ind. ii. 500. *Persica vulgaris*, Mill.; Boissier Fl. Orient. ii. 640. The Peach with velvety, and *Nectarine* with smooth fruit.—Vern. *Ghuwarshtāi*, Afg.; *Aru*, *aōr*, *chinnanu*, *beinni*, *beimu*, Pb.; *Aru*, N.W.P.

A moderate-sized, deciduous tree, with dark-green foliage; glabrous. Leaves oblong-lanceolate, conduplicate in bud, serrate, petiole with 2-4 glands, or without glands, shorter than greatest width of leaf; stipules subulate, fimbriate. Flowers rose-coloured, appearing before or with the leaves, sessile, from scaly buds on last year's wood. Calyx campanulate. Drupe downy or smooth, with a tender succulent sapid pericarp, the stone deep and irregularly furrowed. Cotyledons large, plano-convex, filled with oil; albumen none.

Commonly cultivated in the Himalaya from the Indus to Sikkim, also Trans-Indus, in the plains of the Panjab, the Dekkan, in Afghanistan, Western Asia, Europe, and China. It is certainly naturalised in the N.W. Himalaya, and is often found apparently wild. In the same way it has been found in North Persia and in Transcaucasia, but it seems more probable that the peach-tree is originally indigenous in China, where its cultivation has been traced back to the tenth century B.C. Into South Europe it was introduced from Persia about the commencement of the Christian era. Hardy in England. In the N.W. Himalaya it is grown at different elevations, in Kunawar up to 10,000, and in Lahoul to 9000 ft. Fl., according to elevation, between January and May, the fruit ripening between May and October. The foliage turns red before it is shed.

The tree is grown for its fruit, which is an important article of food. The blossom is apt to be killed by frost, and a small green beetle at times strips the tree of its leaves. The wood of trees past bearing is used for building and other work; the heartwood is brown, compact, even-grained, and smooth to work.

3. *P. armeniaca*, Linn.; Roxb. Fl. Ind. ii. 501.—Syn. *Armeniaca vulgaris*, Lam.; Boissier Fl. Orient. ii. 652. The Apricot. Vern. *āri*, *gārdālu*, *jaldāru*, *shāran*, *cheroli*, *cherkush*, *serkaji*, *shāri*, Pb. hill Iser, Kashmir; *Zardālu*, Pb. plains; *Chūāri*, *zardālu*, N.W.P. Himalaya.

A moderate-sized, deciduous tree. Nearly glabrous, petiole of young leaves pubescent. Leaves convolute in bud, broadly ovate, nearly as broad as long, acuminate, crenate; petiole glandular, half the length of leaf; stipules lanceolate. Flowers pinkish white, solitary or fasciculate, appearing before or with the leaves from scaly buds on the previous year's wood; peduncles generally short, included in buds. Calyx campanulate. Drupe downy or smooth, with a tender, succulent, sapid pericarp, the stone smooth, with a thickened sulcate margin.

Commonly cultivated between Indus and Sarda, in the N.W. Himalaya, in the plains of the Panjab, in Afghanistan, Western and Central Asia, Europe, and

China. Hardy in England. In the Himalaya the fruit ripens well up to 10,000 ft., but it is best between 6000 and 9000 ft. In West Tibet the tree is cultivated as high as 12,000 ft. : at that elevation, however, the fruit seldom ripens properly. Believed to be indigenous in the Caucasian region, and to have been introduced into Europe about the same time as the Peach-tree. Often found seemingly wild in the N.W. Himalaya. Fl. Jan.-May, according to elevation, the fruit ripens between June and Sept. The foliage turns yellow in August, and becomes red before falling.

Attains 30-35 ft. and 5-6 ft. girth ; crown close, spreading, rounded. In the N.W. Himalaya the dried apricots form a considerable portion of the food of the people, particularly during autumn and winter. In the apricot districts—for instance, on the Sutlej, Tonse, and Jumna—the roofs of all houses are covered with the yellow fruit in the season, spread out to dry. The dried fruit is an important article of trade, and is imported into the plains from the hills, and from Afghanistan. Oil is extracted from the kernels, which is burnt, used in cooking, and for the hair. The heartwood of the apricot is reddish, and is much used for various ordinary purposes. *P. dasycarpa*, Ehrh., the Black Apricot, a variety with dark purple velvety fruit, is cultivated in Kashmir, Afghanistan, Beluchistan, and in Europe.

4. *P. communis*, Hudson ; Hook. Stud. Fl. 106.—Vern. *Alūcha*, *olchi*, *er*, *aor*, *gardālu*, Pb.

A shrub or moderate-sized tree, unarmed or spinescent ; extremities pubescent. Leaves convolute in bud, ovate, or ovate-lanceolate, serrate, more or less pubescent along the nerves beneath ; petioles shorter than greatest breadth of leaf. Stipules linear, fimbriate. Flowers on slender pedicels, 3 or 4 times the length of calyx-tube, from lateral often leaf-bearing buds. Pedicels solitary or in pairs, buds often approximate. Drupe globose or oblong.

I follow Bentham (Handbook of the Brit. Flora, i. 236) and Hooker in uniting the Sloe, the different kinds of plums, damsons, and prunes under one species. The principal sub-species are the following :—

a. *P. spinosa*, Linn. ; Boissier l. c. 650.—*Sloe*, *black-thorn*. A shrub with divaricate spinescent branches, bark black ; pedicels solitary or in pairs, glabrous ; drupes erect, small, globose or sub-globose. Europe, North Africa.

P. insititia, Linn. ; Boissier l. c. 651.—*Bullace*. A shrub with straight branches, sometimes spinescent, branchlets velvety ; leaves pubescent beneath ; pedicels in pairs, downy ; drupes middle-sized, globose, $\frac{1}{2}$ -1 in. diameter. Europe, North Africa.

c. *P. domestica*, Linn. ; Boissier l. c. 652.—*Plum*, *prune*. A tree, unarmed, branchlets glabrous ; pedicels in pairs, pubescent ; drupes large, oblong.

d. *P. cerasifera*, Ledebour ; Boissier l. c. 651.—Syn. *P. cerasifera*, Ehrh. A small tree, unarmed, rarely spinescent, branchlets glabrous, pedicels solitary ; leaves whitish-villous beneath at the nerves or at the midrib only ; drupes yellow, globose, or ovoid. Macedonia, Caucasus, North Persia.

I do not venture to decide to which sub-species the Kashmir plum belongs. The drupe is round, globose or ovoid, $\frac{1}{2}$ in. long ; the branchlets are glabrous, the leaves woolly beneath, with long hairs half-way up the midrib ; the pedicels are solitary or in pairs from one bud, but appear fasciculate because the flower-bearing buds (shortened branchlets) are often approximate. It is cultivated for its fruit, which is very palatable, in Kashmir at 5000-7000 ft., at places in

the Panjab plains, and in Afghanistan. The wood is light or dark reddish-brown, smooth to work. In Kashmir the skeleton of the so-called Papier-mâché boxes is made of it. About Almora two kinds of plum are cultivated, one a dark-blue damson (*Bhotiya badām*), ripens in July, the other (*Ladakh*) orange-red, much larger, and ripens in June (Madden As. Soc. Jour. xvii. pt. I. 445).

The cultivation of plums and prunes in Europe is very old, probably as old as that of pears and apples. Plinius mentions a large number of varieties (*ingens turba prunorum*). Some of the better kinds, however (*damascena*), were brought from Syria.

5. *P. Cerasus*, Linn.; Hook. Stud. Flora 107. Cherry.—Vern. *Gilas*, *olehi*, *krusbal*, Pb. Him.

An unarmed shrub, or moderate-sized tree; glabrous or nearly so. Leaves conduplicate in bud, elliptic or obovate, abruptly acuminate, irregularly crenate-serrate; petiole less than the breadth of leaf, 2 glands on the edge of leaf near base, or on the petiole; stipules linear or subulate, fimbriate. Flowers white, on long slender peduncles in fascicles of 2-5, from lateral generally leaf-bearing buds. Calyx turbinate, lobes obtuse. Drupe smooth, sweet or acid, with a polished round stone.

I follow Benthani L. c. 237, and Hooker, in classing the sweet and acid Cherries as one species. The following are commonly accepted as the distinctive characters of the two sub-species.

a. *P. Avium*, Linn.; Boissier Fl. Orient. ii. 649. A tree, without root-suckers; leaves flaccid, drooping, hairy beneath, petiole with 2 glands. Flower-bearing buds leafless, peduncles drooping; calyx-tube contracted at the mouth, lobes entire, subacute; fruit sweet. Indigenous in Europe and North Africa.

b. *P. Cerasus*, Linn.—Syn. *Cerasus caproniana*, DC.; Boissier l. c. 649. shrub, or small tree, numerous suckers from the root; leaves subcoriaceous, firm, shining, erect, no glands on petiole. Flower-bearing buds leaf-bearing, peduncles stiff; calyx-tube not contracted at the mouth, lobes serrate, oblong. Fruit acid, naturalised in Europe, indigenous in Western Asia. It must have been a variety of the acid cherry which was introduced to Rome by Lucullus. Sweet cherries were cultivated in Italy before his time.

Several varieties of cherries are cultivated in Kashmir, Bussahir, and elsewhere in the North-West Himalaya, generally between 5000 and 8000 feet, where they are also found in a seemingly wild state. Fl. April-May. In Kashmir the fruit ripens in June. A moderate-sized tree, with short trunk, and a round, green crown. The bark flakes off in horizontal belts.

6. *P. prostrata*, Labillardière; Sibth. Fl. Græca t. 478.—Vern. *ter*, *talle*, Pb., Him.

A small scraggy shrub, 5-6 ft. high; branchlets hoary. Leaves oblong, sharp-serrate, narrowed into short petiole, glabrous above or clothed with white woolly tomentum beneath; petiole short or inferior. Flowers red, on short peduncles, appearing with the leaves in bud. Disc twin from lateral buds. Calyx-tube cylindrical, pubescent, perigynous, outside, teeth short, obtuse, hairy inside. Fruit ovoid, short or none, long, reddish purple when ripe, with scanty pulp. 5 petals or on the

North Afghanistan frequent between 11,000 and 12,000 feet, usually didy-
acid parts of the North-West Himalaya. Kashmir, small, usually didy-
(7500-8500 ft.), Lahoul (10,000 ft.), Ravi, rare (7500-8500 ft.) to the calyx-tube;

Also in Persia, on the Caucasus, Taurus, in Asia Minor, Syria, Crete, Greece, Sardinia, Spain, and Algeria. Fl. Apr. Hardy in England. In dry rocky places, with stiff, divaricate, often procumbent branches. Bark reddish brown or blackish, longitudinally rugose, a smooth white pellicle peeling off. The fruit is eaten.

This sp. might be identified with *P. Cerasus Griffithii*, Boiss. Fl. Or. ii. 648, but the characters separating *Griffithii* from *prostrata*, solitary flowers and glabrous calyx-tube in the latter, do not seem to be constant.

7. *P. Puddum*, Roxb. MSS.—Syn. *P. sylvatica*, Roxb. Fl. Ind. ii. 501; *Cerasus Puddum*, Wall. Pl. As. rar. t. 143. Sans. *Padmaksh*. Vern. *Chamiāri*, *umalgūch*, *pāja*, *pāja*, *Paddam*, *padm*, *pāya*, N.W.P.

A handsome moderate-sized tree, with glossy green leaves; nearly glabrous. Leaves ovate, long-acuminate, sharply and often duplicate-serrate, 3-5 in. long, petioles $\frac{1}{2}$ in., with 2-4 large glands near base of leaf. Stipules palmately 3-5-fid, the divisions lanceolate, glandular-fimbriate. Flowers white or pink, appearing before the leaves, on slender pedicels as long as flowers, or somewhat longer, often branched, in umbellate fascicles crowded near the ends of branches. Calyx turbinate, with ovate acute lobes. Stigma stellate, 3-lobed. Fruit in pendulous clusters, yellow and red, ovoid or globose, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, acid, and somewhat astringent when ripe; kernel ovoid, rugose and furrowed.

Wild, and frequently cultivated in the Himalaya and the Doons, from the Indus to Sikkim, generally at elevations between 2500 and 7000 ft. Kasia hills. Fl. Apr.-May, sometimes in autumn. Madden states (Bhimañ in Kamaon), "The flowers appear in Oct.-Nov., and are soon succeeded by the leaves. In January the leaves are beset by myriads of aphides, which distil great quantities of honeydew * over them;" and adds that the tree is evergreen at Almora, and bears its fruit in spring. Trunk short, 4-5 ft. girth. Bark brownish grey, peeling off in flakes. Wood reddish brown, hard, strong, and durable, for walking-sticks and bludgeons. Fruit acid and astringent, not much or valued.

Pseudocerasus, Lindl., China, Japan, is nearly related to *C. Puddum*. Two species belonging to the same group as the Cherry and Puddum are found in North-West Himalaya. 1. *P. humilis*, Bunge, called *Reis, she, būnārāla*, &c., in the Panjab Himalaya, is a small glabrous shrub, with brownish-ovate-lanceolate, coriaceous, deep- and sharp-serrate leaves, fimbriate, 5-fid stipules, which is found between 7000 and 12,000 ft. in the more northern parts of the North-West Himalaya, from the Chenab to the Jumna, also in the Kumaon, and is supposed to be the wild form of *Prunus japonica*, Thunb., of which are cultivated in Japan on account of their beautiful often double, blossoms. 2. *P. tomentosa*, Wall., found in Kash-
 Flowers
 Leaves
 Leaves

1. *P. Ahson*, between 5000 and 6000 ft., is remarkable on account of its *dalus commi*, ovate leaves, and an ovoid, acuminate, nearly sessile fruit. It 641. The *Aomentosa*, Thunb., a shrub or small tree, wild in North China, gardens in Japan, with sessile scarlet fruit; valued in Japan for its dysentery (Sieb. Zucc. Fl. Jap. p. 53 t. 22).

A moderate-sized tree, with greyish when in flower; Hook. Stud. Fl. 107.—Syn. *Cerasus Padus*, Boiss. Stipules subulate, 0. *Cerasus cornuta*, Wall.; Royle Ill. t. 38, f. 2. before the leaves, *Pāras, kālakāt, gīdar-dāk, bart, zūm, zam, zambu*, on last year's wood. *lla, krūn*, Pb.; *Jāmana*, Kamaon. separating into 2
 only a secretion of the leaves, which attracts the aphides.

Nearly glabrous; young branchlets, inflorescence, and axils of nerves on the underside of leaves pubescent. Leaves conduplicate in bud, oblong or obovate, greatest width generally above the middle, acuminate, serrate, slightly cordate at the base; stipules linear, early deciduous. Flowers white in lax racemes, appearing after the leaves, 3-8 in. long at the end of short lateral, often leaf-bearing branches. Bracts linear, caducous. Stamens 25-30. Drupe globose, $\frac{1}{2}$ in. long, red first, then dark purple or nearly black.

Himalaya, between 4000 and 10,000 ft., at times ascending to 12,000 ft., from the Indus to Sikkim. Occasionally planted. A widely-spread tree, from North and Central Europe through Siberia to Amur land and Kamtschatka. Caucasus and Western Asia. Deciduous, the mature foliage dark green, turning red before its fall, generally in autumn, sometimes as early as June. Fl. April-June to Sept. Fr. usually ripens July-Oct., remains long hanging on the tree.

Usually found in mixed forests; thrives best in moist places, where it attains 50 to 60 ft., with a girth of 5-6 ft. Bark $\frac{1}{2}$ in. thick, brown or purple, fairly smooth, a scurfy tuberculate grey pellicle peeling off. Wood brownish white, close- and even-grained, takes a fine polish. In France it is occasionally used by cabinet-makers. The fruit is sour, with a slight mawkish astringent flavour, but is much eaten by the hill people. In Sweden and Lapland, and some parts of Russia, the bruised fruit is fermented, and a spirit distilled from it. The unripe fruit of this species is often attacked by an insect, and then swells out into a curved horn-like excrescence; hence Wallich's name of *P. cornuta*. Similar excrescences are often found on Plum-trees in Europe, particularly on prunes (*Zwetschen*) in Germany. The leaves are considered excellent cattle-fodder.

A small tree, resembling *P. Padus*, with coriaceous, oblong-lanceolate leaves, and numerous short lateral racemes, 2-4 in. long, and 10-20, generally 15 stamens, is *P. capricida*, Wall., in the Himalaya, between 6500 and 8000 ft., from the Jumna to Bhutan, and in the Kasia hills.

9. *P. Mahaleb*, Linn.—Syn. *Cerasus Mahaleb*, Boissier Fl. Orient. ii. 649. French, *Bois de Ste-Lucie*. German, *Weichsel Kirsche*.

A small deciduous, glabrous tree. Leaves ovate, obtusely serrate; petioles $\frac{1}{2}$ or $\frac{1}{3}$ the length of leaf. Flowers fragrant, on lateral, pedunculate, corymbose racemes on the previous year's wood, lower pedicels 1 in. long and longer. Drupes ovoid, compressed, $\frac{1}{2}$ in. long.

Cultivated at Kelat in Beluchistan (Stocks). Wild in Western Asia, on the Caucasus. Wild or naturalised in South and Central Europe. The scented kernels are sold as medicinal in the bazaars of Sindh and South India. (On the Rhine, as far north as Altenahr and the Drachenfels.) The wood of the European tree is prized on account of its fragrance, hardness, and the fine polish it takes. Tobacco-pipe tubes and snuff-boxes are made of it. It is believed that this tree was introduced from the East into Europe simultaneously with the Horse-chestnut tree. Hardy in England.

2. PRINSEPIA, Royle.

A shrub with lanceolate, serrate leaves and bisexual flowers. Calyx persistent, tube cup-shaped, with 5 unequal, rounded lobes, imbricate in bud. Petals 5, inserted at the mouth of calyx, rounded, short-clawed. Stamens numerous, inserted with petals, multiseriate, with short filaments;

anther-cells separated by a broad connective. Carpel 1, sessile, with 2 pendulous, collateral ovules. Drupe oblique, oblong-cylindrical, fleshy, with a coriaceous 1-seeded kernel. Remains of style at the base of the drupe.

1. *P. utilis*, Royle; Ill. t. 38 f. 1.—Vern. *Bekkar*, *bekkra*, *bekkli*, *bhekal*, *bhigal*, *bekala*, *karanga*, N.W. Him. Local names: *Gurinda*, Hazara; *Tatua*, *phūlwāra*, Rajaori; *Jinti*, Chenab; *Cherara*, *dhatela*, *jhatela*, Gharwal, Kamaon.

Nearly glabrous, youngest branchlets only pubescent. Leaves coriaceous. Axillary spines often leaf-bearing. Flowers white in short axillary racemes, generally from the outside base of the spines. Drupes purple, seeds oily.

Common on dry rocks at elevations between 2000 and 9000 ft. in the outer Himalayan ranges from Hazara to Bhutan. Also on the Kasia hills. Generally in flower in autumn, in fruit in spring. From the seeds oil is expressed, used as food, and for burning. The pith of stem and branches is large, and in drying separates into thin horizontal layers. Wood close-grained.

3. *RUBUS*, Linn.

Trailing shrubs or creeping herbs, almost always prickly. Leaves alternate, simple or compound, the stipules more or less adnate to the petiole. Flowers white or red, in terminal or axillary corymbose panicles, rarely solitary. Calyx broadly cup-shaped, deeply cleft into 5 persistent lobes. Petals 5. Stamens numerous. Carpels many, on a convex receptacle; style subterminal; ovules 2, collateral, pendulous. Drupes many, 1-seeded, crowded on a dry or spongy conical receptacle.

Leaves simple, lobed 1. *R. paniculatus*.

Leaves tri- or quinque-foliolate, rarely unifoliolate.

Petiole of terminal leaflet less than half the length of common petiole; fruit black 2. *R. fruticosus*.

Petiole of terminal leaflet more than half the length of common petiole; fruit yellow 3. *R. flavus*.

Leaves imparipinnate, rarely trifoliolate.

Flowers in lax corymbose panicles; petals red, shorter than calyx-lobes; fruit white-tomentose when unripe, black when ripe; leaflets 2-5 pair 4. *R. lasiocarpus*.

Flowers often axillary; petals white, as long as calyx-lobes; fruit oblong, red when ripe; leaflets 1-3 pair 5. *R. rosafolius*.

Flowers axillary; petals white, as long as calyx-lobes; fruit subglobose red or deep orange; leaflets 1-2 pair 6. *R. biflorus*.

1. *R. paniculatus*, Sm.; DC. Prodr. ii. 567 (not Roxb. or Schlechtendal).—Syn. *R. tiliaceus*, Sm. (probably). Vern. *Kāla ākhi*, Kangra. *Anchu*, *pattarola*, *kala hisālu*, Kamaon, Garhwal.

A shrub, armed with few, short, scattered prickles; branchlets, inflorescence, and underside of leaves clothed with dense soft grey silky tomentum. Leaves from a cordate, rarely entire rounded base, broad-ovate, acuminate, longer than broad, serrate, more or less lobed with 3 or 5 prominent basal nerves. Stipules and bracts linear or oblong, often cleft at the top, or half-way down, into linear segments. Flowers on long slender pedicels, in lax, spreading terminal panicles. Calyx-segments ovate-lan-

ceolate, long-acuminate, longer than the white petals. Fruit blackish purple.

Common in many parts of the Himalaya from Hazara to Sikkim, between 3000 and 8000 ft. Kasia hills. Fl. April-June.

Nearly related to this species are two other brambles with white flowers and entire, lobed leaves, marked by pectinate stipules and bracts, deeply cleft, often nearly to the base, into linear segments; *R. reticulatus*, Wall., from the higher ranges (7000 to 10,000 ft.) in Kamaon and Sikkim, grey tomentose, with leaves reticulate beneath, generally broader than long, and compact cylindrical panicles; and *R. rugosus*, Sm. (*R. Hamiltonianus*, Wall. Pl. As. rar. t. 234), from Nepal and the Eastern Himalaya, the mountains of Burma, Ceylon, and South India (on the Ghats as far north as Mahableshwar), rusty tomentose, with leaves rugose above, and finely reticulate beneath, ovate calyx-segments, and red fruit.

2. *R. fruticosus*, Linn.; Hook. Stud. Fl. 109. Blackberry, Bramble.
—Vern. *Ankri*, *ālīsh*, *ālāch*, *kanāchi*, *chench*, *pakhāna*.

A large shrub, armed with few recurved compressed prickles. Branches more or less angular. Branchlets, inflorescence, and underside of leaves canescent, or clothed with short grey tomentum. Leaves trifoliolate on flower-bearing, and often quinquefoliolate on leaf-bearing branches; leaflets oval or obovate, irregularly serrate; petiole of terminal leaf less than half the length of common petiole. Stipules linear. Flowers in compact cylindrical panicles; calyx reflexed. Fruit more or less hemispherical, black when ripe.

Afghanistan, Waziristan, Peshawar valley, and further south in the trans-Indus territory. Salt range 1500-3000 ft. Common in Hazara, Rajaori, Kashmir, as far as the Ravi, generally between 2000 and 6000 ft. This is a tomentose form of the common Blackberry, a widely-spread species in Europe, Siberia, West Asia, and North Africa. Of the numerous European forms of the Blackberry, *R. discolor*, Weihe et Nees, Deutsche Brombeer sträucher, t. xx.; Engl. Bot. t. 447; Boissier Fl. Orient. ii. 695, is probably most nearly allied to the Himalayan variety. Fl. April-June; fruit ripens Sept.-Oct.

3. *R. flavus*, Ham.—Syn. *R. Gowreepful*, Roxb. Fl. Ind. ii. 517; W. & A. Prodr. 298; Wight Ic. t. 231. *R. ellipticus*, Sm. (*R. Wallichianus*, W. & A. Prodr. 298, Wight Ic. t. 230 (= *R. hirtus*, Roxb.), does not seem to differ from this species). Vern. *Akhi*, *ānkri*, *kanāchi*, *gurācha*, *pukāna*, Pb., Him.; *Esar*, *hishālu*, *hisālu*, Garhwal, Kamaon.

A large shrub with long trailing branches, armed with copious long reddish bristles and sharp curved prickles. Branchlets, inflorescence, petioles, and underside of leaves clothed with soft grey or tawny tomentum. Leaves trifoliolate, those at the base of branchlets often unifoliolate; leaflets elliptical or rotundate, sharp-serrate, often acuminate, the terminal largest; midrib of terminal leaflet forming an angle with petiole. Petiole of terminal leaflet often forming an angle with, and generally exceeding half the length of common petiole. Flowers white, in axillary fascicles and in broad compact rounded terminal panicles; pedicels short or long, slender. Calyx-segments broadly ovate, striate. Petals cuneiform, obovate, twice the length of calyx. Fruit yellow.

Himalaya, from the Indus to Bhutan. Kasia hills, mountains of South India. In the N.W. Himalaya and Siwalik tract, at elevations between 1500 and 8000 ft. Fl. March; fruit ripens April, May.

4. *R. lasiocarpus*, Sm.; W. & A. Prodr. 299; Wight Ic. t. 232.—Syn. *R. racemosus* and *albescens*, Roxb. ii. 519; *R. mysorensis*, Heyne.—Vern. *Gunācha*, *pagūnāi*, *pukāna*, Hazara; *Kandiāri*, *kharmuch*, *surganch*, *gurācha*, Kashmir; *Tūlanch*, Chenab; *Niū*, *kalliāchi*, Bias; *Kālawar*, *kala hisalu*, Garhwal, Kamaon.

A spreading shrub, with long stems, rooting at the extremities, armed with few straight or curved sharp prickles. Branches round, often purple, glabrous, or pruinose, rarely with glandular hairs. Leaves canescent or white-tomentose beneath, imparipinnate; leaflets 2-5 pair, ovate or ovate-lanceolate, with large serratures, the terminal leaflet often lobed. Flowers on long slender pedicels, in lax corymbose panicles. Inflorescence and calyx white-tomentose; petals red, shorter than the ovate-lanceolate calyxlobes. Fruit white-tomentose when unripe, black when ripe.

Abundant throughout the Himalaya, the Kasia hills, the mountains of Burma, South India, and Ceylon. In the North-West Himalaya, and in the Siwalik tract, at elevations between 2000 and 8000 ft. Rare in the Peshawar valley, probably brought down by the rivers. Fl. March, April; fruit ripens June, July. Fruit very good to eat. Hardy in England.

5. *R. rosæfolius*, Sm.; DC. Prodr. ii. 556.—Syn. *R. rosæflorus*, Roxb. ii. 519; *R. pungens*, Cambess. in Jacqu. Bot. t. 59. Vern. *Kanāchi*, Hazara, Khagan; *Yeshul*, Kamaon, Garhwal.

A spreading shrub, armed with straight and curved prickles, glabrous, or with glandular hairs. Leaves imparipinnate, leaflets 1-3 pair, lanceolate, deep and irregularly serrate or lobed; stipules lanceolate. Flowers on long slender pedicels, axillary, or in lax terminal corymbs. Calyxlobes ovate-lanceolate, long-aristate, $\frac{1}{2}$ -1 in. long, as long as, or a little shorter than, the large white petals. Fruit oblong, or cylindrical, red when ripe.

Himalaya from Hazara to Assam. Kasia hills. Java, China, Japan. In the North-West Himalaya between 5000 and 10,000 ft. Often cultivated with double flowers, var. *coronarius*.—Bot. Mag. t. 1783.

6. *R. biflorus*, Buch.; DC. Prodr. ii. 558; Bot. Mag. t. 4678.—Vern. *Chānch*, *kantunch*, *khanīāra*, Kashmir; *Karer*, *akhreri*, *akhe*, Ravi.

A large spreading shrub, armed with scattered sharp prickles, subulate from a broad base, the branches covered with a white pruinose coating, which is easily rubbed off. Leaves imparipinnate, leaflets generally 1 pair only, ovate-lanceolate, deep- and irregularly serrate, the terminal leaflet often lobed; stipules lanceolate. Flowers white, on long slender pedicels, solitary, or in fascicles of 2 or 3 in the axils of the upper leaves; calyxlobes ovate-lanceolate, shortly aristate, as long as petals. Fruit drooping, subglobose, red or deep orange, sweet.

Himalaya from Hazara to Bhutan. North-West Himalaya from 4000-10,000 ft. Fl. April, May. Hardy in England.

Two other species are common in the North-West Himalaya:—*R. viscus*, Wall., at 7000 to 11,000 ft., from Kashmir to Bhutan; leaves trifoliolate, sometimes imparipinnate, with broad ovate leaflets, the terminal leaflet often lobed; long subulate stipules; calyx-segments often more than $\frac{1}{2}$ in. long, much exceeding the small red petals; and red or yellowish brown fruit; *R. macilentus*, Camb. in Jacq. t. 60, Kashmir to Sikkim, between 5000 and 8000 ft., with 3 ovate-lanceolate leaflets, often 1 only, white petals as long as calyx, and bright yellow fruit.

4. ROSA, Linn.

Erect scrambling or climbing shrubs, more or less prickly, with imparipinnate leaves, serrate leaflets and stipules more or less adnate to the petiole. Flowers terminal, solitary corymbose or paniculate. Calyx-tube persistent, globose urceolate or ovoid, mouth contracted, limb divided into 5 foliaceous segments. Disc coating the calyx-tube. Petals 5, rarely 4. Stamens numerous, inserted on the edge of disc, at the mouth of calyx-tube. Carpels free below, many, rarely few, enclosed in the calyx-tube, the styles protruding from the tube, and occasionally united. When in fruit, the carpels are dry, hairy, 1-seeded achenes, enclosed in the more or less succulent calyx-tube, the whole forming a dry or pulpy red or black berry.

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|---|----------------------------|
| Styles united in a column as long as stamens; flowers white | 1. <i>R. moschata</i> . |
| Styles distinct; flowers yellow | 2. <i>R. lutea</i> . |
| Styles distinct; flowers pink, red, or white. | |
| Branches armed with prickles and bristles; petals 4 | 3. <i>R. sericea</i> . |
| Branches armed with prickles only; petals 5. | |
| Leaves $\frac{1}{2}$ -2½ in. long; leaflets 7, obovate or rotundate | 4. <i>R. Webbiana</i> . |
| Leaves 2-8 in. long; leaflets 7-11, elliptical | 5. <i>R. macrophylla</i> . |

Numerous species are cultivated in India. Those more generally grown—with-
out, however, any reference to garden varieties and hybrids—may be classed as
follows, the groups being partly taken from Lindley's *Rosarum Monographia*,
London, 1820, partly from Boissier's *Fl. Orientalis*, ii. 669. The characters
given are those commonly assigned to each species, but cultivation and crossing
have created such a multitude of forms, that in many cases it is impossible to
recognise any satisfactory specific distinctions.

A. STYLES DISTINCT.

1. *Bracteata*. Fruit and branchlets clothed with dense persistent woolly
tomentum; flowers bracteate; prickles twin, mostly infra-stipular.

1. *R. involucrata*, Roxb. *Fl. Ind.* ii. 513; Wight *lc.* t. 234. Flowers sub-
sessile, large, white, fragrant, surrounded by large pectinate, woolly bracts.
Indigenous in Bengal and the Eastern Himalaya.

2. *R. Lyellii*, Lindl. *l. c.* t. 1. Flowers pedunculate, large, white or blush;
bracts linear, hoary, entire. Indigenous in Nepal, Kamaon, and on Mt. Abo.

3. *R. bracteata*, Wendl.; Redouté les Roses, i. 35. Flowers large, white,
solitary, surrounded by 8-10 ovate imbricate, finely pectinate bracts. China—
Macartney's rose, with double fl., believed to belong to this sp.

II. *Eglanteria*. Prickles scattered, of two kinds, some slender, setaceous,
others stout, straight, or curved; flowers yellow or red; calyx-lobes persistent
in fruit.

4. *R. lutea*, Mill. (see below).

5. *R. sulphurea*, Aiton. Flowers large, yellow, always double; leaflets 7,

glabrous above, whitish and slightly pubescent beneath. Native country not known. Said to have been brought to Constantinople from Persia in the sixteenth century (C. Koch Dendrol. i. 226). *R. Rapini*, Boiss. l. c. 672—Asia Minor, Armenia, North Persia—a yellow rose similar to *R. sulphurea*, may possibly be its wild form.

III. *Gallica*. Erect shrubs; prickles scattered, mixed with bristles, which are mostly glandular; leaflets generally 5, rarely 7, ovate or oval, rugose, more or less pubescent beneath; flowers solitary, or in few (5-15) flowered corymbs, rose-coloured or purple; calyx-segments more or less pinnatifid. Scent very delicate. The commonly accepted 3 species of this section are probably not specifically distinct.

6. *R. damascena*, Mill. (*Golab, sudburg.*) Prickles unequal, the larger ones falcate; sepals reflexed during flowering. Native country unknown. The rose most generally cultivated in India. Attar (otto) of roses is made principally from the flowers of this species. Also called *R. Calendarum*, because the time of flowering extends over several months.

7. *R. centifolia*, Linn. *Cabbage rose, Moss rose, Provence rose*. Prickles unequal, the larger falcate glandular, bristles numerous; leaflets and calyx glandular-ciliate; flowers nodding. Caucasus, mountains of Assyria. Fl. June, July (Europe).

8. *R. gallica*, Linn. Prickles equal, slender; flowers erect. South and Central Europe, Asia Minor. Fl. June, July (Europe).

IV. *Canina*. Prickles uniform, no bristles. Flowers white or rose-coloured.

9. *R. indica*, Linn.; Lindl. l. c. 106.—Syn. *R. chinensis*, Jacquin; Roxb. Fl. Ind. ii. 513; Koch l. c. 273. *R. sinica*, Linn. Glabrous, evergreen; stipules very narrow, adnate nearly to the apex; flowers large, double, half double, rarely single, white yellow pink red or purple, on long slender pedicels; calyx-segments reflexed. Indigenous in China, but early brought to India. The *Indian (China or Bengal)* roses have a powerful scent, by no means so delicate as that of the *Gallica* group: their flowering time extends over a great part of the year. To this species belong *Rosa fragrans*, Redouté, the Tea Rose, yellow, very fragrant; *R. semperflorens*, Bot. Mag. t. 284; Roxb. Fl. Ind. ii. 514, with dark-red flowers,—and numerous other varieties. *R. Noisetteana*, Red. l. c. ii. p. 77, the Noisette Rose, is a cross of this and *R. moschata*. The large host of *Hybrid Perpetuals* are chiefly derived from *R. indica*.

10. *R. microphylla*, Lindl. Bot. Reg. t. 919; Roxb. Fl. Ind. ii. 515; Bot. Mag. t. 3490. Branchlets flexuose, prickles infra-stipular; leaflets 9-15, small, subcoriaceous. Calyx densely clothed with long subulate prickles; segments short, broad-ovate, dentate. Flowers solitary, or 2-3 together, large, double, pale rose-coloured. Indigenous in China. Not quite hardy in England.

11. *R. alba*, Linn.—Syn. *R. glandulifera*, Roxb. Fl. Ind. ii. 4 (?) A tall spreading shrub, prickles scattered, straight or falcate, somewhat unequal, but no bristles. Foliage grey, leaflets 5-7, large, rugose; downy and very pale beneath. Fl. large, often double, mostly corymbose, white, or of a delicate blush colour, calyx segments often pinnatifid. Probably indigenous in the Caucasian region, and possibly wild in Afghanistan and N.W. India. Nearly allied to *R. canina*, Linn., the common English *Dog rose*.

V. *Banksiana*. Scandent or climbing; stipules small, subulate, nearly free, often deciduous; leaflets 3 or 5, rarely more. Flowers corymbose, not very large.

12. *R. Banksia*, R. Brown.—Syn. *R. inermis*, Roxb. l. c. 516. *Lady Banks' Rose*; Bot. Mag. t. 1954; Bot. Reg. t. 1105. No prickles; leaflets 3 or 5 shining; flowers small, corymbose, white or yellow. China, Japan.

13. *R. microcarpa*, Lindl. l. c. t. 18. Armed with curved prickles; leaflets 3, rarely 5, shining. Flowers white, corymbose; calyx deciduous. Fruit small, globose, red. China.

14. *R. sinica*, Aiton; Lindl. l. c. t. 16; Bot. Reg. t. 1922. Armed with scattered, red, falcate prickles. Leaflets 3, shining. Flowers solitary, large, white; peduncles and calyx-tube thickly covered with straight prickles or bristles. Fruit orange-red, muricate, crowned with the spreading rigid sepals. China, Japan.

15. *R. Fortuniana*, Lindley; Paxton Flower-Garden, ii. 71. Armed with small falcate prickles. Leaflets 3 or 5, dark green, shining; flowers solitary, white, double on short, setose peduncles. Calyx-tube perfectly glabrous, without prickles or bristles. China.

B. STYLES UNITED IN A COLUMN EXsertED BEYOND THE CALYX-TUBE.

VI. *Systyleæ*. Flowers numerous, in terminal corymbs; prickles uniform; leaflets 2-3 pair.

16. *R. moschata*, Mill. (see below).

17. *R. sempervirens*, Linn.; Bot. Reg. t. 465.—Syn. *R. Leschenaultiana*, Redouté Roses, iii. 87; W. & A. Prodr. 301; Wight Ic. t. 38. Climbing, prickles scattered, curved from a broad base, generally red. Leaves evergreen, glabrous, shining; stipules and bracts narrow, glandular, ciliate; petioles, peduncles, and outside of calyx-tube with glandular bristles. Flowers white; calyx-segments ovate, acuminate, densely pubescent inside, deciduous; fruit small, orange-coloured. South Europe, North Africa, East Himalaya, Kasia hills, mountains of South India.

18. *R. multiflora*, Thunb.; Bot. Reg. t. 425. Stipules and bracts linear-oblong, pectinate, with linear segments. Flowers double, bluish red; petioles, peduncles, and calyx-tube pubescent, with long soft hairs without glands. Calyx-segments broad-ovate, shortly acuminate. Japan, China.

1. *R. moschata*, Mill.; Bot. Reg. t. 829.—Syn. *R. pubescens*, Roxb. Fl. Ind. ii. 514; *R. Brunonii*, Lindl. Monogr. Ros. t. 14. Vern. *Kūji*, *kūju*, *kajei*, *karer*, N.W. Himal.; *Phūlwāri*, *chal*, Kashmir; *Kwia*, *kuiala*, Kamaon.

Climbing young shoots and underside of leaves pubescent, branches armed with a few stout recurved prickles. Leaflets 2-3 pair, nearly sessile, ovate-oblong, acuminate, 1-3 in. long. Flowers white, 1½ in. across, in large compound terminal corymbs. Pedicels 1-1½ in. long, slender, pubescent, often with glandular hairs, but without bristles or prickles. Calyx-lobes long, narrow-acuminate, twice the length of ovary, often pinnatifid. Styles united in a hairy column, clavate above, as long as stamens or longer. Fruit dark brown, subglobose or ovoid, ¼-½ in. long.

North-West Himalaya, from Afghanistan to Nepal, ascending to 11,000 ft., commencing at 2000 ft. in the Panjab, and at 4000 ft. in Kamaon. Fl. May, June. Forms masses of thorny scrambling scrub, and climbs to the top of lofty trees, hanging down in elegant festoons. Cultivated in Europe (hardy in England), China, and throughout India, where it blooms all the year round, but chiefly during the cold season. Wild in North Africa, and naturalised in Spain.

2. *R. lutea*, Mill.; Bot. Mag. t. 363; Boissier Fl. Orient. ii. 671.—Syn. *R. eglanteria*, Linn.

A shrub; youngest branchlets pubescent, and armed with large and

small prickles; petioles, stipules, and underside of leaves pubescent and glandular. Branches armed with pale, scattered, straight, nearly equal prickles and no bristles; root-shoots more densely armed. Leaflets 2-4 pair, elliptical or oblong-obovate, with deep, generally double and glandular serratures, more or less hairy and glandular beneath. Stipules adnate above the middle. Flowers yellow, solitary or 2 or 3 together, on pedicels $\frac{3}{4}$ -1 in. long. Calyx-segments lanceolate hairy; apex dilated and often dentate or pinnatifid. Ovary and back of calyx-segments with scattered bristles. Disc thickened; styles villous, distinct.

Arid parts of the inner Himalaya. Lahoul, Ladak, Western Tibet between 8000 and 11,000 ft. In British Lahoul near villages only (Cleghorn). In Kishtwar at 7500 ft. (T. Thomson). Fl. June, July. Mountains of Afghanistan and Beluchistan. Naturalised in Central and South Europe. Hardy in England.

3. *R. sericea*, Lindl. Monogr. Ros. t. 12; Royle Ill. t. 42 f. 1.

Armed with large, shining, generally infra-stipular prickles $\frac{1}{2}$ - $\frac{3}{4}$ in. long, from a broad, flat, triangular base, straight or slightly curved upwards. Copious small prickles and bristles. Leaves approximate; leaflets 3-5 pair, oblong oblong-obovate or cuneate, entire near the base, dentate near top with deep sharp teeth, glabrous above, silky, especially near nerves beneath. Stipules adnate beyond the middle, petioles pubescent. Flowers solitary, white or pink; peduncle and ovary glabrous. Calyx-segments broad-lanceolate, pubescent. Petals 4. Fruit scarlet, pear-shaped, crowned by the persistent calyx-segments.

Higher ranges of the outer and inner Himalaya, between 9000 and 14,000 ft. from the Chūr (Royle) to Bhutan. Fl. June. Hardy in England.

4. *R. Webbiana*, Wall.; Royle Ill. t. 42.—Vern. *Kāntiān*, *shingāri*, Hazara; *Shūkand*, *sikanda*, *shāwali*, *manyar*, *brāzen*, Chenab; *Chūa*, Lahoul; *Sia*, Ladak; *Sea*, Piti.

Erect shrub; glabrous, or petioles and leaves pubescent. Branchlets without bristles, armed with prickles of one size, straw-coloured, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, on a large flattened base, straight or nearly so, divaricate or ascending. Leaves small, subcoriaceous, $\frac{1}{2}$ - $2\frac{1}{2}$ in. long; leaflets generally 3 pair, subcoriaceous, obovate or rotundate, entire near the base, with deep sharp teeth near the apex. Flowers pink, solitary or geminate; peduncles $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Calyx-segments twice the length of ovary, nearly as long as petals, lanceolate, long-acuminate, apex slightly dilated. Peduncles, ovary, and back of calyx-segments nearly always clothed with large, glandular hairs or bristles. Styles villous, distinct. Fruit ovoid or globose, $\frac{1}{2}$ in. long, red, fleshy.

Chiefly in the arid tracts of the N.W. Himalaya from the Indus to Kamaon, generally between 5000 and 10,000 ft., ascending to 13,500 ft. in Ladak. On the south of the Safedkoh between 8000 and 9000 ft. The fruit is eaten. In Piti the branches are collected and piled up on houses to be used as fuel. Hardy in England.

Nearly allied is the *Scotch* or *Burnet Rose*, *R. spinosissima*, Linn., sub-sp. *R. pimpinellifolia*, Hook. Stud. Fl. 120, of Europe and the East, which differs by more numerous leaflets (generally 4-5 pair), copious, slender, large and small

prickles, the ovary and calyx-segments glabrous, calyx-segments shorter than petals, and a depressed globose fruit.

5. *R. macrophylla*, Lindl. Monogr. Ros. t. 6.—Syn. *R. Hoffmeisteri*, Klotzsch, Reise des Prinzen Waldemar Bot. t. 7. Vern. *Gūlāb*, *gūlābi*, *bangūlāb*. Local names: *Jikjik*, Chenab; *Akhiāri*, Ravi.

Erect, often unarmed, pubescent, often with glandular hairs; prickles from a conical basis, long, straight, $\frac{1}{4}$ – $\frac{1}{2}$ in. long, no bristles. Leaves 2–8 in. long; leaflets 3–5 pair, elliptical, the terminal 1–3 in. long, the others smaller. Petioles tomentose. Flowers red, $1\frac{1}{2}$ –2 in. across, solitary or in terminal corymbs. Bracts large, foliaceous. Pedicels 1 in. long, pubescent with glandular hairs and bristles. Calyx-lobes hoary or grey-tomentose, very long, longer than petals; base narrowly triangular, apex dilated, lanceolate, toothed. Styles pilose, exserted, distinct. Fruit large, soft, turbinate, 1 in. long.

Himalaya from Khagan to Sikkim. In the N.W. Him. between 3500 and 10,000 ft. Fl. May, June. Fruit eaten. Hardy in England.

5. PYRUS, Linn.

Trees or shrubs, with deciduous, simple or pinnate leaves. Flowers white or pink, in terminal corymbs. Calyx-tube urceolate, lobes reflexed or deciduous. Stamens many; filaments sometimes connate at the base. Carpels 2–5, adnate to the calyx-tube; styles free or connate below; ovules 2 in each cell (numerous in *P. Cydonia*). Fruit fleshy, 2–5-celled, cells with a cartilaginous or bony, often 2-valved endocarp, 1–2-seeded (except in *P. Cydonia*).

Leaves simple, flowers in simple corymbs.

Fruit pyriform, not umbilicate at the base; styles free.

Leaves rounded or ovate, simple; fruit smooth 1. *P. communis*.

Leaves ovate-lanceolate, often lobed; fruit rough 2. *P. variolosus*.

Fruit umbilicate, globose, depressed; styles connate.

Extremities white-tomentose; peduncle as long as fruit, or shorter

3. *P. Malus*.

Extremities glabrous; peduncles 3–4 times longer than fruit

4. *P. baccata*.

Leaves simple, entire; flowers solitary

5. *P. Cydonia*.

Leaves simple, lobed, or pinnatifid; flowers in compound corymbs

6. *P. Aria*.

Leaves pinnate; flowers in compound corymbs 7. *P. ursina*.

Carl Koch and Decaisne write *Pirus*, thus restoring the classical spelling of the word, changed for *Pyrus* in the sixteenth century. I follow Bentham, Boissier, and Hooker in retaining the spelling of Linnæus; because, if we were to commence altering the customary spelling of botanical names, the changes would be endless and confusion would be unavoidable.

1. *P. communis*, Linn.; Hook. Stud. Fl. 125; Boissier Fl. Orient. ii. 953. The Pear-tree.—Vern. *Tang*, *batang*, *batank*, *nāk*, *sunkeint*, *charkeint*, *h*, Pb. Him.; *Nāshpāti*, *nāk*, Pb. plains.

A shrub or large tree, entirely glabrous, or extremities, young leaves, and inflorescence more or less pubescent or floccose; branchlets often spinescent in young trees. Leaves rotundate, ovate, or oblong-ovate, acute or short acuminate, entire or obtusely serrate; petiole slender, as

long as leaf or nearly so. Flowers white, in short corymbs at the end of short, often leaf-bearing branchlets. Calyx-tube campanulate or turbinate, not much contracted at the mouth; limb spreading, divided down to the tube or nearly so into 5 lanceolate or triangular acute lobes. Petals clawed, rounded, obtuse, flat, twice as long as calyx, patent. Styles 5, free. Fruit more or less turbinate, not umbilicate at base, crowned with the persistent calyx.

Indigenous in Transylvania, South Russia, mountains of Asia Minor, the Caucasus, and North Persia. Believed to be indigenous in France, and other parts of Central Europe. Naturalised and often seemingly wild in England. Believed to be wild in Kashmir. Cultivated on account of its fruit throughout Europe, Western Asia, and in the North-West Himalaya, between 2000 and 8500 ft., ascending in Ladak to 10,000 ft. Fl. March, April; fr. July-Sept. Some good kinds are grown in Kashmir and Afghanistan, but generally the Himalayan pears are indifferent. Occasionally the tree is cultivated in the Panjab plains, and in other parts of India; the fruit is hard, but good for baking and stewing. At Calcutta it blossoms, but never sets fruit. The wood is only used for ordinary purposes, and is not valued. In Europe the wood is prized on account of its close and compact grain; it is used for engraving, turning, and mathematical instruments. Decaisne, in *Jardin Fruitier du Museum* (Le Poirier), 1871-72, i. 122, considers the Pears, comprising *P. communis*, *variolosa*, *syriaca*, &c., as different races only of one species.

2. *P. variolosa*, Wall.—Syn. *P. Pashia*, Don.; Decaisne *Jardin Fruitier du Museum*, Le Poirier, t. 7. Vern. *Tang, batangi, tangi, shindar, kent, ban keint, katāri, kithu, gād kiyi, ku, shegul*, Pb.; *Mēal, mehal, mol*, N.W.P.; *Passi*, Nepal.

A moderate-sized tree; extremities, underside of youngest leaves, inflorescence, and calyx clothed with dense white or yellow, floccose tomentum. Branchlets often spinescent. Leaves ovate or ovate-lanceolate from a rounded or slightly cordate base, often lobed or pinnatifid, long-acuminate, crenate, on slender petioles half the length of leaf or longer. Flowers white, slightly tinged with pink, on lateral cymose corymbs, at the end of short, often leaf-bearing branchlets. Calyx-tube urceolate, mouth contracted, limb spreading, white-hairy inside and outside, divided half-way down into 5 obtuse or acute ovate lobes. Petals obovate, rounded, with dark radiating veins. Fruit nearly globose when ripe, $\frac{3}{4}$ - $1\frac{1}{2}$ in. diam., crowned with the base of calyx, blackish, rough, and scurfy, with numerous elevated round white spots. The ripe fruit by hanging gets yellowish russet-brown.

Common in many parts of the Himalaya from the Indus to Bhutan, at elevations between 2500 and 8000 ft. Occasionally cultivated. Also in the Kasia hills. Leaves and flowers March, April; fruit ripens Sept.-Dec.; fl. occasionally in autumn. Hardy in England. 20-35 ft. high, trunk short, rarely exceeding 5 ft. girth, crown oval, not very close. Bark dark-coloured, with some whitish spots, and shallow longitudinal furrows. Wood brown, compact, fine-grained, hard and durable, not easily attacked by insects. Walking-sticks, combs, tobacco-tubes, and various implements made of it. The fruit is never eaten, until like a Medlar it is half rotten, and even then is harsh, not sweet. A form with glabrous pedicels and rotundate calyx-lobes from Kamaon is described by Decaisne (l. c. under *P. Pashia*) as *P. Kumaoni*; and another, with

glabrescent, not verrucose fruit, from the Panjab, is figured on tab. 8 of the same work as *P. Jacquemontiana*.

3. *P. Malus*, Linn.; Hook. Stud. Fl. 125.—Syn. *Malus communis*, Desf.; Boissier Fl. Orient. ii. 656. *The Apple-tree*. Vern. *Shewa*, Afg.; *Shū, sho, cho, (amru)sun, seo, chūnt, khajir, bisir, palu*, Pb., Himalaya; *Kūshū*, Ladak; *Seo, seb*, North India.

A moderate-sized tree, rarely exceeding 30 ft.; extremities, underside of leaves, and inflorescence clothed with white silky tomentum, rarely glabrous. Leaves ovate, acuminate, obtusely serrate; petiole about half the length of leaf or shorter. Flowers white, tinged with red, in umbelliform corymbs, at the end of short lateral leaf-bearing branchlets. Stamens about 20. Styles 5, connate. Fruit umbilicate at base, globose, more or less depressed, crowned with the remains of the calyx.

Indigenous in Greece, Macedonia, Asia Minor, the Caucasus, and Persia. Common in woods and hedges, and believed to be wild in England, Ireland, and the greater part of Central and South Europe. Apparently wild in the North-West Himalaya, between 5000 and 9000 ft. Cultivated on account of its fruit throughout Europe, temperate Asia and North America, and the Himalaya, ascending to 9000, in Ladak to 11,400 ft. The apple-tree is grown in gardens in Sindh, the plains of the Panjab, the Dekkan, Tihāt, and Chota Nagpur, and in many places produces good fruit. In Lower Bengal it blossoms, but does not set fruit. Fl. March-May; fr. July-Sept. The wood is used for ordinary purposes.

The cultivation of the apple and pear in Greece and Italy is very old, and there seems no doubt that both trees are indigenous in South and Central Europe.

4. *P. baccata*, Linn.; Koch Dendrologie, i. 210. *The Siberian Crab*.—Vern. *Baror, lū, thājo, tiwar*, Pb. Him.; *Ban mehal, gicālam*, N.W.P., Him.

A small, nearly glabrous tree, with short trunk and a rounded crown of dark-green foliage. Leaves elliptic, acuminate, sharply serrate; petiole longer than half the leaf. Flowers white, in umbelliform corymbs, on long, slender peduncles, at the end of short leaf-bearing branchlets. Calyx-tube glabrous or slightly pubescent outside, urceolate, limb spreading, with lanceolate deciduous lobes, as long as calyx-tube or longer, white cottony inside. Petals with dark veins. Styles 3-5, nearly free, woolly at the base. Fruit red or scarlet, small, globose, umbilicate; peduncles 2-4 times the length of the fruit.

Himalaya, not uncommon, from near the Indus to Kamaon, generally between 6000 and 10,000 ft., in Piti to 11,000 ft. Cultivated occasionally on the Chenab. Outside India in Japan and Siberia. Fl. spring; fr. Aug.-Nov. Hardy in England. Bark greyish brown, thick, tough, traversed by deep cracks, not unlike the bark of some coniferous trees. The fruit is small and sour, but palatable, with a true apple flavour, and is much prized by the hill people. Wood brownish white, even, compact, fairly hard.

5. *P. Cydonia*, Linn.—Syn. *Cydonia vulgaris*, Pers. Boissier Fl. Orient. ii. 656. *Quince*. Vern. *Bihi*, North India; *Bamtsūnt, bumsūtu*, Kashmir.

Extremities, underside of leaves, inflorescence, and calyx white-tomentose. Leaves ovate, obtuse at the base, entire, on short petioles. Stipules oblong, obtuse, glandular-serrate. Flowers large, white, 2 in. across, on short peduncles, solitary, or a few together at the end of short leaf-bearing branchlets. Calyx-lobes leafy, oblong-lanceolate, glandular-serrate, reflexed, longer than calyx-tube. Fruit pyriform, clothed with grey or yellow, woolly tomentum, 5-celled; cells cartilaginous, many-seeded. Seeds covered with mucilaginous pulp.

The Quince is cultivated in Afghanistan, Beluchistan, Persia, Sindh, the Panjab plains, and the North-West Himalaya, ascending to 5500 ft., also in Western Asia and Europe. Wild or apparently wild in Greece, Thracia, the Caucasus, Armenia, and North Persia (Boissier). According to C. Koch, Dendrol. i. 220, the original home of the Quince is not known. Like other pomaceous trees and shrubs, it springs up readily from self-sown seed, and has thus established itself in many localities. In the Panjab the fruit ripens in June and July. Hardy in England.

6. *P. Aria*, Ehrh.; Hook. Stud. Fl. 126.—Syn. *P. Kumaonensis*, Wall.; *P. vestita*, Wall.; *P. lanata*, Don.; *Sorbus Aria*, Crantz; Boissier Fl. Orient. ii. 658. Vern. *Gūn palos*, Afg.; *Doda, chola, chilana, maila (tang), paltu, ban pālā, kanghā, thānki, morphal, marpol*, Ph., Him.; *Galion, māuli, paltu, banpalti*, N.W.P., Him.

A moderate-sized tree. Extremities, inflorescence, underside of leaves, and calyx clothed with white woolly tomentum. Leaves 3-5 in. long, ovate or obovate, coarsely serrate, and generally lobed, with 6-12 pair of prominent lateral nerves, each terminating in an acute lobe. Petiole $\frac{1}{2}$ -1 in. long. Flowers white, odorous, $\frac{1}{2}$ in. diam., in terminal compound corymbs. Fruit red, $\frac{1}{2}$ -1 in. long, turbinate, or globose, crowned with the persistent calyx-lobes, 2-8-celled, cells 1-seeded, endocarp brittle.

Common in many parts of the Himalaya, between 5000 and 10,000 ft., from the Indus to Bhutan. Also in Afghanistan, Europe, North Africa, Siberia, and Western Asia. Fl. Apr.-May; fruit Aug.-Oct. Branchlets brown, with white specks, larger branches often white, bark of trunk reddish or dark-brown, with shallow, longitudinal wrinkles. The tree is readily known by the white underside of leaves, the abundant white blossoms, and the showy red fruit. Wood light-coloured, compact. Fruit eaten when half rotten. In Europe, *P. Aria* is an exceedingly variable species, varying with undivided, lobed, and pinnatifid leaves, and divided by many botanists into several species.

The common Medlar, *P. (Mespilus), germanica*, Linn., with spinescent branchlets, oblong-lanceolate leaves, large solitary white flowers, and 5-celled fruit, with a bony endocarp, the cells 1-seeded, is wild in Western Asia, Greece, and Thracia, naturalised in the rest of Europe, but has not yet been found in the Himalaya.

7. *P. ursina*, Wall.—Vern. *Sūlia, hūlia*.

A shrub or small tree. Buds, inflorescence, petioles and underside of leaflets along nerves hispid with long, generally rusty hairs. Leaves 4-6 in. long, imparipinnate; leaflets 8-12 pair, opposite, sessile, oblong, the middle ones longer than the upper and lower, 1-1 $\frac{1}{2}$ in. long, cuspidate-serrate. Flowers greenish white, unpleasant-smelling, in compound

corymbs, terminal, and from the axils of the uppermost leaves, with long linear, rusty-pilose bracts. Calyx cup-shaped, glabrous, cleft half-way into acute, triangular segments. Petals rusty-villous when young. Ovary hairy; styles 2-5, thick. Fruit ovoid, globose or turbinate, $\frac{1}{2}$ in. diam. or less, crowned with the persistent calyx-lobes, bluish when ripe. (A variety with white fruit recorded from Kamaon and Lahoul.)

Himalaya not uncommon, between 6000 and 11,000, at times 12,000 ft., from Indus to Sikkim. Fl. June, July. Attains 20 ft., in habit most like the mountain-ash.

P. Aucuparia, Gært., the Mountain-ash of Europe and North Asia, with 6-8 pair of leaflets, and scarlet fruit; and *P. Sorbus*, Gært., the Service-tree, of South Europe and Western Asia, with glabrous, glutinous buds, and larger pyriform fruit,—are nearly related to this species. *P. foliolosa*, Wall. Pl. As. rar. t. 189, also belongs to the same sub-genus *Sorbus*; it is a shrub with elongated almost twining branches, branchlets and petioles woolly, leaflets entire, only serrated at the apex, and small red fruit. Nepal, Sikkim, Bhutan, 8000-9000 ft. elevation. Fl. May.

6. CRATÆGUS, Linn.

Shrubs or small trees, often spiny, with simple, lobed or pinnatifid leaves and deciduous stipules. Flowers white or red, in terminal corymbose cymes, with caducous bracts. Calyx-tube urceolate or campanulate, mouth contracted; lobes 5. Petals 5, inserted at the mouth of the calyx. Stamens many. Carpels 1-5, adnate below to the calyx-tube; styles 1-5, stigma truncate, ovules 2 in each cell. Fruit ovoid or globose, with a bony 1-5-celled stone, or with 5 bony 1- rarely 2-seeded stones.

Leaves deeply pinnatifid 1. *C. Oxyacantha*.
Leaves oblong, crenate 2. *C. Pyracantha*.

1. *C. Oxyacantha*, * Linn.; Hook. Stud. Fl. 127. Hawthorn, white-thorn.—Vern. *Ring, ringo, ramnia, pingyat, phindak, patākhan*, Pb.; *Ban-sanjli, sūr sijnli*, Jhelam.

A small tree, branchlets spinescent, leaves pinnatifid, segments 2-3 pair, oblong, lobed or dentate, petiole half the length of leaf or less. Stipules large, leafy, falcate or semicordate. Cymes corymbose, many-flowered. Flowers white, carpels 1-2. Pedicels, calyx-tube, and segments, as well as the young fruit, with long thin, soft white hairs. Fruit ovoid or subglobose, glabrous, red, rarely yellow when ripe, with a hard bony 1-2-celled nut.

North-West Himalaya from Indus to Ravi, between 5500 and 9300 ft.; also in Afghanistan, Western Asia, Siberia, and Europe. Cultivated in Afghanistan (Baber's tomb, Kabul; Mahomed's tomb, Ghazni), and near villages in the North-West Himalaya. Fl. June, July; fr. Sept.-Oct. Attains 25-30 ft., with a rounded moderate-sized head. Trunk short, erect, 3-4 ft. girth, dark ash-coloured, rough, wood close-grained. Cultivated on account of its flowers and the edible fruit, which is much better than that of the European hawthorn.

By many botanists the European hawthorn is commonly divided into 2 species (sub-sp. Hooker l. c.) 1. *C. monogyna*, Jacq., with 1 carpel and style, 1 nut, lan-

* I write *Oxyacantha* and *Pyracantha*, because Linnæus (sp. plant 683, 685) treated these words as substantives.

ecolate calyx-segments, peduncles and calyx-tube pubescent, and deeply lobed or pinnatifid leaves; and 2. *C. Oxyacantha*, Jacq., with 2-3 carpels and styles, 2-3 nuts, calyx-segments triangular, peduncles and calyx-tube glabrous, leaves dentate, with 3 shallow lobes at the top, flowering a fortnight earlier. The Indian specimens approach more to *C. monogyna*, and are referred to it by Boissier l. c. 664. In England there are intermediate forms between the 2 sub-species, though in nursery-grounds the seed of *C. monogyna* is not known to produce plants of the other form (Syme Engl. Bot. iii. 238).

2. *C. Pyracantha*, Persoon.—Syn. *C. crenulata*, Roxb. Fl. Ind. ii. 509; Bot. Reg. 30 t. 52. *Cotoneaster Pyracantha* and *C. crenulata*, Koch. l. c. 175.—Vern. *Gingāru*, *giānru*, N.W.P.

A large shrub, or small, much-branched, stiff-branched tree, with spinescent branchlets, glabrous, the youngest branchlets sometimes pubescent. Leaves glabrous, shining, coriaceous, linear-oblong, 1-2 in. long, narrowed into a short marginate petiole, crenate, generally approximate on short lateral branchlets. Stipules deciduous. Flowers white, numerous, smaller than those of *C. Oxyacantha*, in short compound cymes. Carpels 5. Fruit nearly globose, less than $\frac{1}{4}$ in. diam., orange or vermilion.

Himalaya 5000-7000 ft., from Sutlej to Bhutan. In Kamaon as low down as 2500 ft. Caucasus, Western Asia, and South Europe. Evergreen; fl. April-May; fruit ripens July, Aug. Hardy in England. The western form, *C. Pyracantha*, has scarlet fruit, but there seems to be no other difference sufficiently important to maintain the two as separate species.

Photinia dubia, Lindl. Trans. Linn. Soc. xiii. t. 10, is an evergreen shrub or tree, with coriaceous, crenate, prominently penniveined leaves, and white flowers in terminal panicles. The fruit is an ovoid berry, crowned with the persistent calyx, 1-5-celled, endocarp and dissepiments thin. East Bengal and Burma, has not been found in the N.W. Himalaya. What Madden mentions under this name is *Stranvæsia glaucescens*, Lindl.

7. COTONEASTER, Medicus.

Shrubs or small trees, with alternate, coriaceous, generally entire, often downy leaves and deciduous stipules. Flowers small, white or pink, solitary or in few- or many-flowered axillary or terminal corymbose cymes. Calyx-segments 5, short, persistent. Petals 5. Stamens many, inserted at the mouth of calyx. Carpels 2-5, adnate wholly, or by their backs only to the calyx-tube; styles 2-5, free; stigma truncate; ovules 2 in each cell, erect. Fruit small, with 2-5 bony 1-seeded stones.

Leaves deciduous, soft-pubescent.

Leaves oblong or ovate; flowers numerous in spreading compound pedunculate cymes

Leaves ovate-lanceolate; flowers 5-10, in short compact cymes

Leaves more or less persistent, obovate or rotundate, with white woolly tomentum beneath; flowers in short few-flowered cymes

Leaves evergreen, flowers solitary

1. *C. bacillaris*.

2. *C. acuminata*.

3. *C. nummularia*.

4. *C. microphylla*.

1. *C. bacillaris*, Wall.—Syn. *C. obtusa*, Wall., and *C. affinis*, Lindl. Vern. *Rā*, *riu*, *lin*, *lūn*, *rāu*, *rāuns res*, *rish*, Pb. Him.; *Ruinsh*, Jaonsar Bawur.

A large deciduous shrub or small tree, with ovate or obovate-oblong leaves, 1-3 in. long, entire, soft-pubescent or tomentose beneath; stipules subulate, early caducous. Flowers white, $\frac{1}{4}$ in. across, in pedunculate, spreading, compound, many-flowered cymes, at the end of short leaf-bearing branchlets. Fruit numerous, sub-globose, dark brown, on slender pedicels, in large spreading bunches.

Waziristan, 4000-8300 ft.; Salt range, 1500-2500 ft.; N.W. Himalaya, from Indus to the Sarda. at 5000-10,000 ft. Sikkim, Bhutan. Fl. May, June. Wood white, strong, elastic; used for walking-sticks in the N.W. Himalaya. Hardy in England.

C. frigida, Wall.; Bot. Reg. t. 1229, with oblong-lanceolate leaves and bright scarlet fruit. Nepal, Sikkim. Is nearly allied to this sp., and perhaps not specifically distinct.

2. *C. acuminata*, Lindl. Trans. Linn. Soc. xiii. t. 9, p. 101.—Vern. Rū, rūns, rūnsh.

A deciduous shrub, with fasciculate, ovate-lanceolate, subcoriaceous leaves, entire, 1-2 in. long; extremities and young leaves with soft silky hairs. Stipules subulate, ciliate. Flowers white, $\frac{1}{4}$ in. across, in compact cymes with 2-10 flowers, at the end of short leaf-bearing branchlets. Calyx turbinate, glabrous or with long white soft hairs; segments short, rounded or acute, often fringed with soft white hairs. Fruit subcylindrical or turbinate, thicker at top, $\frac{1}{2}$ in. long (red when ripe, cult. at Kew).

Himalaya, Bias to Sikkim, 4500-10,000 ft. Fl. May-July. Wood white; walking-sticks are made of it on the Deoban range, in Jaonsar Bawur, and exported to the plains. Hardy in England.

3. *C. nummularia*, Fisch. et Meyer; Boissier Fl. Orient. ii. 666.

A shrub or small tree, nearly evergreen, with obovate, rotundate, or broad-elliptic leaves, $\frac{1}{2}$ -1 in. long, obtuse, retuse, or mucronate, densely clothed beneath with white woolly tomentum. Flowers white or pink, $\frac{1}{4}$ in. across, in short, nearly sessile, few-flowered cymes at the end of short leaf-bearing branchlets. Calyx and pedicels densely white tomentose. Fruit black.

Afghanistan, Beluchistan, N.W. Himalaya from the Indus to Bhutan, 6000-11,000 ft. Also on the Caucasus, in the Crimea, Armenia, and Syria. Fl. April, May. Hardy in England.

A sp. of *Cotoneaster*, with glabrous calyx, larger flowers in pedunculate cymes, pubescent pedicels, is found in Hazara, Kashmir, and the arid tracts of the inner Himalaya (Piti, Lahoul), and is probably the same as the common European species, *C. vulgaris*, Lindl., Hook. Stud. Fl. 127, which is also known from Siberia and Tibet. The fruit of the European shrub is red, rarely black.

4. *C. microphylla*, Wall.; Bot. Reg. t. 1114.—Vern. Khāriz, lūni, Kashmir; Garri, Kamaon.

An erect or prostrate evergreen shrub, with small, coriaceous, glossy dark-green, obovate or cuneate-oblong leaves, solitary, large, snow-white flowers, nearly $\frac{1}{2}$ in. across, and scarlet fruit.

Common in the Himalaya from Kashmir to Bhutan, 5000-11,000 ft. Fl. May, June. Used in Kashmir for making baskets. The ripe fruit is sweet. (J. L. S.)

This small showy shrub is hardy in England, and is cultivated in a great variety of forms, some of which have been described and figured as distinct species (*C. thymifolia*, *congesta*, Saunders Refugium Botanicum, t. 50, 51).

C. buxifolia, Wall.; Wight Ic. t. 992, with 3-flowered peduncles, and ovate leaves, from Kamaon, and the Nilgiris and Pulneys, is closely allied to *C. microphylla*. On the Nilgiris and Pulneys this is a very rigid ramous shrub or small tree; the wood is dense and elastic, and clubs are made of it (Bedd. Fl. Sylv. Manual, p. 98).

8. *STRANVÆSIA*, Lindl.

A tree, with alternate, simple, serrulate, coriaceous evergreen leaves and flowers in large corymbose cymes. Calyx-tube campanulate, base semiadnate to the ovary, with 5 short, erect, persistent segments. Petals 5, sessile, pilose at base. Stamens 20; filaments subulate, inserted in the mouth of calyx. Ovary villose, half free, 5-celled, 2 ovules in each cell; styles 5, connate half-way up, stigma reniform. Fruit a fleshy drupe, including a 5-celled, 5-valved capsule; dehiscing loculicidally, the crustaceous valves separating from each other and from the axis, the dissepiments remaining attached to the inner face of the valves.

1. *S. glaucescens*, Lindl. Bot. Reg. t. 1956.—Syn. *Cratægus glauca*, Wall. Vern. *Garmehal*, *sünd*, Kamaon.

A small evergreen tree, with lanceolate leaves 4-6 in. long, glabrous above, pale beneath, and pubescent along the middle nerve. Flowers white, $\frac{1}{2}$ in. across. Calyx white-tomentose.

Himalaya, outer ranges, Garhwal, Kamaon (woods and ravines, associated with *Quercus*, *Andromeda*, *Myrica*, and *Symplocos*), Nepal, generally between 3000 and 4000 ft., ascends to 8000 ft. Kasia hills. Fl. April, June. Fr. Sept., Oct. Very tender in England. 20 ft. high, trunk short, crown close, rounded, dark green. Wood dull reddish-brown, fine-grained, hard.

ORDER XXXIII. SAXIFRAGEÆ.

Trees, shrubs, or herbs; flowers regular, generally bisexual. Calyx free, or adnate to ovary, 5-lobed, rarely 4-12-lobed, valvate or imbricate in bud. Petals 5, rarely 4 or none, imbricate or valvate in bud. Stamens as many as petals, or double their number, free; anthers dorsifixed, connective frequently glandular at the back. Disc tumid, annular or glandular. Carpels 2 or more, usually connate into a 2- rarely 1-celled ovary; styles as many as cells, free or united; stigmas capitellate; ovules many, placentæ attached to the inner angle; parietal in the 1-celled ovaries. Fruit a 1-3-celled berry or capsule, or of 2 or more many-seeded follicles. Seeds small; embryo minute, in a copious, fleshy or horny albumen.—Gen. Pl. i. 629; Royle Ill. 215 (*Philadelphææ*), 225 (*Grossulariææ*, *Saxifragææ*); Wight Ill. ii. 50.

Leaves opposite.

- Stamens 8-10; flowers in terminal corymbs; outer flowers large, sterile
- Stamens 10; capsule globose, separating into 3-5 distinct cocci
- Stamens numerous; capsule turbinate, dehiscing loculicidally

1. HYDRANGÆA.
2. DRUTZIA.
3. PHILADELPHUS.

Leaves alternate.

Flowers numerous, in long racemes; fruit a 2-celled capsule,

free

4. ITEA.

Flowers axillary, or in short racemes; fruit a berry, inferior,
crowned by the remains of calyx

5. RIBES.

1. HYDRANGÆA, Linn.

Erect or climbing shrubs or trees. Leaves opposite, petiolate, exstipulate. Flowers in terminal corymbs with deciduous bracts, the outer flowers often sterile and larger than the fertile inner flowers. Calyx-tube adnate to the ovary, turbinate or hemispherical; limb truncate or 4-5-dentate. Petals 4-5, valvate. Sterile flowers apetalous, but calyx-limb with 4-5 large petaloid veined segments. Stamens 8-10, inserted at the base of an epigynous disc, filaments filiform, anthers short. Ovary inferior, more or less incompletely 2-4-celled; styles 2-4, free or connate at the base; ovules very numerous. Fruit a membranous capsule, crowned by the calyx-limb, and the persistent styles, 2-4-celled, dehiscent at the top between the styles, many-seeded. Seeds minute, with a membranous testa; embryo in fleshy albumen.

1. *H. altissima*, Wall. Tent. Fl. Nep. t. 50.

A large climbing shrub, glabrous, with loose, grey or brown, membranous, shining bark, peeling off in long rolls like that of the birch. Leaves ovate, acuminate, dentate, 4-6 in. long; petiole 1-2 in.; main lateral nerves 6-8 on either side of midrib. Flowers whitish, calyx-segments of sterile flowers $\frac{1}{2}$ - $\frac{1}{2}$ in. long, obovate.

Himalaya, 5000-10,000 ft. in shady forests from Sutlej (Nagkanda, Serahn) to Bhutan. Fl. June, July. Very tender in England. Bark used as a substitute for paper (T. Thomson, Him. Journ. 47).

Two other species are found in Kamaon: *H. aspera*, Don., with oblong-lanceolate leaves, sharp serrate, grey tomentose beneath, styles free from the base; and *H. vestita*, Wall., pubescent, with broader leaves, and styles connate at the base.

H. Hortensia, DC., the common Hydrangea, or *Chinese Guelder Rose*, from China and Japan, is cultivated as an ornamental shrub in Europe and India on account of the splendid heads of sterile flowers, which are green at first, then rose-coloured or blue.

2. DEUTZIA, Thunb.

Shrubs, pubescent or scabrous, hairs generally stellate. Leaves and branches opposite. Leaves serrate, exstipulate. Flowers white, corymbose or axillary. Calyx-tube campanulate, adnate to the ovary; limb 5-toothed. Petals 5, induplicate-valvate or imbricate in bud. Stamens 10, inserted under the edge of the epigynous disc, the alternate stamens longer; filaments flat, often winged, terminating in two teeth at the top; anthers didymous, nearly globose. Ovary inferior, 3-5-celled; styles 3-5; ovules numerous, imbricate on fleshy placentæ. Capsule globose, 3-5-celled, separating septicidally into 3-5 distinct cocci, or dehiscing at the apex between the styles. Seeds numerous; testa membranous; albumen fleshy.

Rough, with grey stellate pubescence; petals oblong, pubescent 1. *D. staminea*.
Smooth, with soft scattered stellate hairs; petals obovate, smooth 2. *D. corymbosa*.

1. *D. staminea*, Brown; Wall. Pl. As. rar. t. 191; Bot. Reg. xxxiii. t. 13.—Vern. *Muneti*, Kamaon.

A shrub, branchlets and inflorescence scabrous with grey stellate pubescence. Leaves lanceolate or ovate-lanceolate, 1-2½ in. long, on short petioles, rough on both sides with stellate pubescence, grey beneath. Flowers white, fragrant, on short trichotomous panicles, with linear bracts, at the ends of branchlets. Calyx-teeth triangular acute, somewhat shorter (when in flower) than the cup-shaped tube. Petals oblong, pubescent outside.

Himalaya, 5000-8000 ft., from Kashmir to Bhutan. Fl. May, June. Hardy in England. A variety with larger flowers is *D. Brunoniana*, Wall.

2. *D. corymbosa*, Brown; Royle Ill. t. 46, f. 2; Bot. Reg. xxvi. t. 5.

A shrub, not scabrous; branchlets and leaves with scattered, soft, stellate hairs or scales; bark peeling off in long shining rolls. Leaves ovate-lanceolate, long-acuminate, 2-5 in. long, on short petioles. Flowers white, in broad, trichotomous, corymbose panicles, at the ends of branchlets; bracts small, deciduous. Calyx-teeth ovate, obtuse, shorter when in flower than the hemispherical tube. Petals broad-obovate or rounded, glabrous.

Himalaya, 6000-10,000 ft., from Suttlej to Bhutan. Fl. May, June. Hardy in England.

3. *PHILADELPHUS*, Linn.

Shrubs, often with stellate hairs. Leaves and branches opposite; no stipules. Flowers white or straw-coloured, axillary or corymbose. Calyx-tube turbinate, adnate to the ovary, with 4, rarely 5 lobes, valvate in bud. Petals 4, rarely 5, convolute in bud. Stamens 20-40, inserted under the edge of the epigynous disc; filaments subulate; anthers globose. Ovary 3-5-celled; styles 3-5; ovules numerous, imbricate. Capsule turbinate, 3-5-celled, dehiscing loculicidally. Seeds numerous, testa membranous, reticulate; albumen fleshy.

1. *P. coronarius*, Linn.—Syn. *P. tomentosus*, Wall.; Royle Ill. t. 46 f. 1.

A shrub, branchlets glabrous. Leaves ovate, sometimes elliptic, acuminate, dentate with distant teeth, clothed beneath with long soft white hairs, 2-3 in. long, on petioles ½-1 in. long; three pairs of main lateral nerves, two from the base or from near the base, arcuate, the innermost pair nearly meeting at the apex of the leaf, a third pair generally halfway up the midrib. Flowers axillary, in short racemes at the ends of the branches, strongly scented. Calyx-lobes pubescent inside, ovate, nearly as long as calyx-tube. Style deeply 4- or 5-cleft, as long as stamens or shorter.

North-West Himalaya, Kishtwar to Kamaon 6000-10,000 ft., Sikkim. Fl. May-July. Also in Japan, China, Mantshuria, the Caucasus, and (indigenous or naturalised) in Central Europe. Hardy in England. I cannot find any specific difference between the European and Himalayan shrub. The former is less hairy, and has more elliptic leaves.

4. ITEA, Linn.

Trees and shrubs, with alternate, petiolate, exstipulate leaves. Flowers small, white, in long, terminal, and axillary simple racemes. Calyx-tube adnate at the base to ovary, with 5 ovate or subulate persistent lobes. Petals 5, perigynous, linear. Stamens 5, inserted under the edge of a perigynous disc; anthers short, oblong. Ovary oblong, free or half free, 2-celled; style simple, erect, persistent, with 2 furrows. Capsule free, septicidally 2-valved, each valve terminated by half the style, the stigma cohering. Seeds numerous or few. Embryo cylindrical, in the axis of a scanty fleshy albumen.

1. *I. nutans*, Royle.—Vern. *Lelar*, Kaghan; *Garkath*, Kamaon.

A shrub, leaves ovate-oblong or elliptic-oblong, acuminate, sharply serrate, 4-6 in. long, subcoriaceous, glabrous and shining above, pubescent or glabrous beneath; main lateral nerves 5-7 pair, anastomosing by slender, closely parallel, transverse, and by distinct intramarginal veins. Flowers in fascicles of 3-5, on pedicels as long as calyx, in slender drooping racemes 4-8 in. long. Calyx and pedicels pubescent or glabrous. Capsules reflexed.

North-West Himalaya 3000-6000 ft., from Hazara (rare) to Kamaon. Fl. Apr.-July.

5. RIBES, Linn.

Shrubs, often armed with prickles. Leaves alternate, entire or lobed, plaited or convolute in bud. Stipules none or adnate to petiole. Flowers white red yellow or green, solitary or racemose, often unisexual; pedicels bracteate. Calyx adnate to ovary, limb tubular or campanulate, 4-5-fid, imbricate or subvalvate in bud. Petals small, 4-5. Stamens as many as, and inserted with petals in the throat of the calyx. Ovary inferior, 1-celled; styles 2; ovules few or many, on 2 slender parietal placenta. Berry ovoid or globose, 1-celled, with few or many seeds. Seeds horizontal; testa with a gelatinous coat; albumen adhering to the testa; embryo minute.

- | | |
|---|----------------------------|
| Armed; peduncles 1-2 flowered | 1. <i>R. Grossularia</i> . |
| Unarmed; flowers racemose unisexual; racemes erect; calyx-limb short, flat. | |
| Pubescent and viscid with stipitate glands; leaves nearly orbicular with obtuse lobes | 2. <i>R. orientale</i> . |
| Nearly glabrous; leaves with large acute or acuminate lobes | 3. <i>R. glaciale</i> . |
| Unarmed; flowers racemose bisexual, racemes drooping; calyx-limb campanulate. | |
| Leaves glandular, dotted beneath; bracts minute | 4. <i>R. nigrum</i> . |
| Leaves eglandular; bracts ovate | 5. <i>R. rubrum</i> . |

1. *R. Grossularia*, Linn.; Wall. in Fl. Ind., ed. Carey, ii. 515; Hook. Stud. Fl. 134.—Syn. *R. Himalense*, Royle. *R. alpestre*, Wall.; Jacq. Voy. Bot. t. 75. Gooseberry. (*Krusbär*, Swed.; *Groseille*, Fr.; *Krushonik*, Russ.; *Krausbeere*, *Graselbeere*, local German names, seem all to have the same origin, and *Grossularia* is derived from them.) Vern. *Pila*, *pütukcha*, *kānsi*, *teila*, *amlānch*, Upper Chenab and Lahoul.

A small pubescent shrub, armed with 1-3 spines under the leaf-buds, and often with smaller scattered prickles. Leaves fasciculate on short lateral branchlets, nearly orbicular, 3-5-lobed, 1 in. diam.; lobes irregularly crenate. Flowers solitary or twin, greenish, drooping, on short, pubescent, 1-3-bracteate peduncles. Berries glandular-hairy.

Southern flank of Safedkoh 8000-12,000 ft. Arid tracts of the inner Himalaya, from the Indus to Kamaon, between 8000 and 11,500 ft. Kaghan, Lahoul, Kunawar, Niti, Europe (in Norway to near the 63d degree N. lat.), North Africa, Armenia, Caucasus. Fl. spring; fruit ripe Sept.-Oct., small and sour. Linnaeus established two species: *R. Grossularia*, with glandular hairy fruit, *R. Uva crisa*, with the ripe fruit glabrous. Both are cultivated in numerous varieties throughout Europe; they are, however, now commonly united into one species.

2. *R. orientale*, Poiret; Boissier Fl. Orient. ii. 817.—Syn. *R. leptostachyum*, Dne. in Jacq. Voy. Bot. t. 76. *R. villosum*, Wall. in Fl. Ind., ed. Carey, ii. 514. *R. glandulosum*, Thoms. West Him. 104. Vern. *Gwāldakh*, *kaghāk*, Kaghan; *Nangke*, *nyāi*, *phulānch* (the fruit *nyangha*), Chenab; *Askūta*, *askūtar*, Ladak; *Yange*, Piti.

A small shrub, unarmed, pubescent with short hairs, and viscid all over with numerous, yellow or brown stipitate glands. Leaves generally fasciculate; branchlets marked with the scars of bud-scales and leaves. Leaves nearly orbicular, with cordate or rounded base, 3- rarely 5-lobed, crenate-dentate, greyish brown beneath; basal nerves 3 or 5, with few lateral nerves. Flowers unisexual, dioicous, in erect racemes, with linear or oblong, concave, ciliate, deciduous bracts, somewhat longer than pedicels. Male racemes with many, female with few flowers. Calyx flat, cup-shaped; segments ovate, obtuse, much longer than the small obovate petals. Filaments short, not exceeding anthers. Berry red or yellow when ripe, with scattered glandular hairs, $\frac{1}{4}$ in. long or less, with about 10 seeds.

Safedkoh 8000-10,000 ft. Arid tracts of inner Himalaya, between 6500 (on the Indus, T. Thomson) and 14,000 ft., from the Indus to Nepal. Tibet. Afghanistan (Griff.) Persia. Kurdistan, Caucasus, Armenia, Syria (Hermon, Lebanon). I follow Karl Koch, Dendrol. 656, and Boissier l. c., in uniting under one species the West Asiatic and Himalayan plant, as I find no specific difference. Fl. April-June; fruit ripe Oct., mawkish sweet.

3. *R. glaciale*, Wall. in Roxb. Fl. Ind., ed. Carey, ii. 513.—Syn. *R. acuminatum*, Wall.

An erect, unarmed shrub, glabrous or slightly pubescent; branches with brown, shining, perfectly smooth cuticle, peeling off in long strips or rolls. Leaves 1-3 in. long, 3- sometimes 5-lobed, lobes acute or acuminate, more or less deeply cut, the subdivisions serrate, basal nerves 3-5, the midrib with 2-4 pairs of main lateral nerves; glabrous or pubescent beneath along the nerves, occasionally with scattered sessile or stipitate glands. Flowers green (Wall.), fuscous (H. & Th.), in pubescent and glandular racemes, 2-3 in. long, erect when in flower, drooping when in fruit; bracts linear-oblong, longer than pedicels, nearly as long as flowers. Berry round, smooth, red, (black?), as large as a common red currant, sour and astringent.

Himalaya at high elevations, 7000-11,000 ft., from Kashmir to Bhutan. Fl. May. Hardy in England.

4. *R. nigrum*, Linn.; Hook. Stud. Fl. 134; Hooker & Thomson, *Præcursores* ad Fl. Ind. in Journ. Linn. Soc. ii. 88. *Black Currant*.

An erect unarmed shrub; calyx and underside of leaves with round, sessile, yellow glands; petioles and racemes pubescent. Leaves somewhat longer than broad, with cordate base, 3- rarely 5-lobed; lobes triangular, acute, serrate, 2-3 in. long; basal nerves 3, each with 2-4 pair of main lateral nerves. Petioles as long as leaf, with a broad winged base. Racemes slender, few-flowered, drooping; bracts minute, much shorter than pedicel. Berries $\frac{1}{2}$ in. diam., globose, black (in gardens in Europe also white and purple), with a strong aromatic smell and taste.

Kashmir (5000-11,000 ft.), Kunawar (7000-12,000 ft.), Garhwal and Kamaon; vern. *pāpar* (6000-10,000 ft.), J. L. S. Europe, Siberia, Dahuria. Fl. July; fruit ripe Aug.-Sept.

5. *R. rubrum*, Linn.; Hook. Stud. Fl. 134.—Syn. *R. Himalense*, Dne. in Jacq. Voy. Bot. t. 77. Vern. *Gwāldākh*, Khāgān; *Rōde*, *murādh*, *nābar*, *nābre*, Chenab.

An erect unarmed shrub, without glands. Petioles and racemes pubescent. Leaves glabrous or pubescent, often with long scattered hairs, as broad as long, with cordate base, 3- rarely 5-lobed; lobes ovate-triangular, crenate, basal nerves 3 or 5, the 3 inner penniveined, with 3-5 pair of main lateral nerves. Petioles as long as or longer than leaves, with a broad, membranous, often ciliated base. Racemes many-flowered, drooping; bracts ovate, shorter than or as long as pedicel. Berries $\frac{1}{4}$ in. diam., globose, red, acid (sweet insipid, Jacquemont).

Himalaya between 5000 and 12,000 ft., both in the outer moister region and the inner arid tracts. The red currant is indigenous in Europe, in Siberia, as far as Kamchatka, and in North America. Red and white varieties are cultivated in gardens in Europe. In Lahoul the berries (*niangha*), are yellow when unripe, black but with the taste of red currants when ripe (Jaschke). The Lahoul specimens have large flowers, with a deep campanulate calyx, the lobes of which are ciliate. I follow Hooker and Thomson, l. c. 89, in referring *R. Himalense*, Dne., to *R. rubrum*, L.; but the matter seems to demand farther inquiry.

ORDER XXXIV. HAMAMELIDÆ.

Shrubs and trees, with petiolate leaves, and persistent or deciduous stipules. Flowers unisexual or bisexual. Calyx-tube more or less adnate to ovary, limb truncate or lobed. Petals 4- ∞ , occasionally wanting. Stamens 4- ∞ , definite or indefinite, perigynous. Ovary consisting of 2 carpels, generally free and rostrate at the top, 2-celled; styles 2, subulate. Fruit a 2-valved capsule, the carpels separating at the top, rostrate with persistent styles. Seeds with a straight embryo in a fleshy albumen.—Gen. Pl. i. 664; Royle Ill. 234.

1. **PARROTIA**, C. A. Meyer.

Trees and shrubs, with large, deciduous stipules, deciduous crenate leaves and capitate flowers, the flower-heads enclosed in large membranous bracts. Calyx campanulate, adhering to the base of ovary; petals none. Stamens 5-15, perigynous; filaments long, filiform; anthers basifixed, oblong, dehiscing longitudinally. Ovary 2-celled; styles 2 (rarely 3); one ovule in each cell.

1. **P. Jacquemontiana**, Decaisne—**Tab. XXVIII.**—Jacq. Voy. Bot. t. 82.—Syn. *Fothergilla involucrata*, Falconer. Vern. *Pusser*, *peshora*, *paku*, *po*, *kūllar*, *kirru*.

A large deciduous, gregarious shrub or small tree, with stellate pubescence on young branches, stipules, calyx, and the underside of young leaves. Leaves orbicular or obovate, obtuse, penniveined, the lowest pair of nerves from the base, margin deep-crenate. Stipules broadly oblong, as long as petioles or longer. Flower-heads ovoid, $\frac{1}{2}$ in. long, with about 20 sessile flowers, on short thick stalks, generally at the end of short, leaf-bearing branchlets, each head enclosed in 4 large rotundate bracts, membranous, white, often emarginate. Flowers bisexual; calyx campanulate; limb thick, woolly, truncate or with a few linear lobes. Stamens generally 15, inserted inside the limb of calyx; anthers oblong without appendage, the cells dehiscing laterally by 2 narrow longitudinal valves, opening like a pair of folding-doors. Capsule woolly, with stellate tomentum, girt by the adhering calyx-tube, 2-celled, the cells separating when ripe, each cell with 1 seed in a hard, horny endocarp, which opens at the top in 2 rostrate valves. Embryo oblique in copious albumen.

North-West Himalaya in many places, from the Indus to the Ravi, at elevations between 2800 and 8500 ft. Rare trans-Indus. Generally found on low slopes, growing gregariously in extensive thickets, often covering several acres, to the exclusion of other shrubs, and with little or no grass underneath. The stems are grouped in close clusters of 5-6 or more together, 15-20 ft. high, and about 15 in. girth, with a few divaricate branches at the top. Rarely solitary, with a more tree-like habit. Fl. March-May; fr. July-Sept. The foliage turns yellow before being shed.

Bark thin, firm, dark brown, occasionally light silvery grey, with many specks, and transverse, blotchy, darker rings, not much marked, except by small circular, elevated, whitish spots. Sapwood whitish, heartwood brown, close, compact, fine- and even-grained, strong, 12-16 rings per inch of radius. Highly esteemed for walking-sticks, charpoys, tent-pegs, and rice-pestles, also used for bows (*goleil*) for throwing pellets (*goi*) of baked earth.

This tree is valuable on account of the toughness and pliability of its twigs, which are used extensively for binding loads and basket-work. They are preferred to all other material for making the twig-bridges over the great rivers of the Panjab Himalaya. These bridges are often 300 ft. long, and consist of one large rope to walk on, and two smaller side ropes, one for each hand, with much smaller ropes connecting the hand-ropes with the foot-rope. In Western Kashmir, near Mozaffurabad, these ropes are made of hides, but ordinarily they are twisted of twigs of *Parrotia*, when it can be got, mixed with *Cotoneaster*, *Olea*, and *Indigofera*, and where these plants are not attainable, they are made of the *Birch* and *Willow*. The *Parrotia* is cut for this purpose at all seasons of the year. With frequent piecemeal repair such bridges do not generally last more than three years.

P. persica, C. A. Meyer; Led. Fl. Ross. ii. 376, Boissier Fl. Orient. ii. 818, which grows in the low forests on the south and south-west coast of the Caspian Sea (hardly in England), differs by long, apiculate anthers, dehiscing longitudinally in the ordinary manner.—Oliver Trans. Linn. Soc. xxiii. 459.

ORDER XXXV. RHIZOPHOREÆ.

Trees and shrubs, generally glabrous, with opposite, petiolate, coriaceous, entire leaves. Stipules interpetiolar, early caducous. Flowers generally bisexual, regular. Calyx more or less adherent to the ovary, or free, limb 4-14-toothed or lobed; lobes valvate, usually coriaceous and persistent. Petals as many as calyx-lobes. Stamens 2-4 times the number of petals; filaments free; anthers 2-celled, dehiscing longitudinally, or with numerous cells. Ovary 2-5-celled, or dissepiments partially suppressed; ovules mostly geminate, collateral, pendulous; style generally 1; stigma simple or lobed. Fruit coriaceous, 1-celled, 1-seeded, indehiscent, or 3-4-celled, and septically dehiscient.—Gen. Pl. i. 677; Royle Ill. 210; Wight Ill. i. 207.

The seed germinates on the tree, with a long exserted radicle (*Mangrove* trees).

Ovary adnate at the base only, protruding beyond the calyx-tube.

Calyx 4-merous; petals entire; anthers multilocellate, subsessile, ovary 2-celled.

Calyx 5-6-merous; petals truncate, or bifid, with apical setæ; anthers 2-celled; filaments filiform.

Ovary entirely adnate to and included in the calyx-tube, calyx 8-14-merous; petals bifid, with apical setæ; anthers 2-celled; filaments filiform.

The seed does not germinate on the tree; calyx-segments 5-8; petals 5-8; stamens 10-16.

1. RHIZOPHORA.

2. CERIOPS.

3. BRUGUIERA.

4. CARALLIA.

1. RHIZOPHORA, Linn.

Trees with stout branchlets, marked with annular scars of leaves and stipules, wholly glabrous. Stipules elongate. Cymes axillary, pedunculate, few- or many-flowered. Flowers coriaceous. Calyx-tube short, supported by confluent bracts; limb 4-lobed; lobes triangular or oblong. Petals 4, entire, edges generally with long woolly hairs. Stamens 8-12, perigynous; anthers sessile or nearly so, erect, linear-oblong, triangular in section, the 2 inner faces multilocellate, pollen liberated by the separation from the inner faces of a common membrane. Ovary half-inferior, 2-celled; ovules geminate, pendulous; style 2-dentate at the top. Fruit coriaceous, long-exserted, ovoid or conic, 1-celled, 1-seeded. Seed without albumen; cotyledons conferruminate. Germination takes place in the fruit on the tree, the radicle protrudes soon after flowering as a long cylindrical body, thicker near the end, attains a length of 12 in. or more, and at length roots in the mud when the fruit falls.

1. *R. mucronata*, Lam.; Wight Ic. t. 238.—Syn. *R. Mangle*, Roxb.; Fl. Ind. ii. 459. *R. Candalaria*, W. & A. Prodr. 310. Vern. *Kamo*, Sindh; *Bhora*, Beng.

A moderate-sized tree, with elliptical leaves, terminating in a distinct, macro or narrow apiculus, broadly cuneate, or slightly rounded at base; blade 3-5 in. long, 2-3 in. broad; midrib very prominent beneath, attenuate upwards. Peduncle axillary, compressed, often recurved, longer than petiole, bearing lax few-flowered dichotomous cymes. Flowers 8-androus, sweet-scented; calyx-segments triangular; petals white, edges woolly. Fruit ovoid, furrowed, supported at the base by the calyx. The radicle of the seed germinating on the tree often 2½ ft. long.

Sindh, tidal creeks of the estuary of the Indus. Coasts and back-waters of the peninsula, Bengal and Burma. A widely-spread species on the coasts of Africa, and over the Indian Archipelago to Australia. 25 ft. high, with a small crown. Wood red, hard, and durable; the bark is used for tanning, the fruit is said to be eatable.

R. conjugata, Linn., a small tree, nearly related to this, and frequently associated with it, has narrow leaves, short 2-3-flowered cymes nearly sessile below the leaves, 12 stamens, and the radicle attaining 12-18 inches.

2. CERIOPS, Arnott.

Trees or large shrubs, wholly glabrous. Flowers coriaceous. Calyx-tube short, supported by confluent bracts; limb 5-6-partite; segments oblong-lanceolate. Petals 5-6, truncate, or emarginate. Stamens 10-12, inserted between the divisions of a lobed, annular disc; filaments slender, filiform; anthers small, ovate-oblong, 2-celled, dehiscing longitudinally. Ovary half-inferior, 3-celled; ovules 2 in each cell; style undivided. Fruit and germination as in *Rhizophora*.

1. *C. Candolliana*, Arnott; Wight Ic. t. 240.—Vern. *Kirrari*, *chauri*, Sindh.

A tall shrub or small tree, with obovate leaves 2-3 in. long, 1-2 in. broad, base cuneate, apex broad, rounded; midrib prominent beneath. Peduncles short, bracteolate, and shortly 2-3-forked at the top. Flowers subsessile, subcapitate. Petals 5, oblong, truncate, with 3 clavate setae, base abruptly narrowed, margins slightly cohering below the middle. Stamens 10, alternately shorter.

Sindh, mud forests at mouth of Indus and salt-water creeks. Coast of peninsula, Indian Archipelago, extends to Australia, and is found on the east coast of Africa. Wood hard, durable, used for the knees of boats, and for other purposes in Sindh. Bark employed as litter for cattle.

Kandelia Rheedii, W. & A. Prodr. 311, Wight Ill. t. 89, is a small tree, common on the western coast, also in Bengal and Burma, which may possibly be found in Sindh. Leaves oblong, obtuse; peduncles axillary, much longer than petioles, 2-3-chotomous, with 4-9 pentamerous flowers, petals narrow, deciduous, thin, membranous, bifid, edge laciniate, hairy; stamens numerous, and an oblong-conical fruit much longer than the calyx-tube.

3. BRUGUIERA, Lam.

Trees with the habit of *Rhizophora*. Flowers coriaceous, solitary or few together, on short, axillary, recurved peduncles, without bracts. Calyx ebracteolate, turbinate, adnate at the base to the ovary, the upper portion

free; segments 10-15, thick, linear. Petals as many, 2-lobed. Stamens twice the number of petals; anthers linear, 2-celled, mucronate, about as long as filaments. Ovary inferior, included in calyx-tube, 2-4-celled, with 2 pendulous ovules in each cell; style filiform, with 2-4 minute stigmatic lobes. Fruit turbinate, crowned by the persistent calyx-lobes. Germination as in *Rhizophora*.

1. *B. gymnorhiza*, Lam.; W. & A. Prodr. 311.—Syn. *B. Rheedii*, Blume; Wight Ic. t. 239 A. *Rhizophora gymnorhiza*, Roxb. Fl. Ind. ii. 460; Griff. Ic. t. 645 iv. Vern. *Kakra*, *kankra*, Beng.

—A large evergreen tree, with oblong-elliptical, short-acuminate leaves 3-6 in. long, $1\frac{1}{4}$ - $2\frac{1}{4}$ in. broad, narrowed into a petiole about 1 in. long. Stipules oblong, 1-2 in. long, very deciduous. Flowers solitary, about 1 in. long. Calyx thick and rigid, lobes usually about 12, the tube about $\frac{1}{3}$ the whole length. Petals shorter than calyx, deeply 2-lobed, densely hairy at the base; margins induplicate, more or less hairy all the way up; setæ usually 1 in the notch and 3-4 at the end of each lobe. Anthers embraced in pairs by the induplicate edges of the petals. Fruit at first crowned by the calyx-limb, which often falls off as the radicle protrudes, the latter assuming a narrow spindle-shaped form, with about 6 prominent angles.

Sindh, estuary of the Indus. Coast of Peninsula, Sundarbans. Indian Archipelago. North Australia. Wood yellowish brown, hard and durable. This tree sends down numerous roots from the trunk and branches, which eventually raise the stem, so that it appears divided before it reaches the ground. *Rhizophora mucronata* and other Mangroves do the same. Griffith (on the family of the Rhizophoreæ, Transactions of the Medical and Physical Society of Calcutta, viii. 6) ascribes the lifting up of the stem to the resistance which the roots meet at their extremities. Nearly allied to this, and probably a variety only, is—

B. eriopetala, Wight. Ill. i. p. 210, Ic. t. 239 B—syn. *B. parietosa*, Griff. Ic. t. 641,—with large solitary flowers, calyx-lobes 8-12, margin of petals from base to apex densely hirsute.

Three other Indian species enumerated in Wight's Ill. p. 210, differ from *B. gymnorhiza* by smaller flowers in axillary, pedunculate 2-to many-flowered cymes; they are small glossy trees closely allied to each other, and probably form one species only. 1. *B. caryophylloides*, Blume (*Rhiz. caryophylloides*, Griff. Ic. t. 642). 2. *B. malabarica*, Arnott. 3. *B. parviflora*, Arnott (*Rhizophora parviflora*, Roxb. Fl. Ind. ii. 461).

4. CARALLIA, Roxb.

Trees and shrubs, wholly glabrous, with small flowers in pedunculate, compact trichotomous cymes. Calyx-tube campanulate, produced beyond the ovary, with 5-8 short segments. Petals as many as calyx-segments, unguiculate, orbiculate, serrate or lacinate. Stamens twice the number of petals, inserted on the crenulate edge of the disc, which clothes the calyx-tube. Ovary adnate to calyx, generally 4-celled; ovules 2 in each cell. Embryo terete in a copious albumen.

1. *C. integerrima*, DC.; Bedd. Fl. Sylv. t. 193; Benth. Journ. Linn. Soc. iii. 74.—Vern. *Manioga*, Burm.

A moderate-sized tree, with elliptical leaves, terminating in a distinct mucro or narrow apiculus, broadly cuneate, or slightly rounded at base blade 3-5 in. long, 2-3 in. broad; midrib very prominent beneath, attenuate upwards. Peduncle axillary, compressed, often recurved, longer than petiole, bearing lax few-flowered dichotomous cymes. Flowers 8-androus, sweet-scented; calyx-segments triangular; petals white, edges woolly. Fruit ovoid, furrowed, supported at the base by the calyx. The radicle of the seed germinating on the tree often $2\frac{1}{2}$ ft. long.

Sindh, tidal creeks of the estuary of the Indus. Coasts and back-waters of the peninsula, Bengal and Burma. A widely-spread species on the coasts of Africa, and over the Indian Archipelago to Australia. 25 ft. high, with a small crown. Wood red, hard, and durable; the bark is used for tanning, the fruit is said to be eatable.

R. conjugata, Linn., a small tree, nearly related to this, and frequently associated with it, has narrow leaves, short 2-3-flowered cymes nearly sessile below the leaves, 12 stamens, and the radicle attaining 12-18 inches.

2. CERIOPS, Arnott.

Trees or large shrubs, wholly glabrous. Flowers coriaceous. Calyx-tube short, supported by confluent bracts; limb 5-6 partite; segments oblong-lanceolate. Petals 5-6, truncate, or emarginate. Stamens 10-12, inserted between the divisions of a lobed, annular disc; filaments slender, filiform; anthers small, ovate-oblong, 2 celled, dehiscing longitudinally. Ovary half-inferior, 3-celled; ovules 2 in each cell; style undivided. Fruit and germination as in *Rhizophora*.

1. *C. Candolliana*, Arnott; Wight Ic. t. 240.—Vern. *Kerrari*, *chauri*, Sindh.

A tall shrub or small tree, with obovate leaves 2-3 in. long, 1-2 in. broad, base cuneate, apex broad, rounded; midrib prominent beneath. Peduncles short, bracteolate, and shortly 2-3-forked at the top. Flowers subsessile, subcapitate. Petals 5, oblong, truncate, with 3 clavate setae, base abruptly narrowed, margins slightly cohering below the middle. Stamens 10, alternately shorter.

Sindh, mud forests at mouth of Indus and salt-water creeks. Coast of peninsula, Indian Archipelago, extends to Australia, and is found on the east coast of Africa. Wood hard, durable, used for the knees of boats, and for other purposes in Sindh. Bark employed as litter for cattle.

Kandelia Rheedii, W. & A. Prodr. 311, Wight Ill. t. 89, is a small tree, common on the western coast, also in Bengal and Burma, which may possibly be found in Sindh. Leaves oblong, obtuse; peduncles axillary, much longer than petioles, 2-3-chotomous, with 4-9 pentamerous flowers, petals narrow, deciduous, thin, membranous, bifid, edge laciniate, hairy; stamens numerous, and an oblong-conical fruit much longer than the calyx-tube.

3. BRUGUIERA, Lam.

Trees with the habit of *Rhizophora*. Flowers coriaceous, solitary or few together, on short, axillary, recurved peduncles, without bracts. Calyx ebracteolate, turbinate, adnate at the base to the ovary, the upper portion

free; segments 10-15, thick, linear. Petals as many, 2-lobed. Stamens twice the number of petals; anthers linear, 2-celled, mucronate, about as long as filaments. Ovary inferior, included in calyx-tube, 2-4-celled, with 2 pendulous ovules in each cell; style filiform, with 2-4 minute stigmatic lobes. Fruit turbinate, crowned by the persistent calyx-lobes. Germination as in *Rhizophora*.

1. *B. gymnorhiza*, Lam.; W. & A. Prodr. 311.—Syn. *B. Rheedii*, Blume; Wight Ic. t. 239 A. *Rhizophora gymnorhiza*, Roxb. Fl. Ind. ii. 460; Griff. Ic. t. 645 iv. Vern. *Kakra*, *kunkra*, Beng.

—A large evergreen tree, with oblong-elliptical, short-acuminate leaves 3-6 in. long, $1\frac{1}{2}$ - $2\frac{1}{4}$ in. broad, narrowed into a petiole about 1 in. long. Stipules oblong, 1-2 in. long, very deciduous. Flowers solitary, about 1 in. long. Calyx thick and rigid, lobes usually about 12, the tube about $\frac{1}{3}$ the whole length. Petals shorter than calyx, deeply 2-lobed, densely hairy at the base; margins induplicate, more or less hairy all the way up; setæ usually 1 in the notch and 3-4 at the end of each lobe. Anthers embraced in pairs by the induplicate edges of the petals. Fruit at first crowned by the calyx-limb, which often falls off as the radicle protrudes, the latter assuming a narrow spindle-shaped form, with about 6 prominent angles.

Smith, estuary of the Indus. Coast of Peninsula, Sundarbans. Indian Archipelago. North Australia. Wood yellowish brown, hard and durable. This tree sends down numerous roots from the trunk and branches, which eventually raise the stem, so that it appears divided before it reaches the ground. *Rhizophora mucronata* and other Mangroves do the same. Griffith (on the family of the Rhizophoraceæ, Transactions of the Medical and Physical Society of Calcutta, viii. 6) ascribes the lifting up of the stem to the resistance which the roots meet at their extremities. Nearly allied to this, and probably a variety only, is—

B. cripetala, Wight. Ill. i. p. 210, Ic. t. 239 B.—syn. *B. parietosa*, Griff. Ic. t. 641,—with large solitary flowers, calyx-lobes 8-12, margin of petals from base to apex densely hirsute.

Three other Indian species enumerated in Wight's Ill. p. 210, differ from *B. gymnorhiza* by smaller flowers in axillary, pedunculate 2-to many-flowered cymes; they are small glossy trees closely allied to each other, and probably form one species only. 1. *B. caryophylloides*, Blume (*Rhiz. caryophylloides*, Griff. Ic. t. 642). 2. *B. malabarica*, Arnott. 3. *B. parviora*, Arnott (*Rhizophora parviflora*, Roxb. Fl. Ind. ii. 461).

4. CARALLIA, Roxb.

Trees and shrubs, wholly glabrous, with small flowers in pedunculate, compact trichotomous cymes. Calyx-tube campanulate, produced beyond the ovary, with 5-8 short segments. Petals as many as calyx-segments, unguiculate, orbiculate, serrate or laciniate. Stamens twice the number of petals, inserted on the crenulate edge of the disc, which clothes the calyx-tube. Ovary adnate to calyx, generally 4-celled; ovules 2 in each cell. Embryo terete in a copious albumen.

1. *C. integerrima*, DC.; Bedd. Fl. Sylv. t. 193; Benth. Journ. Linn. Soc. iii. 74.—Vern. *Manioga*, Burm.

A large tree, with entire, elliptic obovate or oblong leaves. Flowers 6-8-merous, nearly sessile in capitate cymes; petals white, orbicular deeply lacinate, with lanceolate segments.

Common in evergreen forests of South India, Burma, Bengal, and the Eastern Himalaya. On the western coast it extends to the latitude of Bombay, and will probably be found in the range of this Flora either on the Satpura hills or in the Gorakhpur, Oudh, or Kamaon forests. Found also in South China, the Philippine Islands and tropical Australia. Timber reddish brown, rather brittle, but very ornamental, with broad medullary rays, which show on a vertical section like undulating, broad irregular bands, giving the wood a beautiful mottled appearance. Polishes well.

C. lucida, Roxb. Cor. Pl. t. 211; Fl. Ind. ii. 481; Wight Ic. t. 605, is doubtfully referred to *C. lanceaefolia*, Roxb. by Benthani, l. c. 75. In Wall. cat. 4880 *C. lucida* is quoted from Kamaon.

ORDER XXXVI. COMBRETACEÆ.

Trees or shrubs, with simple, petiolate, entire leaves, without stipules. Flowers bracteate, bisexual, rarely polygamous. Calyx-tube adnate to the ovary; limb 4-5 cleft, generally campanulate with valvate segments. Petals none, or 4-5. Stamens as many as calyx-segments, or twice the number, inserted on the limb or inside the calyx. Ovary wholly adnate to calyx-tube, 1-celled; style simple, filiform. Fruit often winged or angled, 1-celled or 1-seeded. Seed pendulous, with a coriaceous or membranous testa, without albumen. Embryo straight, with a small superior radicle, and fleshy, oily, convolute, plicate, or contortuplicate cotyledons. —Gen. Pl. i. 683; Royle III. 209; Wight III. i. 211.

Flowers in spikes or racemes.

- | | |
|--|----------------|
| Climbing shrubs or undershrubs, with opposite leaves | 1. COMBRETUM. |
| Trees or shrubs wholly glabrous, with alternate thick fleshy leaves | 2. LUMNITZERA. |
| Large trees, with alternate or subopposite leaves; fruit large, a fleshy drupe, or dry, with 3-7 wings | 3. TERMINALIA. |
| Flowers in globose heads; fruit small, flat, imbricated | 4. ANOGONUM. |

Calycotris floribunda, Lam. (*Getonia floribunda*, Roxb. Cor. Pl. t. 87; Fl. Ind. ii. 428), is a large climbing shrub; branchlets, underside of leaves, inflorescence, and calyx rusty-pubescent; leaves opposite, ovate-lanceolate; flowers greenish, in large rounded, terminal panicles. Fruit villos, ovoid, 1-seeded, crowned with the persistent calyx, with 5 enlarged, linear-lanceolate, membranous lobes, $\frac{1}{2}$ -1 in. long.—Burma, Bengal, South India probably in the Centr. Prov. Fl. March-April. *G. nutans*, Roxb., is probably not specifically different.

Quisqualis indica, Linn.; Roxb. Fl. Ind. ii. 427; Wight III. t. 92 (*Q. villosa*, Roxb., *The Rangoon Creeper*),—is a large scandent shrub with showy flowers, first white, then blood-red or orange, in drooping racemes. Calyx-tube filiform, 3-4 in. long, bearing at the throat 5 elliptic-oblong petals. Fruit oblong, $\frac{1}{2}$ in. long, with 5 sharp angles or wings.—Burma, Indian Archipelago, grown in gardens throughout the greater part of India. Fl. May-Sept.

1. COMBRETUM, Linn.

Shrubs, generally climbing, with opposite, rarely verticillate petiolate membranous leaves, and polygamo-dioicous flowers. Calyx-tube cylin-

dricul or 4-5-angled, constricted above the ovary, with a campanulate 4-5-cleft deciduous limb. Petals 4-5, small, inserted between the calyx-lobes. Stamens 8 or 10, biseriate, with long slender filaments, and small didymous anthers. Ovary 1-celled, with a subulate style, and 2-6 pendulous ovules. Fruit coriaceous, often filled with spongy cellular tissue, 4-6-angled or 4-6-winged, 1-seeded.

1. *C. decandrum*, Roxb. Fl. Ind. ii. 232 ; Cor. Pl. t. 59. —Syn. *Poirrea Roxburghii*, DC. ; W. & A. Prodr. 317. Vern. *Dhobela*, Chindwara ; *Punk*, Gonda, Oudh.

A large climbing shrub ; young leaves, branchlets, and inflorescence clothed with soft silky pubescence. Leaves glabrous, opposite, elliptic-oblong, acuminate, about 6 in. long on short petioles, with 6-8 main lateral arcuate nerves on either side of midrib. Flowers pentamerous and decandrous, on numerous cylindrical, terminal, and lateral bracteate spikes, forming a long panicle, the floral-leaves coloured. Bracts as well as peduncles and calyx clothed with soft ferruginous hairs. Fruit 1 in. long, with 5 equal broad obtuse membranous wings.

Common in Bengal, Behar, South India, Oudh, Kamaon, and the Central Provinces, chiefly in open jungle. Fl. Feb.-March ; fruit June.

C. nanum, Hamilt. ; Wall. Cat. 3994, is a small undershrub, vern. *Pharsia*, Kamaon, perfectly glabrous, with a thick wooly prostrate stem. Common in grass lands of the Doons, Swatiks, and sub-Himalayan tract, from the Jumna to Sikkim, in the Oudh forests, in Behar, and the Central Provinces. Flowers 1 in. long to end of stamens, in terminal and axillary spikes, bracts deciduous, leaves opposite, broad-obovate, 2-4 in. long, with 3-4 pair of main lateral arcuate nerves. The leaf- and flower-bearing stems are burnt down annually to the root by the fires. Fl. March, April.

2. LUMNITZERA, Willd.

Trees or shrubs with alternate, thick and somewhat fleshy leaves. Flowers white or red, nearly sessile, racemose. Calyx-tube oblong, a little prolonged beyond the ovary, with 2 adnate bractlets ; limb campanulate, 5-lobed, persistent. Petals 5. Stamens 5-10 ; filaments filiform ; anthers cordate. Ovary 1-celled, with 2-5 pendulous ovules. Fruit small, ovate-oblong, more or less compressed, bluntly angled, crowned by the persistent calyx, enclosing in a fibrous pericarp a hard osseous 1-seeded nut. Seed linear, cotyledons convolute.

1. *L. racemosa*, Willd. ; W. & A. Prodr. 316. —Syn. *Petaloma alternifolia*, Roxb. Fl. Ind. ii. 372. Vern. *Kripa*, Beng.

A tree or tall shrub, perfectly glabrous, with spatulate fleshy crenate leaves 2 in. long, somewhat approximate near the ends of branches ; lateral nerves 3-5 on either side of midrib, indistinct. Petals white. Stamens 10. Racemes (more correctly spikes, as the flowers are all but sessile) lax, longer than leaves, axillary, or from below the leaves.

On the edge of salt-water creeks and back-waters in the Sunderbunds, in Malabar and the Konkan ; may possibly be found in Sindh. Found also on the Zambesi river, and in Australia. Wood strong and durable ; used for building, and furnishes a large portion of the fuel for Calcutta (Roxb.)

3. **TERMINALIA**, Linn.

Trees or large shrubs with alternate or subopposite leaves, generally petiolate and entire. Flowers sessile, small, greenish or white, generally in long spikes, bisexual or polygamous. Calyx-tube ovoid or cylindrical, constricted above the ovary; limb campanulate or cylindrical, 5-toothed, deciduous. Petals wanting. Stamens 10, in 2 rows; anthers small, versatile, dehiscing longitudinally. Ovary inferior, 1-celled. Ovules 2, rarely 3, pendulous from the top of the cell. Fruit 1-seeded, the seed included in a coriaceous or osseous kernel; testa membranous; cotyledons convolute.

Fruit fleshy, ovoid, without wings.

Leaves approximate near ends of branches; petiole longer than $\frac{1}{2}$ blade of leaf. Spikes axillary, and below the leaves; bracts small, caducous.

1. *T. bellerica*.

Leaves distant, often subopposite; petioles shorter than $\frac{1}{2}$ blade of leaf. Spikes terminal and axillary, often paniculate, bracts lanceolate or subulate.

2. *T. Chebula*.

Fruit coriaceous, with 3-7 longitudinal wings.

All leaves subopposite; fruit large, with 5-7 thick narrow wings.

3. *T. Arjuna*.

Upper leaves often alternate; fruit large, with 5 thin broad wings.

4. *T. tomentosa*.

Upper leaves always alternate; fruit small, in large panicles, with 1 very large and 2 small wings.

5. *T. paniculata*.

1. *T. bellerica*, Roxb. Cor. Pl. t. 198; Fl. Ind. ii. 431; W. & A. Prodr. 313; Wight Ill. t. 91; Bedd. Fl. Sylv. t. 19.—Sans. *Tusha*, *baheruka*. Vern. *Bahera*, *bhaira*, Hind.; *Bakra*, *balda*, Dekkan; *Behedo*, Mandevis; *Tahaka marra*, Gonds, C.P.; *Manjit* (the bearing tree), C.P. (R. Th.); *Tissein*, Burm.

A large tree, with slight soft rust-coloured pubescence on young branchlets and calyx. Leaves approximate at the ends of branchlets, glabrous, slightly pubescent when quite young, coriaceous, pale beneath, broad-elliptic, or obovate-elliptic, 3-8 in. long, base often unequal, apex obtuse, retuse, or short-acuminate, main lateral nerves arcuate, prominent, 5-8 on either side of midrib. Petiole longer than $\frac{1}{2}$ length of leaf. Flowers sessile, dirty grey or greenish yellow, with a strong offensive smell. Spikes slender, interrupted, 3-6 in. long, on this year's shoots in the axils of leaves or below the leaves, male and bisexual flowers mixed. Bracts linear, very early caducous. Free part of calyx cup-shaped, cleft half-way into 5 acute triangular segments, woolly inside, with long brown hairs. Filaments inserted below the calyx-segments and twice their length. Fruit ovoid, grey, velvety, with 5 more or less indistinct furrows $\frac{3}{4}$ to 1 in. long; nut thick and hard. Roxburgh describes the petiole with 2 "opposite glands on the upper side of the apex, and sometimes near the base." I do not find any distinct glands on the specimens before me, and do not recollect having seen them in India.

Common in the plains and lower hills throughout India and Burma, but not found indigenous in the arid region which comprises Sindh, Western Rajputana, and the Southern Panjab. Along the foot of the Himalaya and in the outer

valleys it extends nearly to the Indus, but is scarce near its western limit. Common in the Oudh Sāl forests. Sheds its leaves in Feb. and March; the new leaves come out in April. The young foliage is of a copper- or tan-colour. Fl. Feb.-May; the fruit ripens during the ensuing cold season.

Attains 80-100 ft., with a tall, straight, regularly-shaped trunk 6-10, and at times 16-20 ft. girth. Branches spreading, forming a broad massive crown. Bark $\frac{1}{2}$ in. thick, dark grey, uneven and tessellated by broad longitudinal furrows, crossed by short narrow transverse wrinkles, the old bark exfoliating in dry corky scales. Wood light grey or yellowish, open- and coarse-grained, easily worked, but not durable. No distinct heartwood, the cub. ft. of green wood weighs 58-60, of seasoned wood 39-43 lb. Used for planking, packing-cases, canoes, and in the North-West Provinces for house-building after having been steeped in water. An insipid gum exudes from wounds in the bark. The fruit is a favourite food of monkeys, deer, sheep, goats, and cattle. It is one of the Myrobalans of commerce, and is used in dyeing cloth and leather, and in tanning, and is exported to Europe. Native ink is made of it, and it is used in medicine (Pharm. Ind. 88). The kernels are eaten, but are said to be intoxicating. Oil is expressed from them.

2. *T. Chebula*, Retzius—**Tab. XXIX.**—Roxb. Cor. Pl. t. 197; Fl. Ind. ii. 433; W. & A. Prodr. 313; Bedd. Fl. Sylv. t. 27.—Sans. *Hari-taki*. Vern. *Har*, *Harra*, *harara*, Hind.; *Halra*, *Harla*, Dekkan; *Hir*, *Māhōka*, Gonds, Satpura range; *Pangāh*, Burm.

A large tree; young branchlets, leaf-buds, and youngest leaves with long soft shining, generally rust-coloured, sometimes silvery hairs. Leaves distant, mostly subopposite, ovate or oblong-ovate, acuminate, 3-8 in. long, main lateral nerves arcuate, prominent, 6-12 on either side of midrib. Petiole shorter than $\frac{1}{3}$ length of leaf, 2 or more glands on the upper side of the petiole. Flowers sessile, dull-white or yellow, with a strong offensive smell. Spikes 2-4 in. long, often panicked, at the end of this year's shoots, terminal, above the leaves, and in the axils of the leaves. Bracts subulate or lanceolate, longer than flower-buds, falling after the flowers open. Free part of calyx cup-shaped, cleft half-way into 5 acute triangular segments, woolly inside with long brown hairs. Filaments more than twice the length of calyx-segments. Fruit obovoid from a cuneate base, sometimes ovoid, 1-1 $\frac{1}{2}$ in. long, more or less distinctly 5-angled; nut thick and hard, with a rough surface, irregularly 5-grooved. *T. citrina*, Roxb. Fl. Ind. ii. 435, from East Bengal, leaves broad-lanceolate, with a tapering base; fruit elongate-obovoid, nut deeply 5-grooved, may possibly be a variety only.

Siwalik tract and outer Himalaya, ascending to 5000 ft., and extending west to the Sutlej. Common in Eastern Bengal, Behar, Central India, and South India. South of the Nerbudda I have always found it more common and of larger size at elevations above 2000 ft.—for instance, on the high lands of the Satpuras. Cultivated occasionally in the sub-Himalayan tract of the Panjab to the Indus. Sheds its leaves in Feb. and March, the new foliage comes out in April, the flowers appear shortly afterwards, and the fruit ripens January to March of the ensuing year.

In the Panjab generally a small tree 4-5 ft. girth, farther south and under favourable conditions, attains a large size, 80-100 ft., with a tall, straight, regularly-shaped stem 8-12 ft. girth. Bark $\frac{1}{2}$ -1 in. thick, dark-coloured, cracked

and furrowed, woody scales exfoliating. Sapwood large, heartwood with an irregular outline, pale or dark brown, finely mottled, often with a yellowish or greenish tinge, hard, close-grained, and heavy. Regarding weight and transverse strength there is some uncertainty. Skinner gives the weight of the wood from the Peninsula at 54 lb. per cub. ft., R. Thompson (wood from the Satpura) at 53½. *Pangah* wood from Burma is said to weigh 58 lb. by Benson, 60 by Skinner, and the result of my experiments in 1864 was 66.3. But in 1861, when preparing a collection of woods for the Exhibition of 1862, I found the Burma wood to weigh 53 lb. only. As there is no reason to believe that the *Pangah* of Burma is a different species, the readiest explanation is, that the weight of the wood varies within wide limits—viz. between 53 and 66 lb. per cub. ft. So much is certain, that it is heavier than the wood of *T. bellerica*. The value of P. is given by Skinner (for South India wood) at 825, for Burma wood at 1032, which agrees with the result obtained by Benson (1033). My experiments with Burma wood (in 1864) gave 810, 1230, and 1230. *Pangah* wood has numerous fine medullary rays, the annual rings are fairly distinct, the pores are numerous in the inner (spring and summer) wood, and there is often a narrow belt of outer (autumn) wood without pores. It takes a good polish, and is fairly durable; it is used for furniture, carts, agricultural implements, and house-building. The bark is employed for tanning and dyeing. Hollow rounded galls to 1 in. diam. are formed on the young twigs; they are very astringent, used to make writing-ink, in tanning, and in dyeing. The galls are called *Halre-ke-phul* in the Dekkan, and *Kadukai* in Tamil. The dried fruit are the Black Myrobalans of commerce (*Har*, *harra*). The dried unripe fruit is called *Bāhar*, *zangihar*, *kalehar* (Moodeen Sheriff Suppl. to the Pharm. of India 242), and many varieties of it are sold for tanning, dyeing, and as a medicine.

3. *T. Arjuna*, Bedd. Fl. Sylv. t. 28.—Syn. *T. Berryi* and *glabra*, W. & A. Prodr. 314; *Pentaptera Arjuna* and *glabra*, Roxb. Fl. Ind. ii. 438, 440. Sans. *Arjuna*, *kakubha* (Roxb.) Vern. *Anjun*, *arjūn*, *arjūna*, *arjanī*, *arjan*, *kahūa*, *kawa*, *kowa*, *koha*. (*Arjuna sadra*, Guzerat.)

A large tree, with huge often buttressed trunk, smooth grey bark, and drooping branchlets; glabrous, inflorescence only slightly pubescent. Leaves generally subopposite, hard, coriaceous, oblong, 5-8 in. long, on short petioles, with 2 large, often cylindrical glands at the base of the leaf or on petiole, glabrous on both sides, pale brown beneath; main lateral nerves arcuate, 10-15 on either side of midrib. Flowers, like those of *T. tomentosa*, in cylindrical, pedunculate, terminal and axillary spikes, generally congregated into short panicles. Fruit 1-1½ in. long, with 5-7 equal, brown, hard, coriaceous, thick, narrow wings, less than ½ in. wide, indistinctly and irregularly marked with ascending cross-lines.

Common on the banks of rivers, streams, and dry water-courses in Central and South India and Bengal. Also in the Oudh forests. Farther west in the Siwalik tract and the outer Himalayan valleys, only here and there (Garhwal, Hardwar). In the Panjab it is cultivated (not indigenous), west to the Ravi. Fine specimens near Kangra. Fl. April, May; the fruit ripens in the cold season. The tree is never quite leafless.

Attains 80-100 ft., with a tall, large, but not regularly-shaped trunk, 40-50 ft. to the first branch, 10-20 ft. girth, with angular excrescences and huge buttresses. Crown handsome, close, large, oval; branchlets drooping. Bark greenish white, often green, or grey, slate-coloured or purplish, flaking off in large thin layers, showing a fresh green surface. Sapwood whitish, heartwood dark brown,

very hard. Weight, 48-54 lb. per cub. ft. Value of P. 806-820. Apt to split in seasoning, not easy to work; used for carts, agricultural implements, and building. The bark, sold in the bazaars of South India, is in great repute as a tonic, and for external use on wounds.

4. *T. tomentosa*, W. & A. Prodr. 314; Bedd. Fl. Sylv. t. 17.—Syn. *T. crenulata* and *coriacea*, W. & A. Prodr. l. c.; *Pentaptera crenulata*, *coriacea*, and *tomentosa*, Roxb. Fl. Ind. ii. 438-440. Sans. *Asana*. Vern. *Sain*, *assain*, *assaina*, *arsain*, *asna*, *assan*, N.W. Ind.; *Ain*, *ayin*, Bomb.; *Sāj*, *sīja*, C.P.; *Mard morra*, Gonds, C.P.; *Sāg*, *hāg*, *Sāder*, *Saddr*, *Sādri*, *hādri*, Nimar, Guzerat, and adjoining parts of Meywar; *Matti*, *kari matti*, Canar.; *Taukkyan*, Burm.

A large tree, with a tall, regularly-shaped trunk. Bark rough, black, deeply cracked; young branches, inflorescence, and young leaves clothed with short, rust-coloured pubescence. Leaves hard, coriaceous, oblong or ovate, rarely obovate-oblong, 5-9 in. long, on short petioles, with 1-2 glands near the base of the midrib, soft-tomentose beneath or glabrous on both sides when full-grown; main lateral nerves arcuate, 10-20 on either side of midrib; the top leaves near the end of the branch generally alternate, the lower leaves subopposite. Flowers of a dull yellow colour, in erect terminal panicles, the lower branches in the axils of leaves. Bracts lanceolate, longer than buds. Free part of calyx-tube flat cup-shaped, hairy within, with 5 broad ovate acute segments. (Fl. all bisexual, Roxb.) Fruit $1\frac{1}{2}$ -2 in. long, with 5 broad, coriaceous, brown wings, $\frac{3}{4}$ -1 in. broad, and as long as the fruit, marked with numerous, closely parallel, horizontal, prominent lines, running from the axis to the edges; edges of wings thin, irregularly crenulate. There is a marked variety with (always?) drooping branchlets, larger broad-ovate leaves, and very large fruit, 2 in. long, which merits further study. I have found it in Burma and (April 1863) in the Oudh forests between the Mohān and Sarda rivers, and it has been noticed in Kamaon and elsewhere. The bark, however, is the same as that of the ordinary form with oblong leaves.

A common tree in the moister regions of India. In the Siwalik tract and outer Himalayan valleys it goes west as far as the Ravi, and in places ascends to 4000 ft. In Western India its limit appears to be in the forests south-west of Neemuch, where several places (Sadri, Bara Sadri, Chota Sadri) seem to have derived their names from it. It is also found on the western edge of the Malwa table-land, east of the Bunass river (Bassi forests). East and south of these points it extends throughout Central, Eastern, Southern India, and Burma. Thrives best in heavy binding soils. Fl. April. The fruit ripens in Feb.-April of the ensuing year. Coppices fairly well. The tree bears long-continued pollarding. In the Sattara district along the line of Ghats, and east of the narrow belt of evergreen forest which fringes the edge of the Ghats, there is a broader belt of forest, mainly composed of deciduous trees, from 10-15 miles wide, where the system of cultivation has been for centuries periodically to cut the underwood, but to leave a certain number of standard trees, which are pollarded, every time the underwood is cut. The underwood is burnt with the branches of the pollards, and the ashes serve to fertilise the fields. The hills in that portion of the district are thus studded with numerous huge pollards, principally of *Terminalia tomentosa*, *bellerica*, *Careya arborea*, and *Lagerstromia lanceolata*:

and along the foot of the Ghats, in the contiguous portion of the Ratnagiri district, as far as there is any forest vegetation left, a similar system of cultivation prevails, and a large portion of the pollards are of *Terminalia paniculata*, in addition to the other trees mentioned.

T. tomentosa does not generally lose its leaves until Feb. March or April, but is one of the latest trees in the dry forest to come out in fresh leaf. Thus on the 1st May 1870, in the Sattara district, *Ain*, *Dhaura*, and *Moi* (*Odina Wodier*) were quite bare, whereas *Dopāli* (*Boswellia thurifera*), *Dhamun* (*Grewia vestita*), *Lendia* (*Lagerstrœmia parviflora*), *Kumbi* (*Careya arborea*), *Dhaiwan* (*Cordia Macleodii*), were in full leaf or coming into leaf.

Attains 80-100 ft., trunk straight, symmetrical, 40-50 ft. clear to the first branch, 8-10 ft. girth. In Burma the tree attains much larger size—80 ft. to the first branch, and a girth of 12 ft., being the average size of full-grown trees on good soil. A small knotty tree when kept down by lopping. Bark 1-2 in. thick, dark grey, nearly black, irregularly tessellated by deep and wide longitudinal furrows, and smaller transverse cracks, thick quadrangular plates exfoliating. Inner bark red. Sapwood whitish or yellow. Heartwood dark brown, mottled with darker streaks, often nearly black, hard. Medullary rays numerous, very fine. Pores small, surrounded by irregular, narrow, more or less concentrically arranged lines of whitish patches. The cub. ft. of seasoned wood weighs 60 lb. on an average, the extremes ranging between 50 and 70 lb. There is no difference in weight between the Burma and Indian wood. The green wood weighs between 70 and 80 lb. per cub. ft. The mean value of P. is given by Skinner at 860, which is a fair average of the numerous experiments made with this wood by different authors and in different parts of India—the extremes being 591 and 1104. Baker's figures alone range considerably lower; 4 experiments made with *Assan* from the Jainaghar (Jynaghar) timber agency, weighing 61.6 lb. on an average, gave the mean value of P. at 677. But Puckle's experiments with *Matti* wood from Mysore (weight 55.75 lb.) gave an average of 1010; and my experiments in 1864 with *Taukkyan* wood from Burma (weight 56.43) gave a mean value of 903. It is for further inquiry whether the wood of this tree from North India has less transverse strength than that from Burma and the South. The wood does not season readily, and is apt to warp and crack; its grain is coarse and curly, and it is not easily worked. Its durability is most uncertain. In Burma the heartwood decays rapidly; in North India beams and kurries are at times found to last well, and at other times they perish from dry-rot and are eaten by insects. It is used largely in North and Central India for house-building, for carts, rice-pounders, ship- and boat-building. It is an excellent fuel, yielding a powerful heat, and furnishing good charcoal. Potash is in places made of it. The bark is used for tanning, and the ashes of the bark are chewed with the Betel-leaf. The common *Tasar* (tussah) silkworm feeds on the leaves, and the tree is on that account pollarded (where not protected) all over the Satpura forests. Lakh is occasionally gathered on the branches, and in Oudh and the North-West Provinces the leaves are lopped for cattle-fodder. The flowers are often attacked by a *cynips*, producing numerous small peppercorn-like galls on the flower-stalks, which are persistent and remain a long time on the tree, in the place of the fruit which is not formed.

5. *T. paniculata*, W. & A. Prodr. 315; Bedd. Fl. Sylv. t. 20.—Syn. *Pentaptera paniculata*, Roxb. Fl. Ind. ii. 442. Vern. *Kinjāl*, *kindal*, *Konkan*; *Honal*, *Canara*.

A large tree, nearly glabrous; inflorescence, bracts, and ovary rusty-tomentose. Leaves coriaceous, pale-brown beneath, oblong, acuminate,

from a cordate or rounded, often unequal base, 4-7 in. long, on short petioles; main lateral nerves 10-15 on either side of midrib. The upper leaves always alternate, the lower subopposite. Flowers on slender spikes in large spreading panicles; bracts ovate, long-acuminate, recurved. Ovary cylindrical or ovoid; free portion of calyx reddish brown, globose in bud, afterwards cup-shaped, with long brown hairs inside. Fruit $\frac{1}{2}$ - $\frac{3}{4}$ in. long, sessile, close-set in large spreading panicles, with 2 smaller and 1 large wing, the latter transversely oblong, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, and $\frac{3}{4}$ -1 in. broad.

Common in the forests along the western coast; rare above Ghat in the latitude of Bombay. I do not know it north of the Konkan, and have not noted it from the Khandeish Dangs and the Mandevi forests; but it may be found in the Nerbudda valley. Fl. Aug., Sept.; the fruit ripens in March, April. The timber is useful, makes good planking, and is fairly durable. The handles of ploughs in the Ratnagiri district are made of *Kindal* and *Ain*.

4. ANOGEISSUS, Wall.

Trees with alternate, petiolate, entire leaves, and small bisexual flowers in globose heads on slender peduncles. Calyx-tube compressed, 2-winged at the base, prolonged above the ovary into a narrow, often slender tube, expanding at the top into a campanulate deciduous 5-cleft limb. No petals. Stamens 10, biseriate; filaments filiform, exserted; anthers small, cordate, versatile, dehiscing longitudinally. Ovary 1-celled, with 2 pendulous ovules. Fruit small, coriaceous, broadly 2-winged, imbricated in globose heads, rostrate by the persistent calyx-tube. Seed ovoid; cotyledons convolute.

Leaves oval ovate or ovate-lanceolate, beak as long as or longer than fruit.

Leaves oval or ovate; flower-heads in fascicles or short racemes; peduncles as long as or shorter than heads.

Leaves ovate-lanceolate, flower-heads solitary; peduncles as long as or longer than heads.

Leaves obovate, beak shorter than fruit.

1. *A. latifolia*.

2. *A. acuminata*.

3. *A. pendula*.

1. *A. latifolia*, Wall.; Bedd. Fl. Sylv. t. 15.—Syn. *Conocarpus latifolia*, Roxb. Fl. Ind. ii. 442; W. & A. Prodr. 316; Wight Ic. t. 994; Royle Ill. t. 45. Vern. *Dhau*, *dhauri*, *dhaura*, *dāva*, *dāva*, *dohu*, *bākeli*, *banli*. Local names: *Gōtra*, *gōldia*, *dhaukra*, *dhōkri*, *dāu*, Rajputana; *Khardhāva*, Banda; *Dindaga*, *dindal*, Canar; *Siri mānu*, Tel.

A large tree, with smooth, white-grey bark; young trees with spinescent branches; branchlets and young leaves with soft silky pubescence. Leaves coriaceous, subopposite, on short petioles, oval or ovate, rarely ovate-lanceolate, obtuse retuse or emarginate, glabrous when full-grown; 2-4 in. long; main lateral nerves arching, 6-10 on either side of midrib. Flower-heads in short axillary racemes; peduncles as long as flower-heads or shorter. Wings of fruit nearly orbicular, glabrous, persistent calyx-tube (beak) slightly pubescent, as long as or longer than the fruit.

Common and often gregarious in the deciduous forest of South and Central India. In the sub-Himalayan forests west to the Ravi, ascending to 3000 ft. Aravalli hills. (A variety with small silky-pubescent leaves, $1\frac{1}{2}$ in. long, not uncommon in the Central Provinces.) Bare during most part of the dry season. From November the foliage begins to have a fine copper-tint, is generally shed in February, and the new leaves come out in May. Fl. May-June, sometimes later (Jan. Feb., Roxb.) The seed ripens Nov.-Feb. Coppices vigorously. Suffers from frost. In January 1870, on the borders of Pertabgarh, south-west of Nimach, I found that it had been injured a good deal, *Acacia Catechu* had suffered less, and *A. leucophleea* not at all. In North India attains 60-70 ft., with a tall, erect trunk, often deeply fluted, and 30-40 ft. to first branch, girth 6-9 ft., in habit and appearance not unlike *Lagerstræmia parviflora*. Bark thin, smooth, white, greenish-white or cinereous, with slate-coloured patches. Thin whitish flakes exfoliating. Inner bark purplish, compact. Wood light- or dark-brown, variegated with darker veins, the centre wood of old trees often very dark. A handsome wood, close- and even-grained, compact, hard, very tough and elastic. A cub. ft. of the seasoned wood weighs between 57 and 65 lb., and 75-80 lb. while green. Its average transverse strength is given by Skinner as $P = 1220$, but other authors give a lower figure. Thus the average of 3 experiments by Puckle (Mysore wood) is 870, and of 3 experiments made by J. B. French at the workshops of the Madras railway was 752. The determination of the transverse strength, therefore, demands further experiments. So much, however, is certain, that the wood is highly valued on account of its great strength and toughness. It is universally used for axe-handles, poles for carrying loads; in many parts of India the axles of native carts are made of it, which stand heavy weights on rough roads.* But it warps and splits in seasoning, and unless kept dry is not very durable. It is used extensively for construction, furniture, agricultural implements, and for shipbuilding. It is valued next to *Teak*, *Sāl*, *Bija sāl*, and *Asna*. It makes good charcoal, and yields excellent fuel. From incisions in the bark a fine white hard gum is obtained (*dhaurika-gond*), similar to gum-arabic, employed in cloth-printing, like that of *Odina*, *Wodier*, and sold extensively. In Meywar and Kamaon the leaves are used for tanning.

2. *A. acuminata*, Wall.; Bedd. Fl. Sylv. t. 16.—Syn. *Conocarpus acuminata*, Roxb. Fl. Ind. ii. 443; W. & A. Prodr. 316. Vern. *Pāchi mānu*, *panchman*, *paunchinan*, Telugu; *Fungben*, Burm.

A large tree, with rough dark-grey bark and pendulous branchlets; branches, leaves, peduncles, and calyx clothed with soft, adpressed tomentum. Leaves subopposite, on short petioles, ovate- or oblong-lanceolate, $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. long. Flower-heads solitary, $\frac{3}{4}$ in. across, when in flower, on slender, axillary, often reflexed peduncles; sometimes branching, often with a few small leaves or bracts. Free part of calyx-tube elongated, tomentose. Peduncles as long as or longer than heads. Fruit with wings broader than long, glabrous; edge of wings irregularly dentate; persistent calyx-tube hirsute, longer than fruit.

* The carts, which carry timber and Bamboos from the Barroca forests to the great timber-mart of Reyna near the Mye river, on the borders of Guzerat, have axles and lynch-pins of *Dhaura*, the boss, nave and fellyes of *Bia* (*Pterocarpus Maranipium*), the spokes of *Khair* (*Acacia Catechu*), the yoke of *Teak*, and the pole of *Ougeinia dalbergioides*. On the other hand, the carts which come up from the open country of Guzerat have axle and lynch-pin of iron, the nave of *Rohin* (*Soyimida febrifuga*), bound with iron, and fellyes, spokes, the yoke-pole, and platform of *Babul* (*Acacia arabica*).

Burma and Northern Circars. Godavery forests. A tree which Mr R. Thompson in 1870 found on the Nagpahar in the Mandla district, and (abundantly) on the Pachmarhi plateau, vern. *Khardi*, was referred to this species by Dr Stewart; but I have not seen any of the specimens collected by Mr Thompson, and am therefore unable to decide whether it is this or the following species. R. Thompson's description states, "The cones of this species are much larger than those of *C. latifolia*," which would point to *C. acuminata*, and not to *C. myrtifolia*, the cones of which are smaller. He further describes it as a tree of moderate size, bark smooth, whitish, occasionally rugose and exfoliating, dusky. Many-branched and well clothed with dense foliage. Leaves considerably smaller than those of *C. latifolia*. Coming into fresh leaf about May, buds and young leaves covered with a beautiful silvery tomentum. Fl. in May; seed ripens Jan.-Feb.

In Burma *A. acuminata* is a large tree, 12 ft. girth, trunk regularly shaped, 80 ft. to the first branch on good soil. The wood is greyish brown, with orange or dark-brown streaks, hard, warps and cracks in seasoning. Medullary rays very numerous and very fine. Pores numerous, small, uniformly distributed. Weight of a cub. ft. 50-59 lb. P. = 880 (Skinner).

3. *A. pendula*, Edgeworth Catalogue of Plants in the Banda district, p. 47.—Syn. *A. myrtifolia*, Wall. Cat. No. 4017; Royle Ill. p. 209. (The latter name is older, but Edgeworth was the first to describe the tree.) Vern. *Dhao*, *Dhaukra*, *kala dhokra*, Meywar; *Kardahi*, Gwalior.

A small gregarious tree, with pendulous branches, and light adpressed pubescence on leaves and branchlets. Leaves alternate and subopposite, obovate, obtuse or mucronate, $\frac{1}{2}$ -1 in. long, narrowed into a short slender petiole, with 5-7 pairs of arcuate lateral nerves joined by elegant reticulate venation. Flower-heads small, $\frac{1}{4}$ in. across when in flower; free part of calyx-tube short, pubescent. Fruit with narrow wings, nearly orbicular; persistent calyx-tube shorter than fruit.

Common in Rajputana and Bandelkhand, extends north to the banks of the Jumna, and south to the Mye river; has been found near Deesa (Stocks). The small-leaved *Conocarpus* on the Pachmarhi plateau is probably this species. (Forsyth gives *Conocarpus myrtifolia* from the Satpuras under the vern. name of *Kardahi*, as not very common, with reddish-white wood.—The Highlands of Central India, p. 462.) On dry hills only a shrub, under more favourable circumstances a moderate-sized tree. Trunk short, 3-5 ft. girth, branchlets drooping. In January, when the tree is in fruit, the foliage has a beautiful reddish-brown colour similar to the foliage of Beech in autumn. This tree forms forests on the hills of Meywar, near Humirgarh, Bassi, Chittor, and other places, either pure or mixed: Often associated with *Conocarpus latifolia*, *Casuarina*, and a few other trees. Many of these forests of *A. pendula* are strictly preserved, among others the forest which clothes the lower slopes of the Chittor fort, and numerous temple forests in that part of the country. It is also found on the dry gneiss hills of Mairwara near Todgarh. The tree coppice well, and as it thrives in the dry districts of Central India its requirements merit careful study. Experiments with the wood, grown in Gwalior, were made by Cunningham—the cub. ft. was found to weigh 59 lb., the value of P. in 5 experiments ranged between 697 and 1034, average 837.

ORDER XXXVII. MYRTACEÆ.

Trees or shrubs, with simple, generally entire leaves, in most genera dotted with translucent glands, opposite or alternate, without stipules. Flowers regular and generally bisexual. Calyx-tube adnate to the ovary, limb free, 4-5-cleft, often closed in bud, and bursting into irregular lobes, or coming off entire. Disc coating the calyx-tube. Petals 4-5, sometimes none, inserted on the edge of the disc, in bud imbricate, sometimes more or less connate into a caducous calyptra. Stamens perigynous, generally numerous, inserted on or inside the edge of the disc, in one or several rows; filaments free, or connate at the base in a short ring or tube, or in bundles generally opposite the petals; anthers 2-celled, versatile or basifix, the cells mostly dehiscent longitudinally. Ovary syncarpous, inferior, rarely adnate at the base only, either 1-celled, or more often with 2 or more cells; style simple; stigma small, capitate or peltate; ovules numerous. Seeds generally without albumen.—Gen. Pl. i. 690; Royle Ill. 216; Wight Ill. ii. 6.

Leaves dotted with resinous glands, generally opposite.

Calyx truncate, the orifice closed by a deciduous operculum;
fruit hard and woody; leaves of young shoots opposite,
of flowering branches alternate.

1. *EUCALYPTUS*.

Calyx generally lobed; leaves opposite; fruit fleshy.

Free portion of calyx entire, bursting irregularly or coming
off entire

2. *PSIDIUM*.

Free portion of calyx 4-5-lobed

3. *EUGENIA*.

Leaves not dotted with resinous glands, alternate.

All stamens antheriferous; fruit dry

4. *BARRINGTONIA*.

A portion of stamens only antheriferous; fruit fleshy

5. *CAREXA*.

1. *EUCALYPTUS*, L'Héritier.

Shrubs or trees attaining sometimes a gigantic size, secreting more or less of resinous gums, whence their common appellation of "Gum-trees;" often flowering when quite young and small. Leaves in young saplings generally horizontal, opposite, sessile, and cordate; in the adult tree mostly vertical, alternate, petiolate, and passing more or less from broadly ovate to lanceolate, acuminate, and falcate, always rigid. Flowers in umbels or heads, usually pedunculate. Calyx-tube adnate to the ovary, truncate, the orifice closed by an operculum (formed of the concrete petals and calyx-lobes?), generally thick, fleshy or woody, covering the stamens in the bud, and falling off entire when the stamens expand. Stamens numerous, in several series. Ovary inferior, the summit glabrous, flat convex or conical, 3-6-celled, with numerous ovules in each cell, on an axile placenta. Fruit consisting of the more or less enlarged truncate calyx-tube, usually of a hard and woody texture, interspersed with resinous receptacles. The fertile seeds are often, but not in all species minute; the embryo has broad-cordate 2-lobed or bipartite cotyledons folded over the straight radicle, but otherwise flat. A large proportion of the seeds

are often abortive, and these are generally enlarged, variously shaped, and of a hard and uniform texture.

Numerous species have been introduced into India; they grow with great rapidity, and the timber is much valued in Australia. It will here suffice to mention two species as representatives of those which are commonly called in Australia *Blue Gum* and *Stringy-bark*.

Leaves of old trees 4-6 in. long; flowers small, umbellate; fruit

3-5 lines diam.

1. *E. obliqua*.

Leaves 6-12 in. long; flowers large, sessile; fruit 9-12 lines diam.

2. *E. Globulus*.

1. *E. obliqua*, L'Hér.; Benth. Fl. Austral. iii. 205.—Syn. *E. gigantea*, Hook. f. Fl. Tasm. i. t. 28. *Stringy-bark*.

An immense tree, attaining from 150 to 250 ft. with a very tenacious rugged, fibrous bark, flaking off in stringy masses. Leaves of young trees opposite, of flowering branches alternate, ovate-lanceolate, falcate, and very oblique at the base, more or less acuminate, 4-6 in. long, with oblique distant, anastomosing veins, inserted along the midrib, and intramarginal veins at some distance from the edge. Peduncles axillary or lateral, bearing each an umbel of about 4-12 flowers. Operculum shorter than calyx-tube. Stamens $\frac{1}{4}$ in. long, all perfect; anther-cells diverging or at length divaricate and confluent at the apex. Fruit more or less pear-shaped, truncate at the top, 3-5 lines diameter; capsule more or less sunk. Seeds minute.

This kind of Stringy-bark forms vast forests in Victoria and South Australia, and is abundant in Tasmania, forming a great part of the hill forests, and ascending to 4000 ft. Specimens have been felled in the valleys at the base of Mount Wellington, Tasmania, 300 ft. high and 100 ft. in girth. Has been introduced extensively on the Nilgiris, and on a smaller scale, by way of experiment, in the Panjab, and in several places of the North-West Himalaya.

2. *E. Globulus*, Labillardière; Benth. l. c. 225; Paxton's Flower Garden, ii. 38, fig. 153. *Blue Gum*.

A lofty tree, attaining 350 ft. Foliage when crushed of a powerful almost offensive smell. Young shoots and foliage glaucous-grey. Leaves of the young tree opposite, sessile and cordate; of the full-grown tree lanceolate or ovate-lanceolate, acuminate, falcate, often 6-12 in. long, with oblique, conspicuous anastomosing veins, all inserted along the midrib, and intramarginal veins at some distance from the edge. Flowers large, axillary, solitary or 2-3 together, closely sessile on the branch or on a peduncle not longer than thick. Calyx-tube broadly turbinate, thick, woody, more or less ribbed or rugose, $\frac{1}{2}$ - $\frac{3}{4}$ in. diameter. Operculum shorter than calyx-tube. Stamens above $\frac{1}{2}$ in. long; anthers ovate with parallel cells. Fruit semiglobular, $\frac{3}{4}$ -1 in. diameter; capsule nearly level with the rim. Seeds minute; 10,000 sifted fertile seeds per ounce (F. v. Mueller).

Gregarious in Victoria and the south of Tasmania. Introduced on the Nilgiris and (experimentally) in the Panjab. Cultivated in the plantations made in the south of France (near Nice) on barren hills. Growth extremely rapid while young (9 ft. girth in twenty years on the Nilgiris). Heartwood brown, hard, tough, durable, takes a fine polish. The leaves are used as a febrifuge in Australia.

The *garrah* wood of Western Australia (*E. rostrata*, Schlechtendal, Benth. l. c. 240) is a very strong and durable wood, but apt to crack and split unless thoroughly seasoned. It is said to resist white ants and the *Teredo navalis*, and has been imported to India for railway-sleepers. The *Red Gum* of Australia is the produce of several species, especially of *E. resinifera*, Smith, Benth. l. c. 245. It is nearly allied to Kino, is largely imported into Europe, and is used in medicine (Pharm. Ind. 71). Several ethereal oils (*Eucalyptus oil*, *Mali oil*) are distilled from the leaves of other species, and form an important article of export. Thus there are many reasons why the cultivation of those species of *Eucalyptus*, which will thrive in India, deserves to be encouraged.

2. PSIDIUM, Linn.

Trees or shrubs, with opposite leaves; peduncles axillary, 1- or few-flowered; flowers large. Calyx-tube ovate, adnate at the base, the upper free portion quite entire, closed in the bud, at length irregularly bursting into lobes or coming off entire. Petals 4 or 5, free. Ovary 2- or more-celled, with many ovules in each. Fruit a many-seeded berry. Seeds with a hard testa; embryo curved with a long radicle and short cotyledons.

1. *P. Guava*, Raddi; Grisebach West Ind. Fl. 241.—Syn. *P. pomiferum*, Linn. Bot. Reg. t. 1079, with globose; *P. pyriferum*, Linn., with obovate fruit. The *Guava-tree*. Vern. *Amrūt*, *amrūd* (the Persian name for Pear), *Safri-ām*, North-West India; *Piyāra*, Beng.

A small tree or large shrub, young branches pubescent. Leaves oblong or elliptic-oblong, 4-6 in. long, on very short petioles, pubescent beneath, nearly glabrous above, with 15-20 pairs of prominent main lateral nerves, arcuate near the edge, and joined by prominent intramarginal veins. Peduncles axillary, $1\frac{1}{2}$ -1 in. long, with 1-3 flowers. Free part of calyx ovoid in bud, larger than the ovoid ovary, bursting into irregular lobes. Petals $\frac{1}{2}$ in. diam. or more. Fruit globose or obovoid, inside red white or yellowish.

Indigenous in Mexico, and possibly in other parts of tropical America, cultivated and naturalized in most tropical countries. In India cultivated almost everywhere, except in the north-western corner of the Panjab. Often run wild, but there is no ground for supposing that the Guava is indigenous in India. Wood compact, close-grained, takes a beautiful polish.

Nearly related is the Myrtle, *Myrtus communis*, Linn.; Boissier Fl. Orient. ii. 736—Vern. *Vilāyati mehndi*, *mūrad*—indigenous in the Mediterranean region, and often cultivated in India; evergreen, wholly glabrous, with small ovate acuminate leaves; white flowers; small black berries; free part of calyx-tube short, regularly 4-5 cleft. Leaves used in native medicine.

3. EUGENIA, Linn.

Evergreen trees or shrubs, with opposite, penniveined leaves; the flowers tetramerous (Indian species), rarely pentamerous, in lateral or terminal trichotomous cymes or panicles. Calyx-tube from globular to narrow-tarbinate. Stamens numerous, in several series, free or obscurely

collected in 4 bundles; anthers versatile, usually small, the cells opening longitudinally. Ovary 2-celled, rarely 3-celled, with several ovules in each cell. Fruit a berry with 1 or few seeds; testa membranous or cartilaginous; embryo thick and fleshy with a very short radicle; the cotyledons either united in an apparently homogeneous mass, or more or less separable.

Flowers large, in short 4-8-flowered terminal cymose racemes . . . 1. *E. Jambos*.

Flowers small in trichotomous panicles arising from the previous year's wood below the leaves.

Leaves coriaceous, lateral nerves close together . . . 2. *E. Jambolana*.

Leaves subcoriaceous, lateral nerves distant . . . 3. *E. operculata*.

1. *E. Jambos*, Linn.; Roxb. Fl. Ind. ii. 494.—Syn. *Jambosa vulgaris*, W. & A. Prodr. 332; Wight Ic. t. 435. The *Rose-apple*. Sans. *Jambu*. Vern. *Gulāb jāman*.

A moderate-sized tree, quite glabrous. Leaves coriaceous, entire, lanceolate, 5-8 in. long, narrowed into short petioles; lateral nerves distant, joined by prominent intramarginal veins. Flowers tetramerous, large, white, 1-1½ in. to tip of stamens, on pedicels ½ in. long, in short cymose terminal racemes, composed of 2-4 pair of opposite flowers (1-flowered cymes), the uppermost opening first. Calyx-tube turbinate, edge free, somewhat produced above the ovary; lobes round, obtuse. Fruit subglobose, 1-2 in. long, crowned with the persistent calyx-lobes.

Only cultivated within the range of this Flora, rare in the Panjab. Indigenous in the Sikkim Terai. Cultivated in many tropical countries. Fl. Feb.; fruit ripens July, Aug. Trunk short; bark thin, grey, with shallow furrows, inner substance reddish, compact, brittle. Wood reddish brown. The tree is planted for shade and ornament, and on account of its fruit, the size of a small apple, with a delicate rose-water perfume, but dry and hardly worth eating.

2. *E. Jambolana*, Lam.—Tab. XXX.—Bedd. Fl. Sylv. t. 197; Roxb. Fl. Ind. ii. 484.—Syn. *Syzygium Jambolanum*, W. & A. Prodr. 329, often called the *Black Plum*. Sans. *Jambu*, *jambula*. Vern. *Jām*, *jāman*, *jamni*, *phalāni*, *phalinda*, *pharenda*, *phaunda*, *paiman*.

A moderate-sized tree, wholly glabrous. Leaves coriaceous, shining, entire, oval oval-oblong or lanceolate-oblong, generally long-acuminate, 3-6 in. long, narrowed into petiole ½-1 in. long; lateral nerves numerous, close together, parallel, confluent near the margin, but not forming regular prominent intramarginal veins. Flowers greenish, tetramerous, small, numerous, ¼-½ in. to tip of stamens, nearly sessile, in 3-flowered cymes (sometimes by abortion 1- or 2-flowered), arranged in broad trichotomous panicles, lateral on the previous year's wood, rarely terminal, the ultimate cymes approximate at the end of each branch of the inflorescence, forming rounded fascicles of flowers. Calyx-tube funnel-shaped, the upper part campanulate, produced above the ovary; lobes very short. Petals cohering and falling off in a calyptra. Berry oblong or subglobose, ½-1 in. long, crowned with the base of the cup-shaped calyx, purple or black, suc-

culent, smooth when ripe. Exceedingly variable in the shape of its leaves, the size of the fruit, and also in other respects. In Wight's *Icones* the following are figured as forms of the same species: *E. Jambolana*, t. 535, with large loose spreading panicles and oblong 5-seeded fruit; *E. caryophyllifolia*, Lam. t. 553; Roxb. l. c. 486, with ovate-lanceolate, long-acuminate leaves and globose fruit; *E. obtusifolia*, Roxb. l. c. 485, t. 620, with obtuse leaves and oblong 1-seeded fruit.

Common throughout India, excepting the arid region of Sindh, and the southern Panjab. In the sub-Himalayan tract and outer hills extends west nearly to the Indus, and ascends to 3000 ft. (Panjab), 5000 ft. (Kamaon). Generally in moist places near rivers and water-courses, but also on high ground, and often associated with *Säl*. Commonly cultivated in India, also in other tropical and sub-tropical countries. In Queensland, New South Wales, and the Indian Archipelago, indigenous or cultivated. Fl. March, April; the fruit ripens in June, July. The leaves are renewed in March, the flush of the young leaves coming out with a bright copper-colour. (In the Panjab the tree is not evergreen, the old leaves are shed in January and the new foliage comes out from March to May.—J. L. S.)

Attains 70-80, at times 90 ft.; trunk not tall, and not very straight, but often 20 ft. clear to first branch; girth 6-8, at times 12-15 ft. Branches spreading and ascending, with drooping branchlets, forming a close shady crown—a great relief in the hot months in the otherwise leafless forest. Foliage dark green; leaves shining, aromatic. Bark 1-1½ in. thick, corky, light or dark grey. Inner bark pale reddish-brown, compact, fibrous. Heartwood reddish-brown, tough and hard. Weight 43-48 lb. per cub. ft. when seasoned, 63 when green. Value of P. 600 (Skinner). Annual layers visible. Warps in seasoning, but is fairly durable. Used much for building, agricultural implements, for well-curbs, and well-steps, where it is considered almost indestructible. Boats and canoes are made of it. The bark is used for dyeing and tanning. The fruit is much eaten by natives: in appearance it resembles a damson, has a harsh but sweetish flavour, somewhat astringent and acid. Is much eaten by birds; a favourite food of the large bat (flying fox). A kind of vinegar is prepared from it, which is used in diseases of the spleen. Grows quickly at first, but slowly afterwards. Young plants suffer from frost in the Panjab plains.

Nearly allied to *E. Jambolana*, is *E. salicifolia*, Wight Ic. t. 539, *Syzygium salicifolium*, Graham Cat. Bomb. Pl. p. 73, Dalz. Bomb. Fl. p. 94, with narrow lanceolate leaves, and small white flowers in lax panicles from the old wood below the leaves; a shrub or tree, common gregariously on the banks of the Koina river, and in other valleys of the Sattara Ghats, identified by Beddome, Fl. Sylv. p. 109, with a narrow-leaved *Eugenia* growing in the bed of the Ner-budda river, near Jubbulpur.

3. *E. operculata*, Roxb. Fl. Ind. ii. 486; Wight Ic. t. 552.—Syn. *Syzygium nervosum*, DC. P. iii. 260. *Eugenia nervosa*, DC.; Bedd. Fl. Sylv. Manual, p. 106 (but not *E. nervosa*, DC. P. iii. 284, which is a different tree from Cochin-China). *E. cerasoides*, Roxb., and *E. Paniata*, Roxb. l. c. 488, 489, probably refer to the same tree. Vern. *Rāi jāman*, *jamawa*, *paiman*, N.W.P.; *Jāman*, *dūgdūgia*, Oudh.

A middle-sized tree, wholly glabrous. Leaves subcoriaceous, broad-ovate or elliptical, 3-8 in. long, 2-4 in. broad, obtuse or shortly acuminate, narrowed into petiole, ¾-1 in. long, with 8-12 pairs of main lateral slightly