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VOLUME VII.—No. 2

FLORA OF ADEN

BY

ETHELBERT BLATTER, S.J., F.L.S.,

Professor of Botany at St. Xavier's College, Bombay.

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Many of the native shopkeepers have built houses at the village of Shaikh Othman, and most of those houses are surrounded by a compound. Many different crops are cultivated in these compounds, the most general being lucerne, Indian corn and jowari. In almost every compound, too, are some trees, generally date and doum palms, with perhaps local babuls and Gold Mohurs and, in addition, a few foreign trees, such as *Thespesia populnea*, *Parkinsonia aculeata*, *Azadirachta indica*, *Lawsonia inermis*, etc. The most interesting cultivated ground in the village is the so-called "Forest," where most of the plants are indigenous species growing under more or less natural conditions.[1]

[1] Yerbury, in epist.

IV.—SYSTEMATIC PART.

I.—SYNOPSIS OF NATURAL ORDERS.*

First Class—Angiosperms.

Flowers bisexual or unisexual, as a rule with a perianth, consisting of one or several whorls of leaves, free or connate (calyx and corolla). Ovules enclosed in an ovary, fertilized by the pollen-tube growing towards them through the stigma and style. Seeds enclosed in the fruit, embryo straight or curved, with or without endosperm.

First Sub-class—Dicotyledons.

Embryo with two cotyledons which, when the seed germinates, are as a rule raised above ground. Foliage leaves mostly with reticulate venation. Vascular bundles arranged in a circle in the stele; increase in thickness usually by means of a cambium layer.

I.—Polypetalæ.

Flowers as a rule with calyx and corolla; petals free.

A.—Thalamifloræ.

Calyx, corolla, and stamens usually free and arising directly from the thalamus, or from the outside of a hypogynous disk.

I. *Menispermaceæ.*—Scandent. Leaves alternate, simple; stipules 0. Flowers small, unisexual, trimerous. Stamens opposite to petals, 6. Carpels 3, free. Embryo curved.

II. *Cruciferæ.*—Leaves alternate, simple; stipules 0. Flowers bisexual. Corolla tetramerous. Stamens tetradynamous. Fruit a siliqua.

III. *Capparidaceæ.*—Leaves usually alternate; stipules often present and spinescent. Flowers bisexual, often irregular. As a rule sepals 4, petals 4. Stamens generally numerous, sometimes 6, but never tetradynamous; filaments filiform. Carpels connate into a 1-celled ovary with 2-4 parietal placentas, often on an elongated gynophore. Embryo curved; endosperm 0 or scanty.

IV. *Resedaceæ.*—Leaves alternate; stipules minute or 0. Flowers in spikes or racemes, bisexual or unisexual; calyx 4-7-lobed. Stamens

* The distinguishing characters of the orders are selected mostly with special reference to the plants described below.

numerous, on a hypogynous disk. Carpels connate into a 1-celled ovary, with 2-6 parietal placentas. Seeds numerous, reniform ; endosperm 0.

V. *Polygalaceæ.*—Leaves alternate, simple, entire ; stipules 0. Flowers bisexual, irregular ; sepals 5 ; petals 3. Stamens 8 ; filaments united into a cleft sheath ; anthers opening by pores.

VI. *Caryophyllaceæ.*—Leaves opposite, entire ; stipules 0 or membranous. Petals, sepals, and stamens 5 ; stamens in 2 whorls. Ovary 2- , 3- , or 5-merous, unilocular. Fruit usually a capsule.

VII. *Portulacaceæ.*—Fleshy herbs. Flowers surrounded by silvery hairs and an involucre. Sepals 2 ; petals 4. Stamens 8. Style 4-fid. Fruit a capsule.

VIII. *Malvaceæ.*—Leaves alternate, stipulate, usually palminerved. Flowers bisexual, regular, with or without involucral bracts. Sepals 5, valvate, more or less connate. Petals 5, base adnate to staminal column, contorted in bud. Stamens numerous ; filaments variously connate ; anthers 1-celled.

IX. *Sterculiaceæ.*—Leaves alternate, mostly stipulate. Sepals 5, valvate, more or less connate. Petals 5 or none. Stamens monadelphous. Fruit a dehiscent capsule or several distinct carpels.

X. *Tiliaceæ.*—Leaves alternate, simple ; stipules deciduous. Flowers regular, bisexual. Sepals 5, valvate in bud. Stamens numerous ; anthers 2-celled. Ovary 2-10-celled.

B.—Disciflorœ.

Thalamus expanded within the calyx into a disk, free or adnate to calyx or to ovary. Stamens arising from the disk. Ovary usually superior, and placentation axile.

XI. *Zygophyllaceæ.*—Leaves opposite, 1-3-foliate or pinnate ; stipules in pairs. Flowers bisexual ; sepals and petals 5 or 4 ; disk annular, fleshy. Stamens not more than 10. Fruit 5-angled, of 5-12 winged or spinous or tuberculate indehiscent cocci.

XII. *Geraniaceæ.*—(Erodium) Leaves simple ; stipules large. Sepals 5, imbricate. Petals 5, imbricate, with alternating glands. Stamens 5, alternating with 5 staminodes. Carpels stipitate, trigonous.

XIII. *Meliaceæ.*—Leaves alternate, pinnate ; no stipules. Flowers regular, in cymose panicles. Calyx small, 5-6-cleft. Petals 5-6. Stamens twice the number of petals ; filaments united into a tube. Disk between stamens and ovary.

XIV. *Burseraceæ.*—Resinous. Leaves alternate, imparipinnate, sometimes 1-foliate. Flowers small, regular. Calyx 3-5-lobed. Petals 3-5.

Stamens as many as petals or twice as many, inserted on the disk or outside at its base. Ovary 2-5-celled ; ovules 2 in each cell.

XV. *Rhamnaceæ.*—Branchlets or stipules often spinescent. Leaves simple, alternate. Flowers small, regular. Calyx 5-cleft, valvate in bud. Disk lining the calyx-tube. Ovary immersed in disk. Drupe fleshy.

XVI. *Vitaceæ.*—Climbing. Leaves alternate; stipules small. Flowers in cymes, regular. Calyx small, truncate. Petals 4, valvate in bud. Stamens opposite to petals, inserted below the margin of the disk. Fruit a berry.

XVII. *Moringaceæ.*—Leaves deciduous, alternate, bi- or tri-pinnate; pinnæ and leaflets opposite, glands at base of petioles and pinnæ. Flowers large, bisexual, pentamerous. Petals unequal. Fertile stamens 5, opposite to petals, alternating with sterile stamens. Fruit a long 1-celled 3-valved capsule.

C.—Calyciflorœ.

Calyx usually gamosepalous, often adnate to ovary. Petals distinct, arising from the calyx or from a perigynous disk. Stamens perigynous or epigynous. Ovary usually inferior or included within the calyx-tube.

XVIII. *Leguminosæ.*—Leaves stipulate, as a rule alternate and compound. Flowers bisexual, in the majority of cases zygomorphic. Petals 5. Stamens 10 or ∞ Carpel 1, free. Ovules usually numerous, attached to the inner suture. Fruit a 1-celled pod.

XIX. *Combretaceæ.*—Leaves simple, entire; stipules 0. Flowers bisexual, regular. Calyx-tube adnate to ovary and produced beyond it, segments 5, valvate. Petals 0. Stamens 10, perigynous. Fruit angled or winged.

XX. *Loasaceæ* (Kissenia).—Leaves alternate. Stipules 0. Flowers in leafy cymes, bisexual. Flower-tube adnate to ovary, 10-ribbed, limb 5-lobed. Petals 10, perigynous, deciduous. Stamens indefinite, arranged in 5 bundles. Ovary inferior, 3-celled. Fruit bristly, 10-ribbed.

XXI. *Lythraceæ* (Lawsonia).—Leaves opposite, entire Flowers in panicled cymes. Calyx cup-shaped, persistent, 4-lobed. Petals 4, inserted at the base of the calyx-tube, imbricate and crumpled in bud. Stamens 8, inserted in pairs on the calyx-tube. Ovary superior.

XXII. *Cucurbitaceæ.*—Mostly climbers with tendrils. Leaves scattered. Flowers diclinous or polygamous. Petals 5, often gamopetalous. Stamens 5, epipetalous; anthers usually long and sinuous. Ovary inferior, unilocular, becoming spuriously multilocular. Fruit baccate. a pepo or succulent berry.

XXIII. *Ficoideæ* (Aizoaceæ).—Leaves opposite, alternate or pseudo-verticillate, simple. Stipules 0 or scarious. Flowers usually cymose or

sometimes solitary. Petals usually wanting or small. Stamens definite or indefinite, perigynous or hypogynous. Disk 0 or annulate. Ovary usually free, 2-5-celled. Fruit usually capsular.

XXIV. *Umbelliferæ* (Ptychotis).—Leaves alternate, compound. Umbels axillary. Calyx-tube adnate to ovary. Petals 5, minute, distinct, epigynous. Stamens 5, epigynous. Fruit 2-celled, separating into 2 indehiscent 5-costate mericarps.

II.—Gamopetalæ.

Flowers usually bisexual, as a rule with both calyx and corolla. Corolla gamopetalous.

Series 1.—Epigynæ.

XXV. *Rubiaceæ.*—Leaves opposite; stipules adnate to the petiole. Flowers bisexual, regular. Calyx-tube adnate to ovary. Corolla inserted round the epigynous disk. Stamens inserted on the corolla-tube, alternating with its lobes.

XXVI. *Compositæ.*—Leaves as a rule alternate; stipules 0. Inflorescence a dense head of many small flowers, sessile on a broad receptacle and enclosed in an involucre of whorled or imbricate bracts. Calyx usually a pappus of hairs on the top of the ovary. Stamens on the corolla-tube; anthers usually connate, connective produced upwards.

Series 2.—Hypogynæ.

XXVII. *Plumbaginaceæ.*—Leaves alternate, entire. Flowers regular, bisexual, pentamerous sheathed by bracts. Calyx 5-ribbed. Ovary 1-celled; ovule 1.

XXVIII. *Salvadoraceæ.*—Glabrous shrubs or trees. Leaves opposite, entire. Stipules minute. Flowers small, tetramerous. Corolla membranous. Ovary free.

XXIX. *Apocynaceæ* (Adenium).—Stem globose. Leaves entire, crowded at the end of the branches. Flowers regular, bisexual, pentamerous. Stamens 5, inserted in the corolla-tube. Carpels 2, distinct. Seeds comose; albumen scanty.

XXX. *Asclepiadaceæ.*—Leaves entire, as a rule opposite. Stipules 0. Flowers regular, bisexual, pentamerous. Calyx inferior, sepals imbricate in bud. Stamens 5, inserted on the base of the corolla; anthers cohering or connate, enclosing the stigma, pollen-grains as a rule united into waxy masses. Corona corolline or staminal. Carpels 2, distinct. Seeds usually winged and surmounted by a dense brush of hairs. Embryo large, in copious endosperm.

XXXI. *Boraginaceæ.*—Leaves as a rule alternate and simple. Stipules 0. Flowers bisexual, as a rule regular and pentamerous, in unilateral spikes or racemes. Calyx free, persistent, lobes valvate in bud. Ovary 2-celled, each cell with 2 ovules, or 4-celled and each cell with 1 ovule. Fruit consisting of 4 nutlets.

XXXII. *Convolvulaceæ.*—Leaves alternate. Stipules 0. Flowers large, bisexual, regular, pentamerous, sepals distinct, persistent. Fruit a berry or capsule ; seeds 2—4.

XXXIII. *Solanaceæ* (Lycium).—Leaves alternate or fasciculate. Stipules 0. Flowers regular, pentamerous. Calyx gamosepalous. Ovary free. Fruit a berry. Seeds many.

XXXIV. *Scrophulariaceæ.*—Leaves opposite or alternate. Stipules 0. Flowers bisexual, irregular, more or less bilabiate. Stamens 2 or 4, in the latter case didynamous. Fruit a capsule. Seeds numerous.

XXXV. *Orobanchaceæ* (Cistanche).—Leaves reduced to fleshy scales. Flowers zygomorphic Calyx 4-5-lobed. Corolla tubular, 5-lobed. Stamens 4, didynamous. Ovary 1-celled. Capsule 2-valved. Seeds numerous. Parasitic plants, destitute of chlorophyll.

XXXVI. *Bignoniaceæ.*—Leaves opposite, compound ; leaflets opposite. Stipules 0. Flowers bisexual, zygomorphic. Calyx gamosepalous. Ovary free, supported by an annular disk. Fruit a capsule.

XXXVII. *Acanthaceæ.*—Leaves opposite. Stipules 0. Flowers bisexual, mostly irregular. Ovary free, 2-celled ; style filiform, bifid, one branch often obsolete. Capsule loculicidal. Seeds often clothed with white elastic hairs, seated on hard curved supports.

XXXVIII. *Verbenaceæ* (Bouchea).—Leaves opposite or sub-opposite. Stipules 0. Flowers bisexual, zygomorphic. Calyx gamosepalous, persistent, at length splitting longitudinally to the base, lobes 5, imbricate. Corolla with 5 subequal lobes. Stamens 4, didynamous. Ovary 2-celled, 1-2 ovules in each cell.

XXXIX. *Labiatæ.*—Mostly aromatic. Branches usually 4-sided. Leaves opposite or whorled. Stipules 0. Flowers bilabiate. Calyx persistent. Corolla-lobes imbricate in bud. Stamens didynamous, the upper 2 sometimes imperfect or wanting. Ovary free, usually 4-lobed, supported by the annular disk. Fruit of 4 one-seeded nutlets.

III.—Monochlamydeæ.

Flowers frequently unisexual. Perianth as a rule simple. Rarely a distinct calyx and corolla.

XL. *Nyctaginaceæ* (Boerhaavia).—Leaves opposite, entire. Stipules 0. Flowers small, bisexual. Perianth small petaloid. Stamens 1, or 25

connate below. Ovary stipitate. Fruit indehiscent, enclosed in the persistent perianth tube.

XLI. *Illecebraceæ* (Cometes).—Leaves opposite. Stipules minute. Flowers 3 together, only the central one perfect, surrounded by ferruginous bracts. Perianth herbaceous, 5-partite. Stamens 5, alternating with staminodes. Utricle enclosed in perianth.

XLII. *Amarantaceæ*.—Leaves alternate or opposite, entire. Stipules 0. Flowers usually bisexual. Perianth of 5 persistent sepals, imbricate in bud. Stamens opposite the sepals. Ovary free, 1-celled. Seed 1; embryo horseshoe-shaped or annular.

XLIII. *Chenopodiaceæ*.—Leaves alternate, rarely opposite, simple. Stipules 0. Flowers small, usually green, bi- or uni-sexual. Perianth of 3-5 sepals. Stamens opposite the sepals. Fruit a utricle, generally enclosed in the perianth. Seed 1 ; embryo curved, annular, or spiral.

XLIV. *Aristolochiaceæ*.—Leaves alternate. Stipule 0. Flowers bisexual. Perianth inflated below, with a trumpet-shaped mouth. Ovary inferior ; placentas parietal. Ovules numerous. Capsule 12-ribbed.

XLV. *Loranthaceæ*.—Parasitic on stems and branches. Leaves opposite, sub-opposite or alternate. Flowers regular, in 4-6-flowered umbels. Perianth double. Stamens equal to and opposite the petals. Ovary inferior, 1-celled ; ovule 1. Fruit baccate.

XLVI. *Euphorbiaceæ*.—Leaves in most genera alternate, undivided and stipulate. Flowers as a rule unisexual. Perianth calycine, some genera with petals. Ovary superior, as a rule of 3 carpels, more or less united. Styles 3. Ovules 1 or 2 in each cell, pendulous from the inner angle.

XLVII. *Urticaceæ* (Forskohlea).—Leaves alternate, dentate. Stipules lateral, free. Flowers unisexual, monoecious, aggregated. Perianth 3-lobed in male flowers, absent in female. Stamen 1. Achenes enclosed in involucre, enveloped in wool.

Second Sub-class—Monocotyledons.

Embryo with a single cotyledon. Vascular bundles arranged in a scattered manner in the stele, without cambium. Foliage leaves usually with parallel venation.

XLVIII. *Hydrocharitaceæ* (Halophila).—Salt-water herbs. Leaves in pairs or solitary, undivided. Flowers 1-sexual, monoecious, enclosed in spathes. Male flowers : sepals 3, stamens 3. Female flowers : sepals 3, petals 0. Fruit a beaked utricle.

XLIX. *Scitaminaceæ* (Musa).—Easily recognized by the enormously long leaves, which reach several feet.

L. *Amaryllidaceæ.*—Flowers bisexual, epigynous. Perianth hexamerous, petaloid. Stamens 6. Ovary of 3 carpels, trilocular. Fruit a loculicidal capsule.

LI. *Liliaceæ.*—Flowers bisexual. Perianth in 2 series, imbricate in bud, hypogynous. Stamens 6. Ovary 3-celled; style 1. Ovules attached to the inner angle of the cells.

LII. *Commelinaceæ* (Commelina).—Flowers hypogynous. Sepals 3, membranous. Petals 3, one larger. Stamens 3, perfect, and 2-3 imperfect. Ovary 3-celled.

LIII. *Palmæ.*—Stem solid. Leaves pinnately or palmately divided. Inflorescence with sheathing bracts. Calyx and corolla of 3 segments each. Carpels 3.

LIV. *Naiadaceæ* (Cymodocea).—Submerged marine plants. Leaves with stipular sheaths. Flowers unisexual or bisexual. Perianth 0. Male flowers with 2 stamens. Female flowers : 2 carpels, 1 ovule. Fruit of 2 ovoid carpels.

LV. *Cyperaceæ.*—Flowers hypogynous, usually diclinous. Stamens 3. Ovary di- or tri-merous, unilocular. Fruit an achene; pericarp not adherent to seed. Tubular leaf-sheaths; stem usually angular and solid.

LVI. *Gramineæ.*—Flowers hypogynous, usually bisexual, surrounded by pales and lodicules. Stamens usually 3; anthers versatile. Ovary monomerous, unilocular. Fruit a caryopsis with an inseparable pericarp. Stem usually hollow.

Second Class—Gymnosperms.

Flowers unisexual. Perianth none or incomplete. Ovules free, not enclosed in an ovary, fertilized by the pollen tube entering the micropyle or a tube formed by the integument. Seeds naked; embryo straight with copious endosperm.

LVII. *Gnetaceæ* (Ephedra).—Climbing shrubs. Dioecious or monoecious. Branches often fascicled. Male flowers in short bracteate spikelets, which are in pairs or 3 together; perianth of 2 sepals. Female flowers consisting of 1 ovule with a single integument. Fruit fleshy with 2 seeds.

II.—DESCRIPTION OF SPECIES.

I.—MENISPERMACEÆ.

Scandent or twining shrubs, with palmate or peltate alternate leaves, without stipules.

Flowers dioecious, rarely perfect or polygamous. Sepals usually 6 (rarely 1—4 or 9—12), imbricate in two series. Male flowers: Stamens hypogynous, equal in number and opposite to the petals; filaments free or connate. Female flowers: Staminodes 6 or 0. Ovaries usually 3.

Ripe carpels drupaceous. Seeds usually hooked or reniform, often curved by an intrusion of the endocarp.

Genera 62; *species* about 100.

Distribution: Chiefly in the tropics of both hemispheres.

1. Cocculus DC.

Climbers or rarely nearly erect.

Flowers in axillary panicles. Sepals 6, in two series, 3 inner larger. Petals 6, shorter than the inner sepals. Male flowers: Stamens 6, free, with 4-lobed anthers. Female flowers: Staminodes 6 or 0. Ovaries 3; styles usually cylindric.

Drupes rotundate or obovate, compressed. Putamen tuberculate or transversely rugose. Seed horseshoe-shaped; embryo with linear, appressed cotyledons in few fleshy albumen.

Species about 18.

Distribution: All warm climates.

1. Cocculus Cebatha DC. Syst. I (1818), 527; Prodr. I (1824) 100.

Cocculus pendulus (Forst.), Diels, Pflanzenf. IV, 94.

C. Leæba DC. Syst. I (1818) 529; Prodr. I (1824) 99; A. Rich. Fl. Seneg. I (1831) 13; Hook. Niger Fl. (1849) 97; Miers in Contrib. Bot. III (1871) 256; Oliver Fl. Trop. Afr. I (1868) 44; Hook. f. et Thoms. Fl. Ind. (1855) 192; Hook. Fl. Brit. Ind. I (1872) 102; Volkens, Fl. Aeg.-Arab. Wüste (1887) 86.

C. ellipticus DC. Syst. I (1818) 256; Prodr. I (1824) 100.

C. Epibaterium DC. Syst. I. (1818) 530; Prodr. I (1824) 100.

C. lævis Wall. Cat. 4975 (1828).

C. glabra W. & A. Prodr. I (1834) 13; Miers in Contrib. Bot. III (1871) 257.

C. recisus Miers in Ann. Nat. Hist. 3. ser. XIX (1867) 24 n. n.; Contrib. Bot. III (1871) 258.

Leæba Forsk. Fl. Aeg.-Arab. (1775) 172.

Leæba dubia Gmel. in Linn. Syst. Nat. II (1791) 567.

Cebatha Forsk. Fl. Aeg.-Arab. (1775) 171.

Cebatha edulis Forsk, ex Vahl Symb. Bot. I (1790) 80.

Cebatha pendula O. Ktze Rev. Gen. I (1891) 9; Hiern in Welw. Pl. Afr. I (1896) 18.

Epibaterium pendulum Forst. Gen. (1776) 108, tab. 54.

Menispermum edule Vahl Symb. Bot. I (1790) 80; Lam. Dict. IV (1797) 99; Willd. Sp. Pl. IV (1805) 828.

Menispermum leæba Delile in Descript. Egypt. t. 31, f. 2, 3 (1813).

Menispermum ellipticum Poir. in Lam. Encyl. XI [Suppl. III.] (1813) 657.

Adenocheton phyllanthoides Fenzl in Flora XXVII (1844) 312.

Bricchettia somalensis Pax in Ann. Ist. Bot. Roma VI (1897) 181.

Arabic name: Turrâch, ssaq-el-ghorab (Schweinf.).

Description: A scandent shrub with slender glabrous or glabrate, striate, pale or ashen, leafy branchlets. Leaves small, rather coriaceous, lanceolate-oblong or lanceolate-ovate or obtusely trapezoidal, entire or sometimes obscurely lobed, mucronate, cuneate or rather rounded at the base, more or less glaucous, ½-1½ inches long, ½-¾ inch broad; petioles hairy.

Flowers axillary, small, inserted in a hairy tubercle, the males clustered in dense axillary fascicles, the females solitary, rarely twin. Petals of the male flowers deeply and acutely emarginate, with 2 lateral lobes embracing the stamens. Ovaries 3.

Drupe obovoid, keeled, compressed; style-scar basal.

Flowers: January 1880 (Balfour), November (Schweinf.).

Locality: Valley north of the Shum Shum Range above Maala village, plain of Maala, scandent on *Salvadora* (Defl., Schweinf.); without locality (Birdw., Perry).

Distribution: Gujarat, Sind, Punjab, Afghanistan, Central and Southern Africa, Socotra, Abyssinia, Kordofan, Eritrea, Nubia, Egypt, Senegambia, Cape Verd Islands.

Uses: According to Forskal the Arabs prepare a liquor from the fruit of this plant which they call 'Chamr el madjnûne'.

Note: *Cocculus Cebatha* is a very variable plant and it has puzzled many a botanist who collected at Aden.

Deflers mentions in one of his lists a *Cocculus sp.* giving the following description: "On the 30th April this liana showed neither flowers nor fruits. Judging from its habit it may be considered as a

Cocculus nearly allied to *C. Leæba*. I found only one specimen rising on a trachytic escarpment to a height of 26—33 feet. This plant which is growing very vigorously has a stem of $2\frac{2}{5}$ inches in diameter. The branches are voluble, the bark glabrous and grey-yellowish striate. The leaves are glabrous, peltate, entire, oval, obtuse, mucronate, of variable dimensions. The limb of the best developed leaf is $3\frac{1}{5}$ inches long and $2—2\frac{2}{5}$ inches broad, the petiole measuring 1 inch."

Faurot collected a similar plant near the Gulf of Tadjurah of which Franchet gives us the following characteristics: "A single branch, sterile; the leaves are very glaucous, soft, puberulous, peltate, truncate at the base, rounded or obscurely pentagonal, 3—5 lobed, terminal triangular; it does not belong to any of the known species of Menispermaceæ growing in that region. The Somalis use the root as food and they call it 'gara.'"[1]

Also Birdwood's herbarium contains some bits of a plant which differ in many respects from the typical *Cocculus Cebatha*. When preparing my former list of Aden plants I considered the specimen as a different species, but for want of sufficient material I was not able to specify it.

The observations made by Schweinfurth in Eritrea and Nubia make it very probable that all these doubtful specimens are only different forms of the same species *Cocculus Cebatha* DC. (=leæba DC.). He writes: "The specimens from Saati (Eritrea) are young branches of a 2 or 3 year old plant which, at this age, always produces long twining shoots with large, broadly ovate, rounded triangular or three-lobed leaves. These leaves are short-peltate at the base, 5-nerved and have in consequence of this, quite a different aspect from all the specimens of a fully developed shrub, and one might be tempted to suspect a new species of Menispermaceæ, if there were not some transition forms. A. Deflers collected in 1886 (Soc. Bot. de France 1887, p. 64) a *cocculus* on the Shum Shum Range of Aden, whose branches combine the elliptical leaves of C. leæba with the broadly ovate peltate leaves of the juvenile form mentioned above. The analogy with the hastate and 3-lobed leaves which always occur in young specimens of *C. villosa* DC. is evident; the only difference is that they are never found in old plants. During my former visits to S. Nubia I had the opportunity of observing various forms of leaves on juvenile specimens, similar to those which occur on *C. villosa, viz.*, cordate-3-lobed, 5-nerved, with peltate attachment of the blade to the petiole. The light-grey colour is constant."[2]

[1] Franchet, A. Plantes du Voyage au Golfe de Tadjourah recueillies par M. L. Faurot, in Journal de Botanique, Vol. I (1887), p. 118.

[2] Schweinfurth. Sammlung arabisch-æthiopischer Pflanzen. Bulletin de l'Herb. Boissier 1894. Append. II.

II. CRUCIFERÆ.

Herbs, sometimes shrubby, with colourless often pungent juice, glabrous, glaucous, or with simple mediofixed or stellate hairs. Leaves simple, alternate, exstipulate.

Flowers racemose or corymbose at first, rarely bracteate. Sepals 4, deciduous, imbricate or valvate in the bud. Petals 4, stalked, arranged in the form of a cross, alternating with the sepals. Stamens tetradynamous. Ovary solitary, 2-locular by a spurious dissepiment extending across from the middle line of the two parietal placentas; stigmas 2, sessile, opposite the placentas.

Fruit a siliqua or silicula, usually 2-locular by the replum, from which the valves separate in dehiscence, leaving the placentas on a frame. Seeds generally pendulous in a single row on each placental margin; embryo with the radicle variously folded on the cotyledons, without perisperm.

Genera about 170; *species* about 1,200.

Distribution :—All temperate and cold regions. A few genera are peculiar to the southern hemisphere

Leaves linear, entire, with appressed mediofixed hairs . . .	1. Farsetia.
Radical leaves lyrate or pinnatifid	2. Diplotaxis.

1.—Farsetia Desv.

Branched herbs or undershrubs, often hoary with appressed hairs. Leaves linear or narrow, entire.

Flowers spikate or racemose. Sepals erect, the lateral slightly saccate. Petals with long claws.

Siliqua various in outline, from linear to orbicular, flat-compressed or turgid, with plane or convex, nerved or nerveless valves; septum membranous, veined. Seeds compressed, often winged, in 1 or 2 series. Cotyledons accumbent.

Species about 20.

Distribution :—Southern Europe, North Africa, Asia Minor, Persia, Arabia, Socotra.

1. Farsetia longisiliqua Dcne. Ann. Sc. Nat. Ser. II. IV, 69; Walp. Repert. I, 139; Journ. Bull. Soc. Bot. Fr. XI, 56; Coss. Comp. Fl. Atlant. II, 227; Oliv. Fl. Trop. Afr. I, 62.

Farsetia stylosa Anders. Journ. Linn. Soc. V, Suppl. p. 1.

Mathiola stylosa Hochst. et Steud. in Schimp. Pl. Arab. Fel. n. 860.

Arabic name : Hamma.

Description :—Suffruticose, hoary with closely appressed white hairs; branches slender, rather rigid, divaricate. Leaves very narrow-linear.

Flowers bright rose, rather distant, in narrow, spicate racemes ; buds oblong. Pedicels at length 1—2 lines long, appressed or ascending.

Siliquas 1 inch long more or less, slightly curved outwards, linear, $1\frac{1}{4}$-$1\frac{1}{2}$ lines broad ; valves hoary, undulate, with a faint midrib. Persistent style about 1 line long.

Balfour found in Socotra "flowers varying in colour from a pink to that livid or violate shade seen in, for example, the common Malcolmia maritima."

Flowers :—March (Schweinf.).

Fruits :—December (Schweinf.).

Locality :—Goldmore Valley (Schweinf., Defl.); without locality (Hook., Birdwood, Hildebr).

Distribution :—Central and Southern Arabia, Socotra, Eritrea, Nubia, Upper Egypt.

Note.—Farsetia longisiliqua Dcne, is distinguished from *F. Hamiltonii* Royle (Illustr. 71) by its much larger flowers, pods, and non-capitate stigmas. *F. linearis* Dcne. is separated from *F. longisiliqua* by its smaller flowers and shorter and relatively broader pods.

2. Diplotaxis DC.

Herbs resembling *Brassica* with regard to the general aspect and only distinguishable by the more distinctly biseriate seeds.

Sepals at length spreading.

Siliquas linear, sometimes elongate, compressed, without or sometimes with a short 1-seeded beak ; valves with a median nerve ; septum membranous. Seeds many, biseriate, ellipsoidal or globose. Cotyledons conduplicate.

Species about 20.

Distribution :—Western Asia, Northern Africa, Europe.

1 Diplotaxis pendula (Vahl) DC. Syst. Veg. II, 630 ; Prodr. I, 222, ; Anders. Journ. Linn. Soc. V, Suppl. p. 2 ; Aschers. et Schweinf. Suppl. Fl. d' Eg. p. 75 ; Batt. et. Trab. Fl. d' Alg. p. 63.

Sisymbrium pendulum Desf. Fl. Atl. II, 82, t (t.) 156.

Sisymbrium hispidum Vahl Symb. II, 77.

Diplotaxis harra Boiss. Fl. Or. I, 388, Aschers. et Schweinf. Fl. d' Eg. p. 41.

Diplotaxis crassifolia DC. Syst. Veg. II, 629.

Diplotaxis hispida DC. Syst. Veg. II, 630.

Description :—Leaves obovate, lanceolate, coarsely dentate, hispid. Corolla large, yellow ; sepals ovate, tomentose.

Siliquas pedicellate, pendulous, glabrous, linear, attenuate at the base ; style very short ; stigma bilabiate.

This plant varies a good deal with regard to the hairiness of its leaves. With the exception of corolla and siliqua, the plant is mostly hispid.

Locality :—Near the Shum Shum Flag Staff (Defl.) ; top of the Shum Shum Range (Busse); without locality (Hook. Birdwood).

Distribution :—Arabia, S. Persia, Syria, Palestine, Egypt, Tripoli, Tunis, Algeria, Morocco, Sicily, S. Spain.

III.—CAPPARIDACEÆ.

Herbs, shrubs or trees, often scandent. Leaves alternate, rarely fasciculate, simple or 3-7-foliate ; stipules, when present, minute or represented by short spines.

Flowers regular or the sepals or petals sometimes unequal, rarely polygamous. Sepals 4, rarely 3 or 5, valvate, imbricate or open in aestivation. Petals usually 4, sessile or clawed, hypogynous or seated on the disk. Stamens inserted at the base or apex of the torus, few or very many ; anthers oblong, basifixed. Ovary sessile, or with a long or short stalk (gynophore), 1-celled ; ovules numerous, on 2-4 parietal placentas.

Fruit capsular or baccate, or dry and indehiscent, rarely drupaceous. Seeds reniform or angled, albumen thin or none ; embryo incurved.

Genera 23 ; *species* about 300.

Distribution :—Chiefly in tropical but also in subtropical countries of both hemispheres.

Herbs ; fruit capsular . . . . . 1. Cleome.

Undershrub ; fruit with membranous wing, indehiscent, 1—seeded . . . . . 2. Dipterygium.

Trees or shrubs ; fruit berried or capsular :—

(*a*) Sepals combined at the base into a tube . . . 3. Maerua.

(*b*) Sepals biseriate :—

* Stamens 4—6, inserted half way up the gynophore . . . . . 4. Cadaba.

** Stamens 8-∞, inserted at the base of the gynophore . . . . . 5. Capparis.

1. Cleome Linn.

Herbs or shrubs, rarely subarborescent, glabrous, glandular, scabrous or aculeolate. Leaves simple or 3-9-foliate ; leaflets entire or serrulate.

Flowers racemose or solitary and axillary. Sepals 4, spreading. Petals 4, subequal, sometimes subunilateral. Stamens 4-20, all or two or more anther-bearing, inserted upon the torus, free or very shortly coherent at the base. Ovary sessile or stipitate, 1-celled ; ovules indefinite on 2 parietal placentas.

Capsule linear, oval or ellipsoid, sessile or stipitate, 1-celled, with membranous or rather coriaceous valves separating from a persistent replum. Seeds indefinite, reniform or globose-reniform ; cotyledons incurved or circinate.

Species about 70.

Distribution :—In tropical and subtropical countries both of the Old and New World.

A. Leaves simple :—

1. Style short, $\frac{1}{12}$—$\frac{1}{8}$ inch long :—
   - *a.* Bracts minute or absent . . . . . 1. C. quinquenervia.
   - *b.* Bracts only slightly smaller than the leaves . . 6. C. brachystyla.
   - *c.* Bracts small, sessile . . . . . 2. C. papillosa.
2. Style long, $\frac{1}{4}$—$\frac{3}{8}$ inch :—
   - *a.* Leaves ovate-cordate . . . . . 5. C. pruinosa.
   - *b.* „ cordate-suborbiculate . . . . 7. C. polytricha.
   - *c.* „ orbiculate . . . . . 8. C. droserifolia.

B. Leaves compound :—

1. Capsule oval or elliptical, 2—4 lines long . . . 3. C. brachycarpa.
2. Capsule linear, 4 inches long . . . . . 4. C. paradoxa.

1. Cleome quinquenervia DC. Prodr I, 239 ; Anders. Journ. Linn. Soc. V, Suppl. p. 3 ; Boiss. Fl. Or. I, 415 ; Cooke Fl. Bomb. Pres. I, 37.

Cleome pentanervia Ait. Cat. Pb. and Sind Pl. p. 9.

Description :—Glaucous, 6-12 inches high, the whole plant covered with glandular hairs ; branches many from a woody base, rigid. Leaves $\frac{1}{2}$-1 inch in diameter, ovate or suborbicular, subcordate, palmately 5-nerved from the base, margins ciliate with glandular hairs.

Flowers pale pink in the axils of leafy bracts on short racemes ; bracts ovate, acute, subsessile ; pedicels slender, $\frac{1}{4}$—$\frac{3}{8}$ inch long. Sepals linear, acute, half as long as the petals, ciliate with glandular hairs. Petals ovate, acute, with a crested appendage across the inside or little above the base. Stamens 4.

Capsule 1—$1\frac{1}{4}$ by $\frac{1}{8}$—$\frac{1}{6}$ inch, narrow-oblong, acute at both ends, straight or slightly curved, rough with short, thick glandular hairs. No gynophore. Seeds minute, numerous, smooth, brown.

Locality :—Sandy places near the sea-shore (Madden) ; without locality (Birdw., Balf.).

Distribution :—S. Arabia, S. Persia, Afghanistan, Sind.

2. **Cleome papillosa** Steud. Nom. Bot. ed. 2, I, 382 ; Anders. Journ. Linn. Soc. V, Suppl. p. 3 ; Boiss. Fl. Or. I, 413 ; Hook. Fl. Brit. Ind. I, 168 ; Oliv. Fl. trop. Afr. I, 76 ; Cooke Fl. Bomb. Presid. I, 36.

Cleome gracilis Edgew. in Journ. Asiat. Soc. Beng. XVI, 1212.

Cleome scaposa DC. Prodr. I, 239.

Cleome Ehrenbergiana Schweinf. Fl. Aethiop. p. 68.

Cleome radula Fenzl. in Flora 1844, p. 312.

Cleome cordata Ehrenbg. ined. in herb. arab.

Cylindrocarpus cordata Kl. ined. ibidem.

Description :—A low scabrous or hispid herb, 4—12 inches high, usually with several erect or ascending slender stems more or less leafy below. Radical leaves ovate to orbicular, shortly hispid-scabrous, entire, $\frac{1}{3}$—1 inch in diameter, petiolate ; cauline leaves often cordate at the base, shortly petiolate or sessile.

Flowers small, pink, in long slender, bracteate, racemes ; pedicels filiform ; bracts small. Sepals linear-lanceolate, glandular. Petals clawed. Stamens 6.

Capsules glabrous or slightly papillose, striate, very slender, $\frac{3}{4}$—$1\frac{1}{2}$ inches by $\frac{1}{32}$ inch. Gynophore almost 0. Seeds minute, brown-black, glabrous, granulate.

Flowers :—March 1878 (Perry).

Fruits :—December (Herb. Kew).

Locality :—Near the Telegraph Office, valley near Steamer Point (Schweinf.) ; Goldmore Valley (Defl.) ; without locality (Edgew., Anders., Birdw., Marchesetti, Wichura, Hildebrandt, Perry).

Distribution :—Kordofan, Nubia, Abyssinia, Somaliland, Eritrea, extending through Arabia to N. W. India, Sind, Socotra.

3. **Cleome brachycarpa** (Forsk.) Vahl in DC. Prodr. I, 240 ; Anders. Journ. Linn. Soc. V, Suppl. p. 4 ; Boiss. Fl. Or. I, 412 ; Hook. Fl. Brit. Ind. I, 169 ; Oliv. Fl. trop. Afr. I, 77 ; Franch. Sert. Somal. in Miss. Révoil p. 11 ; Terrac. in Ann. Inst. Bot. Rom. V, 113.

Cleome ornithopodioides Forsk. Fl. Aeg.-Arab. Cat. n. 402.

Cleome Vahliana Fresen. Mus. Senckenb. II, 110 ; Ait. Cat. Pb. and Sind Pl. p. 9.

Cleome ruta Cambess. in Jacq. Voy. Bot. p. 19, t. 19 ; Ait. Cat. Pb. and Sind Pl., p. 9.

Cleome diversifolia Hochst. et Steud. in Schimp. Fl. Arab. Fel. n. 762.
Cleome parviflora R. Br. in Salt Voy. Abyss. p. 65.
Arabic name : Chosam.

Description :—A low diffuse perennial herb, 6-18 inches high, more or less glandular-pubescent or scabrid-setulose, sometimes glabrescent, with an odour of rue. Leaves 3-5-1-foliate, petiolate or the upper sessile ; leaflets oblanceolate or oblong, acute or obtuse and mucronate, viscidly puberulous.

Flowers yellow, in the axils of leafy bracts, in lax racemes ; pedicels $\frac{3}{8}-\frac{1}{2}$ inch long, filiform ; bracts 3-foliate or simple, subsessile. Sepals $\frac{1}{10}$ inch long, ovate-lanceolate, much shorter than the petals, glandular pubescent outside. Petals $\frac{1}{4}-\frac{3}{8}$ inch long, ovate-oblong, subacute, glabrous, furnished inside with a small scale-like appendage above the short claw. Stamens 6, of which one is sometimes imperfect. Ovary minutely glandular or glabrous, sessile. Style slender.

Capsule $\frac{3}{8}-\frac{1}{2}$ by $\frac{1}{10}-\frac{1}{6}$ inch, oblong, inflated, glandular. No gynophore. Seeds minute, nearly smooth.

Flowers and *fruits* in January in Yemen (Schweinf.).

Locality :—On the slope of the Shum Shum Range (Edgew., Madden, Hook., Anders., Zenker, Hildebrandt, Balf., Marchesetti, Ellenbeck, Busse) ; near Maala (Schweinf.) ; without locality (Birdw., Kuntze).

Distribution :—Kordofan, Abyssinia, Nubia, Somaliland, Socotra, Central and S. Arabia, Punjab.

Uses :—The strongly aromatic leaves of this plant are often sold in the market of Aden. They are put between clothes in order to protect them against insects (Krause).

4. Cleome paradoxa R. Br. in Salt Voy. Abyss. App. p. 65 ; DC. Prodr. I, 241 ; Anders. Journ. Linn. Soc. V, Suppl. p. 2 ; Oliv. Fl. trop. Afr. I, 78.

Cleome venusta Fenzl. in Flora (1844) p. 312.
Cleome muricata Edgew. Journ. Asiat. Soc. Beng. XVI, 1212.
Dianthera grandiflora Kl. in Peter's Reise nach Mozamb., Bot. I, 161.
Cleome grandiflora Ehrbg. ined. in herb. arab.et abyss.

Description :—An erect, somewhat shrubby plant of 2-3 feet ; the branches simple or forking, leafy, glabrous or with dark sessile glands above. Leaves 3—6-foliate ; leaflets linear or linear lanceolate, glabrous, glaucescent.

Flowers on terminal racemes, pedicellate, rather large, citron-yellow or rose, closely corymbose at first. Bracts linear or obsolete. Sepals ovate or ovate-lanceolate, often glandular. Petals unequal. Stamens 6, 2 usually much longer; anthers purple (Schweinf.).

Fruits widely spreading or pendulous, linear, tapering to each end, about 4 inches long, 2—3 lines broad. Gynophore $\frac{1}{2}$—$\frac{3}{4}$ inch long. Style persistent, short, tapering, many times shorter than the glabrous striate valves. Seeds biseriate, subglobose, shortly pilose. Cotyledons circinate.

Flowers in October (Marchesetti).

Fruits from November to March (Schweinf.).

Locality :—Near the coal depôt of the Messag. Marit., on rubbish and loose rocky ground in great quantities (Schweinf.); ravine south-west of the tower of silence in the crater of the Shum Shum Range, plain of Maala (Defl.); on the slope of the Shum Shum on coarse gravel (Ellenbeck, Lunt); without locality (Edgew., Hook., Madden, Anders., Birdw., Hildebrandt, Marchesetti, Kuntze).

Distribution :—S. Arabia, Nubia, Abyssinia, Kordofan.

5. **Cleome pruinosa** Anders. Journ. Linn. Soc., V, Suppl. p. 3; Defl. Bull. Soc. Bot. Fr. XXXII, 346; Schweinf. Herb. Boiss. (1896) Append. II. 189; Franchet Journ. de Bot. I (1887) 40.

Description:—A small undershrub, stem much-branched, subglabrous; branches pruinose, with patent subhirsute pilose hairs, leafy. Leaves long-petioled, 4—8 lines long, 3—6 lines broad, ovate, acuminate, 3-nerved, sparingly scabrous-papillose, margin glandular, subserrate; petiole $\frac{3}{4}$ inch long.

Flowers axillary, solitary, asually greenish-yellow; sepals lanceolate, subglandular; petals linear, unguiculate, the posterior ones sometimes with red nerves, in other cases quite yellow. Stamens 4; filaments purpurascent; anthers greenish-yellow with blackish margin. Style slender, glabrous, 4 lines long. Siliqua sessile, erect, glandular, terete, oblong, longitudinally sulcate, 8 lines long, apiculate with the persistent deflexed style.

Flowers :—Dec. 1847 (Hooker), Dec. 1888 (Schweinf.), January 1863 (Oliver & Cl.).

Fruits :—Nov. 1888 (Schweinf.), Dec. 1847 (Hooker), April 1861 (Thomson), June 1872 (Hildebr.), June 1878 (Perry).

Locality :—Near the Mosque Shaik Aidrus, plain of Maala, valley above the European cemetery of Steamer Point, dry, rocky and stony

places (Schweinf.) ; plain of Maala, ravine near Steamer Point (Defl.) ; on the slope of the Shum Shum Range (Ellenbeck) ; without locality (Hook., Anders., Thomson, Birdw., Perry, Marchesetti, Hildebrandt, Lunt) ; very common (Krause) ; copiosissime at Aden (Perrotet, Remy, Courbon).

This plant is endemic in Aden.

Note:—Cleome pruinosa approaches very nearly *Cleome droserifolia* Del., but it is more glaucous and often less glandular, or even glabrescent ; the shape of the leaves is slightly different ; instead of being rounded like those of *C. droserifolia,* they are prolonged into a very short point. In the form reported by Courbon the leaves are almost glabrous and nearly distinctly cordate.

6. Cleome brachystyla Defl. Bull. Soc. Bot. Fr. XXXIV, 65 ; Morot, Journ. de Bot. I, 39.

Cleome hispida Ehrbg. Herb. arab. ined., ex schedula herb. Parisiensis.

Description:—An undershrub, $1\frac{1}{2}-2$ feet high, densely and softly villose with glandular pilose hairs ; stem erect, ramose, multi-costate. Leaves 10-11 lines long, 8-10 lines broad, long-petiolate, broadly ovate, sub-cordate, 3-5-nerved.

Flowers in terminal, elongate, leafy racemes. Bracts small, sessile. Pedicels half as long as the bracts. Sepals linear-acute. Petals lanceolate, pale yellowish, by one half longer than the calyx. Stamens 4, exserted. Style $\frac{1}{2}-\frac{3}{4}$ lines long, straight, shortly thickened ; stigma rotundate, oblique, purpurascent.

Siliqua 4—5-times as long as the pedicel (12—15 lines), non stipitate, ovate-cylindric, sparingly hairy with small erect glandular aculei ; style persistent, shortly apiculate. Seeds small, smooth, yellow.

Flowers and *fruits* from November to March (Schweinf.).

Locality:—Above the coal depôt of the Messag. Marit., Goldmore Valley, on rocks (Schweinf.) ; Koosaf Valley, Goldmore-Valley (Defl.) ; without locality (Birdw., Courbon, Balansa).

Distribution:—Island of Ketumbal (17° N.L.), Shugra, Somaliland.

Note:—" The specific name given by Ehrenberg is older than the one given by Deflers. But in addition to the fact that Ehrenberg did not furnish us with any description of the plant, it seems that several species have been distributed by the Berlin Museum under the name of *C. hispida.* The specimen received by the Paris Museum under that name is certainly *C. brachystyla Defl.*" (Franchet.)

7. Cleome polytricha Franch. in Morot Journ. de Bot. I, 41; Schweinf. Bull. Herb. Boiss. (1896), Append. II, 189.

Cleome hispida Defl. Bull. Soc. Bot. Fr. XXXII, 346 et XXXIV, 64 (non Ehrbg. in Herb. Mus. Paris.).

Description :—A robust undershrub, 1½ feet high, densely covered with pilose-setulose glandular hairs; stems erect, spreading ramose from the base. Leaves 6—10 lines long and broad, long petiolate, orbiculate-cordate (broadly ovate and subcordate at the base in Deflers' specimen), 3-nerved or obscurely 5-nerved; bracts only slightly smaller than the cauline leaves, reflexed, orbiculate, deeply and narrowly cordate, subsessile.

Flowers in terminal loose and very leafy racemes. Pedicels patulate, 1½-2-times as long as the bracts. Sepals lanceolate, puberulous, long glandular. Petals slightly longer than the calyx, broadly lanceolate, pilose at the apex; ('squama margine undulato-crispa, nunc triloba' according to Franshet). Stamens 4, exserted. Style 2-2½ lines long (7-8 mm. according to Franchet); projecting beyond the stamens; stigma ovate.

Capsule 10-12 lines long, 2½-3 lines broad, oblong-lanceolate (ovate in Deflers' specimen), non stipitate, ascendent on the patent peduncle, covered with spreading pilose hairs which bear a black gland at the apex. Style persistent, deflexed. Seeds small, glabrous, reniform, yellow.

This species is very easily distinguished amongst the long-styled Cleomes by the reflexed and almost sessile bracts which leave at their base a deep narrow opening for the peduncle.

Fruits :—Dec. 1888 (Schweinf.), August (Herb. Kew).

Locality :—Ravine above the European cemetery of Steamer Point, plain of Maala, Goldmore Valley (Schweinf.); plain of Maala, Goldmore Valley, between boulders (Defl.); without locality (Birdw., Courbon, Beaudoin).

Distribution :—Saihut on the Mahra Coast, Tadjura on calcareous ground (Boivin).

8. Cleome droserifolia Del. Fl. d'Eg. p. 250; DC. Prodr. I, 239; Boiss. Fl. Or. I, 415; Oliv. Fl. trop. Afr. I, 77.

Cleome roridula R. Br. in Salt Voy. Abyss. I, 77.

Description :—A much-branched and shrubby glandular-hispid herb of 3-10 inches. Leaves broadly ovate-rotundate, obtuse, with a more or less truncate triplinerved base, setose, hispid or scabrous, ¼—½ inch in diameter, equalling or usually shorter than their petioles.

Flowers axillary, pedicellate. Sepals glandular-setose. Petals somewhat lanceolate with a thickened scale-like appendage at the base. Stamens 4. Ovary oblong or oval, shortly and densely glandular, sessile or subsessile, with a very long slender style.

Fruit oval, 4-5 lines long, with setose-hispid concave valves. Seeds reniform-globose, rather compressed, minutely granular.

Locality:—Great valley between Steamer Point and town (Marchesetti).

Distribution:—Nubia, Abyssinia, Egypt, Sinai, Central and Southern Arabia.

Note:—Marchesetti is the only botanist who reported this species from Aden, and we have included it on his authority. As *Cleome pruinosa* Anderson and *Cl. quinquenervia* DC. resemble very much *Cl. droserifolia,* we are perhaps allowed to doubt the actual occurrence of *Cl. droserifolia* at Aden.

2. Dipterygium Dcne.

A twiggy, divaricately-branched undershrub. Leaves small, petioled, scattered, ovate-oblong, acute, entire.

Flowers small, in long bracteate racemes; pedicels short, filiform. Sepals small, ovate, acute. Petals white, ovate, obtuse, shortly clawed. Stamens 6, equal. Ovary 1-celled; ovules 1-2, often 4-winged, the wings afterwards disappearing; style elongate; stigma capitate.

Fruit indehiscent, small, pendulous, ellipsoid, compressed, surrounded by a membranous wing, 1-seeded. Seeds erect, curved; cotyledons concave, embryo incumbent.

Species:—1.

Distribution:—Nubia, Abyssinia, Kordofan, Central and S. Arabia, N.-W. India.

1. Dipterygium glaucum Dcne. in Ann. Sc. Nat. Ser. 2, IV, 67, tab. 3; Anders. Journ. Linn. Soc. V, Suppl. p. 1; Boiss. Fl. Or. I, 417; Hook. et Thoms. in Journ. Linn. Soc. V, 179; Oliv. Fl. trop. Afr. I, 70.

Pteroloma arabicum Hochst. et Steud. in Schimp. Pl. Arab. Fel. n. 851.

Character of the genus.

Flowers:—Dec. 1847 (Hooker), Dec. 1888 (Schweinf.), January 1863 (Oliver and Cl.), March 1878 (Perry), April 1861 (Thomson), May 1859 (Anderson).

Fruits:—Dec. 1888 (Schweinf.), January 1863 (Oliver and Cl.), Apl. 1861 (Thomson), Nov. 1884 (Beevor).

Locality:—From the sea shore up to 1,000 feet of the Shum Shum Range (Hook., Anders.); on sand fields along the coast (Schweinf.); without locality (Birdwood, Hildebrandt, Lunt, Perry, Beevor); near Shaikh Othman (Defl.).

3. Maerua Forsk.

Shrubs or small trees, destitute of spines, glabrous or pubescent. Leaves simple or trifoliate, often with minute setaceous stipules.

Flowers axillary, solitary or fascicled, or in terminal racemes or corymbs. Sepals 4, united at the base into a persistent infundibuliform tube forming a 4-lobed calyx. Petals 0 or 4, episepalous. Disk infundibuliform, lining the calyx-tube, elongated in the middle into a columnar obconic receptacle or torus equalling or slightly exceeding the calyx-tube. Stamens indefinite, inserted on the torus; filaments free or connate at the base. Ovary cylindrical, linear-oblong or ovoid, on a long gynophore, 1-2-celled; placentas 2-4, parietal or cohering in the middle; stigma sessile or subsessile.

Fruit baccate, the constrictions of the pericarp sometimes separating it into numerous 1-seeded segments. Seeds large, cotyledons fleshy, convolute.

Species:—About 20.

Distribution:—Tropical Africa, Arabia, W. India.

Not climbing—	
Leaves coriaceous	1. M. Thomsoni.
Leaves succulent	2. M. crassifolia.
Climbing	3. M. ovalifolia.

1. **Maerua Thomsoni** Anders. Journ. Linn. Soc. V, Suppl. p. 5.

Description:—A shrub, quite glabrous, virgate, leafy, cortex punctate; branches very few; leaves coriaceous, mucronate, short-petioled, those of the flowering branches fasciculate, oblong, on the other branches alternate, linear.

Flowers solitary, pedunculate. Calyx tubular, shortly 4-partite.

Fruit fleshy, stipitate, glabrous, torulose.

Flowers:—In February 1851 (Hook. f. and Thomson).

Locality:—Aden (Hook. f. and Thomson, Balfour, Kuntze).

Endemic in Aden.

2. Maerua crassifolia Forsk. Fl. Aeg.-Arab, p. 113; Aschers. et Schweinf. Fl. d' Eg., p. 43.

Maerua uniflora Vahl Symb. I, 36; DC. Prodr. I, 254; Oliv. Fl. Trop. Afr. I, 86.

Arabic Name: Sserk, Meru.

Description:—Branches smooth. Leaves about ½ inch long or less, succulent, cuneate-ovate or oval, somewhat retuse.

Peduncles 1-flowered, solitary, slender, ½ inch long. Calyx 4-fid, glabrous; tube urceolate, 4-gonous; segments oblong, obtuse, ciliate, reflexed. Corolla 0, Corona multifid. Stamens about 30. Ovary cylindrical, glabrous.

Fruit ½ inch in diameter.

Flowers:—Dec. 1888 (Schweinf.), Dec. 1889 (Defl.).

Fruits:—Dec. 1888 (Schweinf.).

Locality:—Shum Shum Range, plain of Maala (Schweinf.); without locality (Birdw.).

Little Aden, on the Jebel Ihsan (Defl.).

Distribution:—S. Arabia, Palestine, Egypt, Nubia, Libya, Kordofan, Senegambia.

3. Maerua ovalifolia Cambess. in Jacq. Voy. Bot. 1844, p. 23, t. 24.

Maerua arenaria Hook f. et Thoms. in Fl. Brit. Ind. I, 171; Trim. Fl. Cey. I, 58.

Niebuhria oblongifolia Royle Ill. Him. Bot., p. 73.

Capparis heteroclita Roxb. Fl. Ind. II, 570.

Description:—A climbing shrub with divaricate branches; bark smooth, pale. Leaves 1-2 by ⅝-1 inch, elliptic-oblong, obtuse or retuse, mucronate, glaucous, glabrous; petioles stout, ⅛-¼ inch long.

Flowers in corymbs, greenish-white, terminal or on lateral shoots; pedicels ½-¾ inch long, glabrous; bract 1 at the base of each pedicel, small, ovate, acuminate, rigid, yellow. Calyx-lobes ovate, acute, ½ inch long, hooded at the apex, with a short horn behind the hood and with a line of dense white pubescence on the margin. Calyx-tube ⅛ inch long, lined with an infundibuliform disk as long as the tube with truncate margins, the columnar torus slightly exceeding the calyx-tube. Petals ovate-lanceolate, acute, with slightly undulate margins, half as long as the calyx-lobes and alternate with them or nearly so, inserted on the margin of the cup-shaped disk. Stamens many, inserted on the torus. Gynophore ¾ inch long. Ovary cylindric, truncate; style 0; stigma large.

Fruit pale brown, constricted between the seeds, forming an elongate twisted and knotted berry, each lobe or knot 1 seeded. Seeds brown, globose, echinate.

Locality: Aden (Birdw.).

Distribution: W. India.

4. Cadaba Forsk.

Shrubs, unarmed or the desert species sometimes spinescent. Leaves simple, entire, glandular scabrid or glabrous.

Flowers in terminal corymbs or racemes or axillary. Sepals 4, free, biseriate. Petals 4 or 0, inserted on the torus, unguiculate. Stamens 4 or 5; filaments more or less adnate to the gynophore. Appendix springing from the base of the gynophore, tubular linguiform or ligulate. Ovary on a long gynophore, 1-2-celled. Stigma sessile or subsessile. Ovules indefinite.

Fruit cylindrical, terete or subtorulose or ellipsoidal. Seeds subglobose; testa cartilaginous; cotyledons convolute.

Species about 20.

Distribution:—Africa, Madagascar, Arabia, India, Islands of the Indian Ocean, Australia.

Petals O. Stamens 5, adnate to base of gynophore—

(*a*) Glabrous . . . . . 1. C. rotundifolia.
(*b*) Glandular-pilose or hispid . . . 2. C. glandulosa.

Petals present. Stamens 4 or 5, adnate ½-⅔ length of gynophore—

(*a*) Glabrous or extremities minutely mealy; Stamens 4 . . . . . 3. C. longifolia.
(*b*) Mealy-puberulous at first; stamens 4-5 . 4. C. farinosa.

1. **Cadaba rotundifolia** Forsk. Fl. Aeg.-Arab. p. 68; DC. Prodr. I, 244; Boiss. Fl. Or. I, 418; Schweinf. Beitr. Fl. Aethiop. p. 66; Oliv. Fl. trop. Apr. I, 89.

Strœmia rotundifolia Vahl Symb. I, 19.

Arabic name:—Qadsab, qattab.

Description:—Extremities minutely puberulous. Leaves coriaceous, orbicular or rotundate, glabrous, with one or two pairs of the principal lateral veins from near the base, 1-1½ inches in diameter; petioles about ½-¾ inch long.

Flowers in terminal racemes. Bracts subulate or obsolete. Petals 0. Appendix about ¾ inch long, ligulate, lamina elliptical, obtuse, folded back over its claw in the bud. Stamens 5; filaments adnate 1-2 lines

with the gynophore, which is at length ½-¾ inch long. Ovary 1-celled; placentas 2.

Fruit linear, dehiscing in 2 valves, about 1½ inch long. Seeds reniform.

Flowers and *fruits* in November (Schweinf.).

Locality :—Goldmore Valley (Schweinf.); without locality (Birdw., Balfour). Hinterland: In the plain between Shaikh Othman and Bir Ahmed (Defl.).

Distribution :—S. Arabia, Socotra, Eritrea, Nubia, Abyssinia, Somaliland, Kordofan.

2. **Cadaba glandulosa** Forsk. Fl. Aeg.-Arab. p. 68; DC. Prodr. I, 244; Anders. Journ. Linn. Soc. V, Suppl. p. 4; Boiss. Fl. Or. I, 418; Oliv. Fl. trop. Afr. I, 89.

Strœmia glandulosa Vahl Symb. I, 20.

Cadaba monopetala Edgew. Journ. As. Soc. Beng. XVI, 1212.

Arabic name :—Teneim.

Description :—A much branched shrub, glandular-pilose with short, spreading, viscid hairs. Leaves orbicular, obovate or broadly elliptical, with or without a mucro, more or less shortly glandular-hispid or sometimes scabrid, usually 3-6 lines in diameter, rarely twice as large.

Racemes few-flowered, terminating the branches and lateral shoots. Petals 0. Appendix ¾-1 inch long, ligulate, the lamina petaloid, oblong, obtuse or emarginate. Stamens 5, shortly adnate to the base of the gynophore. Ovary 2-celled, owing to the cohesion of the placentary plates.

Fruit oblong-ellipsoidal, ½ inch long on a gynophore of ½-¾ inch.

Flowers :—February 1851 (Thomson), Oct. (Defl.), Nov. 1888 (Schweinf.).

Locality :—Goldmore Valley (Schweinf.); on the slopes of Shum Shum Range (Edgew., Hook., Hildebrandt, Marchesetti, Ellenbeck); plain of Maala at the foot of the Shum Shum (Defl.); gravelly slope quite close to the town (Busse); without locality (Birdw., Kuntze); common (Krause).

Distribution :—Central and Southern Arabia, highlands of Somaliland, Abyssinia, Nubia, Kordofan.

3. **Cadaba longifolia** DC. Prodr. I, 244; A. Rich. Tent. Fl. Abyss. I, 26, tab. 5; Anders. Journ. Linn. Soc. V, Suppl., p. 4; Schweinf. Beitr. Fl. Aethiop. p. 66; Oliv. Fl. trop. Afr. I, 90.

Strœmia longifolia R. Br. in Salt Abyss. n. 64.

Cadaba scandens Pax in Engl. Bot. Jahrb. XIV, 301.

Description :—A glabrous shrub or the extremities slightly mealy. Leaves coriaceous, linear-oblong or lanceolate or elongate-oval, obtuse or subacute, often with a fine mucro, usually from 1-1½ inches long and 3-6 lines broad ; petiole 2-3 lines long.

Flowers in short terminal corymbs ; bracts reduced to minute scales. Sepals brick-red on the inner side. Petals citron-yellow, narrow-oval or lanceolate, with long claws, rather exceeding the sepals. Appendix linear-lanceolate or oblanceolate, about as long as the sepals, open on the side towards the gynophore. Stamens 4 ; filaments adnate halfway up the gynophore or higher. Ovary minutely glandular, bilocular, at least partially.

Flowers :—November 1888 (Schweinf.), Dec. 1889 (Defl.), Febr. 1851 (Hooker), April 1861 (Thomson), June 1878 (Perry).

Locality :—Goldmore Valley (Schweinf., Defl) ; plain of Maala (Schweinf.) ; slopes of Shum Shum Range (Marchesetti, Ellenbeck) ; without locality (Hook., Thomson, Anders., Birdw., Lunt, Perry, Kuntze).

Distribution :—S. Arabia, Somaliland, Socotra, Eritrea, Sennaar, Abyssinia.

Note : Like several other species of *Capparidaceæ* v.g. *Maerua oblongifolia Rich*, etc., this plant produces on certain long shoots quite narrow leaves with the nervation very indistinctly visible on their upper side. Schweinfurth observed the following forms of leaves on specimens collected in the Goldmore Valley : Oblong-elliptic, pointed at both ends (1⅘ × ½ inch), linear or linear-lanceolate with slightly obtuse apex (2⅘ × ¼ inch), lanceolate (2⅕ × ½ inch).

4. Cadaba farinosa Forsk. Fl. Aeg.-Arab. p. 68 ; DC. Prodr. I, 244; Boiss. Fl. Or I, 418 ; Oliv. Fl. trop. Afr. I, 89.

Strœmia farinosa Vahl Symb. I, 20.

Streblocarpus Fenzlii Parl. in Webb. Fragm. Fl. Aethiop. p. 24.

Arabic name : Assal, el-bejadd, gorrah, gorreh, sserah.

Description :—A shrub or occasionally arborescent, often densely branched, the extremities terete, and more or less hoary-mealy. Leaves coriaceous, oblong, oval-oblong or varying from lanceolate to oblanceolate-oblong, obtuse, emarginate or rarely somewhat mucronulate and acute, pale glaucous-green or whitish and mealy at first, at length glabrate, ½-2 inches long, ⅙-1 inch broad, often very small and fascicled ; petiole about 1 line, rarely 3-4 lines.

Flowers in short terminal racemes, or terminating short lateral branches. Bracts reduced to minute scales or obsolete, except the lowest, which is sometimes leafy. Petals 4, linear or narrow-oval, clawed, exceeding or equalling the sepals. Appendix tubular, obliquely open, and often toothed at the extremity, shorter than, or nearly equalling the sepals. Stamens 4-5; filaments adnate ⅓-½ way up the gynophore. Ovary cylindrical, 1-locular, with 2 placentas. Stigma sessile.

Fruit patent, subterete or slightly torulose, 1-2 inches long, on a gynophore of ½-¾ inch or rather more. Seeds reniform-rotundate, compressed.

Flowers and *fruits* in Yemen from December to January (Schweinf.).

Locality :—Locality not named (Hildebrandt according to Krause).

This species is not represented in Birdwood's herbarium and Hildebrandt seems to be the only one who saw this plant in Aden.

Distribution :—Central and S. Arabia, Nubia, Abyssinia, Kordofan, highlands of Somaliland, Usambara, Kilimandjaro, Senegambia.

5. Capparis L.

Trees or shrubs, often climbing or sometimes prostrate, unarmed or with short, often recurved, stipular spines. Leaves simple, coriaceous or submembranous, rarely wanting.

Flowers usually hermaphrodite, solitary, racemose, corymbose or umbellate, axillary or terminal. Sepals usually 4, free or connate at the base, biseriate, imbricate, or the two exterior subvalvate. Petals 4, imbricate. Torus short. Stamens usually indefinite, inserted upon the torus at the base of the long gynophore. Ovary stalked, 1-4-celled; ovules many, on 2-6 parietal placentas; stigma sessile.

Berry stalked, globose or cylindric, often elongate, rarely dehiscent. Seeds many, embedded in pulp; testa crustaceous or coriaceous; embryo convolute.

Species about 150.

Distribution :—In both tropics and in the warmer regions of the Old and New World.

Leaves ovate to rotundate; anterior sepal galeate . .	1. C. galeata.
Leafless, at least the flowering branches; anterior sepal saccate .	2. C. decidua.

1. Capparis galeata Fresen. Mus. Senckenb. II, 111; Anders. Journ. Linn. Soc. V, Suppl. p. 5; Schweinf. Beitr. Fl. Aethiop. p. 67; Boiss. Fl. Or. I, 421; Oliv. Fl. trop. Afr. I, 96.

Capparis spinosa L. var. galeata Hook. f. et Thoms. in Fl. Brit. Ind. I, 173.

Capparis cartilaginea Dcne. in Ann. Sc. Nat. Ser. 2, III, 273.

Capparis uncinata Edgew. Journ. As. Soc. Beng. XVI, 1213.

Arabic name.—Assef, Kaber (Ibn-el-Beithar); Latssaf (ubique), nutssaf (in Hodjela according to Schweinf.).

English name: Caper.

Description —A glaucous, leafy, diffuse shrub; extremities pulverulent. Leaves thick, cartilaginous, ovate or rotundate, tipped with a more or less curved or hooked mucro, 1—3 inches long, $\frac{3}{4}$—2 inches broad. Stipules spinose.

Flowers solitary, axillary; peduncles stout, recurved in fruit. Sepals 4, the larger galeate. Petals roundish.

Fruit baccate, clavate-pyriform, 3—4 inches long, on stipes of about $1\frac{1}{2}$—2 inches. Seeds reniform.

Flowers: Sept. 1880 (Hunter), Nov. 1888 (Schweinf.).

Fruits: Dec. 1847 (Hooker), Nov. 1888 (Schweinf.).

Locality:—Between boulders on basaltic lava, forming dense bushes, above the coal depôt of the Messag. Marit. (Schweinf.); northern slope of the Shum Shum Range above Maala, Biggari Valley, ravine above the tanks (Defl.); between boulders near the tanks (Busse); the great valley between Steamer Point and the town (Marchesetti); without locality (Edgew., Hook., Anders., Birdw., Kuntze, Hunter, Hildebrandt); common (Krause).

Distribution:—Sinai, Egypt, Nubia, Abyssinia, Somaliland, Socotra, Sind, Zanzibar.

Note:—Most forms of the Aden plant, though showing sometimes flowers of smaller dimensions, agree with the type of *C. galeata* which is so very common all over the region of the Red Sea. The following forms of leaves have been recorded by Schweinfurth: orbicular-ovate ($3 \times 2\frac{3}{5}$ inches) with a petiole of $\frac{4}{5}$ inch in length, elliptical ($1\frac{5}{4} \times 1$ inch). The leaves vary a good deal with regard to their shape, not only in Aden, but also in the neighbouring countries, but the plant never loses its characteristic habit: extremely thick coriaceous-cartilaginous leaves, ascending branches with regular zigzag turns, thickening of the branchlets which is quite out of proportion.

Uses:—This species yields a volatile oil which has the properties of garlic oil (Pharmacogr. Ind. I, 135).

The caper is mentioned by Greek and Latin writers and through them probably the medicinal properties of the root were made known to

the Arabs. It was generally employed in affections of the liver and spleen, and also in amenorrhœa.

For further details see Ibn-el-Beithar, III, 134-137.

2. **Capparis decidua** (Forsk.) Pax in Engl.-Prantl. Nat. Pflanzenf. III, 2, p. 231.

Sodada decidua Forsk Fl. Aeg.-Arab. p. 81; Schweinf. Beitr. Fl. Aethiop, p. 74.

Capparis aphylla Roth Nov. Pl. sp. p. 238; DC. Prodr. I, 246; Oliv. Fl. trop. Afr. I.

Capparis sodada R. Br. in Denh. Trav. p. 255; Boiss. Fl. Or. II, 419.

Arabic name :—Sodâd.

Description :—A straggling, glabrous shrub, branches terete, smooth, green. Leaves on the young shoots only, the older branches being leafless, small, less than ½ inch long, linear-oblong, acute, spinous-pointed; petioles very short or 0; stipular thorns long, sharp, straight, orange-yellow.

Flowers in many-flowered corymbs, from the old branches, or from short lateral shoots; pedicels slender, about ½ inch long. Sepals: the outer pubescent, ciliate, subvalvate, the lower one very saccate, acuminate, the upper much smaller, ovate-oblong, concave; inner sepals elliptic, acute, with floccose margins. Petals red, narrow-oblong, ⅜ by ⅛ inch. Gynophore ½ inch long.

Fruit globular, size of a cherry, glabrous, beaked, red.

[According to Brandis the fruit is 2 inches long, ½-⅔ inch in diameter, on a gynophore 1 inch long.]

Locality :—Precise place of occurrence not mentioned by Hildebrandt.

Distribution :—Upper Egypt, Nubia, Abyssinia, Darfur, Somaliland, Socotra, Central and Southern Arabia, Punjab, Sind, Deccan, Gujarat to Tuticorin.

Note :—I have included this species on the authority of Krause who has the following remark in his list: "As Hildebrandt rarely gives the exact locality and mostly omits it entirely it is quite possible that *C. decidua* (Forsk.) Pax which by no other botanist has been reported to occur on the two peninsulas of Aden and Little Aden, does not grow there at all, but may be found in the distant neighbourhood."

Uses :—The young flower-buds and fruits are eaten. In India the buds are pickled and the fruits eaten both when green and when fully ripe. The wood is employed in India for making combs, small beams

and rafters, for the knees of boots, etc. It is valuable because it is not attacked by white ants.

IV.—RESEDACEÆ.

Annual or perennial herbs, rarely shrubs. Leaves alternate, scattered or fasciculate, entire, 3-fid or pinnatifid ; stipules minute.

Flowers racemose or spicate, bracteate. Calyx persistent, 4—7-partite, irregular ; lobes imbricate in bud. Petals 2—7, hypogynous, entire or lobed, equal, or the upper larger. Disk conspicuous, sessile or shortly stipitate, often unilateral or absent. Stamens usually many, inserted upon the disk, free or connate, equal or unequal. Ovary 1-celled, of 2—6 connate carpels, closed or open at the apex or narrowed into short cuspidate styles ; ovules on 2—6 parietal placentas, amphitropous or campylotropous.

Fruit a closed or open capsule, or indehiscent, (baccate in Ochradenus), or of as many minute follicles as carpels. Seeds many, reniform ; albumen 0 ; embryo curved or folded ; cotyledons incumbent.

Genera 6.

Species about 35.

Distribution :—S. Europe, N. and S. Africa, Asia Minor, Sind.

With petals	1. Reseda.
Without petals	2. Ochradenus.

1. Reseda L.

Erect or decumbent glabrous or pilose herbs. Leaves entire, lobed or pinnatifid.

Flowers in terminal, bracteate racemes. Calyx 4—7-partite. Petals 4—7, unequal, multifid, the upper with a membranous appendage above the claw. Disk subsessile, broad, dilated on the upper side. Stamens 10—40, inserted within the disk. Ovary sessile or stalked, 3-lobed at the apex ; placentas 3—6 ; ovules many.

Capsule indehiscent, open at the top. Seeds indefinite.

Species 26.

Distribution :—The countries bordering the Mediterranean and Western Asia.

1. Reseda amblyocarpa Fresen. Mus. Senckenb. I, 108 ; Walp. Repert. Bot. II, 753 ; A. Rich. Tent. Fl. Abyss. I, 13 ; Muell.-Arg. Monogr. Resed. p. 151 et in DC. Prodr. XVI, 580 ; Anders. Journ. Linn. Soc. V, Suppl. p. 6.

Reseda lurida Muell.-Arg. Monogr. Resed. p. 152, tab. 7, fig. 106.

Reseda quartiniana A. Rich. Tent. Fl. Abyss. I, 13.

Description :—A branching herb, subpruinose. Stem perennial, striate, angular. Leaves mostly entire, (the upper ones very rarely trifid), ovate-lanceolate, acute at both ends, attenuate into the petiole, 2-inches long, 3 lines—½ inch broad.

Flowers small, spikate ; bracts long-subulate, deciduous ; pedicels as long or longer than, the calyx. Sepals 6, unequal, linear, deciduous. Petals 5, the two larger ones 5—10-partite, the 3 smaller ones bipartite or entire.

Capsules obovate, obtusely tridentate, truncate. Seeds minute, reniform, black, punctate.

Flowers and *fruits* from March to December (Schweinf.).

Locality :—Ubique, on basaltic rocks, forming shrubs 3—4½ feet high (Schweinf.); very common in all the valleys and on rubbish at the foot of the mountain, plain of Maala (Defl.); on the seashore (Edgew., Hook., Madden, Schomburgk, Harvey, Anders.); in the great valley between Steamer Point and town (Marchesetti); gravelly slope near the town (Busse); without locality (Birdw., Kuntze).

Distribution :—S. Arabia, highlands of Somaliland, Eritrea, Abyssinia.

Note :—It is doubtful whether *Reseda amblyocarpa* Fresen. constitutes a separate species, or whether it should be united with *Reseda pruinosa* Del. We do not think it is possible to decide the question by examining a few herbarium specimens. Oliver, Krause, and others have done the same with different results. Careful observations on the spot and examination of a greater number of plants are absolutely required. In order to draw the attention to some of the disputed points we consider it advisable to acquaint future visitors at Aden with the views expressed by some botanists.

Anderson writes in his *Florula,* p. 6 : " After a careful examination of the species of *Reseda* in the Hookerian Herbarium, and the study of Mueller's elaborate monograph of the order, I can find no character, except the nature of the seeds, to separate this species from *R. pruinosa,* Del., or *R. Aucheri* and *R. bracteata,* Boiss., which seem to be merely varieties of *R. pruinosa.*

" Having made numerous dissections of all the species allied to *R. pruinosa,* Del., I am convinced that no specific character of the slightest value can be obtained from the number of the divisions or the shape of the petals. I consider *R. amblyocarpa,* Fresen., to be probably distinct from *R. pruinosa,* Del., and its varieties,—from its having a perennial stock, almost always entire leaves, a larger and denser spike, smaller flowers, and a slightly different capsule containing much smaller, black

and punctate seeds. *Reseda pruinosa* is evidently an annual, with generally trifid leaves; it has shorter spikes, larger flowers, and seeds nearly as large again as those of *R. amblyocarpa*, of a dark olive colour, and with an almost perfectly smooth testa. Both, however, are pruinose. The seeds of *R. pruinosa* are also sometimes slightly punctate, and *R. Aucheri*, Boiss., which ranks only as a variety of *R. pruinosa*, has often leaves as entire as those of *R. amblyocarpa*. In *Resedaceæ* the duration of the stock is probably an uncertain character, subject to the influence of climate, and especially the amount of moisture."

Oliver unites *R. amblyocarpa* with *R. pruinosa* (Fl. top. Afr. I, 103). "Notwithstanding Dr. Anderson's remarks," he says, "I do not think *R. amblyocarpa* can be maintained as specifically distinct from *R. pruinosa*. There is no difference as to the seeds between the Abyssinian and N. W. Indian forms, though in the Aden plant, which was specially under Dr. Anderson's notice, they are very small, black, and rough with minute points. The leaves of our only Abyssinian specimen are entire, though Fresenius describes them as mostly 3-fid. Most of the leaves are trifid in the ordinary state of *R. pruinosa*."

Cooke (in Fl. Bombay Presid. I, 49) describes the Sind specimens of *Reseda pruinosa* as having the lower leaves linear-lanceolate, the upper deeply 3—5-divided and the segments narrow-linear. The seeds are yellowish-white, smooth, subglobose.

Krause considers the differences pointed out by Anderson as sufficient to separate *R. amblyocarpa* from *R. pruinosa*.

It is evident from the above statements that the Aden specimen cannot be distinguished from *R. pruinosa* by anything like a constant morphological character, except by its black and punctate seeds. As to the colour of the seeds of *R. pruinosa* the authors do not agree. Anderson calls it dark olive, Krause olive-green, and Cooke yellowish-white.

2. Ochradenus Delile.

Branched glabrous herbs; branches slender, twiggy. Leaves small, linear, on the younger branches only, solitary or fascicled.

Flowers small, spicate or racemose, often polygamous. Calyx 5-fid. Corolla 0. Disk unilateral. Stamens 10—20, inserted within the disk. Ovary sessile, ovoid, closed at the top, 3-cuspidate, placentas 3; ovules many.

Fruit a many-seeded berry.

Species 2.

Distribution :—Spain, Syria, Egypt, Arabia, Sind.

1. Ochradenus baccatus Delile Fl.d'Egyp. (1812) p. 236, t. 31; Oliver Fl. trop. Afr. I, 104; Hook. Fl. Brit. Ind. I, 182. Cooke Fl. Bomb. Presid. I, 50.

Description :—Shrubby; branches terete, divaricate, striate, glabrous. Leaves $\frac{1}{2}$—$1\frac{1}{2}$ by $\frac{1}{12}$inch, entire, scattered near the base of the branches, olive-green, fleshy, narrow-linear, spathulate, with a callous tip, glabrous.

Flowers yellowish, minute, shortly pedicelled, laxly arranged in rigid racemes, 1—2-sexual. Calyx 5—6-lobed. Petals 0. Stamens 10—12.

Berry small, $\frac{1}{3}$-inch in diameter, shortly stalked, obovoid, attenuated at the base, the apex rounded and obtusely 3-denticulate. Seeds few, pale brown.

Locality :—Aden (Hildebrandt).

Distribution :—Syria, Egypt, Sind.

V.—POLYGALACEÆ.

Herbs, shrubs or rarely arborescent, diffuse, erect or scandent. Leaves usually alternate, simple, entire, exstipulate.

Flowers racemose, capitate or panicled, bracteate. Sepals 5, free or 2 anterior connate, two inner larger, petaloid, wing-like, rarely subequal. Petals 3 or 5, declinate, free from each other, but usually united at the base with the staminal sheath, the lower one keeled and generally crested. Stamens 8, 5 or 6, monadelphous; anthers 1—2-celled, opening by a transverse valve or terminal pore. Ovary 2-celled or 1-celled by abortion or 3-celled; one ovule in each cell, pendulous.

Fruit generally a capsule, 2-celled, 2-seeded, loculicidal or indehiscent. Seeds often pilose or glabrous, almost always strophiolate and albuminous; embryo axile with flattened cotyledons and a short superior radicle.

Genera 15; *species* about 500.

Distribution: Throughout the warm regions of the world, except New Zealand.

1. Polygala L.

Herbs or shrubs. Leaves alternate or fascicled, rarely opposite or verticillate.

Flowers in terminal or lateral, axillary or extra-axillary racemes or heads, usually rather small. Sepals unequal, often persistent, the 2 inner larger, usually petaloid. Petals 3, united at the base with the staminal sheath, the lower one keeled and generally crested. Stamens 8; filaments united in their lower half into a split sheath;

anthers opening by pores. Ovary 2-celled; one ovule in each cell, pendulous.

Capsule 2-celled, loculicidal, 2-seeded. Seeds pilose or glabrous, almost always strophiolate and albuminous.

Species about 450

Distribution :—Chiefly in the warmer regions of both hemispheres, except New Zealand and Tasmania.

Leaves $\frac{1}{4}$-$1\frac{1}{2}$ inches long—	
Filaments of crest arranged in 2 bundles . . .	1. P. erioptera.
Filaments of crest not arranged in 2 bundles . .	3. P. chinensis.
Leaves $\frac{1}{3}$ inch long	2. P. Thurmanniana.

1. Polygala erioptera DC. Prodr. I, 326.

Polygala triflora Anders. Journ. Linn. Soc. V, Suppl. p. 6 ; Oliv. Fl. trop. Afr., I, 128; non L. !

Polygala oligantha A. Rich. Tent. Fl. Abyss. I, 38.

Polygala arabica Edgew. Journ. As. Soc. Beng. XVI, 1213.

Polygala irregularis Defl. Bull. Soc. Bot. Fr. XXXII, 346.

Arabic name :—Bissere.

Description :—Annual, 6-15 inches high, usually branched from the base or nearly so; branches ascending, numerous, terete, pubescent or glabrescent. Leaves $\frac{1}{4}$-$1\frac{1}{2}$ by $\frac{1}{12}$-$\frac{1}{4}$ inch, very variable in form, from oblong-obovate to very narrow-linear, narrowed at the base, apex rounded or subacute, sometimes mucronate, clothed on both surfaces with minute simple hairs; petioles about $\frac{1}{32}$ inch long.

Flowers yellow, in axillary or extra-axillary, very short few-flowered racemes; crest dorsal, of many bifid or linear filaments arranged in 2 bundles; pedicels slender, hairy, $\frac{1}{8}$ inch long; bracts minute, ovate, hairy. Outer sepals $\frac{1}{16}$ inch long, ovate, pubescent. Wings $\frac{1}{8}$-$\frac{3}{16}$ inch long, obliquely ovate-oblong, pubescent, a little longer than the capsule, with a strong green midrib and membranous, ciliate margins.

Capsules oblong-elliptic, not margined, pubescent, ciliate, shorter and narrower than the wings, obliquely emarginate. Seeds oblong, densely pilose; strophiole galeate, horny, smooth and shining or sometimes with a few hairs, obscurely 3-lobed.

Flowers and fruits in November and March (Schweinf.).

Locality :—Goldmore Valley, above the coal depôt of the Messag. Marit., Wadi Maala (Schweinf.); Koosaf Valley, ravine west of the Tower of Silence, plain of Maala (Defl.); without locality (Edgew., Hook., Madden, Anders., Birdw.).

Distribution :—Bengal, Punjab, Central and Southern Arabia, Upper Egypt, Nubia, Eritrea, Abyssinia, Kilimandjaro, Darfur, Kordofan, Senegambia, Cape Verd Islands.

Note :—Schweinfurth (in Bull. Herb. Boiss, 1899, Append. II, 297) makes of his Aden specimens the variety : *var. perennis*, with the following characteristics : "Parte inferiori lignescens foliis canescentibus oblongo-obovatis, oblongis vel linearibus obtusis, racemis ab initio paucifloris, demum cum rachide ecrescente alis viridibus obovatis puberulis ciliatis 5-6 mm. longis. Semine 2·5 mm. longo, arillo 0·5 mm. non attingente."

2. **Polygala Thurmanniana** Chodat Monogr. Polygal. p. 346.

Description :—Perennial, woody ; stem hard ; branches erect, simple or few-branched, cinerascent ; branchlets short. Leaves oblong or elliptic, canescent, obtuse, petiolate, about ⅓ inch long or shorter, about ⅛ inch broad, all subequal.

Racemes very short, numerous, superaxillary, few-flowered, often shorter than the leaves or scarcely longer. Bracts subequal, minute, subpersistent, much shorter than the pedicels. Pedicels pubescent. Sepals with membranous margins, pubescent or hirsute, subunequal. Wings elliptic, subunequilateral, with prominent nerves, ciliate on back and margin ; slightly shorter than the corolla. Keel united at the base with the staminal sheath, galeate, appendiculate ; crest showy, multifid with many linear filaments ; upper petals for the greater part free, bearing a horn-shaped lobe on one side, not strongly ligular-obovate. Ovary, style, stigma and stamens as in *P. erioptera*.

Capsule elliptic, emarginate, or obovate-cuneate, with the margin long-ciliate, shorter and narrower than the wings. Seeds similar to those of *P. erioptera*.

This species differs from *P. erioptera* by its habit, the smaller and thicker leaves, and the shape of the upper petals.

Locality :—Gravelly slope of the Shum Shum Range (Ellenbeck, Hildebrandt). Endemic in Aden.

3. **Polygala chinensis** Linn. Sp. Pl. (1,753) p. 704 ; Hook. Fl. Brit. Ind. I, 204 ; Chodat Monogr. Polygal. part 2, 385, t. 29, fig. 45-46. Cooke Fl. Bomb. Pres. I, 60.

Polygala arvensis Willd. Sp. Pl. III, 876 ; Grah. Cat. Bomb. Pl. 11 ; Dalz. and Gibs. Bomb. Fl. 12.

Polygala Rothiana W. & A. Prodr. 37 ; Dalz. and Gibs. Bomb. Fl. 13.

Polygala triflora Linn. Sp. Pl., 705.

Description :—An annual, 4-10 inches high, erect, branched from the base, glabrous or pubescent. Leaves very variable, ½-1½ inches long, obovate, suborbicular or linear-oblong, rather thick, coriaceous, glabrous, ciliate, mucronate; petioles $\frac{1}{12}$ inch long, hairy.

Flowers yellow, fading to pink, in axillary or extra-axillary, short, almost capitate, few-flowered racemes; crest of a single tubular appendage multifid only at the apex; pedicels very short; bracts small, membranous, oblong-ovate, acute, ciliate, persistent. Outer sepals broadly ovate, acuminate, with broad, membranous, ciliate margins. Wings herbaceous, oblique, ovate-oblong, acuminate, with narrow, membranous margins, ciliate towards the base, longer than the capsule.

Capsules didymous, orbicular-oblong, strongly ciliate, obliquely obcordate at the apex, narrowly margined. Seeds hairy; strophiole glabrous or nearly so, rounded at the apex, furnished with 3 membranous basal appendages.

Locality :—Aden (O. Kuntze Rev. Gen. Pl. I, 49, Lunt).

Distribution :—Tropical Asia and Australia.

VI.—CARYOPHYLLACEÆ.

Annual or perennial herbs, often woody below. Leaves opposite, entire, exstipulate or stipules membranous.

Inflorescence usually a dichotomous cyme, rarely racemose or solitary. Flowers regular, usually hermaphrodite. Sepals 4—5, free or connate, imbricate in bud. Petals 4—5, rarely 0, inserted on a hypogynous or more rarely perigynous ring, imbricate. Stamens 8 or 10, rarely fewer, inserted with the petals; anthers 2-celled; cells parallel, dehiscing longitudinally. Ovary free, sessile or shortly stipitate, 1-celled or imperfectly divided at the base, with a free central or basal placenta; styles 2—5, free or connate, stigmatose above on the inner side; ovules indefinite, rarely definite.

Fruit usually a dry capsule, dehiscing by teeth or valves. Seeds usually indefinite, with a mealy albumen and more or less curved peripherical or excentric embryo; testa membranous or crustaceous; cotyledons narrow, incumbent, rarely accumbent.

Genera 35; *species* about 800.

Distribution :—Throughout the globe, chiefly in extra-tropical regions of the northern hemisphere.

Ovary many-ovuled—	
Capsule 3-valved	1. Polycarpæa.
Capsule 4-valved	3. Gypsophila.
Ovary 2-ovuled	2. Sphærocoma.

1. Polycarpæa Lam.

Erect or diffuse dichotomous herbs. Leaves usually linear or lanceolate, often fasciculate forming pseudo-verticels. Stipules scarious.

Flowers in diffuse or compact, panicled corymbose or solitary cymes. Sepals 5, scarious, or rarely herbaceous and scarious on the margins only. Petals 5, entire, 2-toothed or with the margins erose. Stamens 5, slightly perigynous or subhypogynous, or cohering with the petals, into a ring or tube. Ovary 1-celled; ovules many; style elongate, 3-grooved, 3-fid or 3-dentate.

Capsule 3-valved. Seeds obovoid or compressed; embryo curved, rarely almost straight.

Species about 24.

Distribution: In tropical or warm extratropical countries.

Sepals lanceolate, very acute. Leaves narrow-linear or linear-subulate . 1. P. corymbosa.
Sepals ovate-lanceolate. Leaves oblanceolate-spathulate, rosulate . 2. P. spicata.
Sepals ovate-elliptical, apiculate, centre thickly herbaceous. Leaves linear-lanceolate, revolute, mucronate . . . . . 3. P. fragiis.

1. Polycarpæa corymbosa Lam. Tab. Encyc. et Méthod. II, (1800) 129.

Achyranthes corymbosa L. spec. 296.

Lahaya corymbosa Schult. Syst. V, 404.

Polycarpæa indica Lam. Journ. Hist. Nat. II, 8.

Polycarpæa eriantha Hochst., Rich. Fl. Abyss. I, 303.

Polycarpæa fallax J. Gay, Mss. Herb. Kew.

Polycarpæa humifusa J. Gay *ibid.*

Description: An erect or decumbent annual herb, 2-3 inches to 1 foot high, often diffuse. Stems hoary-pubescent, repeatedly and often densely forked. Leaves narrow-linear or linear subulate with axillary tufts forming pseudo-verticels, pubescent or glabrous, much exceeding the lanceolate or subulate, scarious stipules, ⅛-1 inch long or longer.

Flowers erect, in terminal dense or rather lax, silvery, many-flowered cymes; pedicels hoary-pubescent; bracts ⅛ inch long, silvery white, bristle-pointed. Sepals lanceolate, very acute, scarious, silvery-white or coloured, much exceeding the petals and capsule. Petals less than ½ the length of the sepals.

Capsules small, shining, brown.

Locality: Aden (Birdw.).

Distribution: Tropical Asia, Africa, America and Australia.

2. Polycarpæa spicata Wight, ex Arnott in Ann. Nat. Hist. III, 99; Webb. Fl. Aeth.-Aeg. p. 40; Boiss. Fl. Or., I, 738; Hook. f. Fl. Brit. Ind. I, 246.

Polycarpæa staticæformis Hochst. et Steud. ex Fenzl in Endl. Gen. Pl. p. 161.

Description: A small slender glabrous herb, 2-4 inches high, with straight spreading branches from the rosulate radical leaves. Leaves oblanceolate-spathulate, acute or obtuse. Stipules lanceolate, very acute, prolonged to a fine point.

Flowers in fascicled spikes at the apex of the peduncles; bracts scarious. Sepals scarious, lanceolate, acute, with a coloured, broad, herbaceous midrib. Petals very small, oblong.

Capsule about ½ as long as the sepals.

Fruits: January 1880 (Balfour).

Locality: Crater of the Shum Shum at the height of 1500 feet near the flagstaff (Defl.); on the Shum Shum Range (Busse); without locality (Birdw., Beevor, Balfour).

Distribution: Gujarat, Sind, Central and Southern Arabia, Socotra, Abyssinia, Nubia, Upper Egypt.

3. Polycarpæa fragilis Del. Fl. d'Eg. p. 24, tab. 24, fig. 1; Dcne. Ann. Sc. Nat. (1835) p. 262, DC. Prodr. III, 374, Batt. et Trab. Fl. d'Alg. II, 164; Boiss. Fl. Or. I, 737; Oliver Fl. trop. Afr. I, 146.

Description:—Hoary-puberulous or tomentose herb of ¼—1 foot with numerous spreading branches usually from a woody nodose stock; lateral branches usually short. Leaves linear-lanceolate with revolute margins, conspicuously mucronate, hoary or tomentose. Stipules silvery, membranous.

Flowers in small, rather densely fascicled cymes either terminal or lateral on the very short lateral branchlets. Sepals ovate-elliptical, apiculate, rather thick and herbaceous with a broadly membranous margin, exceeding the petals.

Locality:—Goldmore Valley (Schweinf., Defl.); great valley between Steamer Point and town (Marchesetti); without locality (Beevor).

Distribution:—Central and S. Arabia, Nubia, Egypt, Tripolis, Algeria.

2. Sphærocoma T. Anders.

A small shrub. 1-2 feet high, much-branched, glabrous, glaucous. Stem erect, woody. Leaves on the nodes opposite, cauline leaves fascicled, fleshy, terete, obtuse at the apex, alternate at the base, 6-10 lines long.

Glomerules pedunculate, globose, ebracteate, fuscous, 1-3 lines long; peduncles erect, 1—1½ lines long, with 1—2 sepaloid bracts. Flowers densely aggregate, densely setigerous from the accrescent sepals of the abortive flowers. Sepals ovate, concave, (those of the sterile flowers linear), setaceous in fruit; setæ entire. Petals 5, entire, shorter than the sepals. Stamens 5, inserted on a small annular disk. Ovary 1-celled, 2-ovuled; style bifid.

Utricle indehiscent, small, subchartaceous, 1-seeded.

Species: 1.

Distribution: Arabia and Nubia.

1. Sphærocoma Hookeri Anders. Journ. Linn. Soc. V, Suppl. p. 7, tab. 3.

Psyllothamnus Beevori Oliv. in Hook. Ic. Pl. ser. III, V, 77, tab. 1499.

Characters of the genus.

Flowers:—December 1888 (Schweinf.), December 1847 (Hooker), February 1851 (Thomson), April 1890 (Defl.).

Fruits:—March 1878 (Perry).

Locality:—Goldmore Valley, northern] slope of the Shum Shum Range above Maala at a height of 830 feet (Defl.); northern side of the Shum Shum Range (Schweinf.); on the Shum Shum Range (Busse); without locality (Hooker, Thomson, Perry, Birdw.).

Distribution: Soturba, Aden.

3. Gypsophila L.

Perennial or annual, often glaucous herbs, rarely shrubby. Leaves usually flat, very rarely subulate.

Flowers in panicled cymes, rarely solitary in the forks. Calyx turbinate, tubular or campanulate, 5-toothed or lobed, with 5 broad green nerves and membranous interspaces. Petals 5, claw narrow; limb entire or notched, without (rarely with) a scale. Disk small. Ovary 1-celled; styles 2 (rarely 3); ovules many.

Capsule 4-valved to or below the middle, few or many-seeded. Seeds subreniform, hilum lateral; embryo lateral.

Species about 50.

Distribution: Europe and W. Asia, Somaliland.

1. Gypsophila montana Balf. f. in Proc. Roy. Soc. Edinb. Vol. 11, (1882), 501.

Gypsophila somalensis Franch. Sert. Somal.in Miss. Révoil 14.

Description:—A perennial herb; stem woody, procumbent, much-branched; branches ascendent, up to 2 feet long, glabrous, but often

glandular-pilose. Leaves 1½ inches long, ⅓—½ inch broad, obovate-spathulate or oblong and gradually attenuate into a short petiole, obtuse and often mucronulate, or acute and glabrous, or subglandular pilose.

Cymes dichotomous, much-branched, divaricate; pedicels glandular-pilose, the ultimate ones capillary, erect, ½ inch long; bracts foliaceous, much shorter than the pedicels. Calyx subglabrous or with scattered glandular-pilose hairs, ⅛ inch long, campanulate, 5-lobed, lobes long acute, as long as the tube, with submembranous margin. Petals three-nerved, glabrous, white or lilac, ¼ inch long; claw gradually broadened into a truncate erose or emarginate limb, acute at the base. Ovary 8-ovulate.

Capsule subbifid at the apex, shortly stipitate, as long as the calyx, few-seeded. Seeds black, tuberculate; radicle elongate.

Flowers:—End of November and March (Schweinf.).

Fruits:—March (Schweinf.).

Locality:—Above the coal depôt of the Messag. Marit., very common in the plain of Maala, on dry rocky ground and on gravel of water-courses together with *Cassia adenensis* Benth., etc. (Schweinf.); plain of Maala (Defl.); at the foot of the Shum Shum Range (Hildebrandt); without locality (Birdw.).

Distribution:—Yemen, Socotra, Somaliland.

Note:—Balfour describes a glabrous form from Aden under the varietal name:

Var. diffusa Balf. f. Bot. Socotra, p. 20.

"Herba inflorescentia diffusa ramosa ramulis ultimis capillaribus floribusque minoribus."

"The Socotran plant [*Gypsophila montana* Balf. fil.] appears to be identical with a hitherto undescribed one first found at Aden by Thomson in 1872, and since sent home from that locality by several collectors. We obtained it there in abundance. In the Aden plant variations in habit and clothing of the same character as in the Socotran specimens are observed, though not so strongly marked. But there is a further variation observable in the inflorescences and flowers of the glabrous form as found at Aden. The former become exceedingly diffuse, and the pedicels are very short and delicate; the latter are greatly reduced in size, often less than half those of the Socotran plants. In fact the inflorescence assumes more the appearance of an *Arenaria*. I can find, however, no sufficient character separating the forms as species, though a varietal name may be assigned to the Aden plant." Botany of Socotra, p. 20.

This variety seems to be endemic in Aden.

VII. PORTULACACEÆ.

Herbs or shrubs, usually more or less succulent and glabrous. Leaves alternate or opposite, entire, often succulent, with scarious or setose stipular appendages.

Flowers solitary or capitate and terminal, racemose or cymosely panicled, occasionally axillary. Sepals usually 2, free or adnate to the ovary at the base, much imbricate. Petals 4-5, sometimes more, hypogynous or perigynous, free or connate at the base. Stamens 4 to many, inserted with the petals and often adnate to them at the base; filaments filiform; anthers 2-celled; cells parallel, dehiscing longitudinally. Ovary free or semi-inferior, 1-celled; ovules 2 to many on basal funicles or a central column, amphitropous; style 2-8-fid, branches longitudinally stigmatose.

Capsule membranous or crustaceous, circumsciss or dehiscing by as many valves as there are styles. Seeds 1 or many, compressed; embryo curved round mealy albumen.

Genera 15; *species* about 120.

Distribution:—Old World, but chiefly America.

1. Portulaca L.

Fleshy spreading or erect herbs. Leaves alternate, subopposite or opposite, often whorled around the flowers with squamiform or setose stipular appendages, plane or terete.

Flowers terminal, solitary or fascicled, sessile or pedicellate. Sepals 2, united at the base into a tube adnate to the ovary, the free part above deciduous. Petals 4-6, inserted on the top of the tube of the calyx just where it becomes free from the ovary. Stamens 8 or numerous, inserted at the base of the petals. Ovary half-inferior, multiovulate. Style 2-3-8-fid.

Capsule membranous or rather crustaceous, half-inferior, with circumscissile dehiscence. Seeds numerous, compressed, reniform. Embryo peripheric.

Species about 16.

Distribution:—Australia, Africa, chiefly Tropical America.

1. Portulaca quadrifida L. DC. Prodr. III, 354.
Portulaca anceps Rich. Fl. Abyss. I, 301.
Portulaca linifolia Forsk. descr. p. 92.
Illecebrum verticillatum Burm. Fl. Ind. p. 66.

Description :—A prostrate and rooting or decumbent annual, woolly at the joints. Leaves plane, fleshy, $\frac{1}{8}$-$\frac{1}{4}$ inch long, ovate, acute, with long and numerous stipular setæ.

Flowers terminal, solitary, subsessile, surrounded by silvery hairs and an involucre of 4 leaves. Sepals broadly oblong, rounded at the apex. Petals 4, yellow, oblong-obovate. Stamens 8. Style slender, 4-fid to near the middle.

Capsules conical. Seeds minutely tubercled.

Flowers :—August 1898 (Birdwood).

Locality :—Aden (Birdwood, Hunter).

Distribution :—Upper and Lower Guinea, Abyssinia, India.

Note :—"In 1877, during the months of February and March, many parts of the settlement were covered with a green mantle of *Portulaca*. Rain fell in frequent showers during those months." (Hunter.)

VIII.—MALVACEÆ.

Herbs or soft-wooded shrubs and trees, their surface often covered with soft stellate pubescence; wood light. Leaves alternate, mostly stipulate, usually palminerved, entire or more or less deeply lobed.

Flowers large, regular, hermaphrodite or very rarely diœcious or polygamous, axillary, terminal, solitary, clustered or cymose-paniculate. Involucral bracts 2 or more or none. Sepals generally 5, more or less connate, valvate in bud. Petals 5, hypogynous, more or less adnate to the staminal tube, in bud twisted or imbricate. Stamens ∞, rarely definite, usually connate into a tube; anthers globose, oblong or reniform, cells sinuous or twisted, linear or annular, ultimately one-celled, bursting lengthwise. Ovary 2-many-celled, entire or lobed, of 2-5 or more carpels, whorled round a central axis. Styles distinct or more or less connate; stigmas linear, peltate, capitate or spathulate.

Fruit of dry cocci, or capsular and loculicidal. Seeds reniform or obovoid, rarely arillate. Embryo curved in reniform seeds, usually straight in obovoid; cotyledons leafy, usually folded crumpled.

Genera 57; *species* about 700.

Distribution:—Throughout the world except in the Arctic regions.

Bractlets none	1. Abutilon.
Bractlets present.	
Style ultimately dividing into stigmatic branches	2. Hibiscus.
Style club-shaped at the apex (cultivated) . .	3. Thespesia.

1. Abutilon Tournef.

Herbs or shrubs covered with down. Leaves cordate, ovate, angled or lobed.

Flowers axillary or terminal. No involucral bracts. Calyx 5-cleft. Staminal tube divided at the apex into numerous filaments. Ovary 5-∞-celled, each cell with 1-3 or rarely more ovules. Styles as many as the cells of the ovary; stigmas capitate.

Ripe carpels separating from the short central axis, rounded on the back, dehiscent, truncate, pointed, apiculate or with a short oblique or horizontal mucro. Seeds reniform, ascending or horizontal, dark brown.

Species about 170.

Distribution :—In nearly all warm regions.

1. Abutilon fruticosum (Fresen.) Guill. et Perr. Fl. Seneg. I, 73; Franch. Sert. Somal. in Miss. Révoil p. 15; Boiss. Fl. Or. I, 836; Hook f. Fl. Brit. Ind. I, 328; Oliv. Fl. trop. Afr. I, 187.

Abutilon denticulatum Planch. in Herb. Hook.; Anders. Journ. Linn. Soc. V, Suppl. p. 8.

Abutilon microphyllum A. Rich. Tent. Fl. Abyss. I, 70.

Sida kotschyi Hochst. mss.

Sida gracilis R. Br. in Salt's Abyss. App. 65.

Sida denticulata Fresen. in Mus. Senckenb. I, 182.

Description :—A much branched rigid perennial or undershrub, densely covered with fine white down. Leaves ½-2 inches long, on short stalks, cordate-ovate, acute, denticulate, covered with soft down on both surfaces; stipules linear.

Peduncles solitary, axillary, longer than the petiole, 1-3 flowered, jointed. Sepals half the length of the corolla, ovate, acute. Corolla yellow. Carpels 10, persistent, each one oblong, truncate, without beak, splitting down the back.

Fruit ⅓ inch long, cylindrical, truncate. Seeds 2-3 in each carpel, small, brown, dotted with minute white hooked hairs.

Flowers :—March 1878 (Perry).

Locality :—Goldmore Valley (Defl.); on the Shum Shum Range (Schweinf.); without locality (Hook., Birdw., Perry).

Distribution :—Canaries, Trop. Africa, Palestine, Arabia, India, Ceylon.

2. Hibiscus L.

Herbs, shrubs or small trees, generally more or less downy or hairy. Leaves various, usually palmately divided. Stipules usually small and deciduous. Involucral bracts 4-12, rarely 0.

Sepals 5, valvate. Staminal tube bearing on the outside short filaments along its entire length, and sometimes also at the apex, summit truncate or 5-toothed, anthers reniform. Ovary 5-celled, the cells

alternating with the petals; ovules 3 or more in each cell. Styles 5, spreading, connate below; stigma capitate or spathulate.

Capsule loculicidally 5-valved, sometimes 10-celled through false dissepiments. Seeds numerous, reniform, subglobose, rarely obovoid, glabrous, tomentose or woolly.

Species about 150.

Distribution :—Chiefly in the tropical region of both hemispheres.

Involucral bracts 6, pedicel jointed above the middle, flowers pink or white	1. H. micranthus.
Involucral bracts 8—10, pedicel jointed near the apex, flowers yellow	2. H. Welshii.

1. Hibiscus micranthus L. Mant. p. 308; DC. Prodr. I, 453; Anders. Journ. Linn. Soc. V, Suppl. p. 8; Hook. Fl. Brit. Ind. I, 335; Oliv. Fl. trop. Afr. I, 205.

Hibiscus rigidus L. f. Suppl. p. 310.
Hibiscus clandestinus Cav. Ic. I, 1, t. 2.
Hibiscus ovalifolius Vahl Symb. I, 50.
Hibiscus intermedius Hochst. in Schimp. Pl. Abyss. n. 2211.
Hibiscus parvifolius Hochst. *ibid.*
Hibiscus versicolor Schum. et Thonn. Pl. Guin. p. 311.
Urena ovalifolia Forsk. Fl. Aeg.-Arab. p. 124.
Arabic name :—Osaru.

Description :—An undershrub, with long, rod-like, spreading branches, thinly covered with appressed, stellate, bristle-like hairs. Leaves 1-2 inches long, more or less scabrid and hairy, ovate, acute or obtuse, serrate, sometimes cordate; stipules $\frac{1}{2}$ inch long, subulate, hairy.

Pedicels longer than the petioles, reaching $1\frac{1}{4}$ inches, slender, jointed above the middle. Involucral bracts 6, filiform, hairy, longer or shorter than the calyx. Calyx short, deeply divided; lobes lanceolate, hairy. Corolla small, pink or pink and white, stellately hairy outside. Stamens in tufts on the staminal tube.

Capsules $\frac{1}{4}$-$\frac{5}{16}$ inch in diameter, globose. Seeds reniform, cottony.

Flowers :—March and April (Defl.); March (Perry).

Locality :—Near the old cemetery (Anders.); near Maala (Schweinf.); on the top of the Shum Shum Range (Busse); near the flagstaff on the Shum Shum Range (Defl.); without locality (Birdw., Perry).

Distribution :—Tropical Africa, S. Arabia, India, Ceylon.

Note :—Deflers says that the flowers are purplish when they open in the morning and become white in the afternoon.

2. Hibiscus Welshii Anders. Journ. Linn. Soc. V, Suppl. p. 8; Defl. Bull. Soc. Bot. France XXXII, 347.

Cienfugosia Welshii Gürke Herb. Berol. (ex Krause).

Description:—Shrubby, glandular-punctate; branches rod-like. Leaves petiolate, orbicular, subreniform, palmately 5-lobed, dentate-serrate, glandular-punctate on both sides, nerves and petioles slightly hairy with spreading bristles, later on glabrescent.

Pedicels axillary, solitary, one-flowered, by almost ½ longer than the petioles, jointed near the apex, clavately thickened. Involucral bracts 8-10, subulate, small, sparingly hairy, ciliate on the margin. Calyx marcescent, 5-dentate, campanulate, 15-ribbed, punctate with 2 lines of dark glands along the ribs. Petals yellow, glandular hairy, red-spotted at the base, obovate, early deciduous, 2-3-times as long as the calyx. Carpels lanceolate, hairy, glandular-reticulate outside.

Seeds densely tomentose with yellow bristles.

Flowers in March and April.

Locality:—Maala, near the telegraph office, Goldmore Valley (Schweinf.); ravine near Steamer Point, Goldmore Valley (Defl.); without locality (Hook., Anders., Birdw., Hildebrandt).

This plant is endemic in Aden.

Note:—The figure given by Anderson in his 'Florula' is very accurate but for the pedicels which are usually longer and jointed nearer to the apex.

3. Thespesia Soland.

Trees or erect shrubs. Leaves entire, or angularly lobed.

Inflorescence axillary, solitary or racemose. Involucral bracts 5, deciduous, or 0. Calyx truncate, 5-toothed. Staminal tube toothed at the apex. Ovary 4-5-celled; cells few-ovuled, styles club-shaped at the apex, 5-furrowed, or subdivided into erect club-shaped short stigmatiferous branches.

Capsule loculicidally dehiscent or almost indehiscent. Seeds glabrous or pubescent. Cotyledons much folded, usually glandular with black dots.

Species about 6.

Distribution:—Tropical Asia, Africa and the Pacific Islands.

The following species is cultivated in Aden in the vicinity of the tanks:—

1. Thespesia populnea Correa. The Tulip or Portia tree.

A middle-sized evergreen tree of rapid growth, heartwood small, dark-coloured. Leaves cordate, acuminate, entire, on both sides with minute peltate scales, blade 3-5, petiole 1-4 inches long.

Flowers axillary, solitary or 2 together. Bracteoles none, or early deciduous. Calyx cup-shaped, truncate. Corolla yellow, passing into purplish pink when withering, 2 inches in diameter. Staminal tube 5-toothed at the apex.

Capsule dehiscent or indehiscent. Seeds silky.

This plant is found throughout the tropics on the beach and in tidal forests. In the western part of India it is largely planted as an avenue tree. It usually flowers throughout the year.

IX.—STERCULIACEÆ.

Herbs, shrubs or trees, the tomentum of hairs stellate, rarely mixed with simple hairs. Leaves alternate or exceptionally opposite, simple and pinnately or palmately nerved, entire, toothed or lobed or digitately compound. Stipules sometimes absent.

Flowers regular, hermaphrodite or unisexual. Sepals valvate, more or less combined into a calyx. Petals 5, hypogynous, free or adhering to the staminal column, contorted-imbricate in the bud or small and scale-like or none. Stamens usually united into a ring, a cup or a tube with 5 terminal teeth or lobes (staminodes) alternating with or opposite to the petals, and one or more anthers sessile or stipitate (on distinct filaments) in each interval, the anthers 2-celled and opening outwards by longitudinal slits, or exceptionally the anthers are numerous and the staminodes are wanting, or the stamens are 5, free and alternate with the sepals or the anther-cells confluent or opening by terminal pores. Ovary free, 2-5-rarely 10-12-celled or reduced to a single carpel. Styles entire or divided into as many branches as there are cells or rarely styles free.

Fruit various; seeds sometimes hairy, sometimes arillate; testa coriaceous, fibrous or membranous, tegmen horny; albumen fleshy, farinaceous or horny, entire or bipartite or none. Cotyledons flat or folded, thin or fleshy. Radicle short, near to or sometimes remote from the hilum.

Genera 41; *species* about 500.

Distribution:—Tropical regions, South Africa, Australia.

Petals absent	1. Sterculia.
Petals present	2. Melhania.

1. Sterculia L.

Trees with entire or lobed leaves.

Flowers in axillary or terminal panicles, unisexual or polygamous. Calyx 4-5-fid or partite, usually coloured. Petals absent. Staminal column bearing 10-30 anthers arranged in a ring or without order. Carpels of the ovary 5, subdistinct; each cell with 2-∞ ovules. Styles consolidated; stigmas 5-lobed.

Ripe carpels distinct, follicular, sessile or stalked, woody or membranous. Seeds 1 to many, naked or rarely winged, sometimes arillate. Albumen splitting into 2 segments, adherent to the cotyledons; cotyledons flat or slightly undulate, thin or fleshy. Radicle directed towards the hilum or away from it.

Species:—100-120.

Distribution:—Warmer regions of both hemispheres, especially in tropical Asia, one section (Brachychiton) in Australia.

1. **Sterculia arabica** (R. Br.) T. Anders. Journ. Linn. Soc. V, Suppl. p. 9, t. 2, B.

Sterculia abyssinica R. Br. (*partim*) in Append. Salt. Abyss. et in Pl. Jav. Rar. 227.

Description:—A large tree, the stem reaching at Aden about 5 feet in circumference and 13-16 feet in height, with thick, greyish, rugose branches. Petioles 1-5 inches long, as long as the leaves, subglabrous, terete. Leaves rotundate, broadly ovate-obtuse, or subrhomboid acute, sometimes subcordate at the base, entire or crenate, glabrous on both sides; stipules subulate, deciduous.

Racemes at the end of the branches or axillary, simple, few-flowered, much shorter than the leaves (½-1 inch), slender; peduncles glabrous; pedicels jointed, slightly pilose at the apex; bracts minute, subulate. Flowers small, yellowish-green, lurid-purple at the base. Calyx divided about halfway down into 5 ovate-lanceolate spreading segments, pilose on both sides; in male flowers the staminal tube exserted, 10-lobed, glabrous.

Follicles 4 (Anderson), 4-6 (Deflers), 2-5 (Balfour), terete, narrowly ovate, acute, subrostrate, fulvo-pubescent, ¾ inch long, ½ inch broad.

Flowers:—Dec. 1889 (Defl.), January 1880 (Balfour), February 1851 (Thomson), April 1861 (Thomson).

Fruits:—Nov. (Schweinf.).

Locality:—Goldmore Valley, Wadi Maala (Schweinf.); ravine north of Shum Shum Range (Busse); slope of Shum Shum Range, crater south-west of the Tower of Silence (Defl.); without locality (Hook., Hildebr., Birdw.).

Distribution :—Hadramaut, Yemen, Socotra.

Note :—The confusion which existed 50 years ago between *Sterculia arabica*, Anders., *S. abyssinica*, R. Br. and *S. triphaca*, R. Br. can still be found in some more recent publications. It may, therefore, not be considered superfluous, if we reproduce in this place a short passage from Anderson's *Florula*, in which he tried to clear up the doubtful points. He says :—

"I have examined on two distinct occasions the original specimens of *S. abyssinica*, R. Br., in Salt's Abyssinian plants in the British Museum, and at the same time compared them with ten or twelve specimens of the Aden species of *S. arabica*. I find that among Salt's specimens of S. *abyssinica* there is a fragment of S. *arabica*, consisting of a portion of a branch with three leaves, and a fruit of four follicles on a very short axillary peduncle; and from this the description in the '*Plantæ Javanicæ Rariores*,' of the fruit and partly of the leaves, of *S. abyssinica* was deduced. Though Salt's specimens of these two species of *Sterculia* are said to be from Abyssinia, they are possibly from quite distinct localities; for that traveller, after touching at several points on the east coast of Africa, visited Aden and Arabia Felix. Whenever a favourable opportunity occurred he seems to have collected plants, but (judging from his herbarium in the British Museum) without appending any notes or records of stations to his specimens. It is probable that the specimens of *S. abyssinica* were obtained at Mozambique where Salt spent several days; and the fragment of S. *arabica* mixed with the former species is most likely from Aden.

"Had R. Brown seen flowering specimens of *S. arabica*, he would doubtless at once have distinguished the two species, and moreover, would have united his *S. abyssinica* with his other species of *S. triphaca*, described from an imperfect specimen in fruit in the Paris Herbarium, collected by Loureiro at Mozambique, and which seems to have been considered distinct by Brown, on account of the fruit differing from what he mistook for the fruit of *S. abyssinica*, but which I have above shown to be the fruit of *S. arabica*.....

"*S. arabica* is easily distinguished from *S. abyssinica* by its short-petioled, round, rarely acute, and perfectly glabrous leaves, very short, axillary, simple, nearly glabrous racemes, and by the markedly different fruit, which is only half the size of that of *S. abyssinica*.

"The leaves, petioles, and peduncles of *S. abyssinica*, besides possessing other and more important characters, are always more or less tomentose." (Anderson, Flor. Aden, pp. 9 and 10.)

Cf. etiam Balfour, Bot. Socotra, p. 35.

2. Melhania Forst.

Herbs and undershrubs covered more or less densely with stellate tomentum. Leaves ovate or roundish.

Peduncles simple or cymose, remote or crowded at the ends of the branches. Bractlets broad or narrow. Sepals 5. Petals 5, convolute, marcescent. Fertile stamens 5, alternating with an equal number of staminodes, all combined below into a shallow cup. Anthers extrorse, cells parallel; connective thick. Ovary sessile, 5-celled; cells with 1 or many ovules. Styles short, dividing above into 5 liguliform stigmatic branches.

Capsule loculicidally dehiscent. Seeds albuminous. Cotyledons plicate, 2-partite; radicle inferior.

Species 16.

Distribution:—Warmer parts of Africa, Asia, Australia.

1. Melhania Denhamii R. Br. in Denh. et Clapp. Voy. App. p. 233.
Brotera bracteosa Guill. et Perr. Fl. Seneg. I, 80, tab. 17.
Melhania Kotschyi Hochst. Pl. Nub. sect. I, no. 219.
Melhania bracteosa Boiss. Fl. Or. I, 841.
Cardiostegia Kotschyi Presl. Epimel. Bot., p. 249.

Description:—A small shrub; stock woody, dividing into a large number of crowded, spreading, downy, somewhat compressed branches. Leaves ¾-1½ by ¼-¾ inch, elliptic, stellately hairy above, hoary pubescent beneath, crenate-serrate, apiculate, 5-nerved at the base; petioles ½-¾ inch long; stipules subulate, hairy.

Flowers in axillary peduncled racemose cymes; pedicels very short; involucral bracts greatly enlarged, up to ⅝ inch broad in fruit, reniform, broader than long, membranous, veined, apiculate, enclosing the capsule. Sepals ovate-lanceolate, pubescent. Corolla yellow. Style as long as the ovary.

Capsules globose, pubescent, 5-celled with 1 or 2 smooth seeds in each cell.

Fruits:—Nov. 1884 (Beevor).

Locality:—Crater of the Shum Shum Range, near the Flagstaff (Defl.); without locality (Birdw., Beevor); seems to be very rare.

Distribution:—Nubia, Eritrea, Kordofan, Darfur, Central and S. Arabia, Baluchistan, Sind.

X.—TILIACEÆ.

Trees or shrubs, sometimes herbaceous plants. Leaves alternate, entire, dentate or rarely lobed. Stipules in pairs, deciduous, rarely persistent or 0. Flowers cymose, lateral and terminal, rarely axillary

but often by the side of the leaf. Sepals 3-5, free or connate or united into a campanulate calyx, usually valvate. Petals as many or fewer or 0, inserted round the base of the torus, contorted or variously imbricate, induplicate or valvate. Stamens usually indefinite, inserted on a short contracted torus or on an elongated one. Filaments free or more or less united below, sometimes 4-5-adelphous, all fertile or some sterile. Anthers 2-celled, linear or glabose, dehiscing longitudinally or by pores. Ovary free, 2-10-celled. Style entire; stigmas usually small, as many as the cells of the ovary, sometimes large; ovules anatropal, sometimes solitary, pendulous, generally numerous, in two rows in each cell.

Fruit 2-10-celled or 1-celled by abortion, dry or fleshy, loculicidally dehiscent, indehiscent or separating into cocci. Seeds solitary or few, ascending, pendulous or transverse; testa coriaceous, sometimes pilose. Albumen fleshy. Embryo straight. Cotyledons roundish, leafy. Radicle next to the hilum.

Genera 40.

Species about 350.

Distribution:—Especially abundant in the tropics, less in the temperate zones.

Petals glandular at the base internally . . .	1. Grewia.
Petals not glandular	2. Corchorus.

1. Grewia L.

Trees or shrubs, mostly deciduous, at times scrambling or climbing. Branchlets, leaves and sepals mostly clothed with stellate hairs. Simple hairs on petals, androgynophore and ovary. Leaves more or less distinctly dentate, rarely lobed, base generally oblique, with 3, rarely 4 or 5 basal nerves.

Flowers usually yellow, in axillary, terminal or extra-axillary cymes or panicles. Sepals 5, distinct, valvate, often coloured on the inside, deciduous. Petals 5, shorter than the sepals, in most species with a thick base (claw), bearing on the inside an area, generally papillose, surrounded by a densely villous, semicircular or circular rim. Stamens as a rule ∞, free, together with the ovary on a raised more or less costate torus (androgynophore or gonophore), the ridges of which alternate with the petals, the lower part glabrous, the upper hairy or tomentose. Ovary 2- or 4-celled, in most species tomentose; style 1, subulate; ovules as a rule 8; stigma generally broad, more or less distinctly 2-5-lobed or laciniate.

Fruit a drupe, often deeply lobed, with 1—4 pyrenes, which are 1- or few-seeded, the endocarp often osseous, surrounded by a fibrous mesocarp.

Seeds ascending or horizontal; albumen copious, fleshy or rarely scanty, or almost 0; cotyledons flat, foliaceous or fleshy.

Species:—Over 100.

Distribution:—Tropical and sub-tropical, from Africa to Queensland.

1. Grewia populifolia (Fors.) Vahl Symb. I, 33; DC. Prodr. I, 511; Anders. Journ Linn. Soc. V, Suppl. p. 10; Boiss. Fl. Or. I, 843; Hook. Fl. Brit. Ind. I, 385; Oliv. Fl. trop. Afr. I, 246.

Chadara tenax Forsk. Fl. Aeg.-Arab. p. CXIV.
Grewia betulæfolia Juss. in Ann. Mus. IV, 92, pl. 4, f. 1.
Grewia reticulata Hochst. Pl. Schimp. Abyss.
Grewia ribesiæfolia Hochst. Pl. Schimp. Abyss.
Grewia crenata Hochst l. c.
Grewia membranacea Rich. Fl. Abyss, I, 90.

Description:—A shrub or undershrub, 2—6 feet high, with stiff divaricate branches; bark white; wood yellowish-white, tough. Branchlets and leaves slightly rough with short stellate hairs. Leaves up to 1½ by 1¼ inches, broadly ovate or suborbicular, sometimes obovate, acute or obtuse, coarsely dentate, glabrous or nearly so, base rounded or cuneate; petioles ¼—½ inch long, slender; stipules small, linear, caducous.

Flowers white, ¾—1 inch across; peduncles usually solitary, leaf-opposed, thickened near the top, bearing usually 1 flower; bracts 2, near the middle of the pedicel, caducous, leaving a mark which has the appearance of a joint. Sepals ¾ inch, linear-oblong, tomentose outside, blade attached to back of claw. Petals linear-oblong usually notched. Torus with 5 densely villous teeth at the top beneath the ovary. Ovary 4-lobed, glabrous as a rule; style longer than the stamens; stigma 4—5-lobed.

Drupes smooth, orange-yellow, about ½ inch broad, usually of 2 separable halves, each half didymous; stones 1—4, muricate, 1—2-celled.

Fruits: June 1878 (Perry), Aug. 1880 (Hunter).

Locality:—Above the European cemetery of Steamer Point (Schweinf.); ravine west of the Tower of Silence, crater of the Shum Shum Range (Defl.); without locality (Hook., Birdw., Perry); neighbourhood of Aden (Hunter).

Distribution:—Tropical Africa, Senegambia, Mauritius, Egypt, Arabia, Persia, Sind, W. India, Ceylon.

2. Corchorus Linn.

Herbs or undershrubs, more or less covered with stellate tomentum. Leaves serrate.

Flowers small, yellow ; peduncles very short, axillary or leaf-opposed, 1- or few-flowered, bracteate. Sepals 4—5. Corolla of 4—5 glandless petals. Stamens indefinite or rarely twice as many as the sepals, inserted on a short torus. Ovary 2—5-celled ; ovules many in each cell ; style short, the apex stigmatose, hollow, crenulate.

Capsule elongated, slender or subglobose, smooth or prickly, loculicidally 2—5-valved, internally sometimes transversely septate. Seeds numerous, pendulous or horizontal, albuminous. Embryo generally curved ; cotyledons foliaceous.

Species :—About 35.

Distribution :—There are two important cultivated forms of wide distribution. The wild forms are spread over the tropics of Asia, Africa and America.

Capsule short	1. C. antichorus.
Capsule elongate- -	
Capsule scabrous or aculeate, 3-angled, beak short, erect	2. C. trilocularis.
Capsule glabrous, cylindric, 10-ribbed, beak long, erect	3. C. olitorius.

1. Corchorus antichorus (L.) Ræuschel Nom. Bot. ed 3. p. 158; Anders. Journ. Linn. Soc. V, Suppl. p. 10 ; Boiss. Fl. Or. I, 846 ; Hook. Fl. Brit. Ind. I, 398 ; Oliv. Fl. trop. Afr. I, 263.

Antichorus depressus L. Mant. p. 64 ; DC. Prodr. I, 504.

Corchorus microphyllus Fresen. in Mus. Senckenb. II, 156.

Corchorus humilis Munro Hort. Agrensis, Append. p. 35.

Jussiæa edulis Forsk. Fl. Aeg-Arab. p. 210.

Arabic name :—Ueki.

Description :—A woody perennial, 6—9 inches high, prostrate, much-branched from the base ; branches twisted, imbricate, woody. Leaves $\frac{1}{4}$—$\frac{3}{4}$ by $\frac{1}{4}$—$\frac{1}{2}$ inch, roundish, usually wrinkled, glabrous, irregularly crenate-serrate, base rounded or cuneate ; petioles $\frac{1}{2}$—1 inch long ; stipules subulate.

Flowers numerous, on leaf-opposed cymes ; buds obovoid, apiculate ; bracts lanceolate-subulate ; peduncles and pedicels very short. Sepals linear-oblong, apiculate. Petals oblong, obovate.

Capsule $\frac{3}{8}$—$\frac{5}{8}$ inch long, cylindric, beaked, glabrous or hispidulous, often curved upwards, 4-valved. Seeds trigonous, black.

Fruits :—October (Marchesetti), January 1880 (Balfour).

Locality :—Plain of Maala (Defl.); Goldmore Valley (Schweinf.); slope of the Shum Shum Range (Ellenbeck); great valley between Steamer Point and town (Marchesetti); without locality (Hook., Madden, Anders., Birdw., Hildebrandt).

Distribution :—Cape Verd Islands, N. Africa, S. Arabia, Mascat, Afghanistan, Sind, Deccan.

2. **Corchorus trilocularis** L. Mant. p. 77; DC. Prodr. I, 504; Harv.-Sond. Fl. Cap. I, 229; Oliv. Fl. trop. Afr. I, 262; Fl. Br. Ind. I, 397; Boiss. Fl. Or. I, 845; Cooke Fl. Bomb. Presid. I, 149.

Arabic name :—Melochia.

Description :—Annual; stems and branches more or less hairy. Leaves 1—4 by ¾—1¼ inches, elliptic or oblong-lanceolate, acute or obtuse, serrate (the lower serratures often destitute of filiform appendages), somewhat rough below, base rounded or cuneate; petioles ¼—½ inch long, pilose; stipules lanceolate-subulate.

Flowers in short cymes; buds ovoid or obovoid apiculate; bracts lanceolate-subulate; peduncles very short, leaf-opposed, hairy; pedicels very short, pubescent. Sepals ¼ inch long, linear-oblong, acuminate. Petals oblong, slightly longer than the sepals.

Capsules 2—3 inches long, with a short erect beak, hairy when young with stiff stellate hairs, scabrous when old, 3—4-angled, 3—4-valved; valves with transverse partitions between the seeds. Seeds trigonous, black.

Locality :—Crater of Shum Shum Range, Koosaf Valley (Defl.).

Distribution :—Tropical and S. Africa, S. Arabia, Afghanistan, Sind.

3. **Corchorus olitorius** Linn. Sp. Pl. (1753) p. 529; Forsk. Fl. Aeg.-Arab. (1775) 101; Lamk. Encycl. Bot. (1786) II, 103, t. 478, f. 1; Bot. Mag. (1828) IV, pl. 2810 (fruit a little too pointed); DC. Prodr. I, 511; Oliv. Fl. trop. Afr. I, 262; Hook Fl. Brit. Ind. I, 347; Boiss. Fl. Or. I, 845; Trim. Fl. Ceyl. I, 182; K. Schum. in Engl. & Prantl Pflanzenf. III, part 6, p. 19; Cooke Fl. Bomb. Pres. I. 149.

Corchorus decemangularis Roxb. Fl. Ind. II, 582.

Of ante-Linnean writers we may mention: Camerarius, Hort. Med. (1588) p. 47, f. 12; Prosper Alpinus, De Pl. Aegypti (1592) p. 39 et t.; Parkinson Theatr. Bot. (1640) p. 309 et fig.; Plukenet, Alm. Bot. (1696), p. 17; Phyt., t. 127, f. 3 and 4.

Richter, Codex Bot. Linn. (1840) p. 525 shows that Linn. first included Plukenet t. 127, fig. 3 under this species and subsequently placed it under *Corchorus æstuans* (Sp. Pl. 1762, p. 746); but Linn. cites in addition Browne, *Triumfetta*, in Nat. Hist. Jam. 332, t. 25, fig. 1; this plate, however, in Watt's opinion, is rather *Corchorus acutangulus*.

Arabic name:—Molochia or melochia, muluhhije.

English name:—Jute (from the Sanskrit 'juta' or 'jata')* ; Jew's Mallow.

Description:—Annual, 3—4 feet high, much branched ; stems glabrous. Leaves 2½—4 by 1½—2 inches, elliptic-lanceolate, acute or acuminate, glabrous, serrate, the lower serratures on each side prolonged into a filiform appendage over ¼ inch long, rounded at the base, 3—5-nerved ; petioles ¾—1 inch long, slightly hairy, especially towards the apex ; stipules subulate, ¼—⅜ inch long.

Flowers pale yellow, buds obovoid, angled, cuspidate ; bracts lanceolate ; peduncle shorter than the petiole ; pedicels 1—3, very short. Sepals ⅛ inch long, oblong, apiculate. Petals ⅛ inch long, oblong-spathulate. Style short ; stigma microscopically papillose.

Capsules 1¼—2½ inches long, linear cylindric, erect, 10-ribbed, beaked, glabrous ; cells and valves generally four, but five not uncommon ; valves with transverse partitions between the seeds. Seeds trigonous, black.

Locality:—Gravelly slope of the Shum Shum Range (Ellenbeck) ; without locality (Birdw.).

Distribution:—It is stated in Hooker's *Flora of British India,* that this species is indigenous in many parts of India, and distributed by cultivation to all tropical countries. Watt, however, thinks, that its claim to being strictly speaking indigenous in India rests on doubtful evidence.

Note:—It will be well to remember a remark made by Watt on the great variability of the fruit of the cultivated species of Corchorus : "It seems, in fact, probable that the peculiarities of the seed are much more constant than the shape of the fruit or the number of its carpels and valves. It is thus highly likely that this [*C. capsularis* Linn.] as also the next form [*C. olitorius* Linn.] are but cultivated conditions unworthy of the specific positions usually assigned to them. They are at all events each representative of groups of cultivated races that vary in colour of stem, shape of leaf, degree of hairiness, size of flower, shape and number of valves of fruit, etc., etc., until a panorama of specimens might be assorted that would not only break down the separation of *capsularis* from *olitorius* but might even endanger the positions of *C. trilocularis* and *C. acutangulus.* This much is certain, namely, that if specimens be

* According to Skeat, Dutt and others two other names are mentioned by Sanskrit authors, *viz.*, 'patta' and 'kalasaka,' but the plant is by no means very clearly nor fully indicated in the classic literature of India. In the Indian vernaculars it is the pat, jhut, jhoto, jhuto, etc.

furnished in flower but not in fruit, the two chief jute plants can with difficulty be separately distinguished." Commerc. Prod. p. 406

Economic and medicinal uses : Cf. Watt, Dict. Econ. Prod. II, 524—62, IV, 558—60 ; Commerc. Prod. Ind. p. 405—427, Ibn-el-Beithar III, 338.

XI.—ZYGOPHYLLACEÆ.

Herbs or shrubs, rarely trees, with divaricate jointed branches. Leaves opposite or alternate, stipulate, 1—3-foliate ; stipules in pairs, persistent, sometimes spiny.

Flowers hermaphrodite, regular or irregular, pedunculate, solitary or geminate, apparently axillary. Sepals usually 5, free or nearly so. Petals as many, free, hypogynous, imbricate or contorted, rarely valvate. Stamens as many as the petals or twice, rarely thrice as many, inserted at the base of the disk, those opposite to the petals often connate at the base with the claw of the petals ; filaments often with a minute scale at or near the base ; anthers versatile, dehiscing longitudinally. Ovary usually 5-sulcate, 5- or 10-celled. Style simple or styles 5, radiating ; stigma terminal, simple or 5—10-lobed. Ovules 1—2 or more in each cell.

Fruit various, never baccate, crustaceous or coriaceous, often separating into as many dehiscent or indehiscent cocci as there are carpels, sometimes spinose or winged Seeds usually pendulous and solitary in each cell, oblong or linear ; raphe adnate or free ; testa membranous, crustaceous or thick and mucilaginous ; albumen scanty, rarely absent ; embryo as long as the seed, straight or rarely curved ; cotyledons oblong or linear, thick or foliaceous ; radicle short, straight, superior.

Genera 17. *Species* about 100.

Distribution :—Tropical and warm regions of both hemispheres, rare in tropical Africa.

Leaves abruptly pinnate ; filaments naked	1. Tribulus.
Leaves 1—2-foliate ; filaments with a scale . . .	2. Zygophyllum.
Leaves 3—1-foliate ; filaments naked	3. Fagonia.

1. Tribulus L.

Ascending or prostrate, branching, usually pilose or hispid herbs. Leaves opposite, one in each pair smaller, abruptly pinnate, stipulate.

Flowers solitary, pseudo-axillary, pedunculate, white or yellow. Sepals 5, imbricate. Petals 5, spreading, imbricate, fugacious. Disk annular, 10-lobed. Stamens 10, rarely 5, inserted on the base of the disk, the longer opposite to the petals, the 5 shorter with a small gland

outside. Ovary sessile, hirsute, 5-12-lobed, 5-12-celled; ovules 1-5 in each cell, superposed; style short, pyramidal or filiform; stigmas 5-12.

Fruit 5-angled, of 5-12 winged or spinous or tuberculate indehiscent cocci. Seeds obliquely pendulous; testa membranous; embryo exalbuminous; cotyledons oval; radicle short.

Species about 20.

Distribution :—Warmer regions of the globe.

1. **Tribulus terrestris** L. Sp. Pl. (1753) p. 387; DC. Prodr. I, 703; Boiss. Fl. Or. I, 902; Oliv. Fl. trop. Afr. I, 283; Hook. Fl. Brit. Ind. I, 423; Franch. Sert. Somal. in Miss. Révoil 22.

Tribulus albus Poir.; DC. I, 703.

Tribulus humifusus Schum. et Thonn. Guin. Pl., p. 215.

Tribulus Kotschyanus Boiss. Diag. Pl. Or. ser II, I, 111.

Tribulus mollis Ehrenbg. in Schweinf. Fl. Aethiop. p. 29.

Tribulus excrucians Wawr. et Peyr. Sert. Beng. p. 17.

Tribulus lanuginosus L. Sp. Pl. (1753) p. 387.

Description :—A spreading, prostrate or decumbent annual, occasionally more or less frutescent below and persisting 2 or more years; stems and branches pilose; young parts silky-villous. Leaves opposite, abruptly pinnate; stipules lanceolate, hairy; leaflets 3—6 pairs, oblong, mucronate, sericeo-villous, base rounded oblique.

Flowers pseudo-axillary or leaf-opposed, solitary. Sepals $\frac{1}{4}$ inch long, lanceolate, acute, hairy. Petals $\frac{3}{8}$ inch long, oblong-obovate; claw short, hairy. Ovary bristly; style short, stout.

Fruit globose, consisting of 5 hairy or nearly glabrous, often muricate woody cocci, each with 2 pairs of hard, sharp spines. Seeds several in each coccus, with transverse partitions between them.

Locality :—Aden (Birdw.).

Distribution :—Tropics of the Old World, Southern Europe, Australia, Sind.

2. Zygophyllum L.

Frutescent herbs or shrubs, erect or prostrate, often spinose. Leaves opposite, 1—2-foliate, often fleshy. Stipules 2, often spiny.

Sepals 5 or 4, imbricate. Petals as many, unguiculate, imbricate and contorted. Disk fleshy, angular, cup-shaped or concave. Stamens 10-8, inserted at the base of the disk, longer than the petals; filaments filiform, with a scale at the base within; anthers oblong. Ovary sessile, 4-5-gonous, 4-5-celled, attenuated into an angled style; stigma minute. Ovules 2 to many in each cell, superposed.

Fruit capsular, 4-5-gonous or 4-5-winged, indehiscent, or septicidally dehiscent into 5 cocci, or loculicidally 5-valved. Seeds 1 or more in each cell, pendulous; testa crustaceous; albumen scanty; cotyledons oblong.

Species about 54.

Distribution:—Chiefly Australia, extra-tropical Africa, deserts of W. Asia.

1. **Zygophyllum simplex** L. Mant. p. 64; DC. Prodr. I, 705; Anders. Journ. Linn. Soc. V, Suppl. p. 13; Boiss. Fl. Or. I, 912; Hook. Fl. Brit. Ind. I, 424; Oliv. Fl. trop. Afr. I, 286.

Zygophyllum portulacoides Forsk. Fl. Aeg.-Arab. p. 88.

Description:—A much-branched, succulent, watery, procumbent herb; branches slender, reddish, striate. Leaves small, subsessile, cylindric, oblong, or obovate, obtuse, fleshy; stipules lanceolate, acute.

Sepals obovate, cucullate at the apex. Petals yellow, spathulate, spreading, margins flat. Ovary turbinate, glabrous, ribbed; style tapering.

Capsules deflexed, rugulose, separating into 5 compressed 3-5-seeded cocci. Seeds minute, oblong, attenuated at both ends.

Fruits:—February 1851 (Thomson), March 1878 (Perry), April 1861 (Thomson).

Locality:—Plain of Maala, hill near Steamer Point (Defl.); near the coal depôt of the Messag. Marit. on basaltic rubbish (Schweinf.); on the slope of the Shum Shum Range (Elenbeck, Busse, Marchesetti); great valley between Steamer Point and town (Marchesetti); without locality (Edgew., Thomson, Hook., Madden, Anders., Birdw., Perry, Kuntze). Very common.

Distribution:—Cape Verd Islands, Egypt, Palestine, Nubia, Arabia, highlands of Somaliland, Sind, Cape of Good Hope, S.-W. Africa.

3. Fagonia L.

Much-branched spinose herbs, woody at the base, erect or prostrate. Leaves opposite, 1-3-foliate; leaflets entire, mucronate; stipules often spiny. Peduncles solitary, 1-flowered, apparently axillary.

Flowers rosy or violet, rarely yellow. Sepals 5, deciduous, imbricate. Petals 5. Stamens 10; filaments filiform, naked; anthers shortly oblong. Ovary sessile, 5-gonous, 5-celled; ovules 2, collateral, pendulous from cending funicles. Stigma simple.

Fruit 5-gonous, of 5 one-seeded cocci which separate from a horny endocarp. Seeds erect, compressd, broadly oblong; testa mucilaginous; albumen horny; cotyledons broad, flat, ovate.

Species about 7.

Distribution:—Widely distributed throughout the Mediterranean and the Eastern regions, rarer in S. Africa, California, Chili.

Flowers pale rose-coloured—	
Leaves 1-3-foliate; fruit deeply 5-partite . . .	1. F. cretica.
Leaves 1-foliate; fruit not deeply 5-partite . . .	2. F. parviflora.
Flowers white	3. F. glabra.

1. **Fagonia cretica** Linn. Sp. Pl. (1753) 386; DC. Prodr. I, 704; Anders. Journ. Linn. Soc. V, Suppl. p. 11: Boiss. Fl. Or. I, 905; Oliv. Fl. trop. Afr. I, 287.

Fagonia Hispanica Linn. Sp. Pl. (1753) 386.
F. arabica Linn. l. c.
F. glutinosa Delil. Fl. Aeg. 86, t. 28.
F. mollis Delil. l. c. 76, t. 27, f. 2.
F. latifolia Delil. l. c. 86, t. 28, f. 3.
F. cistoides Delil. in Herb. Bové, n. 169.
F. Mysorensis Roth N. Sp. 215.
F. Oliveri DC. Prodr. I, 704.
F. Persica DC. l. c.
F. Bruguieri DC. l. c.
F. acerosa Boiss. Diag. Pl. Or. VIII, 124.
F. Aucheri Boiss. l. c. I, 62.
F. echinella Boiss l. c. VIII, 123.
F. grandiflora Boiss. l. c. 121.
F. Kahirana Boiss. l. c. 122.
F. myricantha Boiss. l. c. 123.
F. Sinaica Boiss. l. c. 61.
F. subinermis l. c. 62.
F. Thebaica Boiss. l. c. 121.
F. Californica Benth. Bot. Sulph. Voy. 10.
F. Chilensis Hook. et Arn. in Bot. Misc. III, 165.
F. virens Coss in Kralik. Pl. Alger.
F. fruticans Coss. l. c.
F. diversifolia Boiss. in Pl. Or. nov. ser. II, 113.

Arabic name:—Shoeka, shuki.

Description:—An erect or ascending, diffuse or densely-branched spinose annual, from a few inches to a foot or more in height, glandular puberulous, scabrid or glabrescent. Leaves opposite, 1-3-foliate;

petioles deeply striate; stipules 2 pairs of sharp thorns; leaflets linear, acute, sessile or with short petiolules.

Flowers pale rose-coloured. Sepals ovate, aristate. Petals twice as long as the sepals, spathulate; claw long. Ovary hairy; style tapering.

Fruit glandular pubescent, rounded at the base, pyramidal towards the apex, deeply 5-partite almost to the axis. Seeds ovoid, acute, flattened, smooth.

Fruits:—December 1847 (Hooker), March 1878 (Perry), April 1861 (Thomson).

Locality:—On the slope of the Shum Shum Range (Edgew., Hook, Anders., Balf., Ellenbeck); great valley between Steamer Point and town (Marchesetti); without locality (Birdw., Perry, Schweinf.).

Distribution:—Both shores of the Mediterranean, in S. extra-tropical Africa, warmer dry parts of Asia, Western N. and S. America.

Note:—The form and size of the leaves and stipules of *Fagonia cretica* are very variable; sometimes the leaves are nearly absent, and their place is supplied by the long and hard spiny stipules; in other cases the leaves are for the most part simple with inconspicuous stipules, but in some states of this variety the leaves are nearly elliptical and the spines exceed the leaves in length. There is also great difference in the amount of general pubescence; it varies from nearly perfect smoothness to viscosity.

The specimens collected by Hooker and Thomson are named *var. subinermis* Boiss. in the Kew Herbarium. We prefer to drop this varietal name; there would be no end of varieties, if we wanted to describe all the different forms of this extremely variable plant.

2. Fagonia parviflora Boiss. Diag. Pl. Or. ser. I, VIII, 124.

Var. brevispina Schweinf. Bull. Herb. Boiss. VII, App. II, p. 274.

Description:—A small shrub, about $1\frac{1}{2}$ feet high, prostrate at the base, forming extensive bushes, glabrous or puberulous in the upper parts when examined under the magnifying glass, biennial or perennial; internodes of old stems very long, $\frac{4}{5}-1\frac{3}{5}$ inches long; branches prostrate, divaricate, terete, striate; stipules 2 pairs of slender thorns, often unequal, short, measuring up to $\frac{1}{5}$ inch in the lower parts and almost invisible in the uppermost. Leaves unifoliate, elongate, elliptic-acute, short-petioled on the young lateral branches and $\frac{2}{5}$ inch long and $\frac{1}{5}$ inch broad; on the upper young branches linear, $\frac{1}{5}-\frac{1}{12}$ inch long.

Flowers axillary, very small, shorter than the pedicels. Sepals triangular-lanceolate, papillose, mucronate, half as long as the corolla. Petals pale rose-coloured. Capsule globose-turbinate, hirsute, usually as

long as the deflexed pedicel, apiculate with the short style; carpels 5, carinate.

Flowers and *fruits* in November and December (Schweinf.).

Locality:—Ravine north of the telegraph office of Steamer Point, above the coal depôt of the Messag. Marit. (Schweinf.); plain of Maala, Goldmore Valley, ravine south-west of the Tower of Silence (Defl.); on the way to the Shum Shum Range at a height of about 650 feet, below the top of the Shum Shum (Busse).

Distribution of the type: Nubia, Upper Egypt, Abyssinia, S. Arabia, S. Persia.

Note:—Schweinfurth found the same variety on the island of Macour on the Nubian coast (21° N. L), where the plant occurs on coral débris under similar conditions (Krause).

3. Fagonia glabra Krause in Engl. Bot. Jahrb. XXXV, Heft 5, p. 42.

Description:—A perennial much branched-herb; branches and leaves quite glabrous; younger branches striate; leaves with a very short petiole, simple, obovate, obtuse, cuneate at the base, thick coriaceous, $\frac{3}{4}$—1 inch long, $\frac{7}{24}$—$\frac{3}{8}$ inch broad; stipules spinose, thin, slightly unequal, often longer than the leaves.

Flowers short-pedicellate, axillary, solitary. Sepals $\frac{1}{8}$ inch long, narrow obovate, acuminate, shortly ciliate. Petals $\frac{1}{4}$ inch long, white, obovate, twice as long as the calyx.

Fruit pubescent.

Locality:—On rocks of the Shum Shum Range at a height of about 1,000 feet, and near the top at about 1,700 feet (W. Busse, n. 2062).

Endemic in Aden.

Note:—*F. glabra* Krause approaches nearest to *F. socotrana* (Balf.) Engl. from which, however, it is sufficiently distinguished by the spinose stipules. It differs from *F. Luntii* Bak. and *F. nummularifolia* Bak. (both from Hadramaut) by the leaves being entirely glabrous and by the colour of the flowers. (Krause.) We have not seen this plant.

XII.—GERANIACEÆ.

Herbs, undershrubs, rarely trees, often glandularly pubescent. Leaves opposite or alternate, rarely entire, often 2—stipulate.

Flowers hermaphrodite, regular or irregular, solitary, umbelled, cymose or racemose; peduncles usually axillary. Sepals 5, rarely fewer, free or united to the middle, usually imbricate, the posticous sometimes spurred, persistent or rarely deciduous. Petals as many as the sepals, fewer by suppression or 0, hypogynous or sub-perigynous, variously

imbricate, rarely contorted. Torus scarcely expanded into a disk, with 5 glands alternating with the petals, or eglandular, raised in the centre, rarely flat. Stamens as many or twice as many (rarely thrice as many) as the sepals; filaments filiform or dilated or connate into a ring; anthers versatile, 2-celled; cells parallel, dehiscing longitudinally. Ovary 3-5-(rarely 2-) lobed, 3—5-celled. Carpels united with the axis as far as the insertion of the ovules, prolonged above into a styliferous beak or into styles which are more or less united; stigmas capitate, linear or ligulate; ovules 1—2 or many in each cell, anatropous, pendulous; raphe ventral.

Fruit capsular, 3—5-lobed; lobes 1-seeded, often separating from the axis, septicidal or loculicidal; rarely berried. Seeds pendulous, horizontal or ascending, usually exarillate; testa membranous, rarely subcrustaceous; albumen scanty or absent, rarely thick and fleshy; embryo straight or curved; cotyledons flat, planoconvex or variously folded, foliaceous or thick, rarely fleshy; radicle short, straight, looking towards the hilum, or longer, inflexed or usually incumbent on the cotyledons.

Genera 20; *species* about 800.

Distribution:—Temperate and subtropical regions of both hemispheres.

1. Erodium L'Herit.

Herbs, rarely undershrubs; branches swollen or jointed at the nodes. Leaves usually pinnately divided.

Flowers regular or irregular; peduncles axillary, umbelled at the apex, rarely 1-flowered. Sepals 5, imbricate. Petals 5, hypogynous, imbricate, with alternating glands. Stamens 5, alternating with 5 staminodes. Ovary 5-lobed, 5-celled, beaked, the beak running into a style with 5 longitudinally stigmatose branches; ovules 2 in each cell, more or less superposed.

Lobes of the capsule 1-seeded, separating septifragally from the axis, the beaks rolling up elastically from the base to the apex, hairy on the inner surface, each with usually 2 pits at the top below the beak. Seeds exalbuminous; embryo incumbent on the induplicate or flexuose radicle.

Species about 50.

Distribution:—Chiefly in temperate regions in the northern hemisphere of the Old World.

1. Erodium malacoides (L) Willd. Phyt. I (1794) 10; Willd. Spec. Pl. III (1800) 639; DC. Fl. Franc. IV (1805) 842; DC. Prodr. I (1824) 648 n. 34; Sibth. et Smith, Fl. Graec. VII (1830) 53, t. 658; Koch Synops. Fl. Germ. ed. I, (1837) 142; Gren. et Godr. Fl. France I (1848) 308; Boiss. Fl. Or. I (1867) 893; Willk. et Lange, Prodr. Fl.

Hisp. III (1880) 538; Batt. et Trab. Fl.de l' Alg. II (1888) 127; A. Gray Syn. Fl. N. Am. I, 1. (1897) 362; Halacsy Consp. Fl. Graec. I (1901) 305; Bub. Fl. Pyren. III (1901) 319; Brumh. Mon. Uebers. Erod. (1905) 45; Knuth Geraniac. in Engler Regni Veg. Consp. IV, 129 (1912) p. 245.

Erodium malacoides var. α Ait. Hort. Kew. ed. 1, II (1789) 415.

Erodium malacoides var. macrophyllum Lange in Willk. et Lange. Prodr. Fl. Hisp. III (1880) 538.

Erodium glabellum Del. Fl. Aegypt. III (1813) 20.

Erodium althæoides Jord. Pugill. Pl. nov. (1852) 41.

Erodium malvaceum Jord. Pugill. Pl. nov. (1852) 41; Loret et Barrand. Fl. Monsp. (1876) 122.

Erodium glutinosum Dulac Fl. Hautes-Pyr. (1867) 238.

Erodium stipulaceum Duf. ex Nym. Consp. (1878—82) 139.

Erodium floribundum Batt. in Bull. Soc. Bot. France XXX (1883) 265; Batt. et Trab. Fl. de l'Alg. II (1888) 128.

Geranium malacoides L. Spec. Pl. ed. 1. II (1753) 680, ed. 2. II (1763), 952; Burm. Spec. Geran. (1759) 31; Forsk. Fl. Aegypt.-Arab. (1775) 123; Cav. Diss. IV (1787) 220, tab. 91, f. 1.

Herodium malacoides Reichb. Ic. Fl. Germ. III (1842—43) 65, t. 185, f. 4868.

Description:—Annual, softly hairy, hairs on the stem deflexed. Stem erect or diffuse, elongate, branched. Leaves ovate-oblong, acute or obtuse, shortly appressed-pubescent, lower cordate; stipules large, scarious, acute or obtuse.

Inflorescence glandular; peduncles 3-many-flowered; bracts ovate, scarious, ciliate. Sepals membranous, two outer 5- and three inner 3-nerved, awn hairy. Petals ciliate at the base, obovate, lilac, 9-nerved. Filaments glabrous, lanceolate. Staminodes linear. Ovary hairy.

Carpels stipitate, 3-gonous, setose; beak 4-5-times as long as the cell, with stiff brown hairs for $\frac{1}{4}$ of its length; pits with a deep fold.

Locality:—Sandy seashore (Madden).

Distribution:—All over the Mediterranean Region (Spain, Portugal S. France, Italy, Dalmatia, Western Asia, Syria, Egypt, Algeria, Morocco), Madeira, Island of Kishm in the southern Persian Gulf.

Naturalized in the S.-W. Cape Region, South America (Argentine, Peru) N. America.

Note:—No botanist after Madden, who found *Erodium malacoides* in 1850, has ever seen the plant in Aden. As this species has never been reported to occur in Arabia, it is quite probable that at no time was it indigenous in Aden.

XIII.—MELIACEÆ.

Trees or shrubs. Leaves alternate, exstipulate, usually pinnate; leaves or leaflets usually entire.

Flowers regular, usually hermaphrodite, in terminal or axillary panicles. Calyx usually small, 4-5-fid or—partite, imbricate, rarely valvate. Petals 4—6 (rarely 3—7), sometimes free and contorted or imbricate, sometimes connate or adnate to the staminal tube and valvate. Stamens 4—10, generally 8—10 (very rarely more), inserted with the petals outside of the base of a hypogynous disk; filaments united by their margins into a more or less complete tube which is entire, toothed or variously laciniate, rarely free; anthers introrse or versatile, erect, usually sessile on the staminal tube, included or exserted, 2-celled, dehiscing longitudinally; connective sometimes produced. Disk various, usually annular, or tubular, and sheathing, free or adnate to the ovary or staminal tube, or 0. Ovary usually free, 2—5-celled; ovules 1—2 (rarely more) in each cell, collateral or superposed; raphe ventral, micropyle superior; style simple; stigma disciform or capitate.

Fruit capsular, baccate or drupaceous. Seeds exalbuminous or with fleshy albumen, winged or not; embryo flat; hilum usually ventral; cotyledons fleshy.

Genera 37; *species* about 300.

Distribution:—Frequent in the warm regions of Asia and America, rarer in Africa.

Seeds albuminous; cotyledons foliaceous	1. Melia
Seeds exalbuminous; cotyledons thick	2. Azadirachta.

The two species described below are not indigenous in the Aden territory.

1. Melia Linn.

Trees or shrubs. Leaves alternate, simply or 2-3-pinnate with an odd one, the young ones often stellately tomentose; leaflets toothed, serrate or entire.

Flowers hermaphrodite, elongate, in large many-flowered axillary much-branched panicles. Calyx 5—6 partite, imbricate. Petals 5—6, free, much exceeding the calyx. Staminal tube a little shorter than the petals, laciniate the mouth dilated; anthers 10, within the staminal tube at its apex, sessile between its laciniae, erect. Disk annular. Ovary 5—8-celled; cells opposite the sepals; ovules 2 in each cell, superposed; style cylindric, much exceeding the ovary; stigma capitate.

Drupe subfleshy; endocarp woody; cells 1-seeded. Seeds pendulous, elliptic; testa crustaceous; albumen fleshy or scanty; cotyledons foliaceous; radicle terete, superior.

Species about 12.

Distribution:—Tropical Asia and Africa.

1. **Melia Azedarach** Linn. Sp. Pl. (1753) 384; Grah. Cat. Bomb. Pl. 30; Harms in Engl. & Prantl Pflanzenfam. III, part IV, 287, fig. 160, A—L; Boiss. Fl. Or. I, 954; Oliver Fl. trop. Afr. I, 332; Hook. Fl. Brit. Ind. I, 544; Cooke Fl. Bomb. Pres. I, 205.

Melia angustifolia Schum. & Thonn. Beskr. Guin. Pl. 214.

Melia australis Sw. Hort. Brit. ed. 2, 85.

Melia Bukayun Royle Illustr. Bot. Himal. 144; Griff. Itin. Notes 355, 403.

Melia cochinchinensis M. Roem. Syn. Hesper. 95.

Melia Commelini Medic. ex Steud. Nomencl. ed. 2, II. 118.

Melia composita Benth. Fl. Austral. I, 380.

Melia florida Salisb. Prodr. 317.

Melia guineensis G. Don in Lond. Hort. Brit. 168.

Melia Japonica G. Don Gen. Syst. I, 680.

Melia orientalis M. Roem. Syn. Hesper. 95.

Melia sambucina Blume Bijdr. 162.

Melia sempervirens Sw. Prodr. Veg. Ind. Occ. 67; Roxb. Hort. Beng. 33; Fl. Ind. II, 395; Wall. Cat. 1252; Dalz. and Gibs. Bomb. Fl. Suppl. 15.

Arabic name:—Ssile-asadiracht.

English names:—Persian Lilac, Bastard Cedar, Bead Tree.

Description:—A tree, reaching 40 feet. Leaves impari-bi- (or sometimes tri-) pinnate, 9—18 inches long; pinnæ opposite or alternate; ultimate leaflets 3—11, opposite or nearly so, $\frac{1}{2}$—2 by $\frac{1}{4}$—1 inch, ovate or lanceolate, acuminate, obtusely serrate, sometimes lobed, glabrous on both surfaces, slightly inequilateral at the base; petioles short, slender.

Flowers fragrant, lilac, in long peduncled axillary panicles which are shorter than the leaves and glabrous or sparsely puberulous; pedicels slender. Calyx pubescent outside, divided nearly to the base; lobes ovate-oblong, acute, ciliolate. Petals $\frac{5}{8}$ inch long, oblong-lanceolate. Staminal tube purple, $\frac{5}{16}$ inch long, glabrous, slightly ribbed outside, faintly pubescent within, acutely 20-toothed; anthers sessile, glabrous, apiculate, 1 between each pair of teeth. Ovary glabrous, 5-celled.

Drupe ellipsoid-globose, 4-seeded.

Locality:—Shaikh Othman (Defl.). Naturalized.

Distribution:—Widly dispersed by cultivation in warm countries; supposed to be indigenous in Baluchistan and the Jhelum Valley in Kashmir (Brandis).

Uses :—This plant yields a brown adhesive gum and the seeds afford a fixed oil. By the Arabs and Persians it has long been used as a medicine.

The wood is handsomely marked and takes an excellent polish.

2. Azadirachta A. Juss.

Trees. Leaves alternate, imparipinnate ; leaflets serrate.

Flowers hermaphrodite, in axillary panicles. Calyx 5-partite. Petals 5, much exceeding the calyx, free, imbricate. Staminal tube a little shorter than the petals, laciniate at the apex ; anthers within the tube at its apex, sessile, opposite to the laciniæ. Disk 0. Ovary 3-celled, the cells opposite the petals ; ovules 2 in each cell, collateral ; style much exceeding the ovary ; stigma shortly cylindric, 3-toothed.

Drupe 1-seeded, endocarp woody. Seed exalbuminous, ellipsoid ; cotyledons very thick and fleshy, acutely 2-lobed at the base ; radicle exserted from the cotyledons, superior.

Species 1.

Distribution :—Wild in the dry region of the Irawadi valley from Prome upwards ; cultivated and naturalized in many hot climates.

1. **Azadirachta indica** A. Juss. Mém. Mél. (1830) 68, t. 2, n. 5 ; C. DC. in DC. Monogr. Phan. I, 459, t. 6, fig. 10 ; W. & A. Prodr. I, 118 ; Wight Ic. t. 17 ; Grah. Cat. Bomb. Pl. 30 ; Dalz. and Gibs. Bomb. Fl. 36 ; Trim. Fl. Ceyl. I, 244 ; Harms in Engl. & Prantl Pflanzenfam. III, part IV, 287, fig. 160, M—S ; Cooke Fl. Bomb. Pres. I, 207 ; Brandis Ind. Trees 139.

Melia Azadirachta Linn. Sp. Pl. 385 ; Roxb. Hort. Beng. 33 ; Fl. Ind. II, 394 ; Griff. Notulæ IV, 500 ; Wall. Cat. 1251 ; Bedd. Fl. Sylv. t. 13 ; Hook. Fl. Brit. Ind. I, 544.

Melia parviflora Moon Cat. 35.
Melia indica Brandis For. Fl. 67.
Melia fraxinifolia Salisb. Prodr. 310.
Melia japonica Hassk. Cat. Hort. Bogor. Alt. 219.
Melia pinnata Stokes Bot. Mat. Med. II, 482.

Arabic name :—Neshem. *English name* : Neem or Margosa Tree.

Description :—A large tree, 40-50 feet high, with a straight trunk. Leaves simply pinnate, 8—15 inches long, crowded near the ends of the branches ; leaflets 9—12, subopposite, 1—3 by ½—1½ inches, obliquely lanceolate, sometimes falcate, acuminate, serrate glabrous on both surfaces, base inequilateral, acute ; petiolules very short.

Flowers white, fragrant, in branched glabrous panicles shorter than the leaves; bracts minute, lanceolate, caducous. Calyx puberulous outside, divided almost to the base; lobes rotund-ovate, minutely ciliolate. Petals $\frac{1}{4}$ inch long, obovate-oblong, faintly puberulous outside, ciliolate. Staminal tube glabrous, a little shorter than the petals, obconic, the laciniæ truncate and toothed at the apex; anthers 10, opposite the laciniæ and a little shorter than them, apiculate. Disk 0. Ovary glabrous, 3-celled, the cells opposite to the petals; ovules 2 in each cell, collateral; stigma 3-toothed, included in the tube.

Drupes the shape of an olive, $\frac{1}{2}$—$\frac{3}{4}$ inch, glabrous, 1-seeded

Locality :—Shaikh Othman (Busse ex Krause); naturalized.

Uses :—This tree is of considerable economic importance. "From the bark there exudes a bright amber-coloured gum, which is collected in small tears or fragments. This is said to constitute a portion of the commercial 'gum gattie,' and 'of East India Gum.' It is considerably esteemed medicinally as a stimulant. From the seeds a fixed acrid, bitter oil is extracted, of a deep yellow colour and disagreeable flavour. As an anthelmintic and antiseptic it is in much demand. The barks of trees are often painted with it to protect them from insect pests. By the women of Sind it is applied as a hair wash. In addition to the gum and oil, the bark, young fruits, seeds, leaves, flowers and sap have all medicinal properties assigned to them or are spoken of as edible. The leaves are utilised to preserve books, papers, cloths, etc., from ravages of insects. They are said, moreover, to be useful in keeping away mosquitoes. Hooper (Rept. Labor. Ind. Mus. Indust. Sec., 1903-04, 30—1) records the results of his investigations. Fresh leaves were distilled in water. It was found that a distinct allyl- or onion-smelling compound was present in the distillate. The powdered leaf, when burnt, gave off an odour found to prove fatal to insects. The extract of the leaves was intensely bitter and contained evidence of an alkaloid.

"The sap ... is yielded by the tree either spontaneously or is extracted artificially. In the former case, a clear and colourless liquid flows in a thin stream or continuous droppings from two, three or more parts of the plant simultaneously for several weeks on end. Artificially it is obtained by exposing a healthy-looking root, cutting it through, and placing a vessel beneath to receive the exuding liquor, which is a refrigerent, nutrient and alterative tonic. The wood is durable, has an average weight of 50 to 52 lb. per cubic foot. Its chief use is for cart-construction, ship-building, agricultural implements, and in South India for furniture. The twigs are largely used as tooth-brushes." Watt.

XIV.—BURSERACEÆ.

Resinous trees or shrubs. Leaves generally alternate, imparipinnate, 3-foliate, in some cases 1-foliate; stipules generally 0.

Flowers mostly small, hermaphrodite or polygamous, racemose or panicled. Calyx 3-5-fid or-partite, imbricate or valvate. Petals 3-5, imbricate or valvate. Stamens as many or twice as many as petals, inserted on the margin or on the outside of a fleshy disk; filaments free, rarely connate at the base; staminodes 0; anthers 2-celled, dehiscent longitudinally. Ovary free, 2-5-celled; ovules generally 2 in each cell, axile, usually pendulous, rarely ascending. Stigma undivided or 2-5-lobed.

Fruit drupaceous, either indehiscent with a 3-6-celled hard stone, or valvately dehiscent with several separate stones. Seeds pendulous; testa membranous; albumen 0; cotyledous often lobed, generally twisted or crumpled.

Genera 18; *species* over 300.

Distribution:—Tropics of both hemispheres.

Drupes indehiscent; pyrenes not separating . .	1. Commiphora.
Drupe dehiscent; pyrenes separating . . .	2. Boswellia.

1. Commiphora Jacq.

Small trees or shrubs, yielding aromatic resin. Branches often thorny. Leaves alternate, crowded at the ends of short branchlets, imparipinnate or 1-3-foliate.

Flowers polygamous fasciculate on thickened nodes or short lateral branchlets, or on 1-4-flowered, axillary, jointed peduncles. Calyx campanulate or shortly tubular, 3-4-toothed, persistent. Petals 3-4, erect or with recurved tips, linear or oblanceolate-oblong, valvate or with the sides slightly imbricate and tips incurved in æstivation. Stamens 8-10, inserted on or outside the margin of a cupuliform disk, alternately shorter. Ovary 3-celled, rarely 2-4-celled, narrowed into a short thick style; stigma obtuse, 3-4-lobed; ovules geminate, collateral, pendulous.

Fruit a drupe, ovoid or subglobose, the rind splitting more or less irregularly into 2-6 valves, leaving the pulp exposed, which encloses the nuts, which are bony, 1-seeded and partially connate. Seeds exalbuminous; embryo straight, the radicle pointing upwards; cotyledons thin, crumpled and plaited.

Species about 80.

Distribution:—Arabia, India, tropical and Southern Africa.

Leaves simple	1. C. abyssinica var. simplicifolia.
Leaves mostly compound . . .	2. C. opobalsamum.

1. Commiphora abyssinica Engl. in D.C. Prodr. Cont. IV, 10.

Balsamodendron abyssinicum Berg in Bot. Zeit. (1862), p. 161.

Balsamodendron Kafal Herb. Schimperi, n. 1359, A. Rich. (ex Engler).

Balsamea abyssinica Engl. in Bot. Jahrb. I, 41.

Var. simplicifolia Schweinf. in Bull. Herb. Boiss. (1899) Append. II, p. 291.

Arabic name :—Quafal, Chaddash (Schweinf.).

Description :—A small shrub ; branches virgate ; branchlets pale, spinous, glabrous. Leaves glabrous, scattered, simple, subsessile ; petiole very short.

Flowering branchlets short, about $\frac{2}{5}$—$1\frac{1}{5}$ inches long, mostly 3-flowered. Flowers very shortly peduncled ; bracts glanduloso-ciliate. Calyx slightly scabrous ; tube $\frac{1}{16}$ inch long. Petals $\frac{1}{7}$ inch long, $\frac{1}{24}$ inch broad. Ovary ovoid, $\frac{1}{24}$ inch long.

Drupe ovoid, acute, $\frac{1}{2}$ inch long, about $\frac{1}{3}$ inch broad.

Fruits in December (Schweinf.).

Locality :—Not far from the Flagstaff on top of the Shum Shum Range (Schweinf.).

Distribution (of the species) : Abyssinia, Kordofan, Eritrea, S. Arabia.

The variety (*simplicifolia* Schweinf.) has, besides, been observed in Yemen.

Note :—Some observations made by Schweinfurth might prove useful in the identification of *Commiphora abyssinica*, Engl.

It is important to remember that locality, season and age cause a good many deviations from the typical form and that in such cases one feels inclined to consider those aberrant forms as distinct and different species.

During the dry season and mostly also during the flowering and fruiting time the shrub is entirely leafless. The bark of the stem is quite smooth and covered with a shining and bright-leather-yellow epidermis which peels off in rather thick layers. In this respect *C. abyssinica* resembles perfectly *C. opobalsamum*, Engl. ; it is, however, easily recognized by the distinct odour of 'White Spruce' of its young branchlets.

The branches are dark grey, (their bark not shining), and either in the shape of long, unarmed and ascending shoots, or shortened, short-branched and armed with shorter and longer thorns. The short-stalked glabrous, thin, delicate leaves are either single on the long unarmed

shoots or fascicled at the ends of short unarmed branchlets, or even more or less approximate at the base of those short branches which are produced into a thorn.

In young 3-foliolate leaves of the typical plant the central leaflet is always considerably longer than the lateral ones. The leaflets are sessile. In the older leaves the length of the lateral leaflets is at the most $\frac{1}{2}$ or $\frac{1}{3}$ of the central one, and in other cases, especially in forms with pointed leaves, $\frac{1}{4}$ or even $\frac{1}{10}$. The central leaflet is oblong-linear, oblong-obovate or oblong-elliptic with rounded apex in cases where the leaf consists only of one leaflet, but long-pointed in 3-foliolate leaves. The margin is usually crenate-serrate in all the leaflets, but forms with the margin entire can often be seen.

The flowers appear twice a year, either on the leafless branches where they form dense fascicles at the ends of the short branchlets seated on very short peduncles, or in axillary cymes between the fascicles of leaves. In the latter case the peduncles are longer and are about as long as the calyx. The triangular bracts are often glanduloso-ciliate; but all the other parts of the inflorescence are entirely glabrous. The calyx is shortly cup-shaped and divided into 3-angular teeth about half-way down during the time of flowering, and for about $\frac{1}{3}$ during the time of fruiting. The petals are 2-2$\frac{1}{2}$ times as long as the calyx. The fruit is globular-oval and at least twice as long as the peduncle, which is generally reflexed and scarcely thickened.

The chief characteristics of *Commiphora abyssinica* may be summarized like this: Very short lateral leaflets; very short petioles; deeply divided calyx; oval outline of the fruit with well-developed pointed apex; glanduloso-ciliate bracts; smooth putamen with a transverse furrow at the apex.

Uses:—E. M. Holmes expressed his doubts (Pharmaceutical Journal, 12th December 1896) as to whether *Commiphora abyssinica* produces myrrh, because neither the bark nor the fruit showed a bitter taste. Schweinfurth, however, states that the bark of specimens collected at Badjil is decidedly bitter. In the same place as well as in other localities he observed that from incisions made in the bark there exuded a yellowish milky-opaque ("milchigtrüb") juice which, in the open air, soon hardened into the resin known as myrrh.

When Deflers travelled in the country of the Fadhlis in South Arabia, *Commiphora abyssinica* was pointed out to him as the plant from which great quantities of myrrh were brought to the market.

The degree of bitterishness may be different according to the season and the branching-region of the same plant.

2. Commiphora opobalsamum (Forsk.) Engl. in DC. Prodr. Cont. IV, 16. **var. gileadense** Engl. l. c.

Amyris opobalsamum Forsk. Fl. Aegypt.-Arab., p. 79.

Amyris gileadensis Linn. Amoen. Acad. vii, 55; Vahl Symb. I, 28 t. 11.

Balsamodendron opobalsamum Kunth Gen. Terebinth. p. 16; Anders. Journ. Linn. Soc. V, Supplem. p. 13; Oliv. Fl. Trop. Afr. I, 326.

Balsamodendron gileadense Kunth l. c., p. 16; Ann. Sc. Nat. ser. 1, II, 349; DC. Prodr. II, 76; Nees Düss. t. 356, f. 1—3.

Arabic names:—Besham (Schweinf.), balasan (Watt).

English names:—Balsam of Mecca, Balm of Gilead.

Description:—Tree or shrub; branches virgate, divaricate, glabrous or the extremities and leaves occasionally finely pubescent, unarmed. Bark smooth, cinereous. Leaves scattered or in fascicles, ternate, rarely imparipinnate, 2-jugate, from short or suppressed lateral branchlets often under 1 inch in length; leaflets obovate or obovate-oblong, obtuse, lateral ones $\frac{1}{4}$—$\frac{2}{5}$ inch long, $\frac{1}{5}$—$\frac{1}{3}$ inch broad, the central one often twice as long; petioles $\frac{2}{5}$—$\frac{3}{5}$ inch long, slender.

Calyx campanulate, shortly 4-dentate.

Fruit ovoid or ellipsoidal, smooth, glabrous, apiculate.

Locality:—Goldmore Valley, above the coal-depôt of the Messag. Marit. valley below the top of the Shum Shum Range (Schweinf.); plain between Maala and the Goldmore Valley, rather rare on the mountains where the shrub grows isolated in places of difficult access (Defl.); Shum Shum Range at a height of about 1,700 feet (Hook.); great valley between Steamer Point and town (Marchesetti); on the slope of the Shum Shum Range (Ellenbeck); Little Aden, plateau and dunes east of Jebel Ihsan (Defl.); without locality (Birdw., Kuntze).

Distribution:—Arabia, Nubia.

Historical note:—This far-famed product of the East is mentioned by both Jewish and classical writers. The tree belongs to the tropical region and can scarcely be counted amongst the products of the so-called Oriental flora.[1] It is very rare, difficult to cultivate and has gradually disappeared from various places where it was grown in former times.[2]

Josephus informs us that the balsam tree grew in the region round about Jericho, of which it was the most costly and valued product.[3] It was also cultivated at Engaddi. The same author mentions that the

[1] Schweinfurth, G. Beitrag zur Flora Aethiopiens, Berlin, 1867, p. 30. Boissier Flora Orient. vol. II. p. 2.

[2] Guibourt, N. J. Histoire naturelle des drogues simples, Paris. 7. ed. 1876, vol. 3, p. 506.

[3] Josephus Ant. Jud. VIII, VI, 6; IX, 1, 2; XIV, IV, 1.

balm was obtained by making an incision in the plant with a sharp stone, and that it was the general belief that the original root from which these trees had sprung was the gift of the Queen of Sheba to Solomon. The balsam garden of Jericho measured about 12 acres and that of Engaddi a little less. They did not produce more than 25 litres (about 5½ gallons) annually. After the destruction of Jerusalem the Romans took charge of the gardens and made them more productive than they had been before. They thus became a source of revenue for the fiscus of the empire. Vespasian and Titus caused specimens of the trees to be exhibited on the day of their triumphal entry in Rome. Pompeius had done the same before. It seems that those gardens existed until the time of the Crusades. The balsam tree, however, like the date palm, has long since disappeared from Jericho and Engaddi.

It appears that even in patriarchal times balm was exported from Gilead to Egypt. At a later period, it is said to have been cultivated, but whether the plants were imported from Palestine or from Arabia has not been ascertained as yet. It was grown especially at Heliopolis, the ancient On. It was also well known that the balsam tree was cultivated from the end of the 11th down to the 16th or 17th century in the vicinity of Cairo, in a place called Matarich or Aïn-Shems. The plantation was surrounded by a wall and guarded by watchmen. When Belon[1] visited Egypt in 1550 he found only some nine or ten plants left which were in a very poor condition, in spite of the fact. that fresh material had several times been imported from Mecca. The last specimen was destroyed in 1615 in an inundation of the Nile.

The balsam tree is alluded to by Pliny[2] and Diodorus, and by the botanists Theophrastus and Dioscorides. The Greeks[3] called the plant 'balsamon' and its products were known as 'opobalsamon', the balm proper, 'xylobalsamon', the wood of the balsam tree, and 'karpobalsamon', the fruit. To the Romans the balm was known under the name of 'balsamum'.[4]

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[1] Belon, P. Les observations de plusieurs singularités et choses mémorables trouvées en Grèce, Asie, Judée, Egypte, Arabie. Paris, 1588. Ch. XXXIX, p. 246.

[2] Plinius. Historia Naturalis XII, LIV, 1—8.

Cf. Strabon XVI, II, 41; XVII, I, 15.

[3] Geoffroy, E F. Tractatus de materia medica, De Veget. Paris, 1741, Vol. II, p. 477.

[4] For good illustrations of this tree we refer to the following books :—

Nees von Esenbeck, Weihe et Funk. Plantæ medicinales, oder Sammlung officineller Pflanzen. Düsseldorf, 1828—1833, pl. 354.

Woodville, W. and Hooker, J. W. Medical Botany. London, 1832, vol. 3, pl. 214.

Many interesting details regarding the history and uses of the balm tree are contained in the writers of the 17th and 18th century. We mentioned only a few :

Alpinus, De Balsamo dialogus. Venice, 1591.

Alexander the Great is said to have recognized the value of the precious gum.

2. Boswellia Roxb.

Trees usually with papery bark. Leaves alternate, crowded at the ends of the branches, deciduous, imparipinnate; leaflets opposite, usually serrate.

Flowers hermaphrodite, small, white, in axillary racemes or panicles. Calyx small, 5-toothed, persistent. Petals 5, narrowed at the base, imbricate. Disk annular, crenate. Stamens 10, alternately long and short, inserted at the base of the disk. Ovary sessile, 3-celled; ovules 2 in each cell, pendulous; style short; stigma 3-lobed.

Drupe trigonous, 3-valved, valves separating from the pyrenes; pyrenes bony, 1-seeded, finally separating from the trigonous axis. Seeds compressed, pendulous; cotyledons contortuplicate, multifid; radicle superior.

Species about 10.

Distribution :—Tropical Africa, Arabia, India.

1. Boswellia Carterii Birdwood in Trans. Linn. Soc. XXVII, 143; Engler in Engl. & Prantl Pflanzenfam. III, 4, p. 246.

English name :—Frankincense-tree, Olibanum tree.

Arabic name :—Maghrayt d'sheehaz (Carter).

Description :—A small tree; branchlets terminal, pubescent or tomentose. Leaves 7-10-jugate, sometimes 5-jugate; petiole pubescent; leaflets ovate-oblong, undulate or crenate-undulate, broadly rotundate or truncate at the base, all pubescent or sometimes glabrous on the upper side and velvety and paler on the lower.

Racemes simple, fasciculate, shorter than the leaves. Corolla patent; petals white or wax-coloured; disc rose-coloured; stamens inserted into

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Pona. Del vero Balsamo di gli antichi. Venice, 1623.

Campi. Parere sopra il Balsamo. Lucca, 1639.

Campi. Riposta ad objettioni. Lucca, 1640.

Campi. In dilucidazione e confirmazione. Pisa, 1641.

Castelli, P. Opobalsamum examinatum. Venice, 1640.

Castelli, P. Opobalsamum triumphans. Venice, 1640.

Baldus. Opobalsami orientalis propugnationes. Rome, 1640.

Vesling. Opobalsami veteribus cogniti vindiciæ. Padua, 1644.

Slevogt. Balsamum verum vulgo Opobalsamum et De Opobalsamo. Jena, 1705—1717.

Vater. Balsami de Mecca natura et usus. Wittenberg, 1720.

Winniken. Beschreibung des wahren Opobalsambaumes. Kopenhagen, 1745.

Stackhouse, J. Extracts from Bruce's Travels in Abyssinia and other modern authorities respecting the Balsam and Myrrh Trees. Bath, 1815.

the side of the disk (in the Arabian variety). Ovary closely appressed to the fleshy disk and half-immersed.

Flowers:—June (Dr. G. Birdwood in 1867).

Locality:—Near the tanks (Playfair, G. Birdwood, Collins); probably not wild in Aden.

"Dr. Trimen, F.L.S., exhibited specimens of the Olibanum, or Frankincense-tree, *Boswellia Carterii*, Birdwood, gathered by Mr. James Collins at Aden in October 1877." Proc. Linn. Soc. (Nov. 1877), p. XXIV.

Distribution:—Somaliland, Hadramaut.

Note:—G. Birdwood's account of how he came to know and describe *Boswellia Carterii* might be of interest to Europeans residing at Aden:

"When I was placed," he says, "in charge of the Agri-Horticultural Society's 'Old Gardens' in Bombay, in 1859, I found the tree which Carter had brought from Arabia[1] growing there and labelled, by Stocks, *Boswellia papyrifera*; and in my catalogue of the Government Central Museum, published in 1862, I adopted *Boswellia papyrifera*, Richard, which Royle had called *Boswellia floribunda*, as the source of olibanum; for I had ascertained that *Boswellia thurifera*, Colebrooke, produced none of the olibanum of commerce, but only an oleo-resinous exudation. But I had not seen Endlicher's and Richard's descriptions and figures, nor probably had Stocks; and I therefore asked Colonel (then Captain) Playfair, at Aden, whether he could procure me any cutting of the African frankincense-tree. Colonel Playfair sent me a large collection of several varieties of dried leaves and of cuttings, accurately labelled with their native names, with samples of the kind of frankincense which they respectively yielded. At my request he subsequently sent duplicates of his dried specimens to Kew. On the cuttings which were sent to me striking and leafing, I found that I had three kinds:—Yegaar, yielding Luban maitee, an undoubtedly new species, and Mohr Add and Mohr Madow, yielding Luban sheheri, the bulk of the olibanum exported from the Soumali country. Judging by the young leaves solely, I should have been inclined to consider Colebrooke's, Endlicher's, Richard's and Carter's plants, and Roxburgh's *Boswellia glabra* all only more or less variations of one species, and Yegaar the only second species. Indeed, if I followed my own erring inclination, I should hold so now.

[1] Carter found the tree growing in the limestone formation about Merbat and Ras Fartak.

"Amongst Playfair's dried specimens of Mohr Add and Mohr Madow, were the leaves of a variety of each, which he said yielded an inferior olibanum, called Luban bedowi.

"Carter's plant never flowered with me, nor until last year would Playfair's. But he had planted duplicates of the cuttings he sent to me, in the romantic little gardens laid out by him near the celebrated tanks of Aden. They had not flowered before he left Aden for Zanzibar; but when passing Aden in June 1867, he found that one of the plants had flowered, and he sent its flowers to Kew. When I saw these in July 1867, it was not known to which kind they belonged, as Playfair had not picked any leaves with them. I therefore on my way back to Bombay, in November 1867, visited the gardens, and found from the gardener that it was Mohr Madow that had flowered the previous June. Seeing the plants were leafing too much, I left directions to water them less abundantly than they had been, and to send me any flowers that they produced. On reaching Bombay, I also stopped watering the plants in Victoria Gardens, the Agri-Horticultural Society's new Gardens in Bombay, and early in the monsoon of last year Mohr Add flowered. In September last, I was again at Aden, and then found Yegaar in full bloom." Transact. Linn. Soc. XXVII, 137-138.[1]

Uses and History :—It is probable that several species yield the true Frankincense or Olibanum of commerce, but the most important, perhaps is *Boswellia Carterii*. These balsamiferous trees inhabit the south coast of Arabia and the Somali coast of Africa to Cape Guardafui.[2]

There is no doubt that the Hebrew 'lebonah' meant frankincense. The same word with slight dialectical modifications, occurs in the kindred languages: 'lebunta' or 'lebonta' in Aramaic, 'lebunto' in Syriac and 'loban' in Arabic. From the semitic languages the word passed into Greek under the form 'libanos' which was invariably employed in the Septuagint for the translation of the Hebrew 'lebonah,' whilst the Vulgate translated it into 'thus'. The root of the word is 'laban' *i.e.* 'to be white', which indicates that the name was first given to the

[1] Interesting particulars regarding Arabian and African Gums and Resins will be found in the Journal Bombay Br. Roy. As. Soc. Vol. II, 1848 (by Carter); Transact. Bombay Geogr. Soc. Vol. VII, 1846 (by Cruttenden); Journ. Roy. Geogr. Soc. Vol. XLII, 1872 (by Miles).

[2] On the so-called Indian Olibanum Tree (Boswellia serrata Roxb. = B. glabra Roxb. = B thurifera Colebrooke) *vide* :

Taleef Shereef, translated by Playfair, 1833, p. 146.

Moodeen Sheriff. Mort. Med. Mad. 1891, p. 96—99.

Biscoe. List of Hyderabad Trees, 1895, p. 3.

Kanny Lal Dey. Indigenous Drugs of India, 1896, p. 50.

Watt. Dict. Economic Prod. Ind. I, 511—17.

Watt. Comm. Prod. Ind. 1908, p. 174.

white incense, which is the purest of all.[1] Certain grammarians defended the opinion that 'libanos' signified the tree and 'libanotos' the incense. But the ancient writers, whilst employing 'libanos' for the tree as well as for the gum, used 'libanotos' exclusively to designate the gum.[2]

Frankincense is not mentioned by Homer, and seems not to have become known to the Greeks till a later period, when it was largely employed in the obsequies of the wealthier citizens, as it is in our day with high caste Hindoos.[3]

Though the frankincense was well known to the ancients, they had, nevertheless, very vague and often erroneous notions of the plant which produces the gum.[4] Pliny confesses that little was known regarding the shape of the tree, and that the Greeks had given thereof the most varied descriptions.[5] The information on the method of obtaining the gum is equally unreliable.[6]

According to the ancient authors the frankincense came from Shebah. In Isaiah (LX, 6) it is said: "All they from Sheba shall come; they shall bring gold and frankincense," and in Jeremiah (VI, 20): "To what purpose do you bring me frankincense from Sheba and the sweet-smelling cane from a far country."—Pliny calls the Sabaeans the best known amongst the Arabs on account of the frankincense,[7] and in another place he says that Sheba is the 'thuriferous country.'[8] Similarly Virgilius in his Georgica:

"Solis est thurea virga Sabaeis."[9]

Niebuhr and Tristram, not being able to understand how Yemen and Hadramaut could produce a quantity of frankincense sufficient to satisfy the demands of the Old World, were of opinion that the Arabs imported part of the supply from India.[10] They thought to have found an argument in the fact, that the Arabs sometimes call the frankincense 'kondor' or 'kundur', an Indian name given to the aromatic gum of

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1 *Cf.* Plinius. Historia Naturalis. XII, 32; Theophrastus. Historia Plantarum IX, 4.
2 Schleusner, J. F. Novus thesaurus philologico-criticus. Leipzig, 1820, vol. 3, p. 453.
3 Groser, W. H. The trees and plants mentioned in the Bible. London, 1895, p. 212.
4 Theophrastus. l. c.; Diodorus Sic. V, 41.
5 Plinius. Historia Naturalis. XII, 31.
6 Plinius. l. c. XII, 32—Theophrastus l. c. XI, 14.
7 Plinius. l. c. VI, 32.
8 Plinius. l. c. XII, 30. *Cf.* Strabo XVI, 19.
9 Virgilius. Georg. I, 58.—For other ancient writers who mention Sheba as being the home of frankincense *cf.* Celsius. Hierobotanicon. Amsterdam, 1748, vol. I, p. 240—241.
10 Niebuhr. Description de l'Arabie. Paris, 1779, vol. p. I, 202—203.
Tristram. The natural history of the Bible. London, 1889 p. 355.

the plant which was described by Colebrooke as *Boswellia thurifera*[1] (= *B. serrata* Roxb.). It must not be forgotten, however, that Arabian and African frankincense has long been regularly imported to India. It bears various names: kundur, luban, thus, visesh, esesh, parangi-shambirani, kunurakkam-pishin, etc. Muhammedan writers distinguish several varieties of the olibanum imported into India: 'kundur zakar', male frankincense which is the best quality and consists of deep yellow tears; 'kundur unsa', female frankincense; 'kundur madharaj' the exudation artificially made into tears;[1] 'kishar kundur' or 'kashfa', the 'dhup' of the Bombay market, consisting of the bark of the tree coated with the exudation, and 'dukak kundur', the dust of the olibanum and substance reserved for the Indian and Chinese market, whilst the finer qualities are assorted and exported from Bombay to Europe.[2] The 'kundur' is and was thus an article imported and subsequently re-exported. In Hindoo books the frankincense is always mentioned as a foreign production, and to this day the people in the bazaars of Western India tell you that it comes from Arabia. It is besides, very probable that nearly all that has been written about the medicinal properties of the Indian Olibanum Tree (*B. serrata*) refers to the imported olibanum. The Indian product is only slightly aromatic and, being consumed almost entirely in Central and Western India, is hardly if at all exported.

If the merchants of Arabia Felix were in need of greater supplies, they had only to cross the Red Sea, in order to find the aromatic product of several species of Frankincense-Trees. There is *Boswellia papyrifera* in Sennaar and Abyssina,[3] *Boswellia frereana* in Somaliland, which produces, besides, several varieties of *Boswellia carterii*.[4]

It is from these countries that the ancient Egyptians obtained their 'anti' (frankincense). Under the reign of Queen Hatespu a fleet of five ships was sent out to gather the treasures of that region. The successful expedition was represented afterwards on the walls of the temple of Deir-el-Bahari. The artist shows the transport and loading of the frankincense-trees. Thirty-one trees were dug out, put into baskets and brought to the ship.[5]

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[1] Colebrooke. On Olibanum or Frankincense. Asiatic Res. Calcutta, vol. 9, p. 377.
Cf. Roxburg. Fl. Ind. Serampore. 1832, II, 388.

[2] Watt. Commerc. Prod. of Ind. London, 1908, p. 174.

[3] A. Richard. Tentamen floræ abyssinicæ. Paris, 1851, vol. I, p. 148.

[4] Joret, C. Les plantes dans l'antiquité. Paris, 1897, vol. I, p. 356, 499.

[5] Naville, M. Egypt Exploration Fund, archæological report, 1894-95, p. 36—37.
Dümichen. Die Flotte einer aegyptischen Königin. pl. 3.
Maspero, G. Histoire ancienne des peuples de l'Orient. 1897, vol. 2, p. 247-253.
Loret, V. La flore pharaonique. 2nd ed. 1892, p. 96.

Some authors were of opinion that the frankincense-tree was also imported and cultivated in Palestine. They were misled by the words of the Canticles (IV, 6), "Till the day break, and the shadows retire, I will go to the mountain of myrrh, and to the hill of frankincense." But there is no reason why we should take these words verbatim and not rather consider them as poetical comparisons describing a delicious place filled with sweet and balmy perfumes.[1]

Pliny says that the kings of Asia planted frankincense-trees at Sardes[2]. It is, however, not very probable that the tree in question was a species of *Boswellia*, introduced either from Arabia, India, or Africa. There is a certain confusion in Pliny's description of this tree and it is, therefore, quite possible that the plantation at Sardes consisted of *Juniperus phœnicea* or *thurifera*. The gum of these trees, after a certain preparation, often went under the name of frankincense.

XV.—RHAMNACEÆ.

Trees or shrubs, erect or climbing, often armed with spinescent branches or stipular spines. Leaves simple, alternate, rarely opposite, usually coriaceous; stipules small or 0.

Flowers hermaphrodite or polygamous, green or yellow, small, usually axillary, solitary or variously fascicled. Inflorescence generally cymose. Sepals 4—5; lobes shortly triangular, erect or recurved, usually keeled within, valvate in bud. Petals 4—5, rarely 0, inserted at the mouth of the calyx-tube, or on the edge of the disk. Stamens 4—5, opposite to and inserted with the petals, often enclosed within their folds; anthers versatile, 2-celled. Disk fleshy and filling the calyx-tube, or thin and lining it, entire or lobed. Ovary sessile, free or immersed in the disk, wholly free from, or more or less adnate to the calyx-tube, 3-, rarely 2—4-celled; ovule 1, rarely 2 in each cell, erect, anatropous; style erect, short, usually 2—4-fid.

Fruit a drupe, or capsule, 1—4-celled. Seeds with fleshy albumen, rarely exalbuminous; embryo large, straight; cotyledons flat, fleshy; radicle inferior.

Genera 37; *species* about 420.

Distribution:—Temperate and tropical regions of the whole world.

1. Zizyphus Juss.

Shrubs or trees. Medullary rays numerous, very fine. Generally armed with stipular spines, which as a rule are unequal, one straight, the other

[1] Celsius, l. c. p. 242-243.

[2] Plinius, l. c. XII, 31.—Cf. Theophrastus, l. c. IX, 4.

curved. Leaves alternate, more or less distichous, with 3, rarely 4 or 5, basal nerves.

Flowers small, pentamerous, mostly bisexual, generally in axillary cymes. Calyx cup-shaped or broad-obconical, lobes keeled inside, petals sometimes wanting, disk lining the calyx-tube, edge free, pentagonous or 5-10-lobed. Ovary immersed in disk, and more or less confluent with it, 2-celled, rarely 3-or 4-celled; styles 2-3, free or partly connate.

Drupe as a rule fleshy; stone rugose or tuberculate, 1-3-celled, 1 seed in each cell; embryo in thin albumen, cotyledons thick, flat or convex, radicle short, inferior.

Species about 40.

Distribution:—Most species are Indo-Malayan, a few in Africa, America and Australia.

Leaves 1—3 inches long, crenate-serrate . . .	1. Z. spina Christi.
Leaves ½—1½ inches long obsoletely crenate . . .	2. Z. lotus.

1. Zizyphus spina Christi (Forsk.) Willd. Sp. Pl. I, 1105; DC. Prodr. II, 20; Boiss. Fl. Or. II, 13; Batt. et Trab Fl. d'Alg. p. 189; Oliv. Fl. trop. Afr. I, 380.

Rhamnus Spina Christi L. Sp. Pl. 282.

Rhamnus nabeca Forsk. Fl. Aeg.-Arab. p. 204.

Zizyphus africana Mill. n 4.

Zizyphus napeca Lam. Dict. III, 320 (non Roxb.).

Zizyphus jujuba Defl. Bull. Soc. Bot. France XXXII.

Arabic name:—Elb, elan, ssidr, arg.

Description:—A tree or shrub with white long flexuose or short imbricate branches. Leaves ovate, ovate-oblong or lanceolate, obtuse or acute, often mucronate, equal at the base, crenate-serrate, 1—3 inches long, glabrous or slightly pubescent beneath when young especially along the veins; petioles ½—1 inch long; stipular spines when present short, both or 1 only recurved.

Cymes pubescent, few- or many-flowered, sessile or on peduncles from a line to an inch or more in length. Flowers large for the genus. Calyx densely pubescent. Disk large, furnished with a fringe of hairs around the base of the styles. Styles united above the middle and then spreading, not recurved.

Drupe 2-celled, large, fleshy, spherical.

Locality:—Plain of Maala (Schweinf.); ravine west of the Tower of Silence, crater of the Shum Shum Range (Defl.); without locality (Balfour).

Distribution:—Senegambia, Niger, Algeria, Egypt, Libya, Nubia, Abyssinia, S. Arabia, Socotra.

Uses :—" Notwithstanding the hardness and length of the spines which grow on its branches, intermingled with its leaves, the camels, from the cartilaginous formation of their mouths, feed on both with much avidity, and without to appearance suffering any inconvenience. The fruit, of which they are equally fond, clusters in great abundance amidst its branches, and from its golden colour gives to the tree a rich and pleasing appearance ; the natives assert that it is produced at all seasons ; it resembles a cherry in form and size, and has a peculiar though mild and pleasant flavour. The Arabs pound them between two stones into a paste-like consistense, which they mix with ghee, and swallow with much apparent relish." (Wellsted in Journ. Roy. Geogr. Soc. V. (1835 151.)

See also : Ibn-el-Beithar, II, p. 238—239.

2. **Zizyphus lotus** Lam. Dict. III, 316 ; Anders. Journ. Linn. Soc. V, Suppl. p. 13 ; Batt. et Trab. Fl. d'Alg. II, 188.

Rhamnus lotus L. Sp. 281.

Description :—Small trees ; branches zigzag, slender, spinose ; bark whitish. Leaves 6 lines —1½ inches long, 4 lines—1 inch broad, ovate, three-nerved, obsoletely crenate, softly tomentose on the lower side ; petiole 6 lines long ; stipular spines unequal, the shorter one recurved, the longer one straight and longer than the petiole.

Flowers inconspicuous, 2 together in the axils of leaves ; peduncle much shorter than the petiole, deflexed. Ovary bilocular ; styles two.

Drupe solitary, subglobose, the size of a cherry.

Fruits :—Dec 1889 (Defl.).

Locality :—Aden (Hook., Birdw., Defl.).

Distribution :—Both shores of the Mediterranean, Palestine, Hadramaut.

XVI.—VITACEÆ.

Sarmentose or suberect shrubs with usually a copious watery juice ; stems and branches nodose. Leaves alternate, rarely opposite, simple or digitately or pedately 3—11-foliate, rarely pinnate.

Flowers regular, hermaphrodite, rarely unisexual, in cymes, racemes, panicles or thyrsi, usually opposite the leaves, peduncles often transformed into simple or compound tendrils. Calyx small, entire or 4—5-dentate or-lobed. Petals 4—5, free or variously cohering, valvate. Stamens 4—5, opposite to the petals, inserted outside and often between the lobes of a hypogynous disk ; filaments subulate ; anthers free or connate, 2-celled, introrse. Ovary usually sunk in the disk, 2—6-celled ; ovules 2, rarely 1, in each cell, ascending, anatropous ; raphe ventral ;

style simple, conical, subulate, or absent; stigma capitate or discoid, sublobate.

Fruit a berry, often watery; cells 1—2-seeded. Seeds rugulose, with a stony or crustaceous testa; embryo small, in a copious generally hard albumen; radicle inferior.

Genera 3, *species* about 500.

Distribution:— Tropical and temperate regions of the world.

1. Vitis Linn.

Shrubs with herbaceous, woody or succulent stems, usually sarmentose with copious tendrils, sometimes suberect. Leaves simple or compound.

Flowers umbellate, cymose, paniculate, racemose or spicate; peduncles leaf-opposed, rarely axillary, usually towards the ends of the branches. Calyx entire or 4—5-dentate or-lobed. Petals 4—5, free or calyptrately cohering at the apex. Disk various or obsolete. Stamens 4—5, inserted below the margin of the disk; anthers free. Ovary 2-celled, rarely 3—4-celled; ovules 2 in each cell.

Berry 1—2-celled; cells-1—2-seeded.

Species about 400.

Distribution:—Cosmopolitan.

1. Vitis quadrangularis Wall. Cat. 5992; W. & A. Prodr. 125; Wight Ic. t. 51; Brand. For. Fl. 100; Hook. Fl. Brit. Ind. I, 645; Oliver Fl. trop. Afr. I, 399; Cooke Fl. Bomb. Pres. I, 250.

Cissus edulis Dalz. in Hook. Lond. Journ. Bot. IX, 248; Dalz. and Gibs. Bomb. Fl. 40; Thw. Enum. 62.

Cissus quadrangularis Linn. Mant. 39; Roxb. Fl. Ind. I, 407; DC. Prodr. I, 628; Grah Cat. Bomb. Pl. 33; Dalz. and Gibs. Bomb. Fl. 39.

Sælanthus quadragonus Forsk. Descr. 33, t. 2.

Cissus tetraptera Hook. f. Fl. Nigrit. 263.

Cissus triandra
Cissus bifida } Schum. et Thonn. Guin. Pl. 81.

Arabic name:—Ssela.

Description:—Stem thick, wide-climbing, herbaceous, quadrangular, constricted at the nodes, the angles of the young branches winged; tendrils long, slender, simple. Leaves 1—2 inches long, broadly ovate or reniform, sometimes 3—7-lobed, denticulate, glabrous, cordate, rounded, truncate or cuneate at the base; petioles ¼—½ inch long; stipules small, broadly ovate, obtuse.

Flowers in shortly peduncled cymes, with spreading umbellate branches. Calyx cup-shaped, truncate, or obscurely lobed. Petals 4, ovate-oblong, hooded at the apex. Disk erect, 4-lobed.

Berry scarcely ¼ inch long, apiculate, red when ripe, 1-(rarely 2-) seeded.

Locality:—Aden (Birdwood, Lunt).

Distribution.—Senegambia, Nubia, Abyssinia, Angola, Zambesi-land, Arabia, throughout India, Ceylon, Java, Malay Archipelago.

XVII.—MORINGACEÆ.

Soft-wooded deciduous trees. Leaves alternate, impari-bi-or tripinnate, clustered at the end of the branches; pinnæ and leaflets opposite; leaflets quite entire, obovate, caducous, and as well as the pinnæ and pinnules, with glands at the base; no stipules.

Flowers large, hermaphrodite, irregular, in axillary panicles. Calyx 5-cleft, with a short, cup-shaped tube and unequal, imbricate, at length spreading or reflexed segments. Petals 5, upper smaller. Disk lining the calyx-tube. Stamens inserted on the free edge of disk, 5 perfect, opposite to petals, alternating with 5, sometimes 7 or 10, filaments without anthers; anthers dorsifixed, oblong, 1-celled. Ovary 1-celled, stipitate; style terminal, slender; ovules indefinite, anatropous, pendulous, biseriate, on 3 parietal placentas.

Capsule beaked, 3—6-angled, 1-celled, loculicidally 3-valved. Seeds numerous; albumen 0; testa corky, winged or not; embryo straight; cotyledons plano-convex; radicle very short, superior; plumule many-leaved.

Genus 1: species 3.

Distribution:—W. Asia and N. Africa.

1. Moringa Lam.

Character of the order.

1. Moringa aptera (Forsk.) Gaertn. Fructus II, 315; Anders. Journ. Linn. Soc. V, Suppl. p. 14; Boiss. Fl. Or. II, 22.

Moringa arabica Pers. Syn. I, 460.

Balanus myrepsica Belon Obs. p. 126.

Hyperanthera Forsk. Fl. Aeg.—Arab. p. 67.

Description.—A small tree, 10—12 feet high, bark cinereo-fuscous; branches divaricate; younger branches green. Rhachis 2—3-pinnate, 4—8-jugate, deflexed; leaflets ovate, obtuse, entire.

Panicles erect, axillary. Flowers herbaceous, glaucous, pedicellate; pedicels bracteolate, articulate. Calyx 5-partite; segments imbricate, subequal, oblong. Petals oblong-linear, reflexed, pale yellow, usually with carmine-red nervation. Stamens 10, unequal; filaments yellow; anthers unilocular.

Ovary free, stipitate, 3-sulcate.

Capsule obscurely trigonous, 3-valved, with the valves longitudinally bisulcate, 3-fastigiate, 8 inches to 1 foot long, deflexed. Seeds turbinate, trigonous, pendulous; testa crustaceous.

Flowers:—January 1880 (Balfour), March 1875 (Hildebr.), March 1878 (Perry), Dec. 1889 (Defl.).

Locality:—In rocky valleys near Steamer Point (Anders.); Steamer Point (Defl.); Goldmore Valley (Schweinf., Defl.); without locality (Balfour, Perry, Birdw, Marchesetti, Kuntze).

Distribution:—Upper Egypt, Abyssinia, Nubia, Eritrea, Kordofan, Sennaar, South Arabia, Syria.

Uses:—From the seeds a clear, limpid, almost colourless oil is easily extracted by pressure. Ben or Ban is the Arabic name for the oil. Commercially it is termed Ben Oil, and is highly valued as lubricant by watch-makers.

XVIII.—LEGUMINOSÆ.

Herbs, shrubs or trees. Leaves alternate with few exceptions, usually stipulate, compound; leaflets sometimes stipellate.

Inflorescence various. Calyx gamosepalous, 5-dentate or-lobed, or 2 or more teeth connate, rarely polysepalous. Corolla of 5, rarely fewer petals, usually irregular and imbricate in sub-orders 1 and 2, regular and valvate in 3. Stamens usually 10 or indefinite, perigynous or subhypogynous; anthers 2-celled. Pistil 1-carpellary; ovary free with 1 or more ovules on the ventral suture; style simple.

Fruit a legume dehiscing by both sutures, more rarely follicular or indehiscent. Seeds usually exalbuminous; cotyledons foliaceous or amygdaloid with a straight or inflexed accumbent radicle.

Genera about 400; *species* between 6,000—7,000.

Distribution:—Throughout the globe.

Sub-order 1. Papilionaceæ.

Herbs, shrubs or trees, sometimes scandent. Leaves alternate, digitate or pinnate, rarely 1-foliate or simple.

Flowers irregular. Calyx gamosepalous, 5-toothed or lobed, or 2 upper lobes more or less connate, or bilabiate, rarely closed in bud and spathaceous. Corolla papilionaceous; petals 5, free or adnate to the staminal tube, the posterior (standard) outside in bud, the 2 lateral (wings) intermediate, the 2 lower inside and usually cohering by their lower margins

(keel). Stamens 10, diadelphous, monadelphous or free. Ovary free; embryo usually with an inflexed radicle. Cotyledons accumbent.

Distribution:—All over the world.

Tribe 1. Genisteæ:—Stamens 10, monadelphous or diadelphous. Anthers usually of 2 kinds. Pod 2-valved, not articulated. Leaves simple or digitately trifoliate—

Tube of stamens slit along the top . . . . . 1. Crotalaria.
Tube of stamens not slit along the top . . . . 2. Argyrolobium.

Tribe 2. Trifolieæ:—Stamens diadelphous; filaments usually dilated at the apex. Pod usually dehiscent, not jointed.

Leaves pinnately 3-foliate. . . . . 3. Medicago.

Tribe 3. Galegeæ:—Stamens monadelphous or diadelphous; anthers usually uniform. Pods usually 2-valved, not articulated. Leaves imparipinnate, rarely simple entire—

a. Anthers apiculate. Hairs fixed by the centre . . . 4. Indigofera.
b. Anthers obtuse. Hairs basifixed.
*Flowers mostly in leaf opposed racemes . . . 5. Tephrosia.
**Flowers mostly in axillary racemes . . . . 6. Sesbania.

Tribe 4. Hedysareæ.—Stamens monadelphous or diadelphous, anthers dimorphous or uniform. Pods usually articulated. Leaves imparipinnate, rarely abruptly pinnate.

Not spinescent . . . . . 7. Taverniera.
Spinescent . . . . . 8. Alhagi.

Tribe 5. Phaseoleæ:—Stamens diadelphous or monadelphous. Anthers usually uniform. Pod 2-valved, not articulated. Scandent, rarely erect herbs.

Leaves pinnately 3-foliate . . . . . 9. Rhynchosia.

1. Crotalaria Linn.

Herbs or shrubs with simple or digitately trifoliate leaves. Flowers in racemes, terminal or leaf-opposed or rarely in the axils of the leaves. Calyx-tube short, of 5 distinct equal or subequal teeth. Petals subequal; standard orbicular or ovate with a short claw; keel rostrate, upcurved. Stamens monadelphous (diadelphous in *C. Schweinfurthii* Defl.); anthers dimorphous. Ovary sessile or stalked, bi-or many-ovulate; style abruptly bent upwards near the base, bearded along the inner side.

Pod straight, linear-oblong, turgid or inflated (not inflated in *C. leptocarpa* Balf.), continuous within.

Species over 350.

Distribution :—Tropical and subtropical regions.

Stamens monadelphous.
- Pod inflated—
  - Pod 8-10 lines long, silky . . . . . 1. C. lupinoides.
  - Pod 1½—2 inches long, glabrous . . . . . 4. C. striata.
  - Pod 1—1½ inches long . . . . . 5. C. falcata.[1]
- Pod not inflated . . . . . 2. C. leptocarpa.

Stamens diadelphous . . . . . 3. C. Schweinfurthii.

1. Crotalaria lupinoides Hochst. in Herb. Kotschy Pl. Nub. n. 41; Benth. Lond. Journ. Bot. II, 583.

Description :—Suffruticose ; branches spreading, curved, upper part thinly silky. No stipules. Petioles about 1 inch long, glabrous. Leaflets 3, subsessile, oblong-obovate, central one 1—1½ by ½—¾ inch, upper surface glabrous, the lower thinly silky.

Flowers in elongate many-flowered, lax, stalked, terminal and lateral racemes, the main ones ultimately 8—12 inches long. Bracts very small, setaceous. Pedicels silky, cernuous, ⅛ inch long. Calyx slightly silky, 2—3 lines deep, teeth lanceolate, reaching about half way down. Corolla bright yellow, ½ inch deep.

Pod short-stalked, cylindrical, much curved upwards, 8—10 lines long, under ¼ inch thick, silky on the outside, filled within with fine silky hairs.

The seeds usually remain undeveloped. Schweinfurth found ripe seeds only in one case, *viz.*, on specimens which he collected on the left side of the Nile at Dar Matamma (Nubia). The seeds were 3.5 mm. long and 2·5—3 mm. broad, oval to triangular, shining, not smooth, leather-yellow.

Flowers and *fruits* :—December and March (Schweinf.).

Locality :—Wadi Maala (Schweinf.), ravine south-west of the Tower of Silence (Defl.), on the way from Aden to the Shum Shum Range at a height of about 500 feet (Busse) ; without locality (Birdw.).

Distribution :—Upper Egypt, Nubia, Eritrea, Kordofan, Yemen.

2. Crotalaria leptocarpa Balf. f. Proceed. Roy. Soc. Edinb. XXXI, 66, tab. XIV, A.

Crotalaria dubia Balf. f. Proceed. Roy. Soc. Edinb. XI, 508 (non Graham).

Description :—A low herb, stem woody, short, subterraneous ; branches subfiliform, numerous, with long internodes, wide-patent, often 1½ feet long, decumbent. Leaves palmately trifoliate, petiolate, villous at the

[1] *C. falcata* is distinguished from *C. striata* by being more shrubby, having shorter petioles, smaller flowers, and broader leaflets.

base; petiole $\frac{1}{4}$—$\frac{1}{2}$ inch long; leaflets usually linear-lanceolate, acuminate, $\frac{1}{2}$—$1\frac{1}{3}$ inches long, but varying to obovate mucronate and only $\frac{1}{5}$ inch long and $\frac{1}{8}$ inch broad, all sessile or subsessile, strigose, the central one longer; stipules minute, subulate. Racemes elongate, terminal, few-flowered, with internodes measuring $\frac{3}{4}$—1 inch; bracteoles very minute; pedicels capillary, $\frac{1}{6}$ inch long. Calyx $\frac{1}{5}$ inch long, externally clothed with appressed, short, pilose hairs; segments narrow, acuminate, $\frac{1}{6}$ inch long, the upper one broader. Corolla yellow, long-exserted; vexillum suborbicular, mucronate, $\frac{3}{10}$ inch long; keel ciliate on the lower margin. Filaments alternately dilate above and united into a tube. Ovary stipitate; style incurved, $\frac{1}{8}$ inch long; stigma more or less distinctly bilobed, each lobe being flattened.

Pod shortly stipitate, obliquely oblong, compressed, membranous, venulose, pubescent, not inflated. Seeds 12 (in Balfour's specimens).

Flowers and *fruits* :—March (Schweinf.).

Locality :—Plain of Maala, together with other small herbs between shrubs of *Acacia* on rocky hills (Schweinf.); Koosaf Valley, ravine of the Jebel Ihsan on Little Aden (Defl.); without locality (Birdw.).

Distribution :—Socotra, Somali-coast at Bulkar.

Note :—"This plant, which in its general habit and structure is thoroughly Crotalarioid, differs so decidedly from the type of the genus that it is with difficulty one can include it as a species. The fruit is not at all inflated or tumid, and the valves are quite thin and membranous with beautiful veining. In addition, there is a divergent character in the stigma, which [in the Socotran plant] is distinctly two-lobed, each lobe being flattened and pointed. But if we exclude the plant from this genus, I can find no other in which to place it, and the characters are perhaps hardly sufficient to warrant at present the creation of a new genus" Balfour, Botany of Socotra, p. 67.

3. Crotalaria Schweinfurthii Defl. Bull. Soc. Bot. France XXXII, 348.

Description :—A low shrubby plant, $1\frac{1}{2}$ feet high or less, silky all over, much branching from the base; branches erect, unarmed. Leaves few, sessile, exstipulate, digitately trifoliate; leaflets small, 3—4 lines long, $\frac{1}{2}$ line broad, all of the same size, obovate-cuneate.

Flowers sessile, solitary. Calyx canescent; teeth linear-lanceolate, 2 lines long, 3—4 times as long as the tube. Corolla white; vexillum $1\frac{3}{4}$ lines long, undulate; keel purpurascent at the apex; rostrum falcate. Stamens diadelphous (!). Ovary 2—3-ovulate, glabrous; style glabrous, geniculate at the base.

Pod ovoid, 2 lines long, ¾ line broad, shortly stipitate, slightly shorter than the calyx. Seeds exarillate, subglobose, smooth.

This species is nearly allied to *C. microphylla* Vahl, but differs from it by the leaves being sessile, by the falcate rostrum and by the few-ovulate ovary.

Flowers :—From March to April (Defl.).

Locality :—Goldmore Valley, Crater of the Shum Shum Range on débris at the entrance of the Koosaf Valley (Defl.). Rare.

Endemic in Aden.

4. Crotalaria striata DC. Prodr. II (1825) p. 131 ; Bot. Magaz. t. 3200 ; Hook. Fl. Brit. Ind. II, 84 ; Oliver Fl. trop. Afr. II, 38 ; Harvey and Sonder Fl. Cap. II, 44; Trim. Fl. Ceyl. II, 18; Cooke Fl. Bomb. Pres. I, 303.

Crotalaria Brownei Reich. Icon. Exot. t. 232 ; DC. Prod. II, 130.

Crotalaria Hookeri Arn. in Ann. Sc. Nat. ser. 2, III, 248.

Crotalaria pisiformis Guill. & Per. Fl. Seneg. 162.

Crotalaria fertilis Delile in Ferr. & Gall. Voy. Abyss. 122, t. 11.

Crotalaria latifolia Hort. Calc.

Crotalaria pallida Klotzsch in Peters. Mossamb. Bot. 57.

Description :—Herbaceous or suffruticose, erect, divaricately branched; branches angular and striate, thinly canescent, the very young ones silky; stipules minute, deciduous or none. Leaves membranous; petioles 1½—3 inches long, stout, slightly pubescent. Leaflets 2—3 by 1— 1½ inches, elliptic, obtuse or acute, sometimes emarginate, glabrous above, minutely puberulous and glaucous beneath.

Flowers numerous, in erect terminal and lateral elongate spikate 20-50 flowered racemes which sometimes reach 1 foot long ; pedicels very short; bracts setaceous, minute. Calyx ¼ inch long, slightly pubescent outside; teeth as long as the tube, lanceolate. Corolla dull yellow, veined with purple, twice as long as the calyx.

Pods 1½—2 inches long, much deflexed, oblong, cylindric, glabrous; shortly stalked. Seeds 20—30, dark brown.

Locality :—Aden (Perry, Lunt).

Distribution :—Throughout the tropics of both hemispheres.

5. Crotalaria falcata Vahl ex DC. Prodr. II, 132; Benth. in London Journ. Bot. II, 585 ; Baker in Fl. trop. Afr II, 40.

Crotalaria striata Schum. et Thon. Pl. Guin., non DC.

Description :—Stem fruticose, 2—3 feet high, diffusely and divaricately branched, slightly silky upwards. Stipules none. Petioles 1 inch long.

Leaflets 3, obovate, subsessile, central 1—1½ inches long, 1¾—1 inch broad, apex rounded, mucronate, upper surface glabrous, lower slightly silky in the young plant.

Flowers in long-stalked lax terminal and lateral racemes. Bracts minute. Pedicels 1 line long, silky, erecto-patent. Calyx slightly silky, ¼ inch long, the teeth lanceolate, reaching about halfway down. Corolla yellow, rather more than twice as long as the calyx, keel much upcurved.

Pod sessile, cylindrical, 1—1½ inches long, ¾ inch thick, very silky when young, 15—20-seeded.

Locality :—Aden (Playfair in Herb. Calc. ex nota Kew.).

Distribution :—Upper Guinea : Niger country.

2. Argyrolobium Eckl. et. Zeyh.

Undershrubs or herbs with digitately trifoliate leaves. Stipules free.

Flowers in racemes or umbels. Calyx deeply bilabiate. Corolla scarcely exserted ; standard suborbicular, wings free, keel slightly upcurved, not rostrate. Filaments usually but not invariably united downwards in a closed tube. Ovary sessile, linear, ∞-ovulate ; style upcurved ; stigma terminal, often oblique.

Pod linear, flattened, faintly torulose.

Species about 50.

Distribution :—Chiefly S. Africa, but also India, Siberia, Central Europe.

Flowers yellow	1. A. arabicum.
Flowers rose-coloured or purplish	2. A. roseum.

1. Argyrolobium arabicum Jaub. et Spach. Ill. Pl. Or. I, 115 ; Anders. Journ. Linn. Soc. V, Suppl. p. 15 ; Boiss. Diag. Pl. Or. ser. I, II, 13.

Cytisus arabicus Dcne. Ann. Sc. Nat. ser. II, IV, 78.

Description :—A diffuse, much-branched, silky-pilose undershrub ; branches slender, terete, hairs adpressed. Leaves trifoliate ; petiole 4—6 lines long ; leaflets 2—6 lines long, usually linear, narrow, often ovate, with the margin revolute.

Flowers pedunculate, shorter than the petioles, two together ; peduncles axillary, bracteolate ; bracteoles small, lanceolate. Calyx silky with adpressed hairs ; segments lanceolate, oblong, acute. Corolla yellow, glabrous, longer than the calyx, 3 lines long ; standard suborbicular, emarginate ; wings cultriform, obtuse ; stamens 10, monadelphous ; style filiform, persistent, glabrous.

Pod $1\frac{1}{2}$ inches long, 1 line broad, linear, strigose, undulate, rostrate acuminate with the persistent style, surrounded at the base by the persistent calyx. Seeds 6—10, lenticular.

Flowers :—March (Schweinf.) ; October (Marchesetti).

Locality :—Plain of Maala, on gravelly ground and volcanic débris (Schweinf.); Goldmore Valley (Defl.) ; great valley between Steamer Point and town (Marchesetti) ; slope of Shum Shum Range (Ellenbeck, ex Krause).

Distribution :—Yemen, Island of Neymen in the Red Sea.

Note :—There are some specimens from Aden in Herb. Kew, named *Argyrolobium arabicum* Jaub. et Spach, which cannot belong to this species, the pod being quite different from that of the typical plant of Jaub. et Spach. One was collected by Perry in March 1878 and the other by Beevor in November 1884. In the same way we do not think that Hooker's and Thomson's specimens (December 1847 and February 1851) are identical with the type of Jaub. et Spach.

2. **Argyrolobium roseum** Jaub. & Spach, Illustr. I (1842) 116; Hook. Fl. Brit. Ind. II, 64; Ait. Pb. and Sind Pl. 38 ; Cooke Fl. Bomb. Pres. I, 289.

Cytisus roseus Camb. in Jacq. Voy. Bot. IV, 35, t. 40.

Argyrolobium ornithopodioides Jaub. & Spach in Ann. Sc. Nat. ser. 2, XIX, 51 ; Illustr. Pl. Or. I, 116.

Argyrolobium Kotschyi Boiss. Diagn. VI, 32.

Description :—A small diffuse annual ; stems many from the root, reaching 6 inches long, very slender, terete, clothed with short appressed silky hairs. Leaves 3-foliolate ; petioles $\frac{3}{16}$—$\frac{3}{8}$ inch long, silky ; stipules minute, triangular, acute, persistent. Leaflets $\frac{1}{4}$—$\frac{3}{8}$ by $\frac{3}{16}$—$\frac{1}{4}$ inch broadly obovate-cuneate, occasionally retuse (the lateral leaflets more or less oblique), silky on both sides with appressed hairs ; petiolules very short.

Peduncles reaching 1—2 inches long, very slender, 1—4-flowered. Calyx pubescent outside ; upper lip shorter than the lower ; teeth all triangular, acute. Corolla rose-coloured or purplish ; standard longer than the upper lip of the calyx.

Pods $\frac{1}{2}$—$\frac{3}{4}$ inch long by $\frac{3}{4}$ inch broad, silky pubescent. Seeds 10—15.

Locality :—Aden (Perry, Lunt).

Distribution :—Tropical and subtropical tracts of the north-west of India, ascending from the plains to 7,000 feet in Kumaon, Sind, Baluchistan, Persia, Aden.

3. Medicago Linn.

Herbs, rarely shrubs. Leaves pinnately 3-foliate ; stipules adnate to the petiole ; leaflets toothed.

Calyx-tube campanulate; teeth 5, subequal. Corolla free from the staminal tube; standard obovate or oblong, contracted at the base, subsessile; wings oblong; keel shorter than the wings, obtuse. Stamens diadelphous; filaments not dilated at the apex; anthers uniform. Ovary sessile, usually many-ovulate; style subulate, glabrous; stigma oblique. Pod spirally twisted (rarely falcate), reticulately veined, scarcely dehiscent.

Species about 40.

Distribution :—Europe, W. Asia, N. Africa.

The following species is cultivated at Shaikh Othman:

1. Medicago sativa Linn.

English name :—Lucern.

Perhaps only a variety of *Medicago falcata* Linn. produced by cultivation. The flowers are almost always violet, purple, or blue, and the pod is spirally twisted so as to form 2, or sometimes 3, complete rings or coils.

4. Indigofera Linn.

Herbs, shrubs or undershrubs of very various habit, more or less clothed with appressed silky hairs. Leaves imparipinnate or simple; stipules usually small, setaceous.

Flowers in axillary racemes or spikes. Calyx minute; teeth subequal or the lowest longest. Corolla usually rosy or purple; standard ovate or orbicular, sessile or clawed; wings oblong, adhering a little to the keel; keel obtuse or acuminate, gibbous or spurred on both sides. Stamens diadelphous; anthers uniform, apiculate. Ovary sessile or nearly so, usually many-ovulate; style glabrous; stigma capitate, often penicillate.

Pod linear or oblong, rarely globose, septate between the seeds.

Species about 300.

Distribution :—Warmer regions of both hemispheres, abundant Southern and Tropical Africa.

Flowers in lax, 6-12-flowered racemes	2. I. parvula.
Flowers in many-flowered racemes—	
Leaflets 3	6 I. leptocarpa.
Leaflets 3-5—	
Pod 6-8-seeded	1. I. paucifolia.
Pod 2-4-seeded	3. I. semitrijuga.
Pod 4-5-seeded	4. I. arabica.
Leaflets usually 3-7	5. I. argentea.
Flowers in dense sessile heads of 12-20 flowers . .	7 I. trigonelloides.

1. Indigofera paucifolia (Forsk.) Del. Fl. d' Eg. p. 127, tab. 37, fig. 2; DC. Prodr. II, 224; Boiss. Fl. Or. II, 190; Hook. Fl. Brit. Ind. II, 97; Oliv. Fl. trop. Afr. II, 88.

Indigofera erythrantha Hochst. in Schimp. Hb. Abyss. n. 2178.

Indigofera oblongifolia Forsk. Fl. Aeg.-Arab. p. 137.

Indigofera argentea Roxb. Fl. Brit. Ind. III, 374.

Indigofera heterophylla Roxb. mss.

Arabic name :—Hassar.

Description :—A suberect shrub, 4-8 feet high; branches numerous, stout, woody, argenteo-canescent. Leaves imparipinnate; stipules $\frac{1}{8}$ inch long, lanceolate, acuminate. Leaflets 3-5, alternate, $\frac{5}{8}$-1 by $\frac{1}{4}$-$\frac{1}{2}$ inch, oblanceolate or elliptic-oblong, more or less hairy above, hoary with dense white hairs beneath, base acute.

Flowers small, in long spiked 20-50-flowered racemes; pedicels short. Calyx $\frac{1}{12}$ inch long, silvery outside; teeth as long as the tube, triangular, acute. Corolla red, thrice the calyx.

Pods 6-9 lines long, slightly curved outwards, torulose. Seeds 6-8, oblong, obtusely 4-gonous, truncate at one end.

Flowers :—August 1898 (Birdw.).

Locality:—Aden (Birdw.); Little Aden in a ravine of Jebel Ihsan (Defl.); near Shaikh Othman (Ellenbeck, Busse).

Distribution :—Java, Ceylon, India, Baluchistan, Arabia, Abyssinia, Nubia, Kordofan, Socotra, Senegambia.

var. **carpostigma** Schweinf. Bull. Herb. Boiss. 1896, App. II, 240.

This variety differs from the type by the pods being very much constricted between the seeds; the leaves are 1-2-foliolate. There is no similar form in Arabia, Nubia or Egypt.

Fruits :—In November (Schweinf.).

Locality :—Plain of Maala (Schweinf.).

2. Indigofera parvula Del. in Caill. Voy. 38, t. 3, fig. 1.

Description :—Stem 6-9 inches long, suffruticose, trailing, copiously and diffusely branched from the base; the branches slender, firm, terete thinly silky. Stipules large, ovate-acuminate, persistent, slightly adnate to the petiole. Leaflets 3, obovate, mucronate, $\frac{1}{8}$ inch long, silky.

Flowers in lax clusters of 2-6; peduncles about $\frac{1}{4}$ inch long. Calyx thinly silky, the lower teeth lanceolate. Corolla twice as long as the calyx.

Pod spreading, linear, mucronate, $\frac{1}{2}$ inch long, 1 line thick, silky, nearly terete, 5-6-seeded.

Fruits :—August 1898 (Birdw.).

Locality :—Aden (Birdw.).
Distribution :—Abyssinia, Nubia.

3. Indigofera semitrijuga Forsk. Fl. Aeg.-Arab. p. 137; DC. Prodr. II, 230; Boiss. Fl. Or. Suppl. p. 172; Hook. Fl. Brit. Ind. II, 98; Oliv. Fl. trop. Afr. II, 93.

Indigofera Burmannii Boiss. Fl. Or. II, 189 et Suppl. p. 172.

Indigofera somalensis Vatke Oesterr. Bot. Zeitschr. XXVI, 201.

Description :—Stem fruticose, 1 foot or more, diffusely branched from the base; the branches erecto-patent, firm, terete, glaucous-silvery. Stipules setaceous. Petioles ½ inch long. Leaves ½ inch long and more, usually with 3 pairs of close sessile obovate leaflets; leaflets 1½—2 lines long, the terminal one stalked, base cuneate, apex rounded, mucronate, texture firm, both sides silvery.

Racemes short-stalked, lax, of 6-12 flowers. Calyx silky, 1 line deep, lower teeth linear, reaching halfway down, the other shorter. Corolla more than twice the calyx, silvery on the outside.

Pods spreading, linear-mucronate, ⅜ inch long, finely silky, 2-4-seeded.

Fruits :—December (Schweinf.); August 1898 (Birdw.).

On the south coast of Arabia it flowers in April and fruits in March.

Locality :—Wadi Maala (Schweinf.); Goldmore Valley, promontory of Marshag, Little Aden in the plain between Jebel Ihsan and Jebel Muzulghum (Defl.); without locality (Birdw.).

Distribution :—Upper Egypt, Nubia, Abyssinia, Kordofan, Sennaar, highlands of Somaliland, Eritrea, S. Arabia, Sind.

4. Indigofera arabica Jaub. et Spach Ill. Pl. Or. V, 89, tab. 479; Anders. Journ. Linn. Soc. V, Suppl. p. 15.

Description :—Stem more or less woody below, diffusely branched from the base; young branches angular, silky. Stipules setaceous. Petioles very short. Leaflets 3-5, obovate or oblanceolate, ¼-¾ inch long, 2-3 lines broad, lateral ones sessile and close, all often folded with a decurved point, both sides silvery.

Racemes short, close, of 6-10 flowers. Flowers nearly sessile in the axils of the leaves. Calyx campanulate, silvery, teeth subequal, setaceous. Corolla scarlet, nearly twice the calyx, externally silvery.

Pod ¼-⅜ inch long, 1 line broad, linear-oblong, mucronate, slightly silvery, 4-5- seeded.

Fruits : Dec. 1847 (Hook.).

Locality :—On rocks (Hook.); without locality (Birdw.).

Distribution :—Yemen, Hadramaut, White Nile.

Note:—Jaub. and Spach describe the plant as being sometimes 1 foot long. It seems, however, that the Aden specimens are stunted and much smaller, not exceeding 5 inches.

5. **Indigofera argentea** L. Mant. II, 243 (non Roxb.); DC. Prodr. II, 224; Boiss. Fl. Or. II, 190; Hook. Fl. Brit. Ind. II, 98; Oliv. Fl. trop. Afr. II, 97; A. Terrac. Fl. d' Anfilha p. 23.

Indigofera glauca Lam. Encycl. III, 246.

Indigofera articulata Gouan Ill. et Observ. p. 49.

Indigofera cœrulea Roxb. Fl. Ind. III, 337.

Indigofera tinctoria Forsk. Fl. Aeg.-Arab. p. 138.

Arabic Name:—Houer.

Description:—A copiously branched shrub, 2-3 feet high. Branches deeply sulcate, silky. Leaves 1-2 inches long; petioles $\frac{1}{4}$-$\frac{1}{2}$ inch long; stipules minute, subulate. Leaflets 3-7, $\frac{1}{2}$—1 by $\frac{3}{8}$-$\frac{5}{8}$ inch, obovate, rounded and apiculate at the apex, argenteo-canescent on both sides, turning blackish when dried.

Flowers in short-peduncled or subsessile racemes of 10-20 flowers; pedicels short, slender. Calyx $\frac{1}{16}$ inch long, silvery-hairy; teeth triangular, acute, rather shorter than the tube. Corolla yellow, $\frac{1}{6}$ inch long; standard pubescent on the back.

Pods $\frac{3}{8}$ inch long, thick, turgid, recurved, shortly mucronate, torulose. Seeds 2-4, commonly 3.

Flowers and *fruits* in Yemen in January and February, on the south coast of Arabia in April (Schweinf.).

Locality:—Top of the Shum Shum Range (Schweinf.); Goldmore Valley (Defl.); without locality (Birdw.).

Distribution:—Egypt, Nubia, Abyssinia, Eritrea, Kordofan, Socotra, S. Arabia, Sind, W. India.

6. **Indigofera leptocarpa** Hochst. et Steud. in Schimp. Pl. Arab. n. 731; Balf. Proc. Roy. Soc. Edinb. XI, 510; Bot. of Socotra 74.

Indigofera tenuisiliqua Schweinf. Bull. Herb. Boiss 1894, App. II, 241.

Description:—A low rigid herb, strigose, canescent, much branched. Branches with long internodes, wide-patent, decumbent, subfastigiate, subcompressed, angular. Leaves $\frac{1}{4}$ — $\frac{5}{12}$ inch long, trifoliate, petiolate; petiole $\frac{1}{12}$ — $\frac{1}{9}$ inch long; leaflets all sessile, ovate, or elliptic acute, or obtuse, rigidly strigose. Stipules $\frac{1}{8}$ inch long.

Racemes about 5 inches long, flowers disposed towards the apex, pedicels $\frac{1}{12}$ inch long, bracteoles setiform. Calyx $\frac{1}{9}$ inch long; lobes

acute, the upper one as long as the tube, the others shorter. Corolla small; vexillum $\frac{1}{6}$ inch long, obovate, unguiculate, slightly longer than the keel. Ovary as long as the stout style.

Pod $\frac{2}{3}-1\frac{1}{2}$ inches long, $\frac{1}{12}$ inch broad, linear, strigose, $6-8-\infty$-seeded.

Locality:—Little Aden, plain between Jebel Ihsan and Jebel Muzulghum (Defl.).

Distribution:—Nubia, Eritrea, Central and Southern Arabia, Socotra.

7. Indigofera trigonelloides Jaub. et Spach Illustr. V (1857) 92, t. 482; Hook. Fl. Brit. Ind. II, 94; Cooke Fl. Bomb. Pres. I, 312.

Indigofera asperifolia Hochst. in Schimp. Pl. Abyss. No. 2272.

Indigofera æruginis Schweinf. Fl. Aethiop. 11.

Description:—An annual, densely silvery; stems many, caespitose, trailing, much-branched, 6-15 inches long, trigonous, clothed with appressed silvery hairs and a few spreading ones. Leaves 5-7-foliate; petioles $\frac{3}{16}-\frac{3}{8}$ inch long, hairy; stipules linear, acute, hairy. Leaflets alternate, $\frac{1}{4}-\frac{3}{8}$ by $\frac{1}{8}-\frac{3}{16}$ inch, oblanceolate or elliptic, rounded at the apex, densely clothed on both sides with silvery appressed hairs, base acute, petiolules of the lateral leaflets $0-\frac{1}{16}$ inch, those of the terminal leaflets $\frac{1}{8}$ inch long.

Flowers in dense sessile villous heads, each consisting of $12-20$ sessile flowers; bract minute, ovate-lanceolate, acute, hairy. Calyx $\frac{1}{8}-\frac{3}{16}$ inch long; teeth long, linear, acute, hairy. Corolla red, scarcely exserted.

Pods $\frac{1}{4}$ inch long, linear-cylindric, straight, silvery-hairy, torulose, seeds $3-4$.

Locality:—Aden (Perry).

Distribution:—Punjab, Afghanistan, Sind, Aden, Abyssinia.

5. Tephrosia Pers.

Undershrubs or herbs. Leaves usually imparipinnate, sometimes digitate or simple, stipulate. Leaflets opposite, usually numerous, parallel-veined, often silky beneath.

Calyx-teeth subequal or the 2 upper more deeply connate, or the lower longer. Petals clawed; standard suborbicular, wings obliquely obovate or oblong, keel incurved, obtuse or subacute. Upper stamen free to the base or middle, anthers uniform. Ovary sessile; ovules

usually many; style incurved, often flattened, glabrous or bearded; stigma terminal.

Pod usually linear, flattened, many-seeded, 2-valved. Seeds sometimes with a small strophiole.

Species about 100.

Distribution:—Tropics of both hemispheres.

Pod 5 — 12-seeded	1. Tephrosia apollinea.
Pod 1-seeded	2. Tephrosia pogonostigma.

1. Tephrosia apollinea Link. Enum. Hort. Berol. II, 252; DC. Prodr. II, 254; Boiss. Fl. Or. II, 192; Anders. Journ. Linn. Soc. V, Suppl. p. 16; Oliv. Fl. trop. Afr. II, 126.

Galega apollinea Del. Fl. d'Eg. p. 144, tab. 53, fig. 5.

Arabic name:—Obēira.

Description:—Stems suffruticose, 12—18 inches high, diffusely branched from the base, branches glabrous or sparsely hairy. Leaves $1\frac{1}{2}-2\frac{1}{2}$ inches long, petioles $\frac{1}{4}-\frac{1}{2}$ inch long; stipules linear, $\frac{1}{8}-\frac{1}{6}$ inch long. Leaflets in 2—4 pairs, oblong or oblanceolate, emarginate, mucronate, glabrous above, more or less silky beneath.

Flowers in leaf-opposed lax 6—12-flowered racemes, pedicels $\frac{1}{8}$ inch long; bracts rigid, subulate. Calyx $\frac{1}{6}$ inch long, silky; teeth triangular, acute, equalling the tube. Corolla purple, twice the calyx. Style glabrous; stigma penicillate.

Pods $1\frac{1}{2}-3$ inches long, 2—3 lines broad, curved upwards, mucronate appressedly thinly hairy, 5—12-seeded.

Fruits in Aden in November; *flowers* and *fruits* in Yemen in January (Schweinf.).

Locality:—Goldmore Valley (Defl.); plain of Maala (Schweinf.); without locality (Hook., Birdw.).

Near Shaikh Othman (Ellenbeck, Busse).

Distribution:—Upper Egypt, Nubia, Libya, Abyssinia, highlands of Somaliland, Socotra, S. Arabia.

2. Tephrosia pogonostigma (Steud.) Boiss. Fl. Or. II, 193.

Tephrosia Arabica Steud. Nomencl. Bot. ed. 2, II, 666.

Pogonostigma arabicum Boiss. Diag. Pl. Or. ser. I, II, 39; Anders. Journ. Linn. Soc. V, Suppl. p. 16.

Psoralea arabica Hochst. in Schimp. Pl. Arab. n. 775.

Catacline sericea Edgew. Journ. As. Soc. Beng. vol. 16, p. 1214.

Description :—An undershrub, 1—2 feet high, silky-tomentose, branches ascending. Leaves ½—1½ inches long, petiolate, stipulate, usually bijugate; leaflets 2—6 lines long, opposite, linear-oblong or anceolate, mucronate, softly pubescent on the upper side, silky-tomentose on the lower.

Racemes elongate, subaphyllous. Flowers solitary or 2 together, pedicel 1—2 lines long. Calyx silky; segments subulate, acute. Corolla longer than the calyx; vexillum purple, silky-hirsute on the outer side.

Pod suborbicular, acute, long-apiculate with the persistent style, 1-seeded. Seed olivaceous, 1½ lines long.

Flowers :—December 1889 (Defl.), January 1880 (Balfour), March 1850 (Madden), March 1878 (Perry), April 1894 (Lunt), August 1898 (Birdw.).

Fruits :—December 1889 (Defl.), January 1880 (Balfour), February 1851 (Thomson), March 1850 (Madden), March 1878 (Perry), April 1894 (Lunt), June 1872 (Hildebr.), August 1894 (Birdw.), November 1888 (Schweinf.).

Locality :—Goldmore Valley, plentiful not far from the sea (Schweinf.); Koosaf Valley (Defl.); gravelly slope of Shum Shum Range (Ellenbeck); Aden port, nearly sea level (Lunt); without locality (Edgew., Madden, Hooker, Thomson, Anderson, Hildebrandt, Balfour, Perry, Birdw.).

Distribution :—Yemen, Eritrea.

6. Sesbania Scop.

Herbs or soft-wooded trees or shrubs. Leaves abruptly pinnate, leaflets numerous, linear-oblong, obtuse, quite entire, mucronate, deciduous.

Flowers in axillary lax racemes. Calyx campanulate, shallowly 2-lipped or 5-toothed. Corolla much exserted; petals all with long claws; standard orbicular, or ovate, spreading or reflexed; wings falcate-oblong; keel obtuse and straight, or subrostrate and recurved. Stamens diadelphous, anthers uniform. Ovary usually stalked, many-ovulate, style incurved, glabrous, stigma small capitate.

Pod very long and narrow, dehiscent, septate transversely between the seeds. Seeds numerous, oblong or subquadrate.

Species about 40.

Distribution :—Throughout the tropics.

The following tree is planted for ornament in the village of Shaikh Othman:

1. Sesbania grandiflora Pers. Syn. II (1807) 316; Bedd. Fl. Sylv. 86; Brand For. Fl. 137; Hook. Fl. Brit. Ind. II, 115.

Aeschynomene grandiflora Linn. Sp. 1050; Roxb. Fl. Ind. III, 331.

Agati grandiflora Desv. Journ. Bot. I (1813) 120.

Coronilla grandiflora Willd. Sp. III, 1145.

Description :—A short-lived soft wooded tree, 20-30 feet high, with virgate terete branches; leaves ½ — 1 foot long; leaflets 41 – 61, linear-oblong, pale green, glabrous.

Flowers 2—4 in short axillary racemes. Calyx 1 inch deep, glabrous, shallowly 2-lipped. Corolla 3—4 inches deep and very showy, white or red.

Pod 1 foot long more or less, not torulose, the sutures much thickened.

Flowers :—December (Deflers, Schweinf.).

Distribution :—Mauritius to North Australia, but often cultivated.

7. Taverniera DC.

Shrubs with fleshy-herbaceous, simple or piannately 3-foliate leaves; stipules scarious. Leaflets usually obovate or orbicular, exstipellate.

Flowers in axillary lax racemes. Calyx with a campanulate tube and 5 sub-equal teeth. Corolla much exserted, standard broadly-obovate, narrowed at the base; wings small, keel about equal to the standard, obliquely truncate at the apex. Upper stamen free at the base or altogether; anthers uniform. Ovary stalked, 1—3 ovulate, style filiform, inflexed, stigma terminal.

Pod of 1—3 flattened indehiscent muricated joints. Seeds reniform.

Species about 8.

Distribution :—Egypt, Abyssinia, Arabia, N.-W. and W. India.

Racemes 5—10-flowered	1. T. glauca.
Racemes 2—6-flowered	2. T. Schimperi.

1. Taverniera glauca Edgew. Journ. Asiat. Soc. Beng. XVI, 1214; Anders. Journ. Linn. Soc. V, Suppl. p. 17.

Description :—A glabrous shrub. Leaves unifoliate, fleshy, glabrous, glaucous, rhomboid-ovate, suborbicular, emucronate; stipules 2, small, scarious, cuneate, acute.

Racemes 5 — 10-flowered; bracts shorter than the pedicels, acute, with membranous margins. Vexillum large, concave, subcarinate, shortly emarginate and callous-mucronulate; wings narrow, falcate, elliptic, truncate-auriculate at the base, with a short thin claw much

shorter than the vexillum; keel larger than the vexillum, obtuse Stamens geniculate at the apex, alternately larger and shorter. Style long, tortuose-geniculate at the base, filiform; stigma apical, punctiform.

Pod 2-articulate, hispid with setaceous hairs.

Flowers:—January 1856 (Edgeworth), January 1880 (Balfour), April 1894 (Lunt), November (Schweinf.), November 1884 (Beevor).

Fruits:—March and November (Schweinf.).

Locality:—Goldmore Valley, above the coal-depôt of the Messag. Marit. (Schweiuf.); plain of Maala, Biggari Valley (Defl.); on gravelly ground of the Shum Shum Range (Ellenbeck); Aden port, 100 feet high (Lunt); without locality (Edgew., Balfour, Birdw., Beevor).

Distribution:—Abyssinia.

2. **Taverniera Schimperi** Jaub. et Spach Illustr. Pl. Or. t. 474; Oliv. Fl. trop. Afr. II, 141.

Taverniera cyclophylla Hochst. in Schimp. Herb. Abyss. 2329.

Taverniera floribunda Schweinf. Fl. Aethiop. 17.

Description:—A copiously branched shrub, 2 or 3 feet high, with erecto patent terete subglabrous branches. Leaves usually simple, casually pinnately trifoliate, the petiole ½ inch long, finely silky, geniculate and articulated at the apex, blade obovate, ¾—1 inch long, ½—¾ inch broad, the apex rounded, both sides glabrous and glaucous. Stipules connate into a single small bifid brown scarious deltoid sheath round the base of the petiole.

Flowers very deciduous, in 2—6-flowered racemes on rigid erecto-patent peduncles 1—1½ inches long from the axils of the leaves. Pedicels glabrous, equalling the campanulate calyx, which is 2 lines deep, the teeth linear or lanceolate, reaching halfway down. Corolla rose-red, persistent, ½—⅝ inch deep, the standard ½ inch broad, the wings not more than 2 lines deep by half as broad.

Pod ¼—⅜ inch long, with 2 or 3 articulations, densely muricated with long bristles all over the surface.

Locality:—Aden (Defl.).

Distribution:—Abyssinia.

8. Alhagi Tourn.

Rigid much-branched spiny shrubs with simple leaves. Stipules small. Flowers in axillary racemes. Calyx campanulate; teeth very short.

subequal. Corolla exserted; standard obovate, shortly clawed; wings falcate-oblong; keel incurved, about equalling the standard and the wings. Stamens diadelphous; anthers uniform. Ovary stalked; ovules many; style filiform incurved; stigma terminal.

Pod linear jointed, somewha thick, subterete or compressed, indehiscent, usually contracted between the seeds. Seeds uniform.

Species 3.

Distribution :—Widely spread from Greece and Egypt, through Western Asia, Afghanistan and Baluchistan, extending over the arid and dry regions of India.

1. Alhagi maurorum Medic. in Vorles. Churpf. Phys. Ges. II (1787) 397; Desv. Journ. I (1813) 120, t. 4; DC. Prodr. III, 353.

Alhagi karduchorum Boiss. et Haussk. ex Boiss. Fl. Or. II, 559.

Alhagi mannifera Desv. Journ Bot. I (1813) 120.

Alhagi napaulensium DC. Prodr. III, 352.

English name :—Camel's Thorn.

Description :—An erect wiry much-branched shrub, armed with many sharp spreading spines, 1 inch or more long. Leaves simple, drooping from the base of the spines and branches, obovate-oblong, entire, short-stalked, deciduous.

Flowers solitary or in few-flowered secund racemes from the spines on short pedicels. Calyx teeth deltoid, acute. Corolla red, three times as long as the calyx. Ovary silky.

Pod sickle-shaped, 1 inch or more long

Locality :—Aden (Birdw.).

Distribution :—Nubia, Egypt, Syria.

Uses :—The plant yields a kind of oriental manna, which appears in the form of drops, as of honey, on the leaves, and gradually hardens.

9. Rhynchosia Lour.

Herbs, shrubs or undershrubs, twining or prostrate, rarely erect. Leaves pinnately, rarely digitately 3-foliate. Leaflets dotted beneath with resinous glands.

Calyx-teeth not accrescent, the upper ones more or less connate, the lowest longer than the others. Standard obovate or orbicular, patent or reflexed, the base appendiculate with inflexed auricles, wings narrow; keel incurved at the apex. Upper stamen free, the others connate; anthers uniform. Ovary subsessile, ovules 2, rarely 1; style incurved upwards, filiform or incrassated; stigma small, terminal, capitate.

Pod round or oblong, compressed or turgid, usually continuous within. Seeds 2, rarely 1; the hilum parallel to the sutures and the funicle centrical upon it; strophiole thick, small or absent.

Species :—About 80.

Distribution :—Throughout the tropical regions, a few in extra tropical N. America and South Africa.

1. Rhynchosia memnonia (Del.) DC. Prodr. II, 386; Hook. Fl. Brit. India. II, 224; Oliv. Fl. trop. Afr. II, 220.

Rhynchosia pulverulenta Stocks in Kew Journ. Bot. IV, 147; Boiss. Fl. Or. II, 665; Anders. Journ. Linn. Soc. V, Suppl. p. 17.

Rhynchosia minima DC. Prodr. II, 386, var. memnonia Cooke Fl. Bombay Pres. I, 389.

Glycine memnonia Del. Fl. d' Eg. p. 100, tab. 38, fig. 3.

Description :—A twining or trailing annual, stems numerous, slender, much branched, canescent with short white velvety persistent pubescence. Leaves 3-foliate; stipules linear-lanceolate. Leaflets $\frac{3}{8}$—1 inch long, as broad as long, rhomboid-ovate or rhomboid-obovate, obtuse, apiculate.

Flowers in 6-12-flowered lax racemes, usually exceeding the leaves; pedicels very short. Calyx $\frac{1}{8}$-$\frac{1}{6}$ inch long, pubescent; teeth twice the tube, linear-subulate. Corolla yellow.

Pod $\frac{1}{2}$-$\frac{5}{8}$ by $\frac{1}{4}$ inch, somewhat compressed, turgid, slightly recurved. Seeds 2, rarely 1, compressed, black.

Flowers : January 1880 (Balfour).

Flowers : in Yemen in January, in Eritrea it flowers and fruits in March and April (Schweinf.).

Locality :—Valley of the northern slope of the Shum Shum Range (Schweinf.); crater of the Shum Shum Range (Defl.); great valley between Steamer Point and town (Marchesetti); without locality (Hook., Anders., Balfour, Birdw.).

Little Aden: in ravines on the south-western slope of Jebel Muzulghum (Defl.).

Distribution :—Egypt, Nubia, Abyssinia, Kordofan, Sennaar, highlands of Somaliland, Kilimandjaro, Angola, Lower Kongo, Natal, Central and South Arabia, Sind.

Suborder 2. Cæsalpiniaceæ.

Trees, shrubs, rarely herbs. Leaves alternate, 1-2-pinnate, simple or 3-foliate, usually stipulate.

Inflorescence very various. Flowers irregular, rarely regular. Sepals 5, 2 posterior sometimes coherent throughout, connate below or free to the base, imbricate or rarely valvate. Petals 5, or fewer by abortion

or 0, posterior included in aestivation. Stamens 10 or fewer by abortion, rarely more; filaments usually free, rarely coherent; anthers various. Ovary sessile or stipitate; stipes often adnate to the calyx-tube.

Pods dehiscent or indehiscent. Seeds various, with or without albumen.

Distribution:—Tropical and warm regions.

Leaves bipinnate.
- Calyx-segments valvate or slightly overlapping.
  - Pod flat . . . . . 1. Poinciana.
  - Pod turgid . . . . . 3. Parkinsonia.
- Calyx-segments imbricate . . . . 4. Cæsalpinia.

Leaves simply pinnate . . . . . 2. Cassia.

1. Poinciana L.

Unarmed trees. Leaves bipinnate. Leaflets small, numerous, exstipellate.

Flowers in corymbose racemes; bracts small, caducous. Calyx deeply cleft; tube short; segments valvate, subequal. Petals 5, imbricate, subequal. Stamens 10, free, declinate; filaments filiform, pubescent or villous at the base; anthers uniform. Ovary subsessile, ∞-ovulate; style elongate, filiform; stigma truncate, ciliolate.

Legume bivalved, elongate, flat, dehiscent. Seeds transverse, oblong, albuminous; cotyledons rather thick; radicle short, exserted.

Species:—3.

Distribution:—Tropical Asia and Africa.

1. Poinciana elata L. Mant. p. 16; DC. Prodr. II, 484; Hook. Fl. Brit. Ind. II, 260; Oliv. Fl. trop. Afr. II, 266.

Cæsalpinia elata Sw. Obs. 166.

Arabic Name:—Runf.

Description:—An erect tree, 20—30 feet high; bark tolerably smooth, ash-coloured. Leaves abruptly bipinnate, 4-8 inches long; pinnæ 4-8 pairs, opposite; leaflets 10-20 pairs, subsessile, closely set along the rhachis, linear-oblong, rounded and usually apiculate at the apex.

Flowers in terminal, few-flowered, corymbose racemes; pedicels stout, finely pubescent; bracts lanceolate or ovate-oblong. Calyx-lobes coriaceous, oblong or oblanceolate, pointed or obtuse. Petals 4, white, one greenish-yellow, all turning orange when fading, rather longer than the calyx, with a broadly obovate or rotundate-cuneate crisped lamina. Filaments much exceeding the petals, 2-4 inches long, villous and thickened below. Style elongate, filiform.

Pods 6-8 by $\frac{3}{4}$-$1\frac{1}{2}$ inches, attenuated at both ends, reticulately-veined, supported by persistent calyx. Seeds 4-8, much compressed, elliptic-oblong, smooth.

Flowers:—April 1878 (Perry), April 1861 (Thomson), Nov. (Schweinf.), February 1880 (Balfour), March 1875 (Hildebr.).

Fruits:—Nov. (Schweinf.), April 1861 (Thomson), March 1875 (Hildebr.).

Locality:—Near the fisher-huts at the entrance of the Goldmore Valley (Defl.); gravelly slope of Shum Shum Range (Ellenbeck); in the flats of the valleys on the South-West side of Aden (Perry); without locality (Annesley, Birdw., Hildebrandt, Balfour).

Distribution:—Nubia, Abyssinia, Eritrea, highlands of Somaliland, Usagara-Usambara, Kilimandjaro, Central and Southern Arabia, Western India (?).

Note:—The Gardeners' Chronicle (1861, p. 388) contains a short notice by T. Anderson on "*Poinciana Playfairii*". He says: "This (*P. Playf.*) I see you mention as living at Kew. It is a manuscript name given by me on collecting the plant at Aden in February 1861, after the publication of my "Florula Adenensis." I have specimens in my herbarium in good flower and fruit, and a young plant 5 feet high raised from seed recently received from Aden, is also in this garden. I hope soon to describe the species if it proves to be different from *P. elata*, Linn."

The Index Kewensis refers to this note; but after this nothing seems to have been published on this supposed new species. We found a small bit of a specimen of "*Poinciana Playfairii*" in the Kew Herbarium, but judging from that, there can scarcely be a doubt that *P. Playfairii* is identical with *Poinciana elata*, Linn.

Poinciana elata "grows from 8—15 feet high in the flats of the valleys on the South-West side of Aden. One of these valleys is called by the Indian Residents of Aden 'Gold Mohur Valley' from this tree. It does not appear to grow anywhere in the northern crater." Perry in folio Herb. Kew.

2. Cassia L.

Trees, shrubs or herbs. Leaves abruptly pinnate; common petiole frequently with sessile or stipulate glands; stipules various.

Flowers yellow or red, in axillary or terminal racemes or fascicles, or subsolitary in axils. Calyx-tube very short, segments 5, imbricate in æstivation. Petals 5, subequal or the anterior larger, imbricate. Stamens 10, all perfect and subequal or 3 or 5 wanting, or imperfect, anthers uniform or those of the lower stamens the larger. Ovary

sessile or stipitate; ovules many; style short or elongate; stigma terminal.

Pod terete or flat, usually septate between the seeds, dehiscent or indehiscent. Seeds transverse, rarely longitudinal, horizontally or vertically compressed, albuminous. Cotyledons plane or sinuous.

Species about 380.

Distribution:—The Tropics; a few extra-tropical.

Stipules lanceolate or subulate—	
Valves of legume with a row of crest-like plates .	1. C. obovata.
Valves of legume unappendaged—	
Leaflets 5—8 pairs, obtuse, pubescent . . .	2. C. holosericea.
Leaflets 5—8 pairs, acute, glabrous . . .	3. C. angustifolia.
Stipules narrow-cuspidate	4. C. adenensis.
Stipules large, rotundato-reniform (cultivated) . .	5. C. auriculata.

1. Cassia obovata (L.) Collad. Hist. Cass. p. 92, tab. XV, A; DC. Prodr. II, 492; A. Rich. Tent. Fl. Abyss. I, 249; Anders. Journ. Linn. Soc. V, Suppl. p. 18; Boiss. Fl. Or. II, 631; Hook. Fl. Brit. Ind. II, 264; Oliv. Fl. trop. Afr. II, 277; A. Terrac. Fl. d'Anfilha p. 24.

Cassia senna L. Sp. Pl. 539 (*ex parte*).
Cassia obtusa Roxb. Hort. Beng. p. 31.
Senna obtusa Roxb. Fl. Ind. II, 344.
Cassia Burmanni Wight in Madras Journ. VI, 5.
Cassia aschrek Forsk. Fl. Aeg.-Arab. p. 86.

Names:—Sreissi, Aschirák (Arabic); sometimes called Jamaica Senna, Italian Senna, Country Senna.

Description:—Herbaceous, perennial, erect or ascending from a woody stock, 1—4 feet high. Branches spreading, glabrous, except the very young parts. Leaves 2—5 inches long; petioles ½—¾ inch long; stipules ¼ inch long, obliquely lanceolate, very acute. Leaflets 3—6, rarely 7 pairs, ¾—1 by ⅜—½ inch, broadly oblong or obovate-oblong, obtuse, mucronate, pale green above, glaucous or puberulous beneath, base obtuse.

Racemes erect, axillary, at length usually overtopping the leaves, rather laxly many-flowered. Sepals rather unequal, very obtuse. Petals ½ inch long, obovate-oblong, shortly clawed, yellow. Perfect stamens 7, very unequal, the 2 or 3 lowest much the largest, the staminodes minute; filaments short. Ovary appressed-tomentose.

Legume flat, oblong-reniform, broadly rounded at the extremity and obliquely tipped with the remains of the slender style, 1¼—2¼ inches long, 7—10 lines broad; valves membranous, glabrous or pulverulent, transversely marked with anastomosing veins, and longitudinally over

the seeds with a single series of crest-like plates. Seeds 6—12, wedge-shaped, truncate or retuse at the apex, finely reticulate-rugose, dark-brown, shining.

Flowers:—March 1888 (Schweinf.), July 1874 (Perry).

Fruits:—August 1880 (Balfour), Nov. (Schweinf.), July 1879 (Perry).

Locality:—East of Steamer Point, near the telegraph-office (Schweinf.); plain of Maala (Defl.); great valley between Steamer Point and town (Marchesetti); slope of Shum Shum Range (Ellenbeck); without locality (Hook., Birdw., Perry, Balfour).

Distribution:—W. India, Sind, Arabia, Palestine, Egypt, Nubia, Eritrea, Abyssinia, Kordofan-Sennaar, highlands of Somaliland, Senegambia, Angola, Hereroland.

Note:—We have included Forskal's synonym (*C. aschrek*) on the authority of Schweinfurth. Forskal's short diagnosis seems to agree completely with the characteristics of *Cassia obovata*. Also the arabic name and the locality point to the species growing in Southern Arabia. Ehrenberg, too, found the species in the vicinity of Mor.

Uses:—This plant is occasionally to be seen in Indian bazars as an inferior quality of Senna. (Greenish, in Pharmaceut. Journal, 4th ser., vol. 9, p. 470—471.)

2. Cassia holosericea Fresen. in Flora (1839) I, 54; Franch. Sert. Somal. in Miss. Révoil p. 30; Oliv. Fl. trop. Afr. II, 278.

Cassia pubescens R. Br. in Salt Abyss. App. p. 64.

Cassia Schimperi Steud. Nomencl. Bot. ed. 2, I, 307.

Cassia cana Wenderoth in Linnaea XII, 22.

Description:—Shrubby, 1—4 feet high; entire plant usually clothed with a short, dense or subvelvety pubescence. Leaves 2—5 inches long; stipules $\frac{1}{4}$ inch long, linear-lanceolate, very acute with a small auricle at the base. Leaflets 5—8 pairs, $\frac{5}{8}$—1 by $\frac{1}{3}$—$\frac{1}{2}$ inch, obovate-oblong, obtuse or retuse, mucronate, base obliquely rounded or subacute.

Flowers in narrow axillary racemes shorter than the leaves. Calyx $\frac{3}{8}$ inch long, divided at the base; segments oblong, obtuse, membranous. Petals $\frac{1}{2}$ inch long, obovate-oblong, cuneate, shortly clawed, yellow. Stamens 10, the 3 upper reduced to small staminodes. Ovary densely pubescent.

Pods 1—1$\frac{1}{2}$ by $\frac{1}{2}$—$\frac{3}{4}$ inch, flat, papery, recurved, rounded at both ends, transversely veined. Seeds 4—10, obovoid-cuneate, $\frac{1}{4}$ by $\frac{1}{8}$ inch, retuse at the apex, reticulate-rugose, flattened, yellow.

Flowers:—January 1863 (Oliver and Cl.), February 1851 (Hooker), March 1878 (Perry), April 1861 (Thomson), August 1898 (Birdw.).

Fruits :—January 1863 (Oliver and Cl.), March 1878 (Perry), March 1888 (Schweinf.), April 1861 (Thomson), Dec. 1847 (Hooker).

Locality :—Great valley between Steamer Point and town (Marchesetti) ; without locality (Hook., Anders., Thomson, Birdw., Schweinf., Perry, Oliver and Cl.).

Distribution :—Nubia, Eritrea, Central and Southern Arabia, Socotra, Sind.

3. **Cassia angustifolia** Vahl. Symb. Bot. I, 29.

Cassia lanceolata Wall. Cat. n. 5318; Royle Ill. t. 37; W. et A. Prodr. Fl. Pen. Ind. Or. p. 288.

Senna officinalis Roxb. Fl. Ind. II, 346.

Arabic Name :—Ssonna (Schweinf.).

Description :—Shrub or undershrub with pale subterete or obtusely angled erect or ascending branches. Leaves usually 5—8-jugate; leaflets oval-lanceolate, glabrous.

Racemes axillary, erect, laxly many-flowered, usually considerably exceeding the subtending leaf. Bracts membranous, ovate or obovate, caducous. Sepals obtuse, membranous.

Legume flat, 7 – 8 lines in breadth. Seeds obovate, cuneate, compressed ; cotyledons plane.

Locality —(Aden Birdw., Schweinf.).

Distribution :—Mozambique (near Tette), extending eastward to the desert tracts of North-Western and Peninsular India.

Note :—Dalzell and Gibson (Bombay Flora, Suppl. p. 29) wrote in 1861 :—

"It certainly grows wild in Sind. The narrow-lanceolate leaves, and peculiar broad falcate legume, at once distinguish it from our other Cassias, of which *C. obovata* is the only one having a similar legume. Introduced at Hewra from seed furnished by Captain Haines from Aden ; is now largely cultivated by ryots near the Hewra garden, from whence it is supplied to the Medical Stores, quite free from all admixture of other leaves."

Uses :—" Adams (Comment. in Paulus Aegineta, III, 431—33) gives a most interesting sketch of the early knowledge in Senna. He says Serapion was undoubtedly the first author who describes the drug as an article of the Materia Medica. He, however, quotes still other writers such as Isaac Ebn Amram and Abix. All the Arab physicians, in fact, extol the merits of Senna in purging black or yellow bile and in acting as a cordial when mixed with suitable drugs, such as violets. The present species, as also the Alexandrian (*C. acutifolia*, Delile), were introduced to both Indian and European pharmacy through the Arabs. The

former species (the only one grown in India) is fairly extensively produced in Tinnevelly, and recently its cultivation has been extended to Madura and Trichinopoly, districts of South India, and to Poona in Bombay.

"Indian senna is either exported coastwise to Bombay and thence to foreign countries, or is consigned direct from Tuticorin. The drug is also imported from Arabia, where it is collected from the wild plant and accordingly often much adulterated. It would appear that about 5,000 cwt. are usually taken by India and again re-exported under the name of East Indian Senna or Moka or Aden Senna, and is thus no doubt the true sanna (sona)—kokki (maki) or sanna hajazi. For many years past, however, the imports from Arabia have been declining and the exports of Tinnevelly senna improving. The purity, high quality and low price of the Indian article place it in the front rank." (Watt, Commercial Products of India, London, 1908, p. 288).

Cf. also: Ibn-el-Beithar. II, 293—294.

4. Cassia adenensis Benth. Trans. Linn. Soc. XXVII, 553.
Senna Hookeriana Batka Monogr. Senn. p. 52.
Cassia lanceolata Defl. Bull. Soc. Bot. France (non Wall.).
Arabic name :—Ssonna.

Description :—A glabrous undershrub; branches angular-terete, stout, sulcate. Leaves 3—7—8-jugate, petiolate; leaflets ovate, distinctly petiolate, scarcely mucronulate, green on both sides, glabrous, cartilaginous on the margins; stipules persistent, long, narrow-cuspidate.

Racemes usually longer than the leaves. Corolla twice as long as the calyx.

Pods subtransparent, numerous, oblong, of a peculiar flavescent colour; peduncles revolute, about $1\frac{2}{5}$ inches long and $\frac{3}{8}$ inch broad. Seeds rugulose-scrobiculate, green. Cotyledon distinctly emarginate, intensely flavo-lutescent.

Flowers :—April 1861 (Thomson), June 1872 (Hildebr.), July 1878 (Perry), Nov. (Schweinf.).

Fruits :—April 1861 (Thomson), June 1872 (Hildebr.), July 1878 (Perry).

Locality :—Plain of Maala (Schweinf., Defl.); near the Telegraph office not far from the seashore (Lunt); without locality (Hooker, Thomson, Oliver and Cl., Hildebrandt, Perry, Kuntze).

Distribution :—Hadramaut, Bakrais near Mokalla, Somaliland.

Note :—This plant has not got the penetrating odour nor the peculiar taste of the officinal species of the genus *Cassia*.

"In planta hacce vegetant Hyphomycetes qui a nonnullis glandulæ capitulatæ vocantur; a me autem partes hac byssi ex facie putredine partium novellarum et succulentarum ortæcontestantur." Batka in folio Herb. Kew.

The following species is grown as an ornamental tree near a well at Shaikh Othman:

5. **Cassia auriculata** L. Sp. Pl. (1753) p. 379; Schweinf. Bull. Herb. Boiss. 1896, App. II, 221.

Name:—Tanner's Cassia.

Description:—A tall much-branched shrub; bark smooth, reddish-brown; branchlets finely pubescent. Leaves 3—4 inches long; rhachis densely fulvous-pubescent with an erect linear gland between each pair of leaflets; stipules foliaceous, reflexed, very large, rotundato-reniform, produced at the base on the side next the petiole into a long subulate point, persistent. Leaflets 8—12 pairs, $\frac{3}{4}$—1 by $\frac{3}{8}$—$\frac{1}{2}$ inch, slightly overlapping, oblong-obovate, obtuse or emarginate, mucronate, glabrous or finely downy, dull green above, paler beneath, base usually rounded; petioles $\frac{1}{2}$ inch long.

Flowers large, reaching 2 inches across, in terminal and axillary corymbose racemes; pedicels $\frac{3}{4}$—1 inch long; bracts ovate, acuminate, caducous. Calyx glabrous; segments leathery, concave, the 2 outer much smaller than the other 3. Petals with long claws, crisped on the margin, bright yellow, veined with orange. Stamens 10, of which the 3 upper are reduced to staminodes, the remaining 7 perfect, of which the 3 lower are longer than the 4 lateral ones.

Pods 3—5 by $\frac{1}{2}$—$\frac{5}{8}$ inch, flat, thin, papery, oblong, obtuse, mucronate, pale brown, deeply depressed between the seeds, having a crumpled appearance, transversely veined, pubescent.

Flowers and *fruits*:—November (Schweinf.).

Distribution:—India and Ceylon (common on dry stony hills and on black soils).

Uses:—The bark is largely used in tanning and gives a buff-coloured leather. The seeds are valued as a local application in purulent ophthalmia. An infusion of the leaves is esteemed as a cooling medicine and as a substitute for tea. The root is said to be of great value in tempering iron metal.

3. Parkinsonia Plum.

Shrubs or small trees. Leaves bipinnate; pinnæ 2—6, very long, flattened. Leaflets numerous, small, oblong or linear, opposite or scattered.

Flowers in lax axillary racemes; bracts small caducous. Calyx divided nearly to the base; segments 5, membranous, slightly unequal, imbricate or subvalvate. Petals 5, spreading, the upper the broadest. Stamens 10, free; filaments pilose at the base; anthers uniform, versatile. Ovary narrowed to the base, many-ovuled; style subfiliform; sti gma terminal.

Pod turgid, moniliform, finally dehiscent. Seeds 1—6 or 8, oblong or subcylindrical, albuminous.

Species 3.

Distribution :—America and the Cape.

The following species is cultivated near the tanks of Aden (Busse) and in the village of Shaikh Othman (Defl.).

1. Parkinsonia aculeata L. DC. Prodr. II, 486.

Description :—A glabrous shrub or small tree with sharp woody spines. Pinnæ 1—3 pairs, 6—12 inches long, rhachis flattened, striate. Leaflets numerous, minute, oblanceolate, obtuse.

Flowers in lax axillary racemes; pedicels $\frac{3}{8}$—$\frac{5}{8}$ inch long, jointed near the top. Calyx $\frac{1}{3}$ inch long, divided nearly to the base; segments oblong, obtuse. Petals yellow, broadly obovate or suborbicular, with a villous claw. Filaments flattened, villous at the base. Ovary silky-villous; ovules many.

Pods 3—4 by $\frac{1}{4}$—$\frac{3}{8}$ inch, moniliform, attenuated at both ends, glabrous

This plant is indigenous in tropical America, but cultivated in most tropical countries. In India it is naturalized, where it is grown chiefly as a hedge plant in the drier districts.

Uses :—The natives of Aden use this plant for various purposes. The bark is employed against consumption in cattle, the flowers and seeds against fever, and the bast for the manufacture of paper.

4. Cæsalpinia Linn.

Trees or climbing shrubs, unarmed or armed. Leaves large, abruptly pinnate; stipules various.

Flowers yellow or red, in axillary or terminal racemes or panicles. Calyx deeply cleft, with the disk confined to its base; segments 5, imbricate, the lowest concave or boat-shaped. Petals distinctly clawed, orbicular (rarely oblong), spreading, imbricate, subequal or the uppermost (the inner) smaller than the others. Stamens 10, free, declinate; filaments often villous or glandular at the base; anthers uniform, dehiscing longitudinally. Ovary sessile or subsessile; ovules few; style filiform, sometimes clavate at the apex; stigma terminal.

Pod oblong or ligulate, flat or turgid, indehiscent or dehiscent, smooth or prickly.

Species about 40.

Distribution :—Tropics of both hemispheres.

1. Caesalpinia pulcherrima Swartz Obs. p. 166. ; Hook. Fl. Brit. Ind. II, 255.

Poinciana pulcherrima Linn. Sp. Pl. 380 ; Bot. Mag. t. 995.

Description :—A glabrous shrub or small tree, unarmed or with a few weak prickles. Leaves 4-6 inches long ; pinnæ 6—8 pairs ; leaflets 8—12 pairs, sessile, close, membranous, ½—¾ inch long, very obtuse.

Racemes very broad, the lower pedicels 3—4 inches long. Calyx ½—⅝ inch long, glabrous. Petals round, crisped, reddish-yellow, with a very distinct claw, the largest and most showy of all the species. Filaments bright red, 3—4 times the length of the corolla. Pods nearly straight, 2—3 inches long, ⅜ inch broad.

Locality :—Aden (Lunt). Introduced.

Distribution :—Home unknown. Has been found, apparently wild, by T. H. Aplin, in December 1887, in the Tapel Choung valley, Shan States, 1,700—5,000 feet.

Suborder 3. Mimoseæ.

Shrubs or trees, rarely herbs. Leaves bipinnate, rarely simply pinnate.

Flowers small, regular, usually pentamerous, in globose heads or cylindric spikes, rarely shortly pedicelled and in slender racemes or globose umbels. Sepals usually connate in a 5-dentate or-lobed calyx. Petals free or connate, hypogynous or subperigynous, valvate in æstivation. Stamens as many or twice as many as petals or indefinite, free or monadelphous ; anthers minute, dehiscing longitudinally. Ovary free, in the bottom of the calyx.

Seeds albuminous or with scanty albumen ; cotyledons flat ; radicle straight, shortly exserted or included.

Distribution :—Tropical and warm regions.

Stamens indefinite, free anthers without glands . . .	1. Acacia.
Stamens 10, anthers with deciduous apical glands . . .	2. Prosopis.
Stamens indefinite, monadelphous	3. Calliandra.

Nos. 2 and 3 are represented by cultivated species only.

1. Acacia Willd.

Trees, shrubs and climbers, armed with stipular, infra-stipular or scattered spines. Leaves bipinnate, pinnæ and leaflets opposite. Stipules spinescent or inconspicuous, rarely membranous.

Flowers yellow or white, in globose heads or cylindrical spikes; numerous scaly bracteoles between the flowers; peduncles axillary, solitary or fascicled or panicled at the end of the branches. Calyx and corolla 4—5-merous. Calyx campanulate or funnel-shaped, dentate or lobed. Petals free or more or less united, valvate. Stamens indefinite, exserted, free or consolidated at the base with the disk. Ovary sessile or stalked; ovules many; style filiform; stigma small, terminal.

Legume usually linear or oblong, flat, convex or terete, straight, falcate or twisted, membranous, coriaceous or woody, dehiscent or indehiscent.

Species about 450.

Distribution :—The leaf-bearing groups throughout the tropical and subtropical regions; the phyllodineous ones almost restricted to Australia.—

A.—Flowers spicate—
- I. Leaflets 1-jugate . . . . . 6. A. mellifera.
- II. Leaflets 2—10-jugate—
  - Spines 3 together . . . . . 3. A. hamulosa.
  - Spines not 3 together . . . 7. A. læta.

B.—Flowers capitate—
- I. Bract almost at the base of peduncle . . . 2. A. Edgeworthii.
- II. Bract near the apex of peduncle . . . . 9. A. Farnesiana.
- III. Bract between apex and base of peduncle.
  - 1. Pod not or scarcely curved—
    - A. Pod not constricted—
      - * Pod pilose . . . . . 5. A. nubica.
      - * * Pod not pilose . . . . 1. A. eburnea.
    - B. Pod constricted . . . . . 8. A. arabica.
  - 2. Pod spirally contorted . . . . . 4. A. spirocarpa.

Uses :—What is true of the Indian species of Acacia with regard to their economic value, may, on the whole, be applied to the species described below.

The bushy and arborescent forms, as a rule, afford astringent barks, leaves, or pods, and are appreciated as medicines, as tans or as dye auxiliaries. Some of them afford useful gums that are more or less soluble and edible. The trees are of great value both as sources of timber and fuel. The leaves beaten from the twigs afford a much-valued fodder to the cattle. For detailed information on the different species we refer to Watt's publications and Wiesner, Die Rohstoffe des Pflanzenreiches.

1. Acacia eburnea (L.) Willd. Sp. Pl. IV, 1081; DC. Prodr. II, 461; Benth. Lond. Journ. Bot. I, 501 et Trans. Linn. Soc. XXX, 511; Boiss. Fl. Or. II, 637; Anders. Journ. Linn. Soc. V, Suppl. p. 19.

Mimosa eburnea L. Mant. p. 437.

Description :—A large shrub or small tree; branches and leaves ferruginous-villous. Branches armed with straight stipular spines, mostly stout, ivory-white, 1—2 inches long. Leaves small, often shorter than the spines, clothed with long hairs; pinnæ 4—8, small, scarcely 2 lines long, with a petiolar gland; leaflets densely arranged, 8—12 pair, linear, acute; peduncles axillary with a bract below the middle.

Flowers yellow, with an unpleasant smell; heads under ½ inch in diameter, fasciculate, reddish brown while in bud.

Pod 2—5 inches long, ⅓—⅔ inch broad, linear, slender, flat, veined, generally 2—4 from one flower-head, edges undulate. Seeds (in Schweinfurth's specimens 5—7 in one pod) dark-grey, oval-spherical, ¼ inch long, almost ½ as broad, very little laterally compressed.

Flowers and *fruits* :—December (Schweinf).

Locality :—In the Upper Wadi Maala, not far from the top of the Shum Shum Range (Schweinf.); Goldmore Valley (Defl.); great valley between Steamer Point and town (Marchesetti); without locality (Hook., Anders., Birdw.).

Distribution :—Ceylon, Deccan, Sind, Salt Range, Subhimalayan tract and outer valleys, ascending to 3,000 feet, east as far as Oudh, Baluchistan, Afghanistan, Arabia.

2. **Acacia Edgeworthii** (Edgew.) Anders. Journ. Linn. Soc. V, Suppl. p. 18; Benth. Trans. Linn. Soc. XXX, 504.

Acacia erioloba Edgew. Journ. As. Soc. Beng. XVI, 1215 (non E. Mey.).

Arabic name :—Ssamma, Khereb, Quaratt.

Description :—Low shrub; stem glaucous; young branches often pubescent; pinnæ 3—6-jugate; petioles subtomentose; spines straight, long, albescent or puberulous; leaflets 6—10-jugate, linear, obtuse, minutely pruinose.

Flowers white; peduncles shorter than the leaves; bracts almost at the base of the peduncle (not above the middle as stated by Bentham l. c.). Filaments white; anthers yellow.

Pod 5 inches long, 4 lines broad, linear, falciform, tomentose, obscurely striate, 14-seeded (Anderson).

Flowers :—November to March.

Fruits :—March (Schweinf.).

Locality :—Wadi Maala, Goldmore Valley (Schweinf.); plain of Maala (Defl.); above the town on rocks (Busse); common (Edgew. Hook, Anders.).

Distribution :—Yemen (Defl.).

3. Acacia hamulosa (Willd.) Benth. Lond. Journ. Bot. I, 509 ; Anders. Journ. Linn. Soc. V, Suppl. p. 19.

Acacia asak Willd. Sp. Pl. IV, 1077 ; Schweinf. Bull. Herb. Boiss. 1894, App. II, 215.

Acacia Hunteri Oliv. in Hook. Ic. Pl. tab. 1350 ?

Description :—A densely branched low shrub, 8 feet high, divaricate, armed with sharp spines. Spines 3 together, the infrastipular ones straight, the intrapetiolar one hooked-recurved, nigrescent when old. Leaves 1—1½ inches long; petioles aculeate; pinnæ 2—3-jugate, the lower ones subopposite or alternate; leaflets 3—6-jugate, obliquely oblong, obtuse, glabrous.

Flowers in lax spikes, white; peduncles axillary, at the end longer than the leaf; fruiting peduncle 2½ inches long.

Pod 3½ inches long, 1½ inches broad, ovate, linear, rounded at both ends, mucronulate, indehiscent; valves membranous, plane, glabrous. Seeds 1—2 [2—4 in the specimens from Saati, Eritrea].

Flowers :—December (Schweinf.), September 1880 (Hunter).

Fruits :—March and December (Schweinf.), December 1889 (Defl.), September 1880 (Hunter).

Locality :—Above the coal depôt of the Messag. Marit., Wadi Maala, Shum Shum Range (Schweinf.); plain of Maala (Defl.); in valleys (Hook., Anders.); great valley between Steamer-Point and town (Marchesetti); without locality (Birdw.).

Distribution :—Eritrea, Jeddah, Yemen, Hadramaut.

Note :—D. Oliver described and figured a plant in Hooker's Icones Plantarum (tab. 1350) under the name of *Acacia Hunteri*, which Hunter had found in the "neighbourhood of Aden."

It is doubtful whether this species is identical with *Acacia hamulosa*. Schweinfurth is of opinion, that Oliver's plant is nothing but a small-leaved and small-fruited specimen of Bentham's *A. hamulosa*. The description of the flowers and leaves as far as it goes agrees in every detail with that of *A. asak* Willd. It must, besides, not be forgotten, that many species of *Acacia* show a tendency towards developing forms with smaller leaves and fruits. If Schweinfurth says that the leaves of his own specimens are linear-oblong, oblong and obovate-oblong, and always rounded at both ends, it should be remembered that Oliver figured just that type of leaf which is less common in his *A. Hunteri*, for he says in his diagnosis: "foliolis latiuscule oblongis obtusis vel *interdum* obscure mucronulatis."

In order to enable botanists to clear up on the spot any doubtful point as to the identity of *A. Hunteri*, we think it advisable to add Oliver's description of this species from Hooker's Icones Pl. p. 36 :

"Glabrata, pallida; aculeis ternis rectis vel curvulis, foliis parvis, pinnis 2—3-jugis; foliolis latiuscule oblongis obtusis vel interdum obscure mucronulatis basi oblique subcordatis glabris, rhachide puberula, floribus spicatis sessilibus, spicis breviter pedunculatis, calyce campanulato puberulo, petalis oblanceolatis mucronulatis, legumine oblongo stipitato, valvis obtusis mucronatis transverse venulosis puberulis.

"Folia $\frac{1}{3}$—$\frac{1}{2}$ poll. longa, rhachide puberula; foliola ad 1 lin. longa. Inflorescentia cum pedunculo $\frac{1}{2}$—$\frac{3}{4}$ poll. longa. Legumen $\frac{3}{4}$—$1\frac{1}{4}$ poll. long., $\frac{1}{3}$ poll. lat., 1—3-sperm."

4. Acacia spirocarpa (Forsk.) Hochst. in Schimp. Pl. Abyss. n. 658 et in A. Rich. Tent. Fl. Abyss. I, 239; Schweinf. Linnæa XXXV, 332, tab. IV—VI; Oliv. Fl. trop. Afr. II, 352; Benth. Trans. Linn. Soc. XXX, 505.

Mimosa tortilis Forsk. Fl. Aeg.-Arab. p. 176?

Acacia nubica β pubescens A. Terrac. Fl. d'Anfilha, p. 24.

Arabic name:—Ssammor or Ssamr (Schweinf.).

Description:—A low tree; extremities red-brown, pubescent. Stipular spines patent, straight, slender, varying in length to $2\frac{1}{2}$ inches sometimes on the same branch, hooked or obsolete. Leaves short, $\frac{1}{2}$—2 inches long, petioles pubescent; pinnæ in 4—10 pairs; leaflets very small, oblong, in 7—15 pairs.

Peduncles 1 or few, axillary, bearing the minute involucel below or near the middle. Flowers capitate.

Pod spirally twisted or contorted, linear, compressed, slightly constricted between the seeds, valves coriaceous, longitudinally nerved, pubescent or puberulous, 3—6 inches long, $\frac{1}{4}$—$\frac{1}{3}$ inch broad.

Fruits in March (Schweinf.).

Locality:—Above the coal depôt of the Messag. Marit., Goldmore Valley, plain of Maala (Schweinf.); without locality (Birdw.).

Near Shaikh O'thman (Busse).

Distribution:—S. Arabia, Eritrea, Abyssinia, Nubia.

5. Acacia nubica Benth. in Lond. Journ. Bot. (1842), p. 498.

Acacia aucheri Benth. in Lond. Journ Bot. (1842), p. 498.

Acacia pterygocarpa Hochst., Benth. in Journ. Bot. (1846), p. 96.

Description:—Shrubs; branches glabrescent; young shoots at first pubescent. Stipular spines straight or slightly curved. Pinnæ in 3—12 pairs; rhachis with 2 or 3 minute sessile glands, or without glands; leaflets in 6—15 pairs, oblong, obtuse, or broadly pointed, glaucous, 2—3 lines long.

Peduncles 1—3 from each axil, about ½ inch long. Calyx-teeth short, rounded. Petals connate nearly throughout, scarcely twice the calyx.

Pod linear-oblong, straight or nearly so, compressed, narrowed at each end, margins narrowly compressed, valves continuous, slightly convex, firmly coriaceous, faintly longitudinally striate, yellowish-grey, puberulous, 5—10-seeded, 2—3 inches long.

Fruits:—March 1878 (Perry).

Locality:—Aden (Birdw., Perry, Beevor).

Distribution:—Abyssinia, Nubia.

6. Acacia mellifera (Forsk.) A. Rich. Tent. Fl. Abyss. I, 241; Benth. Lond. Journ. Bot. I, 507 et Trans. Linn. Soc. XXX, 517; Schweinf. Linnæa XXXV, 365; Oliv. Fl. trop. Afr. II, 340.

Mimosa unguis cati Forsk. Fl. Aeg.-Arab. p. 176.

Mimosa mellifera Vahl Symb. III, 103.

Inga mellifera Willd. Sp. Pl. IV, 1006.

Arabic name:—Dsub, Kittr or Tekker.

Description:—A shrub or small tree, wholly glabrous, with brownish or sometimes pale and glaucous extremities, unarmed excepting a pair of short recurved infra-stipular prickles, usually below each node. Leaves as broad as long, not exceeding 1—2 inches, glaucous at least beneath; pinnæ in 2 pairs; leaflets unijugate, obliquely obovate-oblong or obovate-rotundate, obtuse entire or retuse, the larger leaflets ⅓—½ inch long.

Spikes axillary, fascicled, equalling or exceeding the leaves. Pedicels about equalling the short truncate purple calyx. Petals 3—5 times longer than the calyx, apparently united to the middle. Stamens white. Flowers with the odour of Syringa.

Legume flat, few-seeded, oblong, continuous or sinuous, apiculate, narrowed at the base, valves thinly coriaceous, transversely venose, pale and glabrous, 1½—2 inches long, ½—¾ inch broad.

Flowers:—March and December (Schweinf.).

Locality:—Shum Shum Range, upper Wadi Maala (Schweinf.); ravine south-west of the Tower of Silence (Defl.); without locality (Birdw.).

Distribution:—Yemen, Eritrea, highlands of Somaliland, Kordofan, Abyssinia, Nubia, Togo.

7. Acacia læta R. Br.; Benth. in Hook. Lond. Journ. Bot. 1842, 508; Schweinf. Acacien Arten d. Nilgeb. 367, t. 19, 20, 21; Reliq. Kotschyanæ, t. 1, 2; Oliv. Fl. trop. Afr. II, 34.

Description:—A small or moderate-sized tree. Extremities brown, smooth, with short black and shining hooked infra-stipular prickles, or wholly unarmed. Leaves glaucous, scarcely exceeding 2—3 inches in length; pinnæ lax in 2—3 pairs; leaflets oblanceolate-or obovate-oblong, oblique, obtuse, often mucronulate, subsessile, in 3—5 pairs, $\frac{1}{4}$—$\frac{1}{3}$ inch long, $1\frac{1}{2}$—2 lines broad above.

Spikes axillary, solitary or fascicled, equalling or exceeding the leaves. Flowers subsessile. Calyx broadly and shortly toothed. Petals at least at first united about $\frac{2}{3}$ their length. Ovary glabrous, shortly stipitate.

Legume flat, oblong, often once or twice constricted owing to abortion of seeds, obtuse or pointed; valves thinly coriaceous, transversely reticulate, glabrous, shortly stipitate, 2—3 inches long, $\frac{3}{4}$—1 inch broad.

Locality:—Aden (Defl., Schweinf.).

Distribution:—Abyssinia, Nubia.

The following species are cultivated in Aden and its immediate neighbourhood:

8. Acacia arabica (Forsk.) Willd. Sp. Pl. IV, 1085; DC. Prodr. II, 461; Hook. Fl. Brit. Ind. II, 293; Benth. Lond. Journ. Bot. I, 500 et Trans. Linn. Soc. XXX, 506; Schweinf. Linnæa XXXV, 335; Oliv. Fl. trop. Afr. II, 350.

Mimosa arabica Lam.; Roxb. Cor. Pl. t. 149.

Mimosa nilotica Forsk. Fl. Aeg.-Arab. p. LXXVII.

Acacia vera Willd. Sp. Pl. IV. 1056.

Arabic names:—Quaradd, sselm, sselam.

Description:—A large tree; bark rough with deep narrow longitudinal fissures; heart-wood pale red, when fresh cut nearly colourless, on exposure turning reddish-brown. Stipular spines straight, $\frac{1}{2}$—2 inches long. Pinnæ 3—6 pair, cup-shaped glands at the base of the lowest, and generally also of the uppermost pair. Leaflets small, linear, 10—20 pair

Flowers golden-yellow, in globose heads, $\frac{1}{2}$ inch in diameter; peduncles slender, fasciculate; a pair of scaly bracts in the middle.

Pod solitary, moniliform, much contracted between seeds at both sutures, whitish-tomentose; stalk $\frac{1}{2}$—$\frac{3}{4}$ inch long.

Schweinfurth says that the Aden plant is the 'Indian form' with pods very much or only slightly constricted between the seeds. It is, nevertheless, quite probable that the seeds originally came from Arabia; but there is no reason for asserting that *A. arabica* is indigenous in Aden.

Flowers:—Aug. 1898 (Birdw.).

Fruits—March (Schweinf.).

Locality:—Near the tanks (Schweinf.); Shum Shum Range (Ellenbeck); without locality (Birdw.).

Distribution:—Ceylon, Northern Deccan, Sind, S. Persia, Central and S. Arabia, Kordofan, Abyssinia, Libya, Nubia, Syria, Egypt, Algeria, Morocco, Togo, Senegal.

Note:—This tree was very common in Egypt in Pharaonic times, growing spontaneously and being cultivated at the same time.[1] It is mentioned among the plants of 24 out of 42 sacred groves. Strabo speaks of an acacia-wood in the neighbourhood of a sanctuary of Acanthos in Libya.[2] Fragments of this tree have frequently been found in the Pharaonic tombs. Flinders Petric discovered different utensils made of acacia-wood in the necropolis of Kahun.[3] Some of the garlands which adorned the mummies of Ahmes I and Ahmenhotpu I consisted of acacia-flowers.[4]

The tree is often mentioned in Egyptian texts. It was called 'shent' in the hieroglyphic language ('shett' in Hebrew, 'sant' in Aramaic, 'shonte' or 'shanti' in Coptic) which probably means 'thorn.'[5] Even the Arabs of our days call it 'sunt.' The Greeks named it 'acantha'[6] or 'acacia,' whilst to the Romans[7] it was known under the names of 'acanthus' or 'spina ægyptiaca.' The Greek 'kommi' and the Latin 'gummi' were probably derived from the Egyptian 'kami' (also 'kemai' and 'kema') which was the name for the gum of the acacia.[8]

9. **Acacia Farnesiana** Willd. Sp. Pl. IV (1805), p. 1083; Hook. Fl. Br. Ind. II, 292; Aitch. Pb. and Sind Pl. p. 54.

Vachellia Farnesiana Wight et Arn. Prodr. p. 272; Grah. Cat. p. 58.

Name:—Known in Europe as the Cassia Flower.

Description:—A shrub or low tree; branches slender, zigzag, marked with grey or pale-brown dots; stipular spines only. Leaves 2-pinnate, 1—2 inches long; main rhachis more or less pubescent; petioles usually furnished with a minute gland about the middle; stipules spinescent,

[1] Moldenke, C. E. Ueber die in altægyptischen Texten erwähnten Bäume und deren Verwerthung. Leipzig, 1887, p. 74—81.

[2] Dahshour. Geographica. Lib. XVIII, cap. 1, 35.

[3] Flinders Petrie. Kahun, Gurob and Hawara, p. 50, 1.

[4] Schweinfurth, G. Ueber Pflanzenreste. Ber. d. bot. Ges. vol. 2 (1884), p. 363.

[5] Loret, V. La Flore pharaonique, d'après les documents hiéroglyphiques. 2nd. ed. Paris, 1892, p. 84, no. 142.

[6] Theophrastus. Historia Plantarum, lib. IV, c. 2, 8.

[7] Plinius. Historia naturalis, lib. XIII, 9 (19), ed. Teubner, Vol. II, p. 327.

[8] Wiedemann, A. Sammlung altaegyptischer Wörter, welche von klassischen Autoren umschrieben oder übersetzt worden sind. Leipzig, 1883, p. 26.

$\frac{1}{6}$—$\frac{1}{3}$ inch long, hard and sharp, divaricate ; pinnæ 4—8 pairs, $\frac{3}{4}$—1 inch long. Leaflets 10—20 pairs, $\frac{3}{16}$—$\frac{1}{4}$ by $\frac{1}{20}$—$\frac{1}{16}$ inch, sessile, rigidly coriaceous, linear-oblong, acute, green, subglabrous, base oblique, rounded.

Flowers in globose heads, $\frac{1}{4}$—$\frac{1}{3}$ inch in diameter, fragrant, deep yellow ; peduncles $\frac{3}{4}$—1 inch long, crowded on axillary nodes, slender, terete, pubescent, with a ring of small deflexed ciliate bracts at or near the apex ; bracteole solitary, deltoid, on a long slender stalk, ciliolate. Calyx $\frac{1}{16}$ inch long, membranous, teeth short, triangular, acute. Corolla $\frac{1}{16}$ inch long ; lobes very short ; obtuse. Ovary glabrous.

Pods 2—3½ by ½ inch, subcylindric, turgid, slightly curved, conspicuously striately veined, glabrous, brown ; mesocarp pulpy. Seeds biseriate.

Locality :—Cultivated at Shaikh O'thman (Defl.).

Distribution :—Indigenous in America, but naturalized in India, Burma and other countries.

2. Prosopis Linn.

Erect prickly trees or shrubs. Leaves 2-pinnate ; stipules small or 0. Leaflets small, narrow.

Flowers 5-merous, usually sessile, in narrow spikes or subspicate racemes. Calyx campanulate, shortly toothed or subentire. Petals connate below the middle or at length free, valvate. Stamens 10, free, shortly exserted ; anthers crested with a deciduous gland. Ovary sessile or stalked ; ovules many ; style filiform ; stigma minute, terminal.

Pod turgid, cylindric or oblong, straight, falcate, or variously twisted, septate between the seeds ; mesocarp thick, spongy. Seeds usually ovoid, compressed.

Species about 18.

Distribution :—Tropical and subtropical regions of the world.

The following species is cultivated near the tanks of Aden :

1. Prosopis juliflora DC. Prodr. II, 447 ; Benth. in Trans. Linn. Soc. vol. 30, 337.

Prosopis glandulosa Torrey Ann. N. Y. Lyc. II, 192, t. 2.

Algarobia glandulosa Torr. & Gray Fl. I, 399 ; Gray, Pl. Wright, I, 60.

Prosopis odorata Torr. in Frem. Rep. 313, t. 1, excl. fruct.

Description :—A shrub or tree, glabrous or puberulent, with stout axillary spines, or often unarmed. Leaflets 6—30 pairs, short-oblong to linear, 3—18 inches long, obtuse or acute.

Spikes shortly peduncled, 2—4 inches long, usually dense, 1—3-fruited. Flowers nearly sessile, a line long.

Pod 4—6 inches long or more, straight or curved, at first flat and constricted between the seeds, 3—6 lines broad, at length sweet and pulpy within, acuminate, longitudinally veined; stipe 3—6 lines long.

Distribution: —Tropical America.

Note:—*Prosopis juliflora* DC. is the Algaroba of the Mexicans or Honey Mesquit, found as a small shrub in South-eastern California and eastward to Texas. It extends in various forms southward through Mexico, and along the Andes to Chili, and to Buenos Ayres.

The abundant fruit is eaten by the Indians and often by whites, and is a valuable food for horses. The shrub also furnishes a valuable gum, resembling Gum Arabic, which in Texas and Mexico is collected in considerable quantity for export.

3. Calliandra Benth.

Shrubs or trees. Leaves bipinnate, with small or large leaflets.

Flowers in globose heads, polygamous, 5-merous. Calyx campanulate, toothed. Corolla funnel-shaped, deeply 5-cleft. Stamens indefinite, monadelphous at the base; filaments filiform, much exserted; anthers minute, not gland-crested. Ovary stalked, many-ovuled; style filiform; stigma minute, capitate.

Pod strap-shaped, slightly falcate, flat, rigidly coriaceous, the valves dehiscing with elasticity, bordered by much-thickened sutures, continuous within, narrowed gradually to a short stalk.

Species about 80.

Distribution: —Mostly tropical American.

The following species is cultivated at Shaikh O'thman according to Deflers:—

1. **Calliandra umbrosa** Benth. in Gen. Pl. I, 597; Hook. Fl. Brit. Ind. II, 302.

Inga umbrosa Wall. Pl. As. Rar. t. 124; Cat. 5273.

Albizzia umbrosa Benth. in Hook. Lond. Journ. III, 86.

Description: —A tree 20—25 feet high with slender glabrous branches and sometimes with small suberect stipular spines Leaves 2-pinnate, petiole 1¼ inches long, glabrous; pinnæ 2, terminal, each with rhachis 1¼—1½ inches long, with a pair of large, sessile, oblique, oblong, rigidly subcoriaceous end-leaflets, acute at apex, cuneate at base, 6 inches long, 2 inches wide and with an odd similar but much smaller leaflet 1½—2 inches long, ½—¾ inch wide, on the outer side below; leaflets all glabrous on both sides, rather distinctly nerved beneath and each with a gland on rhachis at base.

Flowers sessile in small dense globose heads $\frac{2}{5}$ inch across, with minute bracts, on short ascending slender peduncles $\frac{2}{5}$—$\frac{1}{2}$ inch long, usually several together from old nodes on the branches; elongating in fruit to $1\frac{1}{2}$—2 inches. Calyx campanulate, teeth valvate. Corolla $\frac{1}{8}$ inch long, yellow, inodorous.

Pod 6—9 inches long, $\frac{3}{4}$—1 inch wide, smooth, finely veined, the valves with elevated rounded thickened edges. Seeds 6—9, ovate, $\frac{1}{2}$ inch long, $\frac{7}{20}$ inch wide, long diameter transverse, very much compressed; testa smooth, shining, thin, crustaceous, brown.

Distribution:—Penang.

XIX.—COMBRETACEÆ.

Trees or shrubs; leaves simple, entire; without stipules.

Flowers bracteate, usually sessile, bisexual, rarely polygamous, regular with a zygomorphic tendency. Calyx-tube adnate to ovary and produced beyond it, free portion 4—5-cleft; segments valvate. Petals wanting, or small, inserted on the edge of the calyx-tube between its segments. Stamens as many as calyx-segments or twice their number, inserted inside the calyx; anthers dehiscing longitudinally. Ovary inferior, 1-celled, ovules 2—5, rarely more, on large funicles, pendulous from the apex of the cell.

Fruit generally angled or winged; seed 1, without albumen. Embryo straight; radicle superior; cotyledons oily, generally convolute.

Genera 15. *Species* about 320.

Distribution:—Tropics of the whole world; outside the tropics in S. Africa.

1. Terminalia Linn.

Trees. Leaves alternate or subopposite, frequently crowded at the ends of the branches, often with glands on the petiole or at the base of the midrib beneath.

Flowers green or white, rarely coloured, small, spicate, hermaphrodite or often the upper flowers on the spikes male and the lower hermaphrodite. Calyx-tube ovoid or cylindric, constricted above the ovary; limb of 5 short valvate triangular lobes, soon deciduous. Petals 0. Stamens 10, inserted on the calyx-lobes, biseriate, the 5 lower opposite the calyx-teeth, the 5 upper longer and alternate with the calyx-teeth; filaments subulate or filiform, exserted. Ovary inferior, 1-celled; ovules 2—3, pendulous from the apex of the cell; style subulate, often thickened and villous at the base; stigma simple.

Fruit ovoid, various in size and texture, smooth or angular or 2—5-winged, indehiscent, coriaceous. Seed solitary, exalbuminous; cotyledons convolute.

Species about 135.

Distribution:—Tropics of both worlds.

1. **Terminalia sp.** ex Krause in Engl. Bot. Jahrb. XXXV, Heft 5, p. 47.

Locality:—Rocky slope of the Shum Shum Range (Ellenbeck).

"This Terminalia, which has been collected by Ellenbeck only and of which we have only a poor specimen, seems to be nearly allied to, and perhaps identical with, *T. Kelleri* Engl. et Diels of Somaliland." Krause.

XX.—LYTHRACEÆ.

Trees, shrubs, or herbs; branches often 4-gonous, leaves entire, usually opposite, sometimes alternate or whorled; stipules 0.

Flowers hermaphrodite, usually regular, cymose or paniculate. Calyx usually free, persistent; primary teeth or lobes 3—6, with sometimes as many accessory teeth added, valvate. Petals as many as the primary teeth of the calyx, rarely fewer or 0. Stamens definite or indefinite, inserted at various heights on the calyx-tube. Ovary superior (rarely inferior), 1—6-celled; ovules many, placentas axile, rarely parietal; style usually filiform; stigma capitate, rarely 2-lobed.

Fruit capsular or baccate, membranous or coriaceous, girt round the base by the calyx or entirely included in it, or rarely surmounted by it, 2—6-celled or, by the imperfection of the partitions, 1-celled, variously dehiscent, rarely indehiscent. Seeds numerous, sometimes winged; albumen 0; embryo usually straight; cotyledons usually oblong or orbicular, flat, 2-auricled at the base and with a short radicle.

Genera 30; *species* about 280.

Distribution:—Chiefly tropical.

1. Lawsonia Linn.

A glabrous shrub; younger branches sometimes 4-gonous, the older terete, often spinescent. Leaves opposite, shortly petiolate, ovate-lanceolate, entire.

Flowers in terminal panicled cymes. Calyx-tube short; lobes 4, spreading, broadly ovate; accessory teeth 0. Petals 4, very shortly clawed, inserted at the base of the calyx-tube in pairs opposite to calyx-lobes; anthers broadly oblong, the connective thick. Ovary

subglobose, 2—4-celled; ovules many, placentas axile; style thick, slightly longer than the stamens; stigma capitate.

Capsule globose, stalked in the base of the calyx-tube, coriaceous, irregularly breaking up, ultimately 1-celled. Seeds closely packed on a central placenta, angular, pyramidal.

Species 1.

Distribution :—Not exactly known; probably indigenous in N. and E. Africa, Arabia, Persia, the drier parts of the Peninsula of India and Ceylon; cultivated in many tropical and subtropical countries.

1. Lawsonia inermis Linn. Sp. Pl. ed. 1 (1753) 349; Bedd. Fl. Sylv. 118, t. 14, f. 6; Blanco Fl. Filip. ed. Manila II (1878) 21, t. 108; Koehne in Engl. Bot. Jahrb. IV (1883) 36; in Engl. & Prant. Pflanzenfam. III, 7 (1891) 15, f. 6; in Engl. Pflanzenreich IV, 270; Cook Fl. Bomb. Pres. I, 511.

Lawsonia spinosa Linn. Sp. Pl. ed. 1 (1753) 349 (non Lour.).

Lawsonia alba Lam. Enc. III (1789) 106; DC. Prodr. III (1828) 91; Wight Ill. I (1840) 207, t. 87; Grah. Cat. Bomb. Pl. 67; Dalz. & Gibs. 97; Hook. Fl. Brit. Ind. II, 573; Trim. Fl. Ceyl. II, 228; Brandis Ind. Trees 340; Baill. Hist. Pl. VI (1877) 433 f. 407—409.

Alcanna spinosa Gaertn. Fruct. II (1791) 133, t. 110.

Casearia multiflora Spreng. Pugill. II (1815) 116 (non Jacq.).

Rotantha combretoides Bak. in Journ. Linn. Soc. XXV (1890) 317.

Mail Anschi Rheede Hort. Malab. I (1678) 73, t. 40.

Cyprus s. Alcanna Rumph Herb. Amb. IV (1750) 42, t. 17.

Arabic name:—Henneh, Alhenna.

English Name:—Egyptian Privet.

Description:—A glabrous much branched shrub; lateral branches 4-gonous, often ending in a spinous point. Leaves $\frac{1}{2}$—$1\frac{1}{4}$ by $\frac{1}{4}$—$\frac{5}{8}$ inch, elliptic or broadly lanceolate, acute or obtuse, often mucronulate, base tapering; petioles very short or 0.

Flowers numerous, less than $\frac{1}{2}$ inch across, fragrant, white or rose-coloured, in large terminal pyramidal panicled cymes; pedicels short, slender. Calyx $\frac{1}{8}$—$\frac{1}{5}$ inch long, broadly campanulate; lobes $\frac{1}{10}$—$\frac{1}{8}$ inch long, ovate, acute. Petals $\frac{1}{8}$ inch long, as broad as long, suborbicular or subreniform, undulate. Stamens 8, inserted in pairs on the calyx-tube.

Capsule $\frac{1}{4}$ inch in diameter, globose, slightly veined outside, supported by the persistent calyx and tipped with the style. Seeds trigono-pyramidal, about $\frac{1}{10}$ inch long, externally subtuberculate.

Locality :—Shaikh O'thman (Ellenbeck, Busse, ex Krause).

Uses and History:—From the leaves the well-known dye, called 'henna,' is obtained. For this purpose the leaves are dried, sifted, a little sarson oil added and then reduced to a powder. It is occasionally used in dyeing cloth, but the principal value is as an article of the toilet, for staining the finger-nails, hands and feet a dull orange colour, also for dyeing the hair into a bright red colour. This is often but a first stage in the production of black by the action of indigo on the original red. The use of henna as a cosmetic dates from very ancient times, and is universal among Muhammadan women. The seeds yield an oil, about which little is known, and the flowers are employed in perfumery and embalming. (Watt.)

The Hebrew name of the henna is 'kopher.' In the hieroglyphic language the flower is called 'puqer'. In Coptic the shrub bears the name 'khuper' or 'kuper'. Even in demotic textes we already find the name 'kapra.' There is evidently some relationship between the Hebrew and Egyptian names; but it is doubtful whether the Israelites have borrowed the name in the valley of the Nile, or whether the Egyptians received the plant with its name from the East. Archæologists could not find the product before the Rameses dynasty, and the name itself occurs only in the Ptolemaic inscriptions.[1] From the dried leaves the Egyptians prepared an orange-red powder which they employed as a dye for the hands, feet, and nails, not only of living persons, but also of mummies. Fragments of leaves and powder of Lawsonia have, besides, been discovered in Egyptian tombs. According to Dioscorides and Pliny the Egyptians diluted the powder with the juice of Saponaria (soap-wort) and used it as a dye for the hair.[2] Henna entered also into the composition of the famous perfume, called 'kyphi,' which consisted of 16 different ingredients.[3]

Pliny says that the best kind of henna grows on the banks of the Nile; the second best at 'Ascalon of Judea'; the third, and most sweet in odour, in 'Cyprus,' from which its Greek name 'cypros' was derived.

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[1] Loret, V. La flore pharaonique, 2nd ed. Paris, 1892, page 80.

[2] Dioscorides. De mat. med. I, 124.
Plinius. Historia nat. XXIII, 46.

[3] Theophrastus. Lib. de odoribus, 195.
Plinius. l. c. XIII, 51.
Prosper Alpinus. De plantis Aegypti, XIII.
Celsius. Hierobotanicon, vol. I, 122.
Plutarchus. De Iside et Osiride. Cap. 80.
Dümichen. Der Grabpalast des Patnamenap, pp. 20—25.
Loret, V. Le kyphi, parfum sacré des anciens Egyptiens. Paris, 1887.
Loret, V. La flore pharaonique, pages 80—81.
Loret, C. Les plantes dans l'antiquité. Paris, 1897, Volume I, pages 318—320.

The plant is only twice mentioned in the Bible. The 'Song of Solomon' compares the spouse to 'a cluster of cyprus in the vineyards of Engaddi' (Cant. I, 13), and addresses her with these words: "Thy plants are a paradise of pomegranates with the fruits of the orchard, with cyprus and spikenard (Cant. IV, 13).

E. W. Lane gives an interesting description of the use of henna in Egypt: "The| females of the higher and middle classes, and many of the poorer women, stain certain parts of their hands and feet (which are, with very few exceptions, beautifully formed) with the leaves of the henna-tree, which impart a yellowish-red, or deep-orange colour. Many thus dye only the nails of the fingers and toes; others extend the dye as high as the first joint of each finger and toe; some also make a stripe along the next row of joints; and there are several other principal modes of applying the henna; but the most common practice is to dye the tips of the fingers and toes as high as the first joint, and the whole of the inside of the hand and the sole of the foot; adding, though not always, the stripe above mentioned along the middle joints of the fingers, and a similar stripe a little above the toes. The henna is prepared for this use merely by being powdered, and mixed with a little water, so as to form a paste. Some of this paste being spread in the palm of the hand, and on other parts of it which are to be dyed, and the fingers being doubled, and their extremities inserted into the paste in the palm, the whole hand is tightly bound with linen, and remains thus during the whole night. In a similar manner it is applied to the feet. The colour does not disappear until after many days: it is generally renewed after about a fortnight or three weeks. This custom prevails not only in Egypt, but in several other countries of the East, which are supplied with henna from the banks of the Nile. To the nails, the henna imparts a more bright, clear, and permanent colour than to the skin. When this dye alone is applied to the nails, or to a larger portion of the fingers and toes, it may, with some reason, be regarded as an embellishment; for it makes the general complexion of the hand and foot appear more delicate; but many ladies stain their hands in a manner much less agreeable to our taste: by applying, immediately after the removal of the paste of henna, another paste composed of quicklime, common smoke-black, and linseed-oil, they convert the tint of the henna to a black, or to a blackish-olive hue. Ladies in Egypt are often seen with their nails stained with this colour, or with their fingers of the same dark hue from the extremity to the first joint, red from the first to the second joint, and of the former colour from the second to the third joint; with the palm also stained in a similar manner, having a broad, dark stripe across the middle, and the rest left red; the thumb dark from the

extremity to the first joint, and red from the first to the second joint. Some after a more simple fashion, blacken the ends of the fingers and the whole of the inside of the hand.[1]"

XXI.—LOASACEÆ.

Bristly undershrubs or (climbing) herbs.

Flowers in cymes, regular, dichlamydeous, hermaphrodite. Flower-tube adnate to the ovary, 10-ribbed; limb 5-lobed; lobes persistent. Petals 10, in two rows, perigynous. Stamens indefinite, arranged in 5 bundles; anthers 2-celled, introrse, opening longitudinally; staminodes petaloid or none. Ovary inferior, 3-celled, free at the apex; style filiform. Ovules solitary in each cell of the ovary (in the African-Arabian species), anatropal, pendulous from the apex of the cavity.

Fruit dry, 1—3-celled, 1—3-seeded. Seed exalbuminous; embryo straight; radicle superior; cotyledons flat, thick.

Genera 13. *Species* about 200.

Distribution.—All of tropical and subtropical America, except the monotypic genus *Kissenia*.

1. Kissenia R. Br.

An undershrub, covered with rough bristles. Leaves exstipulate, alternate, stalked, irregularly pinnately lobed.

Flowers in terminal leafy cymes. Flower-tube bristly, 10-ribbed; limb 5-parted; lobes leafy, oblong, persistent, and enlarged in fruit. Petals 10, deciduous, attached in two rows to the throat of the flower-tube, 5 outer alternate with the sepals, roundish or obovate, concave, slightly keeled at the back; 5 inner smaller, opposite to the sepals, linear-oblong, bent in the middle. Stamens numerous, 65—75 fertile in five phalanges, inserted with the petals; filaments thread-like; anthers didymous. Ovary inferior, 3-celled. Ovules 1 in each cell, pendulous from the apex. Style filiform, spirally twisted near the top.

Fruit bristly, 10-ribbed, surmounted by the persistent calyx-lobes, 2—3-celled with fibrous partitions. Seed solitary in each compartment, compressed or slightly convex on both surfaces; testa membranous, veined, rough; embryo straight; cotyledons leafy, thick; radicle very short, superior.

Species 1.

[1] Lane, E. W. The Manners and Customs of the Modern Egyptians. London, Dent & Co., pp. 39—40.

1. Kissenia spathulata R. Br. in Herb. Mus. Brit.; Anders. Journ. Linn. Soc. V, Suppl. p. 43; Oliv. Fl. trop. Afr. II, 501.

Fissenia capensis Endl. Gen. Pl. Suppl. II, 76 (*sine descript.*); Harv. Thes. Cap. t. 98.

Cnidone Mentzeloides E. Mey. in Herb. Drège, et Presl Bot. Bemerk. p. 73.

Description:—A half-woody shrub, 4—5 feet high; stem erect, striate, scabrous-papillose; cortex pale. Leaves alternate, petiolate, 2 inches long, 1—1½ inches broad, the lower ones 3—7-lobed, the upper ones linear-lanceolate, bracteiform, acute, sinuate-dentate, rough on both sides; petiole ½ inch long, terete, striate, dilatate at the base, prolonged into a prominent nerve.

Calyx accrescent; tube ovate, in fruit 1½ inches long, 10-costate, ribs fulvous-pilose; limb 5-partite; lobes long-spathulate, subherbaceous, 3-nerved, reticulately nervate, scabrous. Corolla half as long as the calyx-lobes, stramineous; petals 10, biseriate, the 5 larger ones alternate with the calyx-lobes, carinate, ovate, concave, the smaller ones opposite the calyx-lobes, ligulate, angular-incurved. Styles 3, short.

Fruit woody, 3-locular, often monospermic by abortion, crowned by 5 membranous wings of the persistent accrescent calyx.

Flowers:—April 1861 (Thomson), April 1878 (Perry), November (Schweinf.), December 1889 (Defl.).

Locality:—Plain of Maala (Schweinf., Defl.); gravelly slope of Shum Shum Range (Ellenbeck); Goldmore Valley (Lunt); common on northern slopes (Perry); without locality (Courbon, Thomson, Birdw.).

"The *Kissenia* is quite abundant in two or three places in Aden. Notably on the slopes stretching from the road leading to the cutting through which the road passes to the town of Aden from Steamer Point. It also grows on Steamer Point. I am told that often two or three years pass without this plant being seen at all. The present year 1878 follows a rainy season which is exceptional." Perry in folio Herb. Kew.

Distribution:—Yemen, Hadramaut, Somaliland, Namaland, Damaraland.

Note:—Anderson gives an explanation of how the original '*Kissenia*' became to be known under the name of '*Fissenia*':

"Since the printing of this Florula," he says, "I have seen a specimen of a *Fissenia*, collected at Aden by Dr. Courbon, of the French exploring expedition under the command of Captain Russel, and kindly communicated to Dr. Hooker for my inspection by Prof. Brongniart of Paris. This is the plant upon which Brown founded the genus and

of which I have examined his original specimen in the British Museum: it does not, however, bear the name *Fissenia*, but *Kissenia*, in honour of its discoverer, M. Kissen, a traveller in Arabia. Endlicher, who is responsible for the spelling *Fissenia*, probably obtained the generic name for the South African species, orally, from R. Brown." (Florula Adenensis, p. 42.)

XXII.—CUCURBITACEÆ.

Usually climbing perennial-rooted herbs. Leaves alternate, simple or compound, exstipulate; tendrils lateral, solitary, simple or 2—8-fid.

Inflorescence various, axillary. Flowers unisexual. Calyx-tube adnate to the ovary; lobes 5, rarely 3 or 6, imbricate. Petals 5, rarely 3 or 6, free or connate, often confluent with the calyx-tube.

Anthers extrorse, free or connate, simple or 2—3-fid; cells straight, curved, conduplicate or contorted; connective sometimes produced beyond the cells. Ovary inferior or rarely free at the apex only, usually 3-carpellary; ovules usually many and horizontal in most genera.

Fruit usually a succulent or hard indehiscent many-seeded berry, rarely dehiscing by valves or bursting irregularly. Seeds of various forms, often imbedded in pulp or fibre; testa coriaceous or crustaceous; no albumen.

Species about 600.

Distribution:—Warmer parts of the globe, especially in the Tropics.

Corolla 5-partite to the base or 5-petalous.
- Connective produced beyond the cells . . . . 1. Cucumis.
- Connective not produced beyond the cells . . . . 2. Citrullus.

Corolla campanulate, divided to the middle or a little below it. 3. Corallocarpus.

1. Cucumis L.

Annual herbs with a perennial root, climbing or trailing, hispid or scabrid. Leaves entire, lobed, palmate or pedate. Tendrils simple, sometimes spinescent.

Flowers yellow, usually monœcious. Male flowers: Fascicled or solitary. Calyx-tube short, subulate. Corolla subcampanulate, deeply 5-lobed or -partite. Stamens 3, free; filaments short; anthers free, oblong, one 1-celled, two 2-celled; cells various; connective produced into a papillose appendage. Rudiment of ovary glandular. Female flowers: Solitary. Staminodes 0 or subulate or reduced to glands. Calyx and corolla as in the male. Ovary ovoid or globose; ovules ∞, on 3 or 5 placentas; style short; stigmas 3, obtuse.

Fruit fleshy or corky, globose or cylindric, terete or obtusely angled, smooth or echinate, or 3-valved. Seeds many, oblong, compressed.

Species about 26.

Distribution :—Tropical Asia and Africa, a few in Australia and America.

Fruit striped, 1—1½ inches long, with soft, slender spines . C. prophetarum.
Fruit 1½—3½ inches long, with distant stout spines . . C. pustulatus.

1. Cucumis prophetarum L. Sp. Pl. ed. I, 32 ; D C. Prodr. II, 301 ; Boiss. Fl. Or. II, 758 ; Naud. in Ann. Sc. Nat. ser. IV, XI, 14 ; Anders. Journ. Linn. Soc. V, Suppl. p. 19 ; Hook. Fl. Brit. Ind. II, 619.

Cucumis arabicus Del. in Cat. Hort. Monsp.

Cucumis anguinus Forsk. Fl. Aeg.-Arab. p. 168.

Cucumis amarus Stocks in Herb. Hook.

Description :—Annual, monœcious. Stems slender, branched, angled and grooved, scabrid. Tendrils striate, sometimes absent. Leaves polymorphous, rigid, ¾—2 inches long and broad, scabrid on both surfaces, subtriangular-reniform or palmately 3—5-lobed ; lobes short or long, quite entire or dentate, obtuse or acute, base truncate or more or less deeply cordate.

Male flowers solitary or fascicled ; peduncles filiform, densely hairy. Calyx and corolla hispid. Connective produced into a linear, flat, simple or 2-fid appendage, glandular at the top. Female flowers : Peduncle stout, ½—1 inch long, covered with rigid prickles. Staminodes linear.

Fruit subglobose, 1—1½ inches long, green with pale vertical bands, covered with scattered, soft, slender spines. Seeds small, ⅓ inch long, elliptic-oblong, smooth ; pulp bitter.

Flowers :—March 1878 (Perry), December 1847 (Hooker).

Fruits :—February 1851 (Thomson), November (Schweinf.).

Locality :—Plain of Maala (Defl.) ; Goldmore Valley, near the coal depôts of the Messag. Marit. (Schweinf.) ; slope of Shum Shum Range (Ellenbeck) ; great valley between Steamer Point and Town (Marchesetti); in sandy places (Hook., Thomson, Anders.) ; Steamer Point (Lunt) ; without locality (Birdw., Perry, Balfour).

Distribution :—Sinai, Egypt, Nubia, Abyssinia, Kordofan, Arabia, Socotra, Baluchistan, Sind.

2. Cucumis pustulatus Hook. in Oliv. Fl. Trop. Afr. II, 544 ; Cogn. in DC. Monogr. Phan. III, 495.

Cucumis abyssinicus Schimp. Herb. Abyss. No. 412.

Arabic name :—Hamak-el-hhomr.

Description :—Perennial, hoary and scabrid. Stem rather stout, angled, rigid, beset with short white prickles. Leaves ½—2 inches in diameter, coriaceous, very variable, oblong, rounded or cordate, subentire or more or less deeply 3—5-lobed, lobes obtuse, quite entire or toothed, petioles rather short. Tendrils short, rather rigid.

Male flowers: Calyx campanulate, shortly scabrid. Connective shortly produced into a broad glandular appendage. Female flowers: Ovary covered with short stout prickles.

Fruit on very stout peduncles, 1½—3 inches long, broadly ovoid, rounded at both ends, covered with scattered, thick, conical tubercles or spines. Seeds small, ⅙ inch, whitish, smooth, elliptic-oblong, without thickened border or depressed disk.

Fruits :—February (Thomson).

Locality :—Aden (Hooker, Thomson, Schweinf.).

Distribution :—Yemen, Eritrea, Highlands of Somaliland, Abyssinia.

Note :—J. D. Hooker, who collected *C. pustulatus* at Aden in 1847 and 1851, says that the fruit of the Aden specimen is scabrid as well as aculeate, which is not the case in others from Arabia Petraea.

2. Citrullus Schrader.

Perennial herbs, usually trailing. Tendrils 2—3-fid, rarely undivided. Leaves deeply 3—7-lobed, the lobes usually lobulate.

Flowers rather large, yellow, monœcious, solitary. Male flowers: Calyx-tube broadly campanulate; lobes 5. Corolla 5-partite beyond the middle, subcampanulate; segments oblong-ovate, obtuse. Stamens 3, filaments short, free; anthers scarcely cohering, one 1-celled, the others 2-celled, the cells linear, flexuose, the connective not produced. Pollen smooth. Rudimentary ovary glanduliform. Female flowers: Calyx and corolla as in the male. Rudimentary stamens 3, setose or ligulate. Ovary ovoid, 3-placentiferous; ovules ∞, horizontal; style short; stigmas 3, thick, reniform.

Fruit globose or ellipsoid, smooth, fleshy, indehiscent. Seeds very many, much compressed, smooth.

Species 3.

Distribution :—Eastern Mediterranean region, Tropical Africa, Western Asia.

1. Citrullus colocynthis (L.) Schrad. in Linnæa XII, (1838), 414; Arn. in Hook. Lond. Journ. Bot. III, 276; Anders. Journ. Linn. Soc. V, Suppl. p. 20; Boiss. Fl. Or. II, 759; Naud. in Ann. Sc. Nat. ser. IV, XII, 99; Oliv. Fl. trop. Afr. II, 548; Batt. et Trab. Fl. d'Alg. p. 332.

Cucumis colocynthis L. Sp. Pl. ed. I, p. 1011; DC. Prodr. III, 302; Cogn. in DC. Monogr. Phan. III, 510.

English name:—Colocynth.

Arabic name:—Hándhal gehed; (dohn el-handhal= oil of C.).

Description:—A monœcious, root-perennial herb; stems diffuse or creeping, angled, hirsute or scabrid. Tendrils simple or bifid. Leaves triangular-ovate in outline, 2—4 inches long, 7-lobed, or 3-lobed with the middle lobe ovate, the lobes pinnatifid or sinuate-lobulate, very scabrid on both surfaces.

Male flowers: Peduncles villous. Calyx campanulate, hairy, $\frac{1}{5}$ inch long; teeth lanceolate, $\frac{1}{12}$ inch long. Corolla pale yellow, segments obovate, apiculate. Female flowers: Ovary ellipsoid, villous.

Fruit globose, slightly depressed, 2—3 inches in diameter, variegated green and yellow; pulp dry, intensely bitter. Seeds small, lenticular, smooth.

Fruits:—January 1863 (Oliver and Cl.).

Locality:—Goldmore Valley (Schweinf.); Ravine south-west of the Shum Shum R., sandy plain between Bir Achmed and Shaikh O'thman (Defl.); great valley between Steamer Point and town (Marchesetti); on the shore (Anders.); without locality (Birdw., Oliver and Cl., Kuntze).

Distribution:—Spain, Canaries, Cape Verd Islands, N. Africa, Arabia, Palestine, Sind, Punjab, Ceylon.

Uses:—The fruit is in size and shape much like an orange, marble-green on the surface and changing to yellow as it ripens. The intensely bitter taste of the pulp is due to an amorphous yellow glucoside, Colocynthin, which is found in it to the extent of about 0·6 per cent., but not in the seeds. The fruit is a drastic purgative, and is used both in Native and European medicine. The yield is about 110 lb. compound extract to 60 lb. dried fruit.

The seeds contain from 15—17 per cent. of a fixed oil which is said to make a useful illuminant.

For the London market the peeled fruit is imported chiefly from Smyrna, Trieste, France, Spain, and more rarely from Persia. The unpeeled fruit is brought from Mogador. (Watt).

"Every part of the plant, especially the fruit, is of a very bitter taste, and is, therefore, employed by the Bedouins as an anthelmintic. Goats and Ibexes are very fond of the leaves and young plants, but the fruit is only eaten by donkeys. The ripe dried fruit is thrown into the fire and charred. Of this the Bedouins make gun-owder, time-fuses, and tinder." A. Kaiser in fol. Herb. Kew.

On the oil prepared from the ripe fruit and its uses, see Ibn el Beithar, vol. II, p. 127—128.

The same author says that the pulp of the fruit is called 'kebest' (vol. III, 143) and according to Abu Hanifa, the name of the seed is 'hebed' (eod. l. III, 387).

Historical Note:—The Colocynth seems to be the plant which is mentioned under the name 'pakknoth' in connection with an episode in the life of Eliseus. (IV, Reg. 4, 39). When Eliseus returned to Galgal, there was a famine in the land. One day he wanted to prepare a meal for his guests and for this purpose he sent a servant to gather some herbs. "And one went out into the field to gather wild herbs. And he found something like a wild vine, and gathered of it wild gourds of the field, and filled his mantel, and coming back he shred them into the pot of pottage, for he knew not what it was. And they poured it out for their companions to eat. And when they had tasted of the pottage, they cried out, saying: Death is in the pot, O man of Gcd. And they could not eat thereof."

The opinion that the Colocynth was the plant in question is strengthened by Rabbinical writers who state that the 'pakknoth' contained seeds which yielded an oil. To this may be added the fact, that the Colocynth, according to Tristram, grows most abundantly in the barren sands near Gilgal, and all around the Dead Sea in the low flats, covering the ground with its tendrils. The same author points out, that it was easy for an inhabitant of the highlands of Palestine to mistake this unfamiliar vegetable for one of the harmless kinds; and as it was a time of scarcity, he would be glad to appropriate any likely esculent.[1]

3. Corallocarpus Welw.

Prostrate or climbing, scabrid or subtomentose herbs. Leaves lobed or palmate. Tendrils simple, or absent.

Flowers minute, monœcious. Male flowers crowded at the end of a long peduncle. Calyx broadly campanulate, 5-lobed. Corolla 5-partite. Stamens 3, free, inserted on the calyx-tube; anthers entire or bipartite, one 1-celled, two 2-celled; connective produced or not, often bifid. Rudimentary ovary minute or absent. Female flowers sessile or shortly pedicelled, solitary or fascicled. Staminodes minute or absent.

[1] *Cf.* also:—Celsius. Hierobotanicon, vol. I, p. 397.
Tristram, H. B. The natural history of the Bible, London, 1889, p. 452.
Groser, W. H. The Trees and Plants mentioned in the Bible. London, 1895, p. 146.
Buxtorf. Lexicon chaldaicum, p. 891.

Calyx and corolla as in the male. Ovary ovoid, usually beaked 2—3-celled; ovules few on 2—3 placentas; stigma 3-, rarely 2—4-lobed.

Fruit a berry, fleshy, ovoid or ellipsoid, obtuse or beaked, operculately dehiscent near the base. Seeds few, tumid.

Species about 15.

Distribution :—India, Arabia, tropical Africa.

Male flowers forming axillary glomerules of 3—5 . .	1. C. glomeruliflorus.
Male flowers not so :—	
Anthers sessile	2. C. erostris.
Anthers subsessile	3. C. velutinus.

1. Corallocarpus glomeruliflorus Schweinf. Manuskr. Sammlung arab.-æthiop. Pflanzen (ex Krause).

Rhynchocarpa Courboni Defl. in Bull. Soc. Bot. France XXXII, 349.

Phialocarpus glomeruliflorus Defl. in Bull. Soc. Bot. France XLII, 304.

Corallocarpus Gijef Schweinf. in Herb. Berol. (ex Krause).

Description :—An erect undershrub, $\frac{2}{3}$—$1\frac{1}{3}$ feet high, very scabrous; cortex green-succose on the inner side, at last papery, on the outer side suberose, white-cinereous, pulverulent; caudex succose, short, thick-clavate in the upper half, branching at the apex; branches spreading, rigid, sulcate, thickened at the base; branchlets shortened or slightly elongate, ecirrose, leafy, densely woolly at the axils of the leaves, the lower internodes covered with the hardened remains of the old petioles. Leaves green, velutinous-scabrous, orbicular, of various size, often $\frac{3}{5}$—$\frac{4}{5}$ inch long and $\frac{3}{5}$—$\frac{4}{5}$ inch broad, at the base deeply emarginate, sinuate-denticulate, subundulate; petiole as long as the lamina or slightly longer.

Flowers diœcious (?), greenish-yellow, minute, short-pedicelled. Male flowers forming axillary glomerules of 3—5; female flowers axillary, solitary, rarely geminate; pedicels erect, immersed in wool. Male calyx very small; tube globose-urceolate, hirsute, with the throat woolly-bearded; limb rotate; lobes linear-oblong, slightly acute, pubescent, as long as the corolla; corolla rotate, pubescent; limb 5-partite; segments ovate-lanceolate, obtuse. Stamens 3, opposite the petals, attached to the throat; filaments very short, complanate, glabrous; middle anther 1-locular, lateral ones 2-locular, hippocrepiform; loculi linear, arcuate, confluent at the apex; connective broad, obtuse. Female calyx acute than the male calyx; tube ventricose, adnate to the ovary, hirsute; limb campanulate, lobed scarcely to the middle; lobes deltoid-acuminate, acute, pubescent on the back, slightly longer than the corolla; corolla campanulate, as to the rest as in the male; ovary 2-placentiferous; style

columnar, very short, glabrous, no basilar disk; stigmas 2, orbicular, large, irregularly lobulate, deflexed; ovules 2—4, horizontal; placentæ tumid, pulpy.

Fruit (imperfectly ripe) $\frac{1}{2}$—$\frac{3}{5}$ inch long, $\frac{1}{3}$—$\frac{2}{5}$ inch broad, pubescent, ovate, attenuate into an oblique rostrum, longitudinally 10-costate from the rostrum to the fourth or fifth lower part; rostrum cylindrical, subarcuate; dehiscence doubtful, probably basilar. Seeds ovate-globose, subcompressed, black, minutely punctate, glabrous.

Fruits:—March (Schweinf.).

Locality:—On the Shum Shum Range (Defl.); Wadi Maala, above the coal depôt of the Messag. Marit., plateau below the top of the Shum Shum Range at a height of about 1,300 feet (Schweinf.); without locality (Beevor, Hildebrandt); on the Jebel Muzulghum of Little Aden (Defl.).

Distribution:—Yemen.

Note:—Deflers says that this species attains its normal development only in the wooded valleys of the Jebel 'Areys (in Fodhli). In the neighbourhood of Aden, where the climate is extremely dry, only a very poor form is to be found, often leafless and sometimes with leaves much reduced. After the showers the leaf-buds develop very rapidly, but are soon arrested in their growth by the succeeding dryness.

2. **Corallocarpus erostris** (Schweinf.) Oliv. Fl. trop. Afr. II, 567.

Rhynchocarpa erostris Schweinf. in Verh. Zool. Bot. Ges. Wien 1868, p. 673.

Description:—Stem sparingly branched, angular, pruinose, sparsely hairy. Leaves orbicular, deeply sinuate-cordate, with 5 obtuse or rounded obscurely toothed angles, scabrous above, tomentose ashy scabrous below, nerves flattened. Tendrils woody pubescent.

Male flowers: Racemes very long, dense-flowered, ebracteate; pedicels puberulous, bracteolate in the middle. Corolla 5-lobed to the middle, yellow-green, three times as long as the calyx. Anthers sessile; cells oblong, obtuse, connate by the dilated connective. Female flowers: Racemes short, axillary, sessile, subfascicled, much smaller than the male.

Fruit ovoid, orange-yellow, glomerate, base constricted, apex acute or obscurely beaked, 4—6-seeded, resinous when dry. Seeds globose, somewhat compressed, yellow or brown, margined, marked with elevated lines.

Locality:—Valley on the south-western slope of the Shum Shum Range (Defl.); near the coal-depôt of the Messag. Marit. (Schweinf.).

Distribution:—Yemen, Eritrea, Nubia.

3. **Corallocarpus velutinus** Benth. et Hook. f. Gen. Pl. I, 831.

Aechmandra velutina Dalz. and Gibs. Bomb. Fl. p. 100.

Description :—A stout climbing herb; root fibrous; stems angular, hairy, deeply grooved, not much branched. Tendrils long, striate, simple. Leaves fleshy, suborbicular in outline, 2—3 inches long, pale-green and at first softly villous, finally scabrid above, tomentose and ashy grey beneath, cordate or subcordate at the base, deeply palmately 3—5-lobed; lobes rounded or oblong, irregularly denticulate.

Male flowers in 15—20-flowered racemes; peduncle 2—4 inches long. Calyx hairy; teeth narrowly triangular; corolla greenish-yellow; segments ovate—oblong, subacute, $\frac{1}{16}$ inch long. Anthers subsessile; connective scarcely produced, bifid. Female flowers fascicled, subsessile.

Fruit including the beak $\frac{3}{4}$ inch long, sessile, ellipsoid, red when ripe, finely velvety. Seeds $\frac{1}{8}$ inch in diameter, globose.

Fruits :—March (Schweinf.).

Locality :—Aden (Birdwood, Schweinf.).

Distribution :—Tropical Africa, Sind.

XXIII.—FICOIDEÆ.

Herbs or low shrubs. Leaves opposite, alternate or pseudo-verticillate, simple, often fleshy; stipules none or scarious.

Flowers solitary or usually cymose. Petals usually wanting or small. Stamens perigynous or hypogynous, definite or indefinite; filaments free or variously connate at the base. Disk 0 or annulate. Ovary usually free, 2—5-celled; styles or stigmas as many as cells of ovary; ovules solitary, few or ∞.

Fruit usually capsular, splitting dorsally or circumscissilely, or less commonly separating into cocci. Seeds solitary or numerous, usually reniform, compressed; testa membranous or crustaceous; embryo curved round farinaceous or fleshy albumen.

Genera 22; *species* about 450.

Distribution :—Tropical and sub-tropical regions.

Stamens inserted on the calyx-tube	1. Trianthema.
Stamens hypogynous.	
Fruit capsular.	
Petals many	2. Orygia.
Petals o	3. Mollugo.
Fruit of 2 one-seeded cocci	4. Limeum.

1. Trianthema L.

Herbs or undershrubs, glabrous or papillose. Leaves opposite, unequal, entire, linear to rotundate; petiole dilated with membranous stipuliform margins.

Flowers axillary, solitary, cymose or panicled. Calyx 5-fid, lobes with a dorsal subapical cusp. Petals none. Stamens 3—5—10 or ∞, inserted near the top of the calyx-tube. Ovary 1—2-celled, free, sessile, often truncate at the apex; ovules 1—∞, basal; styles 2 or 1.

Capsule membranous or coriaceous, 1—2-celled, 1—2—∞-seeded, circumsciss. Seeds rotundate-reniform, compressed; embryo annular.

Species 10.

Distribution:—In warm regions.

Style 1.	
Flowers in glomerules	1. T. crystallina.
Flowers solitary	3. T. monogyna.
Styles 2	2. T. pentandra.

1. Trianthema crystallina (Forsk.) Vahl Symb. I, 32; DC. Prodr. III, 352; Anders. Journ. Linn. Soc. V, Suppl. p. 20.

Papularia crystallina Forsk. Fl. Aeg.-Arab. p. 69.

Trianthema triquetra Rottl. (ex Anders.).

Trianthema sedifolia Visian. Pl. Aeg. t. 3.

Description:—Ascending or diffuse, with spreading or prostrate branches, repeatedly 2—3-chotomous from the base, annual or biennial; branches, at least towards the extremities, and leaves cellular-papillose. Leaves fleshy, oblanceolate-obovate or rotundate, obtuse, much reduced and often roundish and subcordate on profusely flowering branches, $\frac{1}{4}$—$\frac{3}{4}$ inch long; petioles sheathing.

Flowers in axillary few- or many-flowered, often dense fascicles. Calyx 5-fid, lobes as long as the tube, ovate or deltoid with a lanceolate or short and obtuse dorsal apiculus. Stamens 5. Ovary truncate, 1-celled, 2-seeded; style 1, as long as the ovary.

Seeds plicate-rugose.

Flowers: April 1894 (Lunt).

Fruits: June 1872 (Hildebrandt).

Locality:—Sandy places of the great valley between Steamer Point and town (Marchesetti); eastern shore of the isthmus between Barrier-Gate and the village of Migrad (Defl.); plain of Maala, nearly sea level (Lunt); common in cemetery (Beevor); without locality (Anders., Birdw., Hildebrandt).

Distribution:—Upper Egypt, Nubia, Abyssinia, Kordofan, S. Arabia, Sind, Punjab.

2. Trianthema pentandra L. Mant. 79; DC. Prodr. III, 352.

Trianthema obcordata Wall. Cat. 6837, F.

Trianthema Govindia Wall. Cat. 6838.

Arabic name:—Rogama (Schweinf.).

Description :—Diffuse, much-branched, from a few inches to 2—3 feet high; stems and branches more or less papillose, often nearly smooth and glabrous. Leaves ½—2 inches long, elliptic-oblong, sometimes slightly obovate; petioles distinct, ¼—½ inch long, dilated at the base.

Flowers in few- or many-flowered sessile or subsessile axillary fascicles; bracteoles thinly membranous. Calyx deeply 5-lobed; lobes ovate-oblong, coloured within, with a short apiculus at the back. Stamens 5. Styles 2.

Capsules ⅛ inch long, exserted, the cap with broad deflexed horns, mitriform. Seeds orbicular-reniform, compressed, rugulose, dull-black.

Flowers :—August 1898 (Birdw.).

Locality :—Aden (Birdw.).

Distribution :—Yemen, southern coast of Arabia (common weed in gardens, on sand and water-courses), Tropical Africa, India.

3. **Trianthema monogyna** L. Mant. 69; Schweinf. Bull. Herb. Boiss. (1896) App. II, p. 169.

Trianthema obcordata Roxb. Hort. Beng. 24; Wight Ic. t. 228.

Trianthema pentandra β obcordata DC Prodr. III, 352.

Arabic name :—Riqma (Schweinf.).

Description :—A prostrate somewhat succulent herb; stems more or less angular, glabrous or pubescent, much branched. Leaves subfleshy, obliquely opposite, unequal, the upper one of the pair the larger, ¾—1½ by ¾—1¼ inches, the lower ⅜—½ by ¼—⅜ inch, broadly obovate, rounded and often apiculate at the apex, cuneate at the base, glabrous; petioles ¼—½ inch long, much dilated and membranous at the base, especially those of the smaller leaves in which the membranous enlargement forms a triangular pouch.

Flowers solitary, sessile, almost concealed by the pouch of the petiole. Calyx-lobes ovate, acute. Stamens 10—20. Ovary truncate; style 1.

Capsules small, almost concealed in the petiolar pouch, lid truncate, slightly concave, with 2 spreading teeth, carrying away at least one seed, the lower part 3—5-seeded. Seeds reniform, muriculate, dull-black.

Locality :—Shaikh O'thman (Schweinf.).

Distribution :—Throughout India, Ceylon, and most tropical regions.

2. Orygia Forsk.

A rigid or somewhat wiry herb. Leaves alternate, rather fleshy, petiolate; no stipules.

Flowers in terminal or leaf-opposed few-flowered cymes. Sepals 5, ovate-cuspidate, with membranous margins. Petals 0. Staminodes many, subhypogynous, narrow, connate at the base. Stamens 12 or more, inserted at the base of the calyx, subhypogynous. Ovary free, globose, 5-sulcate, 5-celled; styles 5, filiform; ovules many, axile.

Capsule subglobose, included in the calyx, 5-celled; loculicidally 5-valved, many-seeded. Seeds reniform, strophiolate.

Species 1.

1. Orygia decumbens Forsk. Fl Aeg.-Arab. p. 103; DC. Prodr. III, 455; Anders. Journ. Linn. Soc. V. Suppl. p. 20; Boiss. Fl. Or. I, 755; Harv.-Sond. Fl. Cap. I, 136.

Glinus trianthemoides Heyne in Roth Nov. Sp. p. 231.

Portulaca decumbens Vahl Symb. I, 33.

Talinum decumbens Willd. Sp. Pl. II, 864.

Orygia mucronata Klotsch in Peters' Reise nach Mossamb. p. 140, t. 25.

Axonotechium trianthemoides Fenzl in Ann. Wien. Mus. I, 354.

Description:—Decumbent, diffuse, from a few inches to 1—2 feet high. Leaves ½—1 inch by ½—⅞ inch, alternate, obovate, glabrous, glaucous.

Bracts at the base of the peduncles ⅛—⅙ inch long, membranous, pinkish. Flowers light carmine-red. Staminodes about 20, purple-red.

Capsule pale-yellow.

Flowers:—April 1844 (Lunt).

Fruits:—March 1878 (Perry), Dec. 1847 (Hooker), Dec. 1889 (Defl.).

Locality:—From the seashore to a height of 1,000 feet (Edgew., Hooker); Shum Shum Range (Ellenbeck); plain of Maala, valleys near the telegraph office (Defl.); Goldmore Valley, nearly sea level (Lunt); without locality (Perry, Hunter).

Distribution:—Africa, Arabia, Baluchistan, Sind, Punjab, Mysore.

3. Mollugo Linn.

Erect or diffuse glabrous, pubescent or stellately tomentose herbs, often dichotomously branched. Leaves often falsely whorled or alternate, or all radicle, linear, obovate or spathulate; stipules membranous, fugaceous.

Flowers axillary, solitary, fascicled or in diffuse or umbelliform cymes, usually greenish. Sepals 5, subequal, persistent, with membranous margins. Petals 0. Stamens 3—5, subhypogynous, usually alternate

with the sepals, sometimes intermixed with subulate staminodes. Ovary free, 3—5-celled; ovules ∞, attached to the interior angle of the cells; styles 3—5.

Capsule membranous, included in the calyx, oblong, globose, or subcylindric, 3—5-celled, loculicidally 3—5-valved. Seeds several (rarely 1) in each cell, reniform, appendaged at the hilum or not; embryo more or less curved.

Species about 12.

Distribution:—Tropical and subtropical regions of both hemispheres.

1. Mollugo Cerviana (L.) Seringe MS; DC. Prodr. I, 392; Anders. Journ. Linn. Soc. V, Suppl. p. 7; Boiss. Fl. Or. I, 756; Harv.-Sond. Fl. Cap. I, 138.

Pharnaceum Cerviana L. Sp. Pl. ed. I, p. 388.

Description:—An annular erect slender glabrous herb 3—8 inches high. Stems very many, almost filiform; branches umbellate, the nodes thickened. Radical leaves $\frac{1}{4}$—$\frac{1}{2}$ inch long, rosulate, spathulate or linear-spathulate. Cauline leaves $\frac{1}{4}$—$\frac{3}{4}$ by about $\frac{1}{30}$ inch, narrow-linear, apiculate, 2—8 in a whorl; petioles obscure.

Flowers numerous, on long filiform stiff pedicels subumbellately arranged, usually in threes on the top of long filiform axillary and terminal peduncles. Sepals $\frac{1}{10}$ inch long, elliptic-oblong, obtuse, with white membranous margins. Stamens 3—5. Styles 3, very short.

Capsules subglobose, equalling the sepals. Seeds numerous, smooth, without tubercular points, yellowish-brown.

Flowers:—March 1878 (Perry).

Fruits:—March 1878 (Perry).

Locality:—Ravines at the foot of the hill of the telegraph office (Defl.); on sand in the great valley between Steamer Point and town (Marchesetti); under shrubs and in sandy places (Hook., Anders.); without locality (Birdw., Wichura, Perry).

Distribution:—Tropical and subtropical countries of the Old World, also in Southern Europe.

4. Limeum L.

Annual or perennial low branched glabrous herbs, sometimes frutescent at the base; branches usually prostrate. Leaves alternate or subopposite, linear-lanceolate, elliptic or obovate, entire or obscurely ciliolate; stipules 0.

Flowers small, bracteate, greenish, hermaphrodite or unisexual, in dense terminal and subaxillary cymes. Sepals 5, unequal, ovate, herbacious or with membranous margins. Petals 3—5, oblong or spathulate, or minute, or 0. Stamens 5—10, sometimes imperfect, hypogynous;

filaments dilated and connate at the base. Ovary free, globose, compressed, 2-celled; ovule solitary in each cell, ascending, with basal funicle; style very short, with 2 branches which are stigmatose within.

Fruit separating into 2 orbicular or hemispheric cocci which at length dehisce ventrally. Seeds vertical; embryo annular; radicle inferior.

Species about 10.

Distribution :—Tropical and South Africa, Arabia, India.

1. Limeum indicum Stocks in Herb. Hook.; Anders. Journ. Linn. Soc. V, Suppl. p. 30; Oliv. Fl. Trop. Afr. II, 596.

Description :—A prostrate glandular herb; root perennial; stems diffuse, much-branched, glandular-pubescent. Leaves opposite or nearly so, $\frac{1}{4}$—$\frac{3}{8}$ by $\frac{3}{16}$—$\frac{1}{4}$ inch, broadly elliptic or suborbicular, inequilateral, shortly apiculate, entire, glandular-pubescent; petioles distinct, $\frac{1}{8}$ inch long, slightly dilated at the base.

Flowers crowded, in axillary subsessile cymes; pedicels short, glandular, bracteate at the base. Sepals $\frac{1}{10}$ inch long, glandular-pubescent, ovate, acute, with membranous margins. Petals much shorter than the sepals, clawed, truncate and 2-dentate at the apex. Stamens 7 (Stocks), 6—7 (Anderson).

Carpels in fruit as long as the sepals, hermispheric, dehiscing ventrally, the margins of the valves inflexed so as to retain the seed till moistened. Seeds broader than long, about $\frac{1}{12}$ inch broad, concavo-convex, quite smooth on the back, yellowish-white.

Flowers :—January 1863 (Oliver and Cl.), March 1878 (Perry), Dec. 1847 (Hooker).

Fruits :—January 1863 (Oliver and Cl.).

Locality :—Seashore (Hook.); without locality (Perry, Oliver and Cl.).

Distribution :—Nubia, S. Arabia, Sind, Baluchistan, Punjab, Multan.

XXIV.—UMBELLIFERÆ.

Usually herbs, rarely shrubs or trees. Leaves usually alternate, simple or compound, usually exstipulate; petiole generally sheathing at the base.

Flowers in simple or compound umbels, rarely in heads or whorls. Calyx-tube adnate to the ovary; teeth 5 or 0. Petals 5, epygynous, distinct, sometimes unequal, usually imbricate in bud. Stamens 5, epygynous. Ovary inferior, 2-celled, crowned by an epygynous, usually 2-lobed disk; ovule solitary in each cell, pendulous; styles 2; stigmas minute, capitate.

Fruit 2-celled, usually separating into 2 indehiscent 1-seeded mericarps which are attached near the apex of their faces to a central axis (carpophore), which usually splits and allows the mericarp to separate from their median plane or commissure, or occasionally remains undivided. Mericarp usually marked by five longitudinal lines (primary ridges), 2 of which are lateral, 1 dorsal at the middle of the back and 2-intermediate, and often with 4 more (secondary ridges) alternating with the primary ones. Seed one in each carpel, pendulous from the point of attachment to the carpophore; testa thin; albumen cartilaginous; embryo minute, straight, near the apex of the seed; radicle superior.

Genera 152; *species* about 1,300.

Distribution:—Temperate regions, especially of the northern hemisphere, but more or less throughout the world.

1. Ptychotis Koch.

Annual or biennial herbs. Cauline leaves multifidly capillaceous. Umbels axillary, compound; involucre wanting or few-leaved; involucel of several leaves. Flowers white. Margin of calyx 5-toothed. Petals obovate, bifid, or deeply emarginate, with a long inflexed point proceeding from the sinus. Fruit compressed, ovate or oblong. Mericarps with 5 equal, filiform, primary ridges, the lateral ones marginal. Interstices with single vittæ. Carpophore bi-partite. Seeds terete or gibbously convex, flattish in front.

Species 6.

Distribution:—Europe, Africa, Arabia.

1. Ptychotis arabica Anders. Journ. Linn. Soc. V, Suppl. p. 21.

Arabic name:—Kelesere.

Description:—A small herb, 2—4 inches high, puberulous; stem erect, terete, puberulous with pilose hairs. Leaves herbaceous, subtomentose or glabrous, pinnate or bipinnate, slender-petioled; segments ternate, deeply lobate; lobes cuneate, 3—4-fid. Involucrum pentaphyllous; laciniæ setaceous, subulate, acute; involucellum 3—5-phyllous. Flowers inconspicuous, white when dry. Petals minute, squamæform, mucronate at the apex; mucro involute. Mericarps 5-costate; ribs glandular-hairy.

Flowers and fruits:—February 1851 (Thomson), March 1878 (Perry), April 1861 (Thomson), December 1847 (Hooker).

Locality:—Wadi Maala (Schweinf.); top of Shum Shum Range, 1,700 ft. (Hook., Thomson, Defl., Busse; without locality (Birdw., Perry).

Distribution:—Yemen.

XXV.—RUBIACEÆ.

Trees, shrubs or herbs, prostrate or scandent. Leaves opposite or verticillate, simple, entire; stipules various, inter- or intra-petiolar, persistent or deciduous, free or connate or adnate to the leaf-base or petiole.

Inflorescence various. Flowers hermaphrodite, rarely unisexual. Calyx-tube adnate to the ovary; limb various. Corolla inserted on the ovary, various in form and aestivation, tetramerous or pentamerous. Stamens usually isomerous with the corolla-lobes, inserted at the mouth or throat or on the tube of the corolla; filaments various; anthers 2-celled. Disk at the top of the ovary, usually annular or cushion-shaped. Ovary inferior, 1—12-celled, usually 2-celled; ovules 1 or more in each cell; style simple, bi- or multifid.

Fruit various. Seeds albuminous; embryo straight or curved.

Genera about 350; *species* about 4,000.

Distribution :—Chiefly tropical and subtropical.

1. Oldenlandia L.

Herbs or shrubs with opposite leaves, acuminate or setose stipules adnate to the petiole or leaf-base.

Flowers arranged in terminal or axillary panicles or clusters, small or delicate. Calyx-tube globose obovoid, turbinate or obconic-oblong; limb regular, deeply 4- or rarely 5-lobed, rarely with alternating teeth. Corolla various in shape, membranous; tube straight or somewhat curved; throat glabrous or bearded; limb 4- or rarely 5-lobed, regular. Stamens 4, rarely 5, inserted in the throat of the corolla; filaments short. Ovary 2-celled; ovules numerous; placentas attached to the septum; style filiform; stigmas 2, linear.

Capsule dehiscing longitudinally at or from the apex or dicoccous or tardily dehiscent. Seeds angled, globose or ellipsoid; testa smooth or pitted; embryo clavate in fleshy albumen.

Species about 70.

Distribution :—Tropical and subtropical, chiefly Asiatic.

Flowers in corymbose cymes	1. O. Schimperi.
Flowers in racemose cymes	2. O. stricta.

1. Oldenlandia Schimperi Anders. Journ. Linn. Soc. V, Suppl. p. 21 ; Boiss. Fl. Or. III, 11 ; Oliv. Fl. trop. Afr. III, 55.

Kohautia caespitosa Schnizlein in Flora XXV, Beibl. I, No. 10, p. 145.

Kohautia Schimperi Hochst. et Steud in Schimp. Pl. Abyss. no. 879.

Hedyotis Schimperi Presl. in Dredge Pl. Cap. exsicc., and Bot. Bem. (1844) p. 85.

Hedyotis spec. inc. Edgew. Journ. As. Soc. Beng. XVI, 1216.

Kohautia arabica Hochst.

Oldenlandia retrorsa Boiss. Fl. Or. III, 12.

Description :—An ascendent or decumbent, rigid, glandular-scabrous perennial or annual, 1—3 feet high. Branches virgate, leafy at the base, sparingly so above, terete. Leaves linear, sessile $\frac{1}{3}$—$1\frac{1}{2}$ inches long ; stipules 3—1-cuspidate.

Flowers tetramerous, $\frac{2}{3}$—$\frac{1}{2}$ inch long, subsessile and pedicellate, in terminal corymbose cymes. Calyx-teeth lanceolate-subulate. Corolla salver-shaped ; tube slender, several times the length of the calyx ; lobes narrowly oval, sub-obtuse, $\frac{1}{6}$ inch long.

Capsule subglobose, subdidymous, truncate and loculicidally splitting at the apex ; base subturbinate. Seeds angular.

Flowers :—March 1878 (Perry), April 1861 (Thomson).

Fruits :—February 1851 (Thomson), March 1878 (Perry), April 1861 (Thomson), December 1847 (Hook.).

Locality :—Maala (Schweinf.) ; plain of Maala, Goldmore Valley (Defl.) ; Shum Shum Range (Ellenbeck) ; steep gravelly slope at the end of the great valley between Steamer Point and town (Marchesetti) ; in sandy places (Edgew., Madden, Hook., Anders.) ; without locality (Birdw., Perry, Balfour).

Distribution :—Nubia, Abyssinia, Kordofan, Kilimandjaro, Sansibar, Socotra, Central and South Arabia, Baluchistan, Sind.

2. Oldenlandia stricta Linn. Mant. (1781) 200 ; Hook. Fl. Brit. Ind. III, 68 ; Trim. Fl. Ceyl. II, 316.

Hedyotis maritima Wall. Cat. 6192 (partim) ; Moon Cat. 10 ; Thw. Enum. 144.

Hedyotis graminifolia Linn. f. Suppl. I, 119.

Oldenlandia graminifolia DC. Prodr. IV. 425.

Description :—Annual or perennial, with a woody base, and numerous, erect, slender, wiry, sub-quadrangular, glabrous, dichotomously branched stems, often 2 feet high ; leaves 1—$1\frac{1}{2}$ inches, sessile, linear, very acute, glabrous ; stipules adnate to the base of the leaves and with them forming a close sheath round the stem, mouth truncate, ciliate.

Flowers on slender, erect pedicels, few, distant, in slender, erect, elongated, racemose cymes; calyx-segments short, lanceolate, subulate; corolla-lobes oblong, obtuse, longer than the tube.

Capsule $\frac{1}{6}$ inch long, twice as long as broad, oblong, crowned with the tooth-like calyx-segments, glabrous, top slightly rounded.

Locality:—Aden (O. Kuntze Rev. Gen. Pl. I, 292).

Distribution:—Ceylon, Southern India, Aden.

XXVI.—COMPOSITÆ.

Herbs, shrubs or rarely trees. Leaves alternate or opposite, exstipulate.

Inflorescence a centripetal head of usually many small flowers sessile on the dilated top of the peduncle (receptacle), enclosed in an involucre of whorled bracts. Receptacle sometimes furnished with bracteoles (paleæ, scales), sometimes naked and smooth or with pits. Flowers either all bisexual or some or all 1-sexual. Calyx-tube wholly adherent to the ovary; limb 0 or of scales, bristles or hairs (pappus). Corolla epigynous, gamopetalous, tubular, cylindrical or campanulate, 4—5-dentate with valvate teeth or occasionally very slender with an entire truncate or oblique mouth, or ligulate, the lamina spreading from the centre of the capitulum. Stamens 5 or 4, inserted in the tube of the corolla; filaments free; anthers 2-celled, introrse, cohering into a tube which sheathes the style. Ovary inferior, 1-celled; style filiform, usually bifid; ovule solitary, erect, anatropous.

Fruit an achene, articulated to the common receptacle, generally sessile, naked above or crowned by the persistent sessile or stipitate pappus. Seed erect; testa membranous; no albumen; embryo straight; cotyledons plano-convex; radicle short.

Genera about 1,000; *species* about 8,000.

Distribution:—Throughout the world.

Tribe I.—Vernonieæ: Heads homogamous; flowers all tubular, hermaphrodite. Anther-bases sagittate, rarely subcaudate. Style-arms subulate, hairy. Leaves usually alternate. Corollas never yellow . . 1. Vernonia.

Tribe II.—Inuleæ: Heads heterogamous, discoid or rayed; or homogamous, rayless. Anther-bases tailed. Style-arms linear, obtuse, inappendiculate, or the style of the sterile flowers undivided. Leaves usually alternate. Disk- and ray-flowers usually yellow.

Sub-tribe.—Plucheineæ: Style-branches of the hermaphrodite florets filiform, not truncate . . . . . 2. Pluchea.

Sub-tribe.—Euinuleæ: Style-branches of the hermaphrodite florets wider and rounded at the apex.

Capitula homogamous.

Outer pappus short, not paleaceous . . . . 3. Iphiona.

Outer pappus short, paleaceous, lacero-dentate . . 4. Pegolettia

Capitula heterogamous . . . . . 5. Pulicaria.

Tribe III.—Mutisieæ: Heads homogamous; flowers all tubular and hermaphrodite, or the outer bilabiate; or heterogamous, with the ray-flowers female or neuter, sometimes bilabiate. Involucral bracts usually ∞-seriate, unarmed or spinescent. Receptacle rarely paleaceous. Corollas 2-lipped or with a deeply 5-fid limb. Anthers usually tailed. Style-arms rounded or truncate, inappendiculate. Pappus setose or paleaceous, rarely o. Leaves radical or alternate, rarely opposite. . 6. Dicoma.

Tribe IV.—Cichorieæ: Heads homogamous. Corollas all ligulate; ligules truncate, 5-toothed. Anther-bases sagittate, rarely tailed. Style-arms slender. Pappus setose, paleaceous or o. Leaves radicle or alternate, never opposite. Herbs.

Achenes compressed, beaked . . . 7. Lactuca.

Achenes columnar, truncate at both ends . 8. Launæa.

1. Vernonia Schreb.

Herbs, shrubs or trees. Leaves simple, alternate, entire or toothed.

Capitula terminal or axillary, homogamous, cymose or panicled. Involucre ovoid, globose or hemispheric, equalling or shorter than the flowers; bracts in many series, the inner longest. Receptacle naked or pitted, sometimes shortly hairy. Corollas all equal, regular, tubular, slender; lobes 5, narrow. Anther-bases obtuse. Style-arms subulate, hairy. Pappus usually biseriate of many hairs.

Achenes striate, ribbed or angled, rarely terete.

Species about 280.

Distribution:—Chiefly tropical, mostly in America.

1. Vernonia atriplicifolia (Forsk.) Jaub. et Spach. Ill. Pl. Or. IV, 94, tab. 359; Anders, Journ. Linn. Soc. V, Suppl. pp. 21; Boiss. Fl. Or. III, 154; Oliv. Fl. trop. Afr. III, 270.

Vernonia spathulata Schultz Bip. ex Aschers. in Schweinf. Beitr. Fl. Aethiop. pp. 162.

Vernonia arabica Dcne. ex Boiss. Fl. Or. III, 154.

Chrysocoma spathulata Forsk. Fl. Aeg.-Arab. pp. 147.

Description:—A small shrub, ranging up to 3 feet high, with numerous, dichotomous, spreading branches, covered with close, whitish sericeous, stiff hairs and scattered with sessile glands. Leaves alternate, ovate, varying from oval to rhomboidal, pointed or rounded at the apex, rounded or narrowed at the base, with 1—3 coarse teeth on each side, fleshy, small, subsessile or shortly stalked, ranging up to ½—1 inch by ¼—½ inch.

Capitula subturbinate, about 12-flowered, in terminal dichotomous or numerous small congested cymes, forming a diffuse leafy panicle.

Scales of the involucre 15—18, pluriseriate, from ovate to oblong-lanceolate, acute. Receptacle naked. Corolla gradually narrowed, glandular. Anther-base acutely produced, apex lanceolate.

Achenes obtusely 5-sided, with short, ascending white setæ between the ridges. Pappus biseriate, outer of short equal, linear, pointed squamæ, inner of white barbellate caducous setæ.

Locality:—Plain of Maala, Koosaf Valley (Defl.); from the seashore to the top of the Shum Shum Range (Edgew., Hook., Anders.); Shum Shum Range (Ellenbeck, Schweinf., Busse); without locality (Birdw., Hildebrandt).

Distribution:—Yemen, Muscat, Etbai, highlands of Somaliland, Nile-Land.

2. Pluchea Cass.

Shrubs or herbs, tomentose or glutinose. Leaves alternate, dentate or rarely entire, sometimes pinnatifid.

Heads usually small, in terminal corymbose cymes, or large and subsolitary, heterogamous, disciform, white yellow, or lilac. Outer florets female, in several series, fertile, filiform. Disk-florets hermaphrodite, few, sterile, tubular, 5-fid. Involucre broadly ovoid or campanulate; its bracts few or in many rows, imbricate, ovate or lanceolate, dry, rigid; receptacle flat, naked. Corollas of the female flowers filiform, shorter than their own styles, their apices with 3 teeth; corollas of the hermaphrodite flowers regular, tubular, the limb slightly widened, 5-cleft. Anthers sagittate at the base, their basal auricles tailed. Style-arms of the hermaphrodite flowers filiform, entire or bifid.

Cypselas small, 4- or 5-angled. Hairs of pappus slender, rigid, in a single series, free, or (in the sterile cypselas) connate in groups.

Species about 30.

Distribution:—Tropical and subtropical.

1. **Pluchea indica** Less. in Linnæa (1831), 150; DC. Prodr. V, 451; Wight Ill. t. 131; Clarke Comp. Ind. 93; Hook. Fl. Brit. Ind. III, 272; Benth. Fl. Austral. III, 527; King and Gamble Fl. Malay-Penins. in Journ Asiat. Soc. Beng. vol. 74, part II, extra N. (1905), 37; Prain Beng. Pl. 600.

Pluchea foliosa DC. Prodr. V, 451.
Conyza corymbosa Roxb. Fl. Ind. III, 426; Wall. Cat. 3009.
Conyza indica Miq. Fl. Ind. Bat. II, 58.
Baccharis indica Linn. Sp. Pl. 1205.

Description :—A low shrub, glabrous or nearly so; stems smooth, terete. Leaves membranous, obovate or oblanceolate, the apex obtuse, or acute, acuminate or apiculate, narrowed to the base; edges dentate, serrate or sub-serrate; both surfaces olivaceous-brown when dry; glandular; main-nerves 3—6 pairs, curving upwards; length $\frac{1}{2}$—$2\frac{3}{4}$ inches, breadth $\frac{1}{3}$—$1\frac{1}{4}$ inches; petioles $\frac{1}{10}$—$\frac{2}{5}$ inch long.

Capitula $\frac{1}{4}$ inch in diameter, in compound puberulous corymbose cymes, much longer than the leaves; involucral bracts few, rather broad, obtuse. Florets of the disk 3; those of the ray numerous.

Cypselas minute, ribbed, nearly glabrous; pappus scanty, spreading, reddish-white.

Flowers:—June 1872 (Hildebrandt).

Locality:—On sandy seashore near Shaikh Othman.

Distribution :—British India, Malay Archipelago, China, Australia.

Note:—Vatke who named Hildebrandt's plant says: "Habitus plantæ summitatibus decerptis paullulum mutatus, sed procul dubio huc refero."—We have not seen the specimen.

3. Iphiona Cass.

Branching shrubs, more or less glabrous or scabrid, with alternate entire or toothed leaves and yellowish-white capitula, either solitary or cymose.

Capitula homogamous, discoid; florets usually all tubular and hermaphrodite. Involucre campanulate or ovoid, bracts multi-seriate, imbricate, dry, more or less scarious; receptacle narrow, naked. Anther-base sagittate with slender tails.

Achenes subterete or hirsute, 8—10-costate. Pappus 1—∞-seriate; setæ copious.

Species 10.

Distribution :—Chiefly Mediterranean and Mascarine.

1. Iphiona scabra Dcne. in Ann. Sc. Nat. ser. II, II, 263; DC. Prodr. VI, 475; Anders. Journ. Linn. Soc. V, Suppl. p. 22; Boiss. Fl. Or. III, 210; Oliv. Fl. trop. Afr. III, 360.

Description :—Shrubby, scattered with short, glandular, scabrous pubescence; branches ascending, numerous. Leaves subulate-pungent, sessile, $\frac{1}{2}$—1 inch long, with 1—3 spines about $\frac{1}{8}$ inch long at the base on each side.

Capitula campanulate, $\frac{1}{2}$ inch long, about 14-flowered, solitary, axillary and terminal, often crowded on pedicels ranging up to 1 inch long. Scales of the involucre 3—4-seriate, puberulous. Receptacle $\frac{1}{16}$ inch wide, naked.

Achenes oblong, $\frac{1}{16}$ inch long, sericeous-hirsute, striate. Pappus tawny, multiseriate, uneqal, subscabrid.

Note :—The leaves vary a good deal. They are usually rigid and spinescent, sometimes herbaceous; the margin is generally entire, but dentate leaves are sometimes to be found.

Flowers and fruits :—January 1863 (Oliver and Cl.), February 1851 (Thomson), March 1850 (Madden), March 1878 (Perry), April 1861 (Thomson), April 1844 (Lunt), June 1872 (Hildebr.), November 1888 (Schweinf.), December 1889 (Defl.).

Locality :—Near the coal-depôt of the Messag. Marit. (Schweinf.); plain of Maala (Defl.); slope of the Shum Shum Range (Ellenbeck); gravelly slope above Aden at a height of about 500—1,000 feet (Busse); great valley between Steamer Point and town (Marchesetti); very common (Madden, Hook., Thomson, Anders.); Steamer Point,—nearly sea level (Lunt); without locality (Birdw., Hildebrandt, Perry, Oliver and Cl.).

Distribution :—Egypt, Nubia, Eritrea, Arabia.

4 Pegolettia Cass.

Small, rather rigid half-shrubs or herbs. Leaves alternate, dotted, elliptical or linear.

Capitula terminal solitary or loosely panicled, many-flowered, homogamous, discoid, companulate; florets all tubular fertile. Involucre imbricate in 2—3 rows, shorter than the flowers; scales acute. Receptacle naked, dotted, flat. Corolla tubular, 5-fid, regular (or sub-ringent). Anthers 2-tailed at base. Achenes cylindrical, 10—12-costate, beakless. Pappus in two or three rows, the inner of long, rigid, straight, serrato-ciliate, rarely plumose bristles; the outer much shorter, either of flat, entire or lacerate, unequal scales, or of bristles nearly similar to those of the inner pappus.

Species about 10.

Distribution :—Tropical and Southern Africa, Arabia.

1. **Pegolettia senegalensis** Cass. Dict. 38, 230; DC. Prodr. V, 481; Jaub. et Spach Illustr. Pl. Orient. IV, 63, t. 341; Oliver Fl. trop. Afr. III, 361.

Kuhnia arabica Hochst. et Steud. in Hb. Schimp. Arab. Fel. n. 863; DC. Prodr. VII, 267.

Description :—Annual, of loose bushy habit, paniculately branched, scaberulous, with short crisp hispid hairs, subglutinous above, $\frac{1}{3}$ – 2 feet

high; branches sub-terete, striate. Leaves linear or oblanceolate, deltoid or sub-acute at apex, usually apiculate, gradually narrowed towards the base, sessile, entire or with a few irregular remote teeth above, $\frac{1}{3}$—$1\frac{1}{3}$ inches long by $\frac{1}{16}$—$\frac{5}{16}$ inch wide; uppermost smaller, bract-like, subulate.

Capitula campanulate, 18—30-flowered, $\frac{1}{3}$—$\frac{1}{2}$ inch long, solitary at the ends of the numerous pedunculiform branches. Scales of the involucre pauciseriate, acute, falling short of the florets; inner linear-lanceolate, with scarious margins; outer shorter, linear-subulate, often recurving. Receptacle alveolate; margins of alveoli toothed. Florets at first yellow, at length purple.

Achenes oblong, $\frac{1}{8}$ inch long, 10—12-costate, with scattered rather rigid hairs. Pappus biseriate, subfulvous; inner subplumose; outer $\frac{1}{3}$ as long, subpaleaceous, multifid.

Flowers:—April 1894 (Lunt).

Locality:—Goldmore Valley, 100 feet (Lunt).

Distribution:—Senegambia, Kouka, Nubia, ? Abyssinia, Cape Verde Islands, Tropical Arabia.

(Oliver and Hiern in Fl. trop. Afr. mention also Sind, but Cooke has not included this species in his Flora of the Bombay Presidency.)

5. Pulicaria Gaertn.

Annual or perennial usually woolly or villous herbs. Leaves alternate, sessile, often cordate-amplexicaul.

Heads yellow, solitary, rayed and heterogamous, or disciform and homogamous; ray-flowers female, 1—2 seriate; disk-flowers slender, hermaphrodite, fertile. Involucre hemispheric or obconic; bracts few-seriate, subequal or the outer shorter, linear, acute or subobtuse. Receptacle flat or sub-convex, pitted. Corollas of female flowers ligulate or tubular, those of the hermaphrodite flowers regular, tubular, slender, the limb elongate, slightly enlarged, shortly 5-fid. Anther-bases sagittate, with minute auricles; tails capillary, simple or branched. Style-arms of hermaphrodite flowers linear, obtuse, slightly flattened, a little broader upwards. Pappus double, the outer row of short jagged teeth or a fimbriate cup; inner of smooth, scabrid or bearded, filiform or flattened hairs, often caducous.

Achenes terete or ribbed.

Species about 24.

Distribution:—Europe, Africa, Asia, abundant in the Mediterranean region.

Leaves narrow, linear or spathulate-linear, coriaceous . . . 1. P. glutinosa.
Leaves lanceolate, not coriaceo . . . . . 2. P. adenensis.

1. Pulicaria glutinosa Jaub. et Spach Ill. Pl. Or. tab. 348.

Platychæte glutinosa Boiss. Diag. Pl. Or. ser. I, XI, 5 et Fl. Or. III, 208.

Description :—A small shrub, about 1 foot high ; herbaceous parts minutely glandular-puberulous and more or less hirsute with villous, crisp, whitish, more or less elongate, simple, articulate, finally deciduous hairs. Stems woody, terete, erect, irregularly dichotomous. Young branches slender, virgate, terete, striate, erect, leafy. Leaves scattered, coriaceous, thick, concave or subterete-involute, straight or falcate, sessile, exauriculate, narrow, linear or spathulate-linear, entire, callose-mucronate, subdilate at the base ; younger ones glaucescent, older ones green ; the upper leaves smaller than the lower ones and subequal on the same branch.

Peduncles terminal, solitary, 1-headed, ebracteate, erect, terete, short, below the head slightly dilate. Heads campanulate, multiflowered, homogamous; involucre campanulate ; bracts 5—6-seriate, densely imbricate. Receptacle glabrous, obsoletely alveolate or areolate. Corolla lutescent, regular, subclavate, 5-nerved, 5-dentate at the apex, subconstricted at the throat, outer side with scattered stipitulate punctiform glands. Stamens inserted a little above the base of the corolla ; filaments capillary, glabrous, almost as long as the anthers ; anthers linear, with short lacerate tails. Ovary columnar, subterete, ⅓ of the corolla in length ; unequally 10-costulate, truncate and subcallose at the base ; basilar areola oblique. Pappus whitish, the outer one persistent, very short, coroniform, irregularly crenate-lobulate, the inner one deciduous, of 15—20 setæ, three times the length of the ovary and slightly shorter than the corolla ; setæ spathulate-lanceolate, acute, barbellulate at the apex.

Locality :—Aden (Hildebrandt, Ellenbeck). Ex Krause.

Distribution :—South Arabia.

2. Pulicaria adenensis Schweinf. ex O. Kuntze Rev. Gen. Pl. I, 358 et in sched. Herb. Kew.

Pulicaria iphionoides O. K. ex O. Kuntze l. c. I, 358.

Varthemia arabica T. Anders. Journ. Linn. Soc. V, Suppl. p. 22 (*non* Boiss.).

Iphiona arabica B. Hgp. ex O. Kuntze l. c. I, 358.

Description :—A perennial undershrub, 8—12-inches high, leafy, glandular-tomentose ; branches corymbose at the apex. Leaves 1—1½ inches long, 1—2 lines broad, lanceolate, attenuate at the base, mucronulate at the apex, entire, puberulous on both sides.

Peduncles terminal, cymose ; scales of involucre lanceolate, acute, adpressed, the outer ones short, subulate. Corolla yellow. Pappus

double ; setæ of outer row very short (three times shorter than the achenes), rigid, of inner row 15-barbate.

Achene ½ line long, subhirsute.

Flowers and fruits :—Jan. 1872 (Thomson), Jan. 1876 (Kuntze), Jan. 1880 (Balf.), March 1878 (Perry), April 1861 (Thomson), November 1888 (Schweinf.), December 1847 (Hook.).

Locality :—Near the sea (Hooker) ; Wadi Maala (Schweinf.) ; great valley between Steamer Point and town (Marchesetti) ; without locality (Perry, Balfour, Kuntze, Thomson, Birdw.).

Apparently *endemic* in Aden.

Note :—This plant has caused a great deal of confusion. We trust that the following details may help to clear up the doubts existing at present :

J. D. Hooker was the first to collect a specimen at Aden ('near the sea,' Herb. Kew) on the 20th December 1847. When, a few years later, Hooker visited Aden in company with Thomson, they did not gather this plant. Hooker's specimen of 1847 was, therefore, the only material which was at Anderson's disposal when he published his 'Florula' in 1860. The specimen, consisting of a tiny branch with a few flowers, is still preserved at Kew. Anderson called it *Varthemia Arabica* Boiss. Diag. VI, p. 74 (cf. Florula Adenensis, p. 22).

Anderson gives this reason for putting the plant under the genus *Varthemia* in spite of its having a double pappus :

"De Candolle describes *Varthemia* as having the pappus uniserial ; in five species that I have examined, in addition to the original species *V. Persica*, the pappus is in two rows, the outer consisting of short rigid setæ." (Florula l. c.)

The second specimen was collected by Thomson on the 11th April 1861 and is named *Varthemia arabica* Boiss. in Herb. Kew. A third specimen, gathered by the same botanist in January 1872, shows on its label : *Pulicaria* (*Varthemia arabica* T. Anderson, *non* Boiss.).

On the 9th January 1876, Kuntze made a small collection of Aden plants. Amongst the specimens we find Anderson's *Varthemia arabica* under the new name *Pulicaria iphionoides* O. Kze. to which is added the synonym *Iphiona arabica* B. Hgp. (No. 7648 Herb. Otto Kuntze in Herb. Kew.) No description, however, has ever been published by Kuntze.

Perry's and Balfour's specimens of the years 1878 and 1880 respectively bear the label : *Pulicaria* (*Varthemia arabica* T. Anders.).

Shweinfurth collected the same plant on the 25th November 1888 and named it in his herbarium *Pulicaria adenensis* Schweinf. (= *Varthemia arabica* T. Anders., *non* Boiss.).

This new name was adopted by Kuntze in his Rev. Gen. Pl. I, 358, in preference to the one (*Pulicaria iphionoides*) which he himself had chosen at an earlier date. Kuntze retained Schweinfurth's name because Schweinfurth's specimens had been distributed under that name in the meantime. Schweinfurth, however, had given it the specific name '*adenensis*' instead of Anderson's '*arabica*' because there existed already a *Pulicaria arabica* Cass.

Oliver and Hiern, when describing in the Trans. Linn. Soc. vol. XXIX, p. 96 (*cf. etiam* Oliver, Fl. trop. Afr. III, 365) their new species *Pulicaria Grantii*, added a note saying: "Identified, perhaps incorrectly, with the plant called by Dr. Anderson, in his 'Florula Adenensis,' p. 22, *Varthemia arabica* (*non* Boiss.) under which name it occurs in App. Speke's Journ. 638."— Anderson's plant is not identical with *Pulicaria Grantii*. The latter has much longer and stouter peduncles which become considerably thicker towards the apex, and the capitula are larger.

Krause (Engl. Bot. Jahrb. XXXV, Heft 5, p. 56) who has not seen Anderson's plant, considers it to be identical with *Pulicaria glutinosa* Jaub. et Spach. In this I followed him in my 'Flora of Aden' (Journ. Bombay Nat. Hist. Soc. vol. XVII, p. 907, n. 95), but after having examined the type specimens, together with the other specimens at Kew, I came to the conclusion that Anderson's plant is a distinct species.

6. Dicoma Cass.

Herbs or low shrubs. Leaves alternate.

Heads subsessile on the branches or in the axils of the upper leaves, or leaf-opposed, rarely corymbose, homogamous, discoid, all the flowers hermaphrodite; or heterogamous, the outer flowers being female, all fertile or the innermost sterile. Involucre globose, conic or subcampanulate; bracts ∞-seriate, imbricate, ovate, lanceolate or linear, acuminate, spinescent or mucronate or with a long apical spine, the outer bracts gradually shorter. Receptacle flat, naked, often pitted. Corollas of hermaphrodite flowers tubular, the limb enlarged, 5-partite, with erect or revolute lobes; corollas of female flowers, if present, slender, subligulate. Anther-bases sagittate; tails long, more or less bearded. Style-arms short, erect, obtuse. Pappus-hairs ∞-seriate, the inner or all flat, barbellate or feathery, the outer shorter, paleaceous or of slender bristles.

Achenes turbinate, densely silky-villous, 5—10-ribbed.

Species 13.

Distribution:—Tropical and S. Africa, Arabia, India.

1. Dicoma Schimperi (DC.) O. Hoffm. in Engl.-Prantl Natürl. Pflanzenfam. IV, 5, 339.

Hochstetteria Schimperi DC. Prodr. VII, 287; Anders. Journ. Linn. Soc. V, Suppl. p. 22; Boiss. Fl. Or. III, 219; Hook. Fl. Brit. Ind. III, 988; Oliv. Fl. trop. Afr. III, 444.

Description :—An erect rigid, branched, perennial herb, 1—2 feet high; branches slender, erect or ascending, angular, glabrous or pubescent. Leaves alternate, $\frac{3}{4}$—2 by $\frac{1}{4}$—$\frac{3}{4}$ inch, elliptic-oblong, subobtuse, mucronate, serrulate, araneously pubescent on both sides, attenuated at the base into a short, obscurely winged petiole.

Capitula homogamous, solitary, terminal, discoid, $\frac{1}{2}$—$\frac{3}{4}$ inch in diameter. Flowers orange, all hermaphrodite. Involucre hemispheric; bracts ∞-seriate, narrow, acute, rigid. Corolla regular, tubular, limb 5-partite, lobes more or less revolute. Anther-bases subciliate, the auricles produced into long tails. Style-branches linear, obtuse, flattened. Pappus of 10 stellately spreading paleæ with hyaline margins below the middle, slender and barbellate above, much longer than the achenes.

Achenes turbinate, $\frac{1}{10}$ inch long, densely villous with long brownish hairs.

Flowers and fruits :—Nov. 1889 (Schweinf.), Dec. 1847 (Hook.), Dec. 1889 (Defl.), Feb. 1851 (Thomson).

Locality :—Plain of Maala (Defl.); Goldmore Valley (Schweinf.); without locality (Hook., Birdw., Lunt).

Distribution :—Nubia, S. Arabia, Sind.

7. Lactuca L.

Glabrous (rarely hispid) usually milky herbs. Leaves radical and alternate, entire, coarsely toothed or pinnatifid, the margins setoso-ciliate or naked; cauline leaves often amplexicaul and auricled.

Heads variously paniculate, sessile or pedunculate, homogamous; flowers all ligulate, yellow, purple or blue. Involucre cylindric, usually narrow; bracts usually few-seriate, often with scarious margins, the innermost elongate, subequal, the outer often very short. Receptacle flat, naked. Corollas ligulate, truncate and 5-toothed at the apex. Anther-bases sagittate, with acute or shortly setaceo-acuminate auricles (rarely prolonged into lacerate tails). Pappus copious; hairs ∞-seriate, very slender, simple, persistent or separately deciduous.

Achenes ovoid, oblong or narrow, more or less compressed, sometimes flattened, shortly contracted at the base, abruptly or gradually produced into a beak at the apex; faces 3—5-ribbed, the ribs slender or strong,

smooth or rarely transversely rugose; beak slender or short and cylindric, more or less dilated into an entire or toothed pappiferous disk.

Species about 60.

Distribution :—Europe, Asia, Africa, and North America.

1. Lactuca goræensis (Hochst.) Schultz Bip. in Flora (1842) p. 422; Oliv. Fl. trop. Afr. III, 452.

Sonchus goræensis Lam. Enc. Méth. Bot. III, 397.

Brachyramphus goræensis DC. Prodr. VII, 177.

Sonchus ciliatus Perr. ex DC. Prodr. VII, 177.

Microrhynchus octophyllus Hochst. in Herb. Kotsch. Nub. n. 406.

Lactuca octophylla Schultz Bip. in Linnæa XV, (1841) 725.

Lactuca nubica Schultz Bip. l. c.

Microrhynchus Hochstetteri Schultz Bip. ex Hochst. in Herb. Schimp. Abyss. III, n. 1448.

Lactuca Petitiana A. Rich. Fl. Abyss. I, 462.

Sonchus Hochstetteri Schultz Bip. in Schweinf. Beitr. Fl. Aethiop. p. 160.

Description :—Erect glabrous or subglabrous glaucescent annual or biennial, 1—3 feet high or more, branched at least above. Stem and branches terete. Leaves pinnatifid, often runcinate, mostly acute, ranging up to 8 by 4 inches, sessile, amplexicaul or the lowest ones narrowed into a short winged petiole; lobes variable in breadth and depth, denticulate-ciliate.

Capitula $\frac{1}{2}$—$\frac{3}{4}$ inch long, on very short pedicels, in panicled racemose cymes. Inner involucral bracts 8, linear-lanceolate, scarcely acute or obtuse, with scarious margins; outer bracts ovate-imbricated, much shorter also with scarious margins. Flowers yellow.

Achenes $\frac{1}{8}$—$\frac{1}{6}$ inch long, dark, fusiform, tapering to a short pale slender apex, about 10-costate, transversely rugulose. Pappus white $\frac{1}{5}$—$\frac{1}{4}$ inch long.

Locality :—Aden (Schweinf.).

Distribution :—Yemen, Eritrea, Abyssinia, Kordofan, Upper Guinea, Mozambique.

8. Launæa Cass.

Perennial or annual glabrous herbs usually with yellow juice. Leaves mostly radical, sinuately lobed or pinnatifid; margins often with cartilaginous or subspinous teeth.

Heads pedunculate or subsessile, solitary, fascicled, racemose or paniculate, homogamous; flowers all ligulate, yellow. Involucre campanulate or cylindric; bracts ∞-seriate, imbricate, often with scarious

margins; innermost bracts subequal; the outer gradually shorter, the outermost often very short. Receptacle flat, naked. Corollas ligulate, truncate and 5-toothed at the apex. Anther-bases sagittate, with acute or shortly setaceo-acuminate auricles. Style-arms slender. Pappus copious; hairs ∞-seriate, simple, very slender, white, a few inner sometimes longer and stronger, all connate at the base into a deciduous ring.

Achenes narrow, usually columnar, not contracted at the base or apex, truncate at both ends, sometimes winged, 4—5-ribbed.

Species about 20.

Distribution:—Mediterranean region of Europe, Canary Islands, Africa, East Indies.

Heads in a lax corymbosely paniculate cyme . .	1. L. lactucoides.
Heads subracemose along the branches . . .	2. L. nudicaulis.

1. Launæa lactucoides (Fresen) O. Hoffm. in Engl.-Prantl. Natürl. Pflanzenfam. IV, 5, 370.

Heterachænia massaviensis Fresen in Mus. Senckenb. III, 74; Oliv. Fl. trop. Afr. III, 455.

Brachyramphus lactucoides Anders. Journ. Linn. Soc. V, Suppl. p. 23.

Lactuca massaviensis Schultz-Bip. in Herb. Schimp. Abyss. II, n. 1045, III, n. 1462.

Sonchus massaviensis Schultz-Bip. in Schweinf. Beitr. Fl. Aethiop. p. 160.

Zollikoferia massaviensis Boiss. Fl. Or. III, 825.

Description:—An annual, glabrous, delicately dichotomously branched herb, 1-2 feet high. Branches terete, glaucescent. Leaves alternate; stem-leaves runcinate, more or less deeply pinnatifid or undivided, cordate, auriculate-amplexicaul, sessile, denticulate, 1½—4½ inches long; radical leaves petiolate.

Flowers blue. Capitula homogamous, ligulate, narrowly oblong, ¼-½ inch long, 9—10-flowered, on slender pedicels of ¼—1 inch, in a lax corymbosely paniculate cyme. Involucre cylindrical, at length thickened at the base; inner involucral bracts 5, narrow, lanceolate, obtuse, equal, membranous; the outer ones few, small. Receptacle flat, naked. Ligule truncate, 5-toothed. Anthers sagittate at the base; auricles acute or shortly setaceous-acuminate. Style-arms slender.

Achenes ⅓—⅛ inch long; outer ones narrow, dorsally compressed, ∞-costate, transversely rugulose, attenuate at the base, contracted at the apex into a very short beak; the inner ones narrow, subterete, 4—5-costate, smooth. Pappus copiously setaceous, smooth, persistent or deciduous in one piece.

Locality :—Ravine south-west of the Tower of Silence (Defl.); Shum Shum Range at a height of about 1,650 feet (Busse); without locality (Hook., Birdw.).

Distribution :—S. Arabia, Socotra, highlands of Somaliland, Abyssinia, Nubia.

2. **Launæa nudicaulis** Less. Synops. p. 139; Hook. Fl. Brit. Ind. III, 416.

Zollikoferia nudicaulis Boiss. Fl. Or. III, 824; Batt. et Trab. Fl. d'Alg., p. 558.

Brachyramphus obtusus DC. Prodr. VII, 177.

Lactuca obtusa C. B. Clarke Comp. Ind. p. 261, (not of Benth.!).

Microrrhynchus nudicaulis DC. Prodr. VII, 180.

Microrrhynchus patens DC. l. c. p. 181.

Microrrhynchus fallax Jaub. et Spach in Walp. Ann. II, 976.

Prenanthes patens Wall. Cat. n. 3258.

Prenanthes procumbens Roxb. Fl. Ind. III, 405.

Arabic name :—Hendibe (Schweinf.).

Description :—Glabrous, 6—24 inches high, branched. Leaves 2—10 by 1—3 inches, mostly radical; lower leaves obovate-oblong, pinnatifid, with rounded or very obtuse segments, spinulose on the margins with white cartilaginous teeth; cauline leaves distant, few, sessile, narrowly oblong, pinnatifid. Flowering stems decumbent or spreading, irregularly branched.

Heads $\frac{1}{2}$—$\frac{3}{4}$ inch long, cylindric, remotely subracemose along the branches, shortly pedicelled, subsolitary or fascicled (sometimes 6—10 in a cluster), supported by leaves or naked. Involucral bracts all with broad white membranous margins; the outer very short, ovate, acute, with a strong midrib, subcordate; the innermost thrice as long as the outer, reaching $\frac{1}{2}$ inch long, linear, subacute, longer than the pappus, the midrib thickened in front. Pappus-hairs subequal, soft, white, copious.

Achenes $\frac{1}{10}$—$\frac{1}{8}$ inch long, polymorphous; inner sometimes as if composed of 4 thick ribs; outer slightly curved and flattened, with a thick ventral and several thick dorsal ribs, all smooth or obscurely uneven.

Locality :—Gravelly slopes of the Shum Shum Range (Hildebrandt, Ellenbeck); without locality (Birdw.).

Distribution :—S. Spain, Canaries, N. Africa, Arabia, Sind, Punjab, Afghanistan.

XXVII.—PLUMBAGINACEÆ.

Herbs or shrubs, often maritime. Radical leaves rosulate, cauline leaves alternate.

Flowers capitate or spicate; spikes solitary or panicled. Calyx inferior, gamosepalous, tubular or infundibuliform, more or less distinctly 5-lobed. Corolla hypogynous, gamopetalous, hypocrateriform, or petals nearly or wholly free, oblanceolate or obovate, imbricate. Stamens as many as and opposite to corolla-lobes or petals, adnate to the base of the tube or claw, or inserted with the petals on a narrow hypogynous ring. Ovary free, 1-celled, often 5-sulcate; styles 5, free from the base or more or less connate; ovule solitary, anatropous, suspended from a long basal funicle.

Fruit dry, dehiscent or indehiscent; seeds with or without albumen; embryo straight.

Genera 8; *species* about 200.

Distribution:—More or less throughout the world, chiefly maritime or in saline or rocky deserts.

1. Statice L.

Usually perennial herbs from a woody or wiry stock, or more or less shrubby and diffusely branched. Leaves alternate, often rosulate or fascicled, linear-spathulate to obovate.

Flowers in unilateral, bracteate, panicled spikes. Calyx funnel-shaped or tubular; limb plicate, hyaline or scarious, 5-toothed or lobed. Petals 5, either free from the base, or the base of the claws connate in a ring, oblanceolate or obcaudate. Stamens adnate to the base of the petals. Styles free from the base or nearly so.

Utricle indehiscent, or circumsciss or variously fissured. Seed filling the cell, more or less albuminous.

Species about 100.

Distribution:—Cosmopolitan on sea-shores and in salt-marches.

Leaves not cylindrical	1. S. axillaris.
Leaves cylindrical	2. S. cylindrifolia.

1. Statice axillaris Forsk. Fl. Aeg.-Arab. p. 58; DC. Prodr. XII, 663; Boiss. Fl. Or. IV, 868; Anders. Journ. Linn. Soc. V, Suppl. p. 29; Oliv. Fl. trop. Afr. III, 486.

Statice Bovei Jaub. et Spach. Ill. Pl. Or. I, 157, tab. 86.

Statice lanceolata Edgew. Journ. As. Soc. Beng. XVI, 1218.

Description:—A low, glabrous shrub with decumbent or ascending leafy branches or scapes erect from a woody stock. Leaves oblanceolate or oblanceolate-spathulate, entire or retuse, glabrous, fleshy,

glaucous, attenuate into the petiole; petiole fuscous at the base, sheathing the stem; scape axillary or subterminal, paniculate, subterete, smooth, glabrous, ½—1 foot high.

Flowers in compound spikes; spikelets 2—3-flowered. Bracts persistent, coriaceous, fuscous; inner bracts glabrous or nearly so, smooth, with scarious margin, about 3 times longer than the outer. Calyx infundibuliform, more or less pilose below, persistent, 5-costate; margin with shallow rotundate-deltoid lobes.

Flowers:—Nov. 1888 (Schweinf.), Dec. 1847 (Hook.), Dec. 1889 (Defl.), February 1851 (Thomson), April 1861 (Thomson).

Locality:—On the sea-shore, top of Shum Shum Range (Edgew., Hook., Thomson, Madden, Anders.); Wadi Maala, near the coal-depôt of the Messag. Marit. (Schweinf.); plain of Maala (Defl.); upper end of great valley between Steamer Point and town (Marchesetti); slope of Shum Shum Range (Ellenbeck, Busse); without locality (Birdw., Wichura, Hildebrandt).

Distribution:—Yemen, Socotra, highlands of Somaliland, Eritrea, Nubia.

2. **Statice cylindrifolia** Forsk. Fl. Aeg.-Arab. p. 59; DC. Prodr. XII, 664; Vahl Symb. I, 26 tab. 10.

Arabic name:—Tissumm (in S. Arabia).

Description:—Branches shrubby, leafless at the base, leafy in the upper part. Leaves fleshy, terete, linear-cylindric, obtuse, mucronulate, pruinose, straight or incurved, slightly thicker in the upper part, dilate at the base into a short amplexicaul fuscous sheath; axillary branches short flexuose.

The 2-flowered spikelets distichously arranged forming short secondary spikes; bracts obtuse, membranous, outer one rounded, upper one oblong, with the margins involute, including the flowers. Calyx-tube glabrous, fuscous; limb whitish, 5-lobed, with 5 fuscous nerves.

Locality:—Eastern shore of the isthmus between Barrier-Gate and the village of Migrad (Hildebrandt, Schweinf., Defl.).

Distribution:—Yemen, Socotra, Eritrea.

Note:—In Kew Herbarium there is under the name of *Statice axillaris*, a coloured sketch by Colonel Playfair of an Aden plant which shows greater resemblance with *Statice cylindrifolia* than with *S. axillaris*. Balfour, however (in 'Botany of Socotra,' p. 149), did not like to call it *S. cylindrifolia*, because he had not seen specimens of such a

plant from Aden. Besides, Anderson does not notice it and there was no record of its occurrence at Aden available at the time of Balfour's publication. Since then, however, the plant has been observed by Schweinfurth and Deflers and even before that, in 1872, by Hildebrandt. It is, therefore, quite possible that Playfair's sketch represents the true *S. cylindrifolia.*

Graham in the 'Addenda' to his 'Catalogue of the plants growing in Bombay and its vicinity' (1839) describes *Eurychiton Adensis*, N. as an Aden plant, and gives the following diagnosis:

"Calyx gamosepalous, infundibuliform, subscarious, with a slightly 5-lobed plaited limb; and subtended by scarious bracteæ. Corolla gamopetalous, funnel-formed, smaller than the calyx and purple coloured. Stamens 5 hypogynous. Styles 5, seed vessel not seen.

"Stem short and branching, leaves obovate oblong, flat, pubescent glaucous-mucronate, attenuated into long petiole which is sheathing at the base. Peduncle erect, panicle circinate, flowers one-ranked."

This plant was referred by Bentham and Hooker (Gen. Pl. II, 626) to *Statice*, and they remark: "Si corolla recte gamopetala descripta ad sectionem Siphonantham pertinet. Collectores recentiores in viciniis Aden S. axillarem, Forsk. solam invenerunt quæ ad Limonii species suffruticosas habitu Armeriastro accedentes pertinet."

As a matter of fact, Graham's plant seems to be neither the one nor the other of the species here described. His description of the flower suits *S. cylindrifolia* and that of the foliage *S. axillaris.*

XXVIII.—SALVADORACEÆ.

Shrubs or trees, usually glabrous. Leaves opposite, entire; stipules minute.

Flowers small, hermaphrodite or diœcious, in panicled spikes or racemes. Calyx free, 3-4-toothed or 4-fid. Corolla 4-merous, shortly campanulate, imbricate in bud. Stamens 4, inserted on the corolla-tube or near the base of the petals, alternate with the lobes or petals; filaments free or connate at the base; anthers ovate. Ovary superior, 1—2-celled; ovules 1—2 in each cell, erect from its base, anatropous; style short; stigma bifid or subentire.

Berry or drupe usually 1-seeded. Seed globose or compressed; albumen 0; cotyledons fleshy, plano-convex.

Genera 3; *species* about 9.

Distribution:—Tropical and subtropical Asia, Africa, Madagascar, Malaya.

Corolla gamopetalous	1. Salvadora.
Petals free	2. Dobera.

1. Salvadora Linn.

Shrubs or trees with opposite, entire leaves.

Flowers along the branches of axillary or terminal panicles. Calyx campanulate, 4-fid. Corolla campanulate; tube short; lobes 4, obtuse, imbricate in bud. Stamens 4, epipetalous; filaments slightly flattened. Ovary 1-celled; ovule solitary; style very short or almost 0; stigma broad, truncate or subpeltate.

Drupe globose, supported by the persistent calyx and corolla; endocarp crustaceous. Seed erect, globose.

Species 2.

Distribution:—East Africa, Arabia, India.

Inflorescence 2—5 inches long; fruit red when ripe .	1. S. persica.
Inflorescence 1—1½ inches long; fruit yellow when ripe .	2. S. oleoides.

1. Salvadora persica L. Sp Pl. ed. I, p. 122; Vahl. Symb. I, 12, tab. IV; DC. Prodr. XVII, 28; Roxb. Cor. Pl. t. 26; Wight Ic. t. 1621; Boiss. Fl. Or. IV, 43; Hook. Fl. Brit. Ind. III, 619.

Salvadora Wightiana Planch. in Thw. Enum. 190; Bedd. Fl. Sylv. t. 247.

Salvadora indica Wight Ill. II, 229, t. 181.

Salvadora crassinervia Hochst. in Schimp. Pl. Abyss. n. 2218.

Cissus arborea Forsk. Fl. Aeg.-Arab. p. 32.

Embelia grossularia Retz Obs. IV, 24.

Salvadora paniculata Zuccar. (ex Anderson).

Arabic name:—Râk, Rhag; name of the fruit 'Kabath' (Forskahl).

Description:—A large, much-branched, evergreen shrub or small tree with soft whitish-yellow wood; bark of old stems rugose; branches drooping, glabrous, terete, striate, shining, almost white. Leaves somewhat fleshy, glaucous, 1½—2½ by ¾—1½ inches, elliptic-lanceolate or ovate, obtuse and often mucronate at the apex; base usually acute, less commonly rounded; main nerves 5—6 pairs; petioles ½—⅞ inch long, glabrous.

Flowers greenish-yellow, in axillary and terminal compound lax panicles 2—5 inches long; pedicels $\frac{1}{16}$—⅛ inch long; bracts beneath the pedicels ovate, very caducous. Calyx $\frac{1}{20}$ inch long, cleft half-way down; lobes rounded. Corolla ⅛ inch long, deeply cleft, persistent; lobes oblong, obtuse, reflexed. Stamens exserted.

Berries ⅛ inch in diameter, globose, smooth, red when ripe.

Flowers: March 1878 (Perry).

Fruits: November 1888 (Schweinf.).

Locality:—Plain of Maala (Schweinf., Defl.); northern side of Shum Shum Range (Defl.); without locality (Perry).

Distribution :—Tropical Africa, Syria, Arabia, S. Persia, drier parts of India, Ceylon.

Uses :—The natives of Aden eat the berries and use the woody branches for cleaning the teeth. In Yemen the plant is used for other purposes. Forskahl writes: "In magno est pretio. Fructus maturus edulis. Folia contusa imponuntur tumoribus Uarm dictis et bubonibus Riahl. Sed vis antitoxica adeo famosa, ut carmine quoque celebretur." (Flora Aeg. Arab. p 32.)

2. **Salvadora oleoides** Dcne. in Jacquem. Voy. Bot. (1844) 140, t. 144; A. DC. Prodr. XVII, 28; Brandis For. Fl. 316, t. 39; Hooker Fl. Brit. Ind. III, 620; Aitchis. Pb. and Sind Plants 91; Talb. Trees Bomb. ed. 2, 220; Watt. Dict. Econ. Prod. VI, part II, 447; Cooke Fl. Bomb. Pres. II, 121.

Salvadora Stocksii Wight. Ill. II, 229, et Ic. t. 1621.

Salvadora indica Royle Ill. 319.

Salvadora persica T. Anders. in Journ. Linn. Soc. V, Suppl. p. 29.

Description :—A shrub or occasionally a small tree with a short twisted or bent trunk; branches numerous, stiff, divergent, whitish. Leaves $1\frac{1}{2}$—3 by $\frac{1}{8}$—$\frac{1}{2}$ inch, whitish-green, coriaceous and somewhat fleshy when mature, linear-lanceolate or elliptic-lanceolate, acute or subobtuse, often mucronate, glabrous; main nerves indistinct; petioles $\frac{1}{6}$—$\frac{1}{4}$ inch long.

Flowers greenish-white, sessile, in erect axillary panicled spikes 1—$1\frac{1}{2}$ inches long, often clustered. Calyx $\frac{1}{16}$—$\frac{1}{12}$ inch long, cleft about half-way down; lobes 4, rounded, obtuse. Corolla a little longer than the calyx, deeply cleft; lobes obovate-oblong, obtuse.

Drupes $\frac{1}{6}$—$\frac{1}{5}$ inch in diameter, subsessile, globose, yellow when ripe.

Locality :—Aden (Hooker, Thomson, Balfour)

Distribution :—Gujarat, Sind, Rajputana, Punjab, Aden.

2. Dobera Juss.

A glabrous tree. Leaves opposite, entire.

Flowers small, polygamo-diœcious, clustered on the branches of an axillary inflorescence, trichotomous in the males, subsimple in the females. Calyx ovoid, irregularly valvate, 2—4-toothed. Petals 4 (or 5), narrowly oblong, free, imbricate. Stamens 4 (or 5), filaments connate into a tube; anthers lanceolate, dehiscing laterally or subextrorsely. Scales 4—5 outside the staminal tube, alternate with the stamens. Ovary probably 2-celled with one erect ovule in each cell.

Fruit a subglobose berry; seed solitary, globose, exalbuminous.

Species 1.

Distribution :—Yemen, Abyssinia, Kordofan (probably not in India).

1. Dobera glabra (Forsk.) DC. Prodr. XVII, 31.

Tomex glabra Forsk. Fl. Aeg.-Arab. p. 32.

Dobera Roxburghii Planch. in Ann. Sc. Nat. 3, X, 191; Hook. Fl. Brit. Ind. III, 619.

Schizocalyx coriaceus Hochst. in Flora (1844) Beil. 2.

Blackburnia oppositifolia (*error pro* B. monadelpha) Roxb. Fl. Ind. ed. C. and W. I, 435, fide Planch. l. c.

Arabic name :—Dobra.

Description.—A fine tree. Leaves $3\frac{1}{2}$—$1\frac{1}{2}$ inches, elliptic, acute, mucronate or obovate-obtuse, coriaceous; petiole $\frac{1}{8}$—$\frac{1}{6}$ inch.

Panicles $1\frac{1}{2}$—3 inches; bracts 0; bracteoles $\frac{1}{30}$ inch, ovate, close to the calyx. Calyx $\frac{1}{10}$ inch, ovate-cylindric, subspathaceous. Petals $\frac{1}{5}$ inch, white, free. Filaments united for two-thirds their length into a sub-quadrangular tube.

Berry $\frac{3}{4}$ inch in diameter; endocarp crustaceous.

The structure of the ovary needs further examination. Bentham and Hooker call it 1-celled, Hochstetter 4—5-celled, Forskal 2-celled and Knoblauch 'probably 2-celled.'

Locality :—Little Aden: dunes at the entrance of ravines on the southern side of the Jebel Ihsan (Defl.).

Distribution :—Yemen, Abyssinia, Kordofan.

XXIX.—APOCYNACEÆ.

Trees, shrubs or herbs with simple entire leaves; juice frequently milky; stipules 0 or small gland-like, intra- or inter-petiolar.

Flowers regular, in terminal or axillary cymes. Calyx inferior, often glandular; lobes 5—4, imbricate. Corolla gamopetalous, usually rotate or hypocrateriform; lobes 5—4, spreading, contorted, and often twisted in bud. Stamens 5—4, epipetalous; filaments usually short; anthers linear-oblong or sagittate, cells 2, dehiscing longitudinally; pollen granular. Disk various. Ovary 1-celled with 2 parietal placentas, or 2-celled with axile placentas, or of 2 distinct or partially connate carpels; style one, simple or divided at the base; stigma various.

Fruit a dry or fleshy drupe, berry or samara, or of 2 drupes, berries or follicles. Seeds various, sometimes winged, sometimes with a pencil

of hairs (coma); embryo straight; cotyledons flat, concave, convoluted or contorted.

Genera about 110; *species* about 900.

Distribution:—Chiefly tropical.

1. Adenium Roem. et Sch.

Shrubs with fleshy, globose stems and entire leaves.

Flowers near the end of the branches, shortly pedicelled, purple. Calyx 5-partite; lobes lanceolate, glandular. Corolla-tube cylindric below, pubescent on the outside, subpubescent on the inner side; lobes convolute in æstivation, shorter than the tube. Filaments 5, very short; anthers linear-sagittate, coherent with the stigma. Ovaries 2, globose or elliptic, glabrous. Style 1; stigma capitate, apex bidentate, margin 5-dentate, base surrounded by a reflexed cupuliform membrane. Ovules ∞ pendulous, imbricate.

Fruit 2 follicles. Seeds cylindric-prismatic, comose at both extremities; testa striate; albumen scanty; embryo straight; radicle superior, ovoid-oblong, apex conical; cotyledons much shorter than the radicle, ovate, foliaceous.

Species 5.

Distribution:—Arabia, Africa.

1. Adenium arabicum Balf. f. Trans. Roy. Soc. Edinb. XXX, 162.

Adenium Honghel Bot. Reg. XXXII, t. 54 (*Ic. tantum, non descript.*) *non* DC. Prodr. VIII, 412.

Adenium obesum Anders. Journ. Linn. Soc. V, Suppl. p. 23 (*syn. partim excl.*) *non* Roem. et Schult.

Adenium obesum Hook. Bot. Mag. t. 5918 (*Ic. tantum, non descript.*).

Arabic name:— Aden, Aobbiana.

Description:—A shrub, 1—3 feet high, with milky juice. Stem thick, globular-gouty, 1—2 feet in circumference, fleshy, rapidly diminishing to short stout branches. Branches terete, aphyllous, dichotomous. Leaves crowded near the apex of the branches, elliptic, ovate or spathulate, subpetiolate, obscurely mucronate, entire, veinless, glabrous, glaucous on the lower surface.

Pedicels solitary or geminate, subaxillary or terminal, villous. Flowers bright rosy, longer than the leaves (1½—2 inches). Calyx-segments lanceolate, pubescent. Corolla puberulous on the outside; lobes rotundate, obtuse, with 5 villous lines interiorly; limb 1 inch broad. Ovaries globose.

Flowers:—March 1862 (Playfair), May 1859 (Anders.), Dec. (Schweinf.).

Fruits : March 1862 (Playfair).

Locality :—Shum Shum Range (Schweinf., Marchesetti) ; rock near the flag-staff, hill between Maala and the Goldmore Valley, ravine on the northern side of the Shum Shum Range above Maala, south-eastern corner of the crater (Defl.) ; on rocks (Hook., Anders.) ; abundant on the hill crags, but now difficult to obtain (Balfour) ; without locality (Beevor, Birdw., Playfair).

This plant is a great favourite in the little gardens of Steamer Point on account of its bizarre shape and beautiful rosy flowers.

Distribution :—Yemen.

Note :—According to Schumann (Symb. Phys. Pars bot. 1900, p. 5) another species of *Adenium* would occur at Aden, *viz. :*—

Adenium obesum (Forsk.) Roem. et Schult. Syst. Veg. IV., 411, of which he gives the following synonyms :

Adenium Honghel A. DC. C. in Prodr. VIII, 412.
Nerium obesum Forsk. Fl. Aeg.-Arab. 205.
Cameraria obesa Sprengel Syst. I, 641.
Pachypodium obesum G. Don. Gen. Syst. IV, 80.
Adenium arborescens Ehrenberg.
In addition he wishes to be included :
Adenium multiflorum Kl. and A. Boehmianum Schinz.

I doubt whether there are two species of *Adenium* at Aden. The specimens I have been able to examine do certainly not belong to *Adenium obesum* Roem. et Schult., but to *A. arabicum* Balf. The genus requires careful revision, and as its representatives are very variable, there is no hope of deciding the numerous doubtful points without detailed observations *in loco.*

Cf. etiam Balfour in his Botany of Socotra and Stapf's diagnoses.

XXX.—ASCLEPIADACEÆ.

Herbs or shrubs, often with milky juice. Leaves opposite or whorled, rarely alternate, entire, exstipulate.

Flowers regular, solitary or few or many together in umbels, umbellate cymes, fascicles or racemes. Calyx inferior, usually divided to the base or nearly so ; segments imbricate. Corolla various, gamopetalous, 5-lobed ; tube usually short, often furnished with a ring of scales or processes (corolline corona) ; lobes imbricate, contorted or valvate in æstivation. Stamens 5, alternating with the corolla-lobes ; filaments usually connate into a fleshy tube (staminal column), with its apex often united to the dilated part of the style, usually with fleshy scales or processes on the back (staminal corona); anthers free or united to the dilated

part of the style, 2-celled, the margins of the anthers or their basal prolongations below the cells more or less horny and wing-like (anther-wings), the adjacent wings of each pair of anthers nearly meeting and forming narrow fissures leading to the stigmatic cavities; pollen forming 1 or 2 granular or waxy masses (pollinia) in each cell, the pollinia of the adjoining cells of two contiguous anthers united in pairs or fours either directly or by appendages (caudicles) to each of the 5 minute turgid or 2-fid bodies (pollen-carriers or corpuscles) which lie on the dilated part of the style. Ovary superior, of 2 one-celled distinct carpels enclosed within the staminal column, with their styles united above into a disk which is 5-angled, or produced beyond the anthers into a long or short simple or bifid column; ovules usually numerous, anatropous, pendulous, imbricate in several series on the projecting placenta.

Fruit a pair of follicles; the seeds usually crowned by a tuft of hairs. Endosperm slight, cartilaginous; radicle superior; cotyledons flat.

Genera about 220; *species* about 1,800.

Distribution:—Mostly confined to the tropics, but a few in temperate regions.

Corona corolline
- Gynostegium sessile or short-stipitate . . . 1. Glossonema.
- Gynostegium distinctly stipitate . . . 4. Steinheilia.

Corona staminal
- Stem erect
  - Shrubs or trees, with many leaves
    - Leaves linear-lanceolate or linear . . . 7. Kanahia.
    - Leaves broad . . . . . 2. Calotropis.
  - Herbs, leafless or almost so . . . . . 6. Caralluma.
- Stem twining
  - Leaves not cordate . . . . . 3. Pentatropis.
  - Leaves cordate . . . . . 5. Dæmia.

1. Glossonema Dcne.

Dwarf perennial, rarely annual herbs, often hoary, branched from the base. Leaves opposite.

Flowers in few-flowered lateral or sublateral cymes arising from between the base of the petioles, rarely solitary. Calyx 5-partite. Corolla subcampanulate; lobes 5, overlapping to the right; corona arising from the corolla-tube, of 5 broad hyaline lobes alternating with the corolla-lobes. Staminal column short; anthers terminated by an inflexed membrane; pollen-masses pendulous, solitary in each anther-cell, attached in pairs to the pollen-carriers by very short caudicles. Style-apex usually exserted beyond the anther, fleshy conical, clavate or peltate

Follicles thick, acuminate, usually echinate. Seeds comose.

Species 7.

Distribution :—Tropical Africa, Arabia, Persia, Baluchistan, Sind.

1. Glossonema Boveanum Dcne. in Ann. Sc. Nat. ser. II, IX, 335; Anders. Journ. Linn. Soc. V, Suppl. p. 24; Boiss. Fl. Or. IV, 61; This.-Dyer Fl. trop. Afr. IV, 292.

Gomphocarpus pauciflorus Hochst. et Steud. in Schimp. Pl. Abyss. n. 920.

Petalostemma chenopodii R. Br. in Salt Voy. Abyss. App. p. 64.

Glossonema affine N. E. Br. in Kew Bull. (1895) p. 249.

Description :—A dwarf herb, 3—10 inches high, branching from the base. Stems ascending, more or less pubescent with white hairs. Leaves spreading; petiole 1—6 lines long; blade ⅓—1½ inches long, 1½—7 lines broad, ovate, or ovate-lanceolate, acute or obtuse, cuneately narrowed or broadly rounded into the petiole at the base, more or less undulate or crisped on the margins, thinly or densely white-pubescent on both sides or glabrous above.

Flowers 1—3 together, sublateral; pedicels 1—1½ lines long, white-pubescent. Sepals 1¼—1½ lines long, lanceolate, acute, pubescent. Corolla-tube 1 line long, campanulate; lobes spreading, 1½—2 lines long, ¾—1 line broad, oblong or oblong-ovate, obtuse or subacute, slightly thickened above or subtuberculate near the apex, with the margins recurved, glabrous or with a few hairs on the back. Coronal-lobes arising a short distance below the sinuses of the corolla, 1¾—2 lines long, ¾ line broad in the broadly oblong basal half, 3-lobed, with the middle lobe long and filiform, or subtruncately or somewhat abruptly contracted into a filiform or subulate point, or occasionally filiform-acuminate. Staminal-column 1 line long; anther-appendages reniform, very obtuse. Style protruded for about ¼ line beyond the anther-appendages; apical part stout, conical, obtuse or shortly bifid.

Follicles 1½—2 inches long, 7—11 lines thick, ovoid, acute, strongly echinate, minutely pubescent or nearly glabrous. Seeds about 2 lines long, 1½ lines broad, ovate, flattened, very minutely scaberulous, dark brown.

Flowers :—April 1894 (Lunt).

Fruits :—January 1872 (Thomson), April 1894 (Lunt).

Locality :—Goldmore Valley, hill near Steamer Point, above Maala (Schweinf.); ravine on the northern side of the Shum Shum Range, Koosaf Valley, ravine south-west of the Tower of Silence (Defl.); top of Shum Shum Range above 1,400 feet (Busse); Aden port, nearly sea-level

(Lunt); without locality (Edgew., Boycott, Thomson, Birdw.). Little Aden (Defl.).

Distribution :—Yemen, Abyssinia, Eritrea, Nubia, Upper Egypt.

2. Calotropis R. Br.

Erect shrubs or small trees with opposite, broad, subsessile leaves.

Flowers in umbellate or subracemose lateral pedunculate cymes. Calyx of 5 distinct sepals, glandular inside, broadly ovate; corolla campanulate or subrotate, divided more than half-way down; lobes broad, valvate; corona of 5 fleshy, laterally compressed lobes, adnate to and standing out as wide buttresses from the staminal column with an upcurved and involute spur at the base and bifid at, or with 2 auricles a little below, the apex. Anthers short and broad, with membranous appendages inflexed over the depressed pentagonal summit of the style-apex; pollen-masses solitary in each anther-cell, pendulous, attached to the pollen-carriers by short caudicles.

Follicles short, thick, not echinate. Seeds comose, flat, ovate.

Species 4.

Distribution :—Africa, India, S. China, Malay Archipelago.

1. Calotropis procera (Forsk.) R. Br. in Herb. Kew. ed. 2, p. 78; Dcne. in DC. Prodr. VIII, 585; A. Rich. Tent. Fl. Abyss. II, 33; Vatke in Linnæa XV, 213; Ham. in Trans. Linn. Soc. XIV, 246; Boiss. Fl. Or. IV, 57; Hook. Fl. Brit. Ind. IV, 18; Batt. et Trab. Fl. d'Alg. p. 585.

Calotropis Wallichii Wight. Contr. p. 54.

Calotropis Hamiltonii Wight. Contr. p. 53.

Calotropis heterophylla Wall. Wight Contr. p. 54.

Calotropis procera Willd. Sp. Pl. I, 1263; Del. Frag. Fl. Arab. Petr. p. 13.

Asclepias gigantea L. ex synon. Prosp. Alpini.

Apocynum syriacum Clus. Hist. 2, p. 87.

Apocynum patula Auch. exsicc. n. 1500, Kotschy exsicc. n. 939.

Asclepias gigantea Forsk. Fl. Aeg.-Arab, p. CVIII.

Arabic name : Ushar.—*Persian name* : Khark.

Description :—An erect shrub, usually 6—8 feet high (in arid places sometimes higher); young parts with white cottony tomentum; bark soft, corky, spongy. Leaves subsessile, usually $2\frac{1}{2}$—6 by $1\frac{3}{4}$—$3\frac{1}{4}$ inches, broadly ovate, ovate-oblong, elliptic or obovate, with a short, abrupt acumination.

Flowers in umbellate cymes; peduncles 1—3 inches long, lateral; pedicels $\frac{1}{4}$ inch long; buds globose. Calyx divided to the base; sepals $\frac{1}{8}$ by

$\frac{1}{10}$ inch long, ovate, acute. Corolla glabrous, about 1 inch across; lobes usually erect, ovate, acute, $\frac{3}{8}$ inch long; corona-lobes compressed, equalling or exceeding the staminal column, the back nearly straight or sometimes slightly curved away from the column above the upcurved subacute spur, the apex obliquely truncate, bifid and without auricles.

Follicles 3—4 by 2—3 inches, subglobose, ellipsoid or ovoid. Seeds $\frac{1}{4}$ by $\frac{1}{6}$ inch, broadly ovate, acute, flattened, narrowly margined, minutely tomentose, light-brown; coma $1\frac{1}{4}$ inches long.

Flowers:—October (Marchesetti); March 1878 (Perry); April 1888 (Lunt).

Fruits:—April 1844 (Lunt).

Locality:—Plain of Maala (Defl., Schweinf., Lunt); great valley between Steamer Point and town (Marchesetti); without locality (Birdw.); not uncommon on N. stony plaines (Perry); Steamer Point, nearly sea level, near telegraph station (Lunt); Shaikh O'thman (Ellenbeck).

Distribution:—Tropical Africa, Egypt, Syria, Arabia, Persia, Afghanistan, Sind, Punjab and in the subhimalayan tract east to the Sarda river, drier districts of the Deccan, dry region of the Irawady valley.

Note:—No mention is made of this plant in the 'Florula Adenensis.' It seems strange that all the botanists before Anderson and Anderson himself should not have noticed this tall conspicuous shrub. We are inclined to believe that our *Calotropis* did not exist in Aden about 50 years ago; it is quite possible that it was carried there by the Arab boats which land quite close to the place where this milky bush is found in abundance.

Historical Note:—Prosper Alpinus was one of the earliest European writers to describe this plant (De Plantis Aegypti, 1592, c. XXV). He tells us that it is the 'beidelsar' of Alexandria, where it grows in damp places. The ancient Arabs seem to have had superstitious beliefs regarding this plant, since they associated it with sun-worship. The Arabic name 'ushar' appears to be a generic word for milk-yielding plants and was probably restricted to *Calotropis* at a comparatively late date. Abu Hanifeh was perhaps the first Arab writer to give an explicit account of it (Watt, Comm. Prod. Ind. p. 205).

With certain Hindus *Calotropis* is a sacred plant, and is associated with the observances of the 'maruts' or winds, the demigods of 'rudra.'

For further details cf. Ibn-el-Beithar, II, p. 267, 448; Rheede Hort. Mal. 1679, II, t. 31; Rumphius Herb. Amb. 1755, VII, 24, t. 14, f. 1; Jones in Asiat. Res., 1798, IV, 267; Joret, Les Plantes dans L'Antiq. 1904, II, 354.

For economic uses (gutta-percha, fibre, floss, medicine) cf. Watt, Dict. Econ. Prod. Ind. II, 33-49; Comm. Prod. Ind. 205-208.

3. Pentatropis R. Br.

Slender twiners with opposite petiolate leaves, and sublateral or subaxillary umbels of small flowers.

Calyx 5-partite. Corolla 5-lobed nearly to the base. Lobes suberect, with spreading tips, overlapping to the left and more or less twisted to the right in bud. Corona simple, arising from the staminal column, of 5 laterally compressed lobes, adnate for half to two-thirds of their length to the backs of the anthers. Staminal column arising from the base of the corolla. Anthers with membranous appendages inflexed over the truncate apex of the style. Pollen-masses pendulous, solitary in each cell of the anthers, affixed in pairs by short slender caudicles to the pollen-carriers.

Follicles lanceolate, narrowed into a beak, smooth. Seeds crowned by a tuft of hairs.

Species about 6.

Distribution :—Through Africa, Arabia, Baluchistan, the drier parts of India into China and the Malay Archipelago.

1. Pentatropis cynanchoides R. Br. in Salt Voy. Abyss. Append. LXIV ; This.-Dyer Fl. trop. Afr. IV, 380, Cooke Fl. Bomb. Pres. II, 154.

Pentatropis spiralis Dcne. in Ann. Sc. Nat. 2 sér. IX, 327, t. 11, fig. E et in DC. Prodr. VIII, 536 ; Engl. & Prantl Pflanzenf. IV, 2, 251, fig. 73, P—Q, and 258 ; Penzig in Atti Congr. Bot. Internaz. (1892) 349.

Pentatropis spiralis Dcne., *var.* longepetiolata Engl. Hochgebirgsfl. Trop. Afr. 343.

Tylophora cirrosa Aschers. in Schweinf. Beitr. Fl. Aethiop. 132.

Description :—Stems slender, twining, glabrous, except in the axils of the leaves and at the base of the young shoots, which are more or less pubescent. Leaves spreading ; petiole 1—4 lines long ; blade ½—1½ inches long, ¼—1 inch broad, oblong, ovate or elliptic-ovate, acute or obtuse, mucronate, more or less fleshy, glabrous.

Umbels subaxillary, 3—6-flowered ; peduncles slender, 1—3 lines long, or sometimes almost absent ; pedicels 3-5 lines long, filiform, sparsely puberulous. Sepals ½—¾ lines long, ovate, acuminate, sparsely puberulous, or subglabrous. Corolla pentagonal and acuminate in bud, 5-lobed nearly to the base, lobes 4—5 lines long, narrowly linear from a triangular base, twisted in bud, glabrous outside, minutely puberulous within. Corona-lobes arising ⅓ line above the base of the staminal column and nearly or quite reaching to its apex, varying in different

flowers in the same umbel, ½ line long, compressed, subtriangular in outline viewed sideways, subtruncate at the base, adnate to the column for ⅔ of their length, with a free narrowly oblong subacute or acute apex.

Follicles 2—3 inches long and about ⅓ inch thick, lanceolate, acuminate into a beak, smooth, glabrous.

Locality:—Shaikh O'thman (Defl.).

Distribution:—S. Arabia (Lahadj, El Hadjar, Shonkra), Dahlak Island in the Red Sea, Nubia, Eritrea, Abyssinia, drier parts of India.

4. Steinheilia Dcne.

A perennial herb, the rhizome giving off one or two leafy stems. Leaves rosulate, petiolate, cordate or rotundate-cordate, mucronate, hoary, reticulately veined; primary leaves subreniform.

Flowers umbellate, violet. Calyx 5-partite. Corolla campanulate, 5-fid; throat with 5 emarginate scales; at the base of the tube 5 pits with alternate scales. No staminal corona. Gynostegium included in the tube, covered at the apex with scales, stipitate, striate. Anthers with 2 lateral, cartilaginous, black horns, which are united with the corpuscles of the stigma, at the apex with an oblong membrane. Pollen-masses subcompressed, clavate, pendulous. Stigma muticous.

Follicles ovoid, rostrate at the apex, fleshy, smooth; seeds comose.

Species 1.

1. Steinheilia radians (Forsk.) Dcne. in Ann. Sc. Nat. ser. II, IX, 339; Anders. Journ. Linn. Soc. V, Suppl. p. 24.

Asclepias radians Forsk. Fl. Aeg.-Arab. p. 49.

Description:—Leaves lurid-green, violaceous on the lower surface, 1 inch long, 1½ inches broad; petiole ½ inch long.

Peduncles axillary, solitary, multiflowered, tomentose, 1—2 inches long. Pedicels short. Calyx-segments lanceolate, incano-hirsute. Corolla 5 lines long, twice as long as the calyx, glabrous; lobes erect, lanceolate, acute, contorted.

Follicles solitary by abortion.

Flowers:—January 1880 (Balfour), March 1878 (Perry), April 1861 (Thomson), April 1894 (Lunt), May 1859 (Anderson), May 1873 (Hildebrandt), June 1872 (Hildebr.).

Fruits:—June 1872 (Hilderbr.).

Locality:—Plain of Maala (Schweinf.); on the south-western slope of the Shum Shum Range (Defl.); great valley between Steamer Point and town (Marchesetti); in sandy places, very rare (Anderson); Plain of Maala, nearly sea-level (Lunt); in sandy places (Perry); in loco saxoso

(Hildebrandt); neighbourhood of Aden (Hunter); without locality (Thomson, Oliver & Cl., Balfour).

Distribution:—Yemen, Somaliland (Herb. Kew).

Uses:—The unripe follicles are edible (Hildebr.).

5. Dæma R. Br.

Twining pubescent or tomentose perennial herbs or undershrubs. Leaves opposite, cordate.

Flowers medium-sized, in lateral racemose or corymbose peduncu-late cymes. Calyx 5-partite, glandular inside. Corolla yellowish-or greenish-white; tube short, campanulate or cylindric; lobes 5, ovate, spreading, overlapping to the right in bud; corona double, the outer at the base of the staminal column, membranous, annular, shortly 5-lobed, the lobes subquadrate or oblong, obtuse, truncate or denti-culate, the inner corona of 5 erect fleshy lobes spurred at the base, adnate to the staminal column up to the anthers, free above and produced into subulate horns incurved over the style-apex. Staminal column arising at the mouth of the corolla-tube; anthers erect, with a mem-branous inflexed appendage. Style-apex exserted; pollen-masses waxy, 1 in each anther-cell, compressed, attached in pairs to the pollen-carriers by their attenuated ends without caudicles.

Follicles lanceolate, usually echinate. Seeds comose.

Species 6.

Distribution:—Tropical Africa, tropical and subtropical Asia.

1. Dæmia cordata (L.) R. Br. Wern. Soc. I, 50; Boiss. Fl. Or. IV, 60; This.-Dyer Fl. trop. Afr. IV, 386; Batt. et Trab. Fl. d'Alg. II, 586.

Pergularia tomentosa L. Mant. p. 53.

Asclepias cordata Forsk. Fl. Aeg.-Arab. p. 49.

Dæmia incana Dcne. Ann. Sc. Nat. ser. II, II, 336.

Dæmia tomentosa Pomel Nouv. Mat. Fl. Atl. 82; Vatke in Oest. Bot. Zeitschr. (1876) 146.

Arabic name:—Demia.

Description:—Stems shortly tomentose, with or without a mixture of long hairs, sometimes slightly hispid. Leaves deflexed; petiole $\frac{1}{6}$ — $\frac{3}{4}$ inch long; blade $\frac{1}{2}$—$1\frac{1}{4}$ inches long, 5 lines to $1\frac{1}{8}$ inches broad, cordate-orbicular or cordate-ovate, apiculate or shortly cuspidate, rather thick, tomentose on both sides.

Flowers in a corymb-like raceme, which (including the peduncle) is 1—2 inches long, tomentose or shortly and softly hairy, as are also the $\frac{1}{3}$ — 1 inch long pedicels, and the 1—2 lines long ovate acute

sepals. Corolla-tube 1½—2 lines long; lobes 3—3½ lines long, oblong-ovate, acute, bearded along their margins. Outer coronal lobes ½ line long, subquadrate or oblong, obtuse, truncate or denticulate. Inner coronal lobes rarely exceeding 2½ lines in length, fleshy, white, lanceolate, attenuate into subulate entire or bifid points, with a spur about ⅓ line long, arising below the middle of the staminal column.

Follicles 1½—2½ inches long, ovoid, acuminate into a beak, more or less echinate, sometimes nearly smooth, minutely tomentose. Seeds ⅓ inch long, ¼ inch broad, nearly flat, ovate, margined, minutely tomentose on both sides.

Locality :—Little Aden, at the foot of the north-eastern slope of the Jebel Muzulghum (Defl.).

Distribution :—Central and Southern Arabia, Nubia, Syria, Baluchistan.

6. Caralluma R. Br.

Succulent perennial herbs, branching, leafless. Stems 3—6-angled, thick and fleshy, obtusely tubercled or acutely toothed along the angles.

Flowers in few- or many-flowered fascicles or sessile umbels at the base, apex, or along the sides of the stems between the angles, small or of moderate size, pedicellate or subsessile. Calyx 5-partite. Corolla rotate, broadly cup-shaped or with a distinct campanulate or subglobose tube, 5-lobed; lobes varying from broadly ovate to linear-attenuate, valvate in bud. Corona double, arising from the staminal column; outer corona sometimes annular or cup-shaped, entire, crenulate, denticulate, 5—10- (rarely 20-) toothed or lobulate, adnate to the backs of the inner coronal lobes at their base or connected to them by narrow partitions; sometimes of 5 lobes more or less adnate by their margins to the sides or backs of the inner coronal lobes forming 5 small pouch-like cavities alternating with the anthers, or spreading, rarely quite free to the base, usually more or less bifid, sometimes so deeply that the whole corona (inner and outer) appears to consist of 5 trifid lobes; inner coronal lobes incumbent on the backs of the anthers and not longer than them, or produced into erect connivent or recurved tips, with or without a dorsal tooth or horn near or at their base, where they are dorsally connected with the outer corona. Staminal column arising from the bottom of the corolla, short; anthers horizontally inflexed or ascending, not appendaged. Pollen-masses horizontal or ascending, solitary in each anther-cell, pellucid along the inner margin or at the apex, attached to the pollen-carriers in pairs by short and rather slender caudicles; pollen-carriers with or without a wing-like expansion on each side, black or brown. Style not produced beyond the anthers, truncate at the apex.

Follicles narrowly fusiform, linear-terete or trigonous, smooth. Seeds crowned with a tuft of hairs.

Species about 40.

Distribution :—S. Europe, Africa, Arabia, India.

Flowers in dense globose heads at the ends of the branches .	1. C_4 adenensis.
Flowers in terminal multiflowered umbels	2. C. Forskalii.

1. **Caralluma adenensis** (Defl.) K. Schum. in Engl.-Prantl Pflanzenfam. IV, 2, 277.

Boucerosia adenensis Defl. Mém. de l'Inst. d'Egypte III, 270.

Description :—A herb, 1½—2 feet high and more, thick-fleshy, juicy, pale-green, branching; branches robust, erect, 4-gonous, the younger ones subclavate, the old ones equally thickened, the angles obtusely sinuate-crenate, prominulous, or even subwinged, with concave faces, at last plane.

Flowers 25—40 together, intermixed with numerous bracts, forming dense globose heads at the ends of the branches. Bracts narrowly linear; pedicels pale-green, terete, glabrous, often half as long as the flowers. Calyx pale-green, with a very short tube, obsoletely 5-costate; laciniæ linear, elongate, 3-nerved, shortly revolute at the apex, papillose-glandular on the outer side. Corolla lurid, glabrous, virescent on the outer side, atro-purple on the inner, often verrucose; tube campanulate, abruptly expanded into a plano-convex limb; lobes deltoid, acuminate, shorter than the tube; corona slightly fleshy, rose-coloured, pubescent, arising from the base of the corolla, lower part cyathiform, 5-locellate by radiant septa which are attached to the staminal tube, double; outer lobes erect, subinflexed, long-bicornute; horns linear, obtuse, scarcely arcuato-divaricate, pubescent on both sides; inner lobes arising from the sinuses, introflexed, liguliform, glabrous, free at the apex, longer than the authers.

Follicles in pairs, involucrate by the marcescent coriaceous calyx, 7—8 inches long, $\frac{1}{5}$—$\frac{1}{3}$ inch broad, terete, very long attenuate-acuminate, subuncinate at the apex, smooth-glabrous. Seeds complanate, ovate, comose, with a narrow membranous wing and thickened marginal ring.

Flowers : December 1888 (Schweinf.).

Fruits : April 1861 (Thomson).

Locality :—Shum Shum Range (Defl.); near Maala, Goldmore Valley (Schweinf.); without locality (Thomson).

Distribution :—Yemen.

Note :—Deflers says that the flowers are sometimes quite inodorous, and that, at other times, they exhale an offensive odour of decaying flesh.

Carnivorous flies are attracted by the smell and deposit their larvæ in the corolla-tube. It is probable that, by doing so, they are the agents of pollination, carrying the pollinia of one plant to another.

2. Caralluma Forskalii (Dcne.) K. Schum. in Engl.-Prantl. Pflanzenfam. IV, 2, 277.

Boucerosia Forskalii Dcne. Prodr. VIII, 648 ; Defl. Mém. de l'Inst. d'Egypte III, 270.

Boucerosia cicatricosa Defl. Voy. Yemen, p. 170, tab. IV.

Desmidorchis, Ehrenberg in Linnæa 1829, p. 24.

Arabic name :—Dra el Kelb, Kousma (Schweinf.).

Description :—Branches acutely tetragonous; angles obtusely calloso-dentate ; callosities orbicular.

Umbels terminal, multi-flowered. Flowers very short-pedicelled. Corolla-lobes densely verrucose glabrous.

Follicles linear-oblong, subangular.

Locality :—Goldmore Valley (Defl.) ; without locality (Balfour).

Distribution :—Yemen : Mount Saber.

7. Kanahia R. Br.

Shrubs with straight erect branches and milky juice. Leaves opposite, linear-lanceolate or linear, with minute bristles in their axils.

Inflorescence lateral at the nodes, with the peduncles racemosely scattered along the upper part of the branches. Flowers spirally arranged around the slightly thickened apical part of the peduncle, which becomes more or less elongated into a flowering axis, pedicellate, bracteate, developing successively, never strictly umbellate. Calyx 5-partite. Corolla 5-lobed to half-way down or nearly to the base; lobes ascending, spreading or reflexed, slightly overlapping to the left in the bud. Corona of 5-lobes arising from the staminal-column, either very thick and fleshy, solid and produced into a short horizontally inflexed subulate entire or bifid beak at the apex, or more or less complicate or cleft down the inner face. Staminal column arising from the bottom of the corolla; anthers erect, with membranous appendages inflexed over the apex of the style. Pollen-masses pendulous, solitary in each anther-cell, attached in pairs to the pollen-carriers by short horizontal caudicles. Apex of the style with a convex central boss surrounded by a depressed ring and with 5 very minute tubercles close to the pollen-carriers.

Follicles fusiform-lanceolate or somewhat ovoid, not echinate.

Species 4.

Distribution :—Tropical Africa, extending to Arabia.

1. Kanahia laniflora R. Br. in Mem. Wern. Soc. I, 40; K. Schum. in Engl. & Prantl. Pflanzenfam. IV, II, 233, not of Decne.; Brown in This-Dyer Fl. trop. Afr. IV, sect. I, 296.

Kanahia Delilii Decne. in Ann. Sc. Nat. sér. 2, IX, 330, in DC. Prodr. VIII, 537; A. Rich. Tent. Fl. Abyss. II, 34; Engl. Hochgebirgsfl. Trop. Afr. 342; Schweinf. in Höhnel, Zum Rudolf-See u. Stephanie-See, Separatabdr. 8; Schweinf. & Volkens Liste Pl. Somalis 10; Martelli Fl. Bogos. 54; Penzig in Atti Congr. Bot. Internaz. 1892, 349; K. Schum. in Engl. Pfl. Ost.-Afr. C. 323, in Engl. & Prantl Pflanzenfam. IV, II, 233, et in Ann. Istit. Bot. Roma. VII, 37.

Asclepias laniflora Forsk. Fl. Aegypt.-Arab. 51; Vahl Symb. I, 23, t. 7; Delile Cent. Pl. Voy. Méroé, 49, t. 3, fig. 3.

Description:—Stem 4—6 feet high, branching, glabrous. Leaves ascending or somewhat spreading, with a cluster of short bristles or teeth in their axils and along the rudimentary stipular line connecting their bases; petiole 1½—3 lines long; blade 2½—6 inches long, 2—6 lines broad, lanceolate or linear-lanceolate, gradually tapering to an acute point, acutely narrowed into the petiole, quite glabrous, not revolute at the margin.

Peduncles 1—2 inches long, rather stout, glabrous, lateral at the nodes, many-flowered at the apical part, which becomes raceme-like from the gradual development of the flowers; lowest bracts 2—9 lines long, the rest 1½—3 lines, linear or subulate, acute, glabrous, mostly with minute bristle-like teeth at their base, like those in the leaf-axils; pedicels ½—1 inch long, glabrous. Sepals 2—3 lines long, lanceolate, acuminate, glabrous. Corolla 7—9 lines in diameter, campanulate, 5-lobed to half-way down or beyond; lobes 4—5 lines long, ascending, ovate, acute, glabrous outside, more or less densely woolly within along the borders. Coronal lobes arising ¾ lines above the base of the staminal column and reaching to its summit, 2 lines long, erect, stout, turgid-oblong, fleshy, solid, not in the least complicate, abruptly contracted at the apex on the inner side into a simple or bifid subulate tooth or beak, inflexed over the tips of the anthers. All the lobes are connected to one another at their base by very obtuse minute flaps that form five pockets, enclosing the basal parts of the anther-wings. Staminal column 2¾—3 lines long; anther-appendages broadly subcordate-ovate, obtuse, inflexed over the apex of the style. Pollen-masses (excluding the caudicles) ¼ line long, ⅛ line thick, turgid, not compressed.

Follicles 2—2½ inches long, lanceolate, acuminate into a beak, glabrous, scrobiculate, but not echinate. Seeds 2 lines long, ovoid, tapering into

a short beak, channelled on one side, very turgid on the other, smooth, crowned with a tuft of hairs.

Locality:—"Neighbourhood of Aden, common near water" (Hunter).

We are not sure whether this plant has been found on British territory.

Distribution:—Arabia, Eritrea, Galabat, Abyssinia, Somaliland, German East Africa.

XXXI.—BORAGINACEÆ.

Herbs, shrubs, or trees, with usually alternate leaves.

Inflorescence normally a dichotomous cyme with helicoid branches, sometimes a simple unilateral raceme or spike or an irregularly trichotomous panicle. Flowers hermaphrodite, usually regular, hypogynous, and pentamerous. Calyx-tube campanulate or cylindric; lobes 4—5 (rarely 6—8). Corolla various, usually 4—5-lobed; lobes mostly imbricate. Stamens as many as the corolla-lobes, epipetalous; filaments filiform or dilated at the base, sometimes with a basal scale; anthers various, dorsifixed, more or less bilobed at the base, introrsely or laterally dehiscent. Disk annular, entire or 5-lobed, sometimes inconspicuous. Ovary superior, confluent at the base with the disk, entire or more or less completely 2—4-lobed, 2-celled and 2-ovulate or 4-celled and 1-ovulate; ovules erect or attached to the inner angle of the cell; style terminal in the entire, gynobasic in the lobed ovary; stigma terminal or annular, entire or bilobed.

Fruit drupaceous or dividing into 2—4 nutlets. Seeds erect, oblique or almost horizontal, straight or curved; testa membranous; albumen copious, scanty or 0; embryo straight or curved; cotyledons flat, plano-convex or thick and fleshy, usually entire; radicle usually much shorter than the cotyledons.

Genera about 85. *Species* about 1,200.

Distribution:—Tropical and temperate regions, specially Mediterranean.

Style terminal on the ovary . . . . . 1. Heliotropium.
Style inserted between the 4 lobes of the ovary:
Flowers regular . . . . . 2. Arnebia.
Flowers irregular . . . . . 3. Echiochilon.

1. Heliotropium Linn.

Herbs, undershrubs or shrubs with usually alternate leaves.

Flowers often unilateral along the branches of terminal scorpioid cymes, sometimes all axillary or arranged in simple leafy racemes

Calyx 5-cleft; lobes linear or lanceolate. Corolla-tube cylindric, usually naked at the throat; lobes 5, imbricate or induplicate. Stamens 5, epipetalous, included. Ovary completely or imperfectly 4-celled, 4-ovulate; ovule pendulous from the inner angle of the cell near its apex; style terminal, usually with a depressed conic or broad stigmatic ring below the apex.

Fruit somewhat fleshy, 2- or 4-sulcate or -lobed, at length dividing into 4 distinct or geminately cohering nutlets. Seeds straight or curved; albumen usually scanty; cotyledons plano-convex; radicle short.

Species about 220.

Distribution:—Tropical and temperate zones.

Corolla-lobes distinctly caudate	2. H. zeylanicum.
Corolla-lobes not caudate	
Annuals	3. H. pterocarpum.
Perennials	
Stigma with two long arms	4. H. ophioglossum.
Stigma with a conical crest	
Spikes ebracteate	
Spikes many-flowered, at length lax	1. H. strigosum.
Spikes few-flowered, dense	
Style-arms very unequal	8. H. paradoxum.
Style arms not so	7. H. undulatum.
Spikes bracteate	
Spikes short, dense, 3—6-flowered	5. H. lignosum.
Spikes subelongate, lax	6. H. adenense.

1. Heliotropium strigosum (Forsk.) Willd. Sp. Pl. I, 743; DC. Prodr. IX, 546; Anders. Journ. Linn. Soc. V, Suppl. p. 25; Boiss. Fl. Or. IV, 143; Hook. Fl. Brit. Ind. IV, 151.

Heliotropium brevifolium Wall Cat. 914; DC. Prodr. IX, 546.

Heliotropium tenue Wall. (ex Anders.).

Heliotropium fruticosum Forsk. Fl. Aeg.-Arab. p. 38.

Heliotropium parvifolium Edgw. Journ. As. Soc. Beng. XVI, 1216.

Heliotropium bicolor Hochst. et Steud. in Schimp. Pl. Abyss. n. 569.

Heliotropium tenuifolium R. Br. Prodr. 494.

Arabic name:—Hhashfe.

Description:—Perennial. Root more or less thick and woody. Stem slender, much branched, clothed with adpressed white bristly hairs. Leaves linear or linear-lanceolate, sessile or very shortly stalked, up to 1¼ inches long, usually much smaller, with adpressed bristly hairs on both surfaces, revolute at the margins.

Spikes very lax, finally 3 inches long; lower flowers often shortly pedicellate and bracteate. Calyx 1 line long, hairy outside; lobes from

linear to lanceolate. Corolla-tube a little longer than the calyx, slightly swollen about the middle; lobes $\frac{1}{3}$ line long, ovate, obtuse, crisped. Stamens inserted about the middle of the corolla-tube; anthers ovate, obtuse, crisped. Ovary globose; style $\frac{1}{4}$ line long, glabrous; stigma shortly conical, persisting on the young fruit.

Fruit depressed, obtusely 4-lobed, $\frac{1}{2}$ line long, hirsute above, separating into 4 nutlets, rounded not angled on the back.

Flowers :—January 1863 (Oliver and Cl.), February (Madden), March 1878 (Perry), November 1888 (Schweinf.), December 1847 (Hooker).

Fruits :—December 1847 (Hooker).

Locality :—Goldmore Valley, plain of Maala, Shum Shum Range (Schweinf.); plain of Maala, crater of Shum Shum Range (Defl.); from the sea-shore to the top of the Shum Shum Range (Edgw., Hook., Anders.); great valley between Steamer Point and town (Marchesetti); slope of Shum Shum Range (Hildebr.); without locality (Birdw., Perry, Madden, Oliver and Cl.).

Distribution :—Tropics of the Old World.

2. **Heliotropium zeylanicum** Lam. Encycl. III, 94 (not of Wall.); Hook. Fl. Brit. Ind. IV, 148.

Heliotropium paniculatum Heyne in Herb. Rottler.

Tournefortia subulata Hochst. in DC. Prodr. IX, 528.

Heliotropium subulatum Hochst. Nub. n. 163 and in DC. Prodr. IX, 523.

Tournefortia royleana DC. Prodr. IX, 527.

Tournefortia edgeworthii DC. Prodr. IX, 529.

Tournefortia zeylanica Wight Ill. t. 170.

Messerschmidia hispida Benth. in Royle Ill. 360.

Heliotropium curassavicum *var.* zeylanicum Burm. Flor. Ind. 41, t. 16, f. 2.

Description :—An erect annual, 1—3 feet high, scabrous and coarsely hairy with stiff hairs arising from white bulbous bases, the globose bases showing distinctly in dried specimens Leaves 1—2 by $\frac{1}{6}$—$\frac{1}{2}$ inch, sessile or nearly so, lanceolate, acute, entire, densely clothed with stiff hairs arising from white bulbous bases, base tapering.

Flowers sessile, in elongate spikes 2—6 inches long, usually in one rank along the rhachis, but sometimes, especially towards the apex of the spike, 2-ranked. Calyx $\frac{1}{10}$ inch long, hairy on both sides, divided to the base; sepales ovate, acute, densely ciliate. Corolla-tube $\frac{1}{6}$ — $\frac{1}{5}$ inch long, the upper half slightly swollen and setose outside; lobes $\frac{1}{10}$—$\frac{1}{8}$ inch long, caudate-acuminate, spreading. Stamens inserted in the

swollen part of the corolla, surrounding the style; anthers sessile, ovate-oblong, bifid at the apex. Style glabrous, $\frac{1}{12}$ inch long; stigma $\frac{1}{16}$ inch long, the stigmatic ring surmounted by a long cone which is penicillate at the apex with erect white glistening hairs.

Nutlets 4, ovate in longitudinal section, $\frac{1}{12}$ inch long, slightly incurved, rounded and rugose or tuberculate on the back, cuneate on the inner face, 2-seeded.

Locality :—South-eastern slope of the Shum Shum Range (Defl.); without locality (Birdw.).

Distribution :—Tropical Africa, Central and S. Arabia, W. India from the Punjab to the W. Deccan Peninsula.

3. Heliotropium pterocarpum Hochst. et Steud. in Schimp. Pl. Abyss. n. 835; DC. Prodr. IX, 552; Bunge, Monogr. Heliotr. p. 53.

Heliophytum pterocarpum DC. Prodr. IX, 552.

Description :—An annual. Stems short, spreading, slender, densely clothed with whitish bristly hairs. Leaves small, oblong, sessile or shortly petioled, thick, crisped on the margin, densely hispid on both sides.

Spikes short, ebracteate, very dense, much curved. Calyx densely hispid, 2 lines long; tube short; lobes oblong, free nearly to the base, or more or less united, 3 lines long. Corolla-tube narrowly campanulate; lobes small, orbicular. Stamens inserted just below the middle of the corolla-tube; anthers oblong. Stigma conical, as long as the glabrous style, together 1 line long.

Nuts glabrous, cohering in pairs, margined with a broad horny wing, with a rounded sinus at the apex.

Flowers :—January 1863 (Oliver & Cl.).

Locality :—Goldmore Valley (Schweinf.); without locality (Birdw., Oliver & Cl.); Shaikh O'thman (Defl.).

Distribution :—Yemen, Socotra, Eritrea, British Somaliland.

4. Heliotropium ophioglossum Stocks ex Aitch. Cat. Pl. Punjab p. 94; Boiss. Fl. Or. I, 145; Hook. Fl. Brit. Ind. IV, 149.

Heliotropium stylosum Franch. Sert. Somal. in Miss. Révoil. p. 45, tab. 4.

Description :—An undershrub, 6—15 inches high, branched from near the base; stems and branches hoary with soft hairs and also clothed with stiff hairs arising from white bulbous bases. Leaves $\frac{3}{4}$—$1\frac{1}{2}$ by $\frac{1}{4}$—$\frac{1}{2}$ inch, densely hirsute with stiff hairs and also clothed with a softer pubescence; the lower leaves petiolate, elliptic, acute, running down into the petiole; the upper leaves subsessile, lanceolate, acute, all with subentire, undulate margins.

Flowers sessile, distant, 1—2-ranked, in simple geminate or ternate densely hairy spikes 2—6 inches long. Calyx divided almost to the base, hairy; segments 5, linear, acute, ciliate. Corolla slightly exserted beyond the calyx; tube cylindric, slightly pubescent outside, the throat plicate; lobes 5, broadly ovate or suborbicular, obtuse or subacute, undulate, veined, usually with small teeth between the lobes. Stamens inserted below the middle of the corolla-tube; anthers linear-oblong, rounded at the tip. Style short; stigma shortly conical at the base, prolonged above into a long subulate appendage about $\frac{1}{6}$ inch long, divided at the apex into 2 filiform, recurved, acute arms.

Fruit $\frac{1}{16}$ inch long, glabrous, black; nutlets 4, rounded on the back and at their apex, 1-seeded.

Flowers:—March 1888 (Schweinf.), March 1878 (Perry).

Locality:—Above the coal-depôt of the Messag. Marit. (Schweinf.); without locality (Birdw., Lunt, Perry, Beevor).

Distribution:—Sind, Baluchistan, S. Arabia, S. Persia, Somaliland.

5. **Heliotropium lignosum** Vatke in Oester. Bot. Zeitschr. (1874) p. 167; Boiss. Fl. Or. IV, 143; This.-Dyer Fl. trop. Afr. IV, sect. 2, p. 40.

Lithospermum lignosum Schweinf. ex Vatke l. c.

Description:—Fruticose. Stems short, woody, ascending, densely clothed with short adpressed whitish bristly hairs. Leaves small, sessile, lanceolate, with revolute crisped edges, densely and shortly bristly on both sides.

Spikes short, dense, 3—6-flowered. Calyx $1\frac{1}{2}$ inches long, very hispid; tube short; segments oblong. Corolla-tube slightly longer than the calyx, subcylindric; segments small, obtuse. Stamens inserted just below the middle of the corolla-tube. Style short; stigma conical; apex bilobed.

Nuts 4, hispid.

Flowers:—Dec. 1888 (Schweinf.).

Locality:—Near the mosque Shaikh Aidrus in the crater of the Shum Shum Range (Schweinf.).

Distribution:—S. Arabia, S. Persia, Nubia.

6. **Heliotropium adenense** Gürke Herb. Berol. ex Krause Engl. Bot. Jahrb. XXXV, Heft 5, p. 51.

Description:—Perennial, much-branched from the base, densely clothed with pilose hairs; lower branches woody. Leaves $\frac{1}{3}$—$\frac{1}{2}$ inch long, $\frac{1}{12}$—$\frac{1}{8}$ inch broad, sessile, pilose, revolute on the margin.

Cymes lax, subelongate; bracts linear, persistent; pedicels very short. Sepals $\frac{1}{6}$ inch long, oblong, pilose. Corolla $\frac{1}{5}$—$\frac{1}{4}$ inch long; tube cylindric, slightly shorter than the calyx, contracted at the apex, pilose externally; petals reddish. Anthers on short filaments. Style included in the tube; stigma elongate-conic.

Locality :—On a rocky slope of the Shum Shum Range (Ellenbeck n. 126). Endemic in Aden.

Note :—" *H. adenense* Gürke is nearly allied to *H. strigosum* (Forsk.) Willd. and seems to approach *H. albo-hispidum* Baker Kew-Bull. 1895 p. 220 which occurs in Somaliland. Not long ago two species from Hadramaut have been described, *viz. H. congestum* Baker and *H. drepanophyllum* Baker, from which *H. adenense* is chiefly distinguished by its lax and erect inflorescence." Krause l. c.

We had no opportunity of seeing the type-specimen of this species, and the London herbaria do not contain any specimen corresponding to the above description.

7. Heliotropium undulatum Vahl Symb. I, 13; DC. Prodr. IX, 536; Boiss. Fl. Or. IV, 147; Hook. Fl. Brit. Ind. IV, 150; Schmidt Beitr. Fl. Cap. Verd. Ins. 225; Hiern in Cat. Afr. Pl. Welw. I, 718.

Heliotropium crispum Desf. Fl. Atlant. I, 151, t. 41.

Heliotropium persicum Lam. Encycl. III, 94; DC. l. c. 537; Boiss. Fl. Or. IV, 147.

Heliotropium persicum Burm. Ind. p. 41, tab. 29.

Heliotropium ramosissimum Sieber exsicc. Aegypt.; DC. l. c. 536.

Heliotropium eriocarpum Del. in Lehm. Asper. 55.

Heliotropium nubicum Bunge in Bull. Soc. Nat. Mosc. vol. 52, 1, p. 330.

Heliotropium cressoides Franch. Sert. Somal. 46.

Heliotropium marocanum Lehm. Asper. 56.

Lithospermum hispidum Forsk. Fl. Aegypt.-Arab. 38.

Arabic name :—Ssga 'a.

Description :—Perennial, much-branched. Stem slender, suberect, densely clothed with white bulbous-based bristles. Leaves scabrid on both surfaces, undulate, the upper lanceolate, sessile, the lower oblong, tapering into a short petiole, up to $2\frac{1}{2}$ inches long and 7 lines broad.

Spikes many, short, dense, ebracteate. Calyx 1 line long, hairy outside; lobes 5, oblong, truncate, as long as the tube. Corolla $1\frac{3}{4}$ lines long; tube slightly inflated near the middle; lobes short, rounded, much undulated. Stamens inserted about half-way up the corolla-tube; anthers lanceolate, acute. Style short, thick, globrous; stigma conical.

Fruit globose, almost 2-winged, pilose at first, finally glabrous; nutlets 4, rugose.

Flowers :—Dec. (Defl.).

Locality :—Aden (Defl.); neighbourhood of Aden (Hunter).

Distribution :—Extends from the Cape Verde Islands through North Africa, Arabia, Socotra and Tropical Asia.

8. **Heliotropium paradoxum** Vatke in Oester. Bot. Zeitschr. (1875) p. 167.

Description :—A perennial, shrubby, much-branched plant up to $1\frac{1}{2}$ feet long; branches stout, densely setulose. Leaves of sterile branches obovate-oblong, petiole-like attenuate at the base or sessile, $\frac{1}{2}$—1 inch long and up to $\frac{1}{6}$ inch broad, slightly acute, entire; of the flowering branches small, sessile, narrow, $\frac{1}{8}$—$\frac{1}{5}$ inch long and about $\frac{1}{12}$ inch broad.

Racemes few-flowered (3—5) ebracteate, dense. Flowers minute. Calyx as long as the corolla. Style-arms very unequal; stigma conical, entire.

Nutlets in pairs.

Flowers and fruits :—June 1872 (Hildebrandt).

Locality :—Shaikh O'thman, on the dunes (Hildebrandt).

Distribution :—Hadramaut.

Note :—Some botanists unite *Heliotropium paradoxum* with *H. undulatum* Vahl. It seems, however, that the reasons given by Vatke still justify *H. paradoxum* being considered as a distinct species:

"Stirps abnormis H. lignoso (Schweinfurth) Vatke (Lithospermum l. ej.) proxima; praeterea vero etiam stigmate conico apice leviter et aequaliter bilobo, id quod in ipsius Schweinfurthii exemplaribus optime videre contigit styloque terminali; species haecce H. undulato Vahl simillima characteribusque proxima, sed differt ut ex analysi optima Schweinfurthii et autopsia mea patet, styli ramis semper valde inaequalibus. H. paradoxum ob fructus structuram Heliophytis est adnumerandum, a quibus habitu abhorret; nuculis geminatim concretis etiam ab H. lignoso differt, quod nuculas separabiles possidet." Vatke, l. c.

2. Arnebia Forsk.

Annual or perennial erect or diffuse hispid herbs; root often staining red. Leaves alternate.

Flowers dimorphic, yellow or violet, sessile or very shortly pedicellate, in simple racemes or spikes or slightly branched cymes; bracts foliaceous. Calyx deeply 5-fid or 5-partite; lobes lanceolate or linear, not or slightly enlarged in fruit. Corolla-tube slender, straight, the throat naked

inside; lobes 5, imbricate, obtuse, spreading. Stamens 5, much below the mouth of the tube in the long-styled, or in the throat and ½ exserted in the short-styled forms; anthers small, oblong, obtuse. Ovary deeply 4-lobed; ovules erect, with short funicles; style filiform, 2-partite; stigmas capitate.

Nutlets usually 4 (rarely fewer by abortion), erect, oblong or acuminate from a broad base, rugose or more or less tuberculate; scar basal, large, triangular, flat, shortly produced up the inner face.

Species about 12.

Distribution:—N. Africa, Western and Central Asia.

1. **Arnebia hispidissima** (Spreng.) DC. Prodr. X, 94; Boiss. Fl. Or. IV, 213; Clarke Journ. Linn. Soc. XVIII, 524; Hook. Fl. Brit. Ind. IV, 176.

Anchusa hispidissima Sieb. H. Aeg.
Strobila hispidissima G. Don Gen. Syst. IV, 327.
Anchusa asperrima Del. Fl. d' Eg. p. 7, N. 210.
Dioclea hispidissima Spreng. Syst. Veg. I, 556.
Echiochilon hispidissimum Tausch in Flora (1829) p. 643.
Lithospermum hispidissimum Lehm. Ic. t. 39.
Toxostigma luteum A Rich. Tent. Fl. Abyss. II, 86.

Description:—Annual or biennial, 3—15 inches high, diffusely branched from a woody base, clothed all over with long white spreading stiff hairs often from bulbous bases. Leaves sessile, $\frac{3}{4}-2$ inches by $\frac{1}{10}-\frac{1}{4}$ inch linear-lanceolate, subobtuse, clothed with stiff white hairs from bulbous bases.

Flowers dimorphic, in dense secund racemes or spikes; pedicels very short or 0; bracts foliaceous, $\frac{1}{5}-\frac{1}{3}$ inch long, linear-lanceolate, densely hispid. Calyx $\frac{1}{4}$ inch long, very hispid, divided to the base or nearly so; segments lanceolate, acute, unequal. Corolla yellow, pubescent outside; tube $\frac{1}{3}$ inch long, slender, lobes $\frac{1}{10}$ inch long, oblong, obtuse. Stamens inserted much below the mouth of the corolla in the long-styled, at or in the throat and half-exserted in the short-styled forms; anthers $\frac{1}{20}$ inch long, oblong; filaments very short. Style slender, 2-partite; stigmas small, flattened on the inside, rounded on the outside.

Nutlets 4, very small, $\frac{1}{20}-\frac{1}{16}$ inch long, triangular in horizontal cross-section, acute, tuberculate on all sides.

Locality:—On rocks along the path leading to the top of Shum Shum Range at a height of about 900—1,000 feet (Busse); without locality (Birdw.).

Distribution:—Egypt, Nubia, Kordofan Abyssinia, Eritrea, S. Arabia, Sind, Punjab, Upper Gangetic Plain, Rajputana.

3. Echiochilon Desf.

Perennials, with many alternate stem-leaves.

Flowers small, blue, arranged in leafy scorpioid spikes. Calyx 5-partite; segments lanceolate, 1 very small or obsolete. Corolla-tube subcylindrical, curved; throat not closed by scales; limb bilabiate, irregular; upper lip erect, obscurely 2-lobed; lower more spreading, 3-lobed. Stamens 5, included in the corolla-tube; filaments very short; anthers oblong. Ovary with 4 lobes attached to the conic gynobase; style filiform; stigma 2-lobed.

Nuts 4, ovoid. Seed straight; cotyledons entire.

Species 2.

Distribution :—Africa, Arabia, Syria.

Hispid	E. fruticosum.
Glabrous	E. longiflorum.

1. Echiochilon fruticosum Desf. Fl. Atl. I, 67, tab. 47; DC. Prodr. X, 27.

Lithospermum divaricatum Sieb. Herb. Palæst. Spreng. Syst. I, 543.

Description :—A dwarf much-branched perennial, with stems and leaves densely clothed with white bristly hairs. Leaves alternate, lanceolate, 3—6 inches long, the lower ones reflexed, the upper adpressed.

Flowers axillary, solitary, sessile, crowded towards the tip of the branchlets. Calyx 4-partite; segments 1½ lines long, subulate, subequal, hirsute. Corolla blue, small, tubular, bilabiate; tube as long as the calyx, subarcuate, villose; throat yellow. Upper lip longer, bilobed; lower lip subtrilobed; all the lobes rounded. Stamens 5, included in the throat; filaments very short. Anthers small, acute, versatile, bilocular, dehiscent longitudinally. Ovules 4, minute.

Seeds 4, glabrous, small, tubercular, basilar.

Locality :—Aden (Birdw.).

Distribution :—N. Africa, Egypt, Palastine, Syria, Arabia, Nubia.

2. Echiochilon longiflorum Benth. in Hook. Ic. Plant. Plate 1277; Gürke in Engl. & Prantl Pflanzenf. IV, 3, 130.

Description :—A herb, divaricate-ramose, 1 foot high, glaucescent or pale-cærulescent, quite glabrous. Leaves alternate, sessile, oblong-linear or sublanceolate, entire, thick, subfleshy, the larger ones 6—8 lines long.

Spikes terminal, 4—6 inches long, thin, unilateral. Flowers scarcely strictly axillary. Calyx unequally 4—5-partite. Corolla blue; tube 4—5 lines long, 4—5 times as long as the calyx, slightly cylindric at the base

widened at the throat, upper lip of limb erecto-patent, broad, 2 lines long, the lower lip reduced to a recurved margin. Anthers oblong-linear, included; filaments very short, attached below the middle of the tube. Style filiform; stigma small, bilobed.

Nutlets almost pyramidal, subcordate at the base, tubercular-rugose or almost muricate, attached to the conical gynobase by an areola.

Echiochilon fruticosum is a much more scrubby plant than *E. longiflorum*, woody at the base and very hispid. The lower lip of the corolla is also much broader and the tube shorter than in *E. longiflorum*.

Flowers:—March 1878 (Perry), February 1900 (Birdw.).

Locality:—Near Aden to the north-west (Perry); without locality (Beevor, Birdw.).

Endemic in Aden.

This species was discovered by Perry in March 1878. It seems to be very rare. Perry says in a letter to Sir J. D. Hooker, dated Aden, 20th April 1878: "During a month's rambling over the N. and W. sides of Aden, I have only seen one solitary specimen of this plant." Herb. Kew.

XXXII.—CONVOLVULACEÆ.

Herbs or shrubs, often twining, with alternate petiolate, usually exstipulate leaves.

Flowers regular, usually hermaphrodite, solitary or in pedunculate axillary bracteate cymes. Calyx free, 5-partite. Corolla campanulate, infundibuliform or rotate, often plicate in bud, entire or shortly lobed. Stamens 5, epipetalous; anthers 2-celled, dorsifixed, linear or oblong, dehiscing longitudinally. Ovary superior, 1—4-celled, rarely with almost distinct carpels; ovules 2, less commonly 1—4 in each cell; style filiform, simple or forked; stigma capitate, 2-lobed or 2 stigmas

Fruit various. Seeds as many as the ovules or fewer; albumen scanty or 0; cotyledons usually broad and much folded.

Genera 42; *species* about 800.

Distribution:—Throughout the world.

Style filiform	
Stigmas 2, filiform	1. Convolvulus.
Stigma capitate	3. Ipomœa.
Styles 2, distinct from the base (in the species described) .	2. Breweria.

1. Convolvulus L.

Herbs or shrubs, with climbing, prostrate or erect stems. Leaves simple.

Flowers solitary, in few-flowered cymes or in dense involucrate heads. Sepals generally subequal, obtuse or acute. Corolla funnel-shaped, colour various, midpetaline areas not well defined, passing gradually into the sepaline areas. Stamens inserted low down in the corolla-tube; filaments generally unequal, filiform. Ovary 2-celled, 4-ovuled; style filiform; stigmas two, filiform.

Capsule 2-celled, usually 4-valved, 4-seeded. Seeds black or brown, glabrous, or pubescent, sometimes tuberculate; cotyledons broad, plicate.

Species about 160.

Distribution:—In the temperate and subtropical regions of both hemispheres; rarer in the tropics.

Calyx up to 5 lines long	1. C. glomeratus.
Calyx 1 line long or slightly longer	2. C. sericophyllus.

1. **Convolvulus glomeratus** (Hochst.) Chois. in DC. Prodr. IX, 401; Anders. Journ. Linn. Soc. V, Suppl. p. 24; Clarke in Hook. Fl. Brit. Ind. IV, 219.

Convolvulus arabicus Hochst. in Schimp. exsicc. II (1843), n. 784.

Ipomœa auricoma A. Rich. Tent. Fl. Abyss. II, 67.

"Convolvulus capitatus Vahl" in Schimp. Pl. n. 731 et 784, *non* C. capitatus Vahl (ex Anders.).

Arabic name:—Lu.

Description:—Perennial. Stems many from the hard woody base, long, slender, terete, trailing or twining, finely hairy, often scabridulous. Leaves lanceolate to oblong-lanceolate, ¼—1 inch long, base slightly cordate, flattened or obscurely cuneate, apex obtuse to acute, mucronulate; sparsely adpressed pilose on both surfaces; petiole very short.

Flowers in dense globose bracteate ferruginously hairy heads, on slender peduncles which are generally shorter than the leaves; outer bracts large, foliaceous, up to 8 lines long, inner smaller, lanceolate, acute, a little longer than the calyx. Sepals ovate-lanceolate, up to 5 lines long, the two outer much larger than the inner, densely clothed with bright brown hairs. Corolla pinkish-white, hairy, 6 lines long.

Capsule globose, glabrous, 2½ lines in diameter, pale-brown. Seeds blackish-brown, scabrid.

Flowers:—February 1851 (Thomson), March 1878 (Perry), April 1894 (Lunt), Nov. 1888 (Schweinf.), Dec. 1847 (Hooker), Dec. 1889 (Defl.).

Fruits:—January 1880 (Balfour), March 1878 (Perry).

Locality:—Valley near Maala, Goldmore Valley (Schweinf.); Steamer Point, 200 feet (Lunt); plain of Maala (Defl.); Shum Shum Range (Ellenbeck); great valley between Steamer Point and town

(Marchesetti) ; without locality (Edgew., Hook., Birdw., Perry, Balfour).

Distribution :—Abyssinia, Nubia, Eritrea, Socotra, S. Arabia, Baluchistan, Afghanistan, Sind, Punjab.

2. **Convolvulus sericophyllus** Anders. Journ. Linn. Soc. V, Suppl. p. 25 ; Hallier f. in Engl. Jahrb. XVIII, 97.

Convolvulus somalensis Franch. Sert. Somal. p. 43 (*non* Vatke).

Convolvulus acicularis Vatke in Linnæa vol. 43, 518.

Description :—A shrubby perennial, reaching 6 feet in height, much branched from the base ; branches strictly ascending, terete, woody, spinescent at the tip, slightly silky when young, glabrate when mature. Leaves silky, acicular, lower oblanceolate, shortly acute, to 1 inch long, upper growing gradually smaller and passing into the bracts.

Flowers 1—3, fascicled, forming terminal racemes. Peduncle up to 9 lines long, generally much shorter. Sepals cartilaginous, ovate-acuminate, minutely silky, very small, barely more than 1 line long. Corolla 3 lines long, externally sericeo-hirsute.

Capsule globose, glabrous. Seeds black, opaque.

Flowers :—Dec. 1847 (Hooker), Dec. 1889 (Defl.).

Fruits :—Dec. 1888 (Schweinf.), Febr. 1851 (Thomson), April 1878 (Perry).

Locality :—South-eastern slope of the Koosaf Valley (Defl.) ; valley at the foot of the Shum Shum Range (Schweinf.) ; great valley between Steamer Point and town (Marchesetti) ; without locality (Hook., Thomson, Birdw., Perry).

Distribution :—Aden, Highlands of Somaliland.

2. Breweria R. Br.

Herbs or undershrubs, large and twining, or small and erect. Leaves entire.

Flowers in axillary pedunculate heads or terminal close panicles, or 1—3 together, sessile and axillary. Sepals equal or unequal. Corolla campanulate or infundibuliform ; limb 5-plaited or very shortly and broadly lobed. Stamens included ; filaments filiform, often dilated at the base. Ovary 2-celled ; ovules 4 ; style filiform, equally or unequally bifid, or styles 2 free from the base ; stigmas capitate.

Capsule globose or ovoid, 4-valved, membranous or coriaceous. Seeds normally 4, glabrous or pilose.

Species about 25.

Distribution :—Tropics of both hemispheres, Australia, N. America.

1. **Breweria latifolia** (Hochst. et Steud.) Benth. et Hook. Gen. Pl. II, 87 ; Hook. Fl. Brit. Ind. IV, 224.

Cressa latifolia Anders. Journ. Linn. Soc. V, Suppl. p. 25.

Seddera latifolia Hochst. et Steud. exsicc. un. itin. n. 884 et Flora 1844, I. Beil. p. 8, tab. 5; Chois. in DC. Prodr. IX, 440; Boiss. Fl. Or. IV, 114.

Breweria evolvuloides Vatke in Linnæa (1843) p. 523 (*non* Choisy).

Breweria argentea Terrac. in Ann. Istit. Bot. Roma V, 104.

Description:—A much-branched, low undershrub with slender, woody branchlets, clothed with dense, short, velvety-white pubescence. Leaves broadly elliptic, rigidulous, shortly stalked, 2—4 lines long, clothed with short adpressed white hairs above and beneath, apex and base generally rounded, the former sometimes inconspicuously mucronate.

Flowers subsessile, solitary in the axils of the leaves or aggregated into short bracteated terminal spikes. Sepals subequal, obovate, coriaceous and rigid with acute herbaceous apex, 2 lines long, back pubescent like the leaves. Corolla not exceeding the calyx, limb two lines in diameter when expanded, tips of midpetaline areas densely hairy. Stamens equal, glabrous; filaments dilated at the base, with short rounded appendages. Ovary obovoid, upper portion hirsute; style divided to the base; stigmas orbicular.

Capsule 1½ lines in diameter, splitting into 4 rigid valves. Seeds narrowly ovoid, blackish, glabrous, 1 line long.

Locality:—Shum Shum Range at a height of 800 feet (Hook.); Wadi Maala (Schweinf.); without locality (Birdw., Hildebrandt).

Distribution:—Nubia, Abyssinia, Eritrea, Socotra, S. Arabia, Sind, Baluchistan, Punjab.

Note:—Anderson says that Wight's figure of *Seddera evolvuloides* (Icones t. 1369) is merely a glabrous state of our species, which Choisy referred to *Breweria*. *Breweria evolvuloides* Choisy (*Seddera evolvuloides* Wight), occurring at Tuticorin, resembles *B. latifolia* very much, but the leaves are nearly glabrous, the flowers often in twos or threes, on slender bracteolate pedicels ⅛—¼ inch long. *B. latifolia* is a characteristic desert plant.

3. Ipomœa L.

Herbs (rarely shrubs) twining or prostrate, rarely erect or suberect. Leaves alternate, usually entire.

Flowers usually large, in axillary (rarely paniculate) cymes which are often reduced to a single flower. Sepals 5, equal or unequal, imbricate, often enlarged in fruit. Corolla campanulate or infundibuliform; limb plicate, slightly lobed; bands usually defined by 2 prominent lines. Stamens 5, usually included; filaments filiform or dilated below, often unequal; anthers straight or contorted; pollen echinulate. Ovary 2-

(rarely 3 or 4)-celled ; ovules 4 (rarely 6) ; style filiform ; stigma capitate, entire or 2—3-globose (rarely stigmas 2-linear).

Capsule 4—6-valved, rarely indehiscent. Seeds usually 4 or 6 (rarely solitary), glabrous, bearded or uniformly velvety or woolly.

Species about 400.

Distribution :—Tropical and warmer regions of the globe.

Leaves not acuminate, usually bilobed or emarginate . .	1. I. biloba.
Leaves acuminate	2. I. calycina.

1. Ipomœa biloba Forsk. Fl. Aeg.-Arab. p. 44 ; Hook. Fl. Brit. Ind. IV, 212.

Ipomœa maritima R. Br. Prodr. 486.

Ipomœa pescapræ Roth. Nov. Spec. p. 109.

Convolvulus pescapræ L. Sp. Pl. ed. 2, 226.

Convolvulus maritimus Lam. Encycl. III, 550.

Convolvulus bilobatus Roxb Hort. Beng. 14 et. Fl. Ind. I, 485.

Batatas maritima Bojer Hort. Maurit. p. 225.

Description :—Root large, long, with a thick brown bark ; stems numerous, very long, prostrate, weak, rarely twining, cylindric, glabrous. Leaves $1\frac{1}{2}$—$2\frac{1}{4}$ by 2—3 inches, usually broader than long, usually deeply 2-lobed (the division often extending half-way down, though sometimes the leaf is only emarginate), fleshy, conspicuously parallel-veined, glabrous, cuneate or truncate at the base ; petioles 1—$3\frac{1}{2}$ inches long, glabrous.

Flowers large, usually solitary (sometimes 2—3); peduncles erect, 1—$4\frac{1}{2}$ inches long ; bracts beneath the pedicels lanceolate, caducous ; pedicels $\frac{5}{8}$—$1\frac{3}{4}$ inches long, stout. Calyx glabrous, the 2 outer sepals smaller than the inner, $\frac{1}{3}$ by $\frac{1}{4}$ inch, oblong, obtuse, apiculate, the 3 inner $\frac{1}{2}$ by $\frac{3}{8}$ inch, elliptic-oblong, obtuse or emarginate, apiculate. Corolla $1\frac{1}{2}$—2 inches long, tubular-infundibuliform, brilliant rose-purple with a deeper colour in the tube, glabrous ; lobes shallow, acute, apiculate. Filaments dilated and hairy at the base. Ovary glabrous.

Capsules $\frac{1}{2}$—$\frac{5}{8}$ inch long, ovoid, glabrous. Seeds villous.

Locality :—Aden, without precise locality (Birdw.) ; Shaikh O'thman, cultivated (Defl.).

Distribution :—Sea-shore of both hemispheres throughout the Tropics.

2. Ipomœa calycian C. B. Clarke in Hook f. Fl. Brit. Ind. IV, 201 ; Cooke Fl. Bomb. Pres. II, 242.

Ipomœa calycina Benth. sec. C. B. Clarke in Hooker f. Fl. Brit. Ind. IV. 201.

Ipomœa sagittata Roxb. Ic. ined. (*non* Desf.).

Ipomœa cardiosepala Hochst. ex Choisy, in DC. Prodr. IX, 429, 393; Vatke in Linnæa XLIII, 508.

Convolvulus calycinus Roxb. Hort. Beng. 13, et Fl. Ind. I, 471, ed. Carey et Wall. II, 51; Wall. Cat. 2255.

Convolvulus Hardwickii Spreng. Syst. curæ post. 60.

Aniseia calycina Chois. Convolv. Or. 100, et DC. Prodr. IX, 429; Wight Ill. t. 168 b, fig. 5, et. Ic. t. 833; Dalz. and Gibs. Bombay Fl. 163.

Description:—Stem twining, sparingly clothed with long spreading hairs. Leaves 2—3 by 1¼—2 inches, ovate, acutely acuminate, entire, sparsely hairy or nearly glabrous, cordate at the base with a wide sinus; petioles ½—1½ inches long, slender, clothed with long spreading hairs.

Flowers 1—3; peduncles hairy; pedicels hairy, about as long as the peduncles; bracts ¼ inch long, ovate, acute. Sepals in flower ⅓ inch long, unequal, ciliate, the outer in fruit ½ by ¼ inch, lanceolate-sagittate with obtuse auricles, the inner linear-lanceolate. Corolla white, tubular, scarcely 1 inch long.

Capsules ¼—⅓ inch long, ovoid, pointed, glabrous. Seeds ⅕ inch long villous all over, fringed on the margin with soft white hairs which are nearly ¼ inch long.

Flowers and fruits:—March 1873 (Hildebrandt).

Locality:—Aden (*fide* Vatke, Linnæa vol. 43, p. 509).

Distribution:—Abyssinia, Aden, India (N. W. Provinces, Oude, W. Peninsula).

XXXIII.—SOLANACEÆ.

Erect, trailing or scandent herbs or shrubs. Leaves alternate, often in unequal pairs, rarely clustered, never truly opposite, entire, lobed or pinnate; stipules 0.

Flowers regular in lateral, terminal, axillary or extra-axillary cymes, or on solitary or clustered pedicels; bracts and bracteoles 0. Calyx inferior; limb usually 5-lobed or -toothed, often accrescent in fruit. Corolla infundibuliform, campanulate or rotate, often plicate; lobes usually 5. Stamens 5, epipetalous; anthers ovate or oblong, dihiscing by apical pores or longitudinally. Ovary 2-celled or imperfectly 1- or 4-celled; ovules many, on prominent peltate placentas; style linear; stigma usually capitate.

Fruit a berry or a circumscissile or valved capsule, usually 2-celled, many-seeded. Seeds compressed, discoid, or subreniform, with peripheric embryo, or seeds scarcely compressed with straight embryo.

Genera about 70; *species* about 1,250.

Distribution:—Warmer regions.

Spinous	1. Lycium.
Not spinous	2. Capsicum.

1. Lycium L.

Spinous shrubs, usually glabrous. Leaves small, alternate or often fascicled, linear, terete or flat.

Pedicels usually solitary (rarely fascicled at the nodes); flowers small. Calyx campanulate, at first 5-merous, then irregularly 3—5-lobed or 2-lipped, in fruit not or scarcely enlarged. Corolla tubular-infundibuliform; lobes 5 (rarely 4), imbricate in bud, spreading in flower. Stamens 5 (rarely 4) on the corolla-tube; anthers exserted or included, dehiscing longitudinally. Ovary 2-celled; ovules few or many; style filiform; stigma subcapitate.

Berry small, globose or oblong. Seeds many, few, or solitary, compressed, scrobiculate; embryo peripheric.

Species about 50.

Distribution:—Temperate and subtropical regions of the world, especially S. Africa and S. America.

1. Lycium europæum L. Syst. Pl. ed. II, p. 28; Anders. Ann. Nat. Hist. ser. II, XX, p. 126 et Journ. Linn. Soc. V, Suppl. p. 26; Hook. Fl. Brit. Ind. IV, 240; Batt. et Trab. Fl. d'Alg. p. 622.

Lycium indicum Wight Ic. tab. 1403.
" salicifolium Mill. Dict. n. 3.
" mediterraneum Dun. in DC. Prodr. XIII, 523.
" Edgeworthii Dun. in Dc. Prodr. XIII, 523.
" saevum Miers Ill. S. Am. Pl. p. 95.
" orientale Miers Ill. S. Am. Pl. p. 99.
" persicum Miers Ill. S. Am. Pl. p. 100 et Ann. Nat. Hist. (1854) 12.

Lycium intricatum Boiss.; Dunal in DC. Prodr. XIII, 525.
" arabicum Schweinf. in Herb. Berol. (ex Krause); Boiss. Fl. Or. IV, 289.

Arabic name:—Awsaj.

Description:—A spiny, nearly glabrous shrub. Leaves lanceolate or oblanceolate, sometimes pubescent when young, ½—1 inch long, alternate or fasciculate. Branches grey.

Flowers white (or light purple), ½ inch long, solitary, on slender pedicels shorter than the flower. Calyx campanulate, longer than broad, with 5 equal teeth. Corolla-tube cylindrical, gradually widening upwards, somewhat curved; segments of limb short, rounded or ovate.

Filaments glabrous at their base; anthers nearly included in the mouth of the tube.

Berry globose, yellow or red, $\frac{1}{8}$-inch in diameter.

Flowers :—February 1851 (Thomson), Dec. 1889 (Defl.).

Fruits :—January 1880 (Balfour), Dec. 1888 (Schweinf.), Dec. 1889 (Defl.).

Locality :—Near the seashore (Hook., Thomson, Anders.); ravine south-west of the Tower of Silence (Defl.); Wadi Maala (Schweinf.); Shum Shum Range above the town from 500—1,300 feet (Busse); wihout locality (Birdw., Hildebrandt, Balfour, Beevor).

Distribution :—Southern Europe, N. Africa, Arabia, Socotra, W. India.

2. Capsicum L.

Annual or perennial herbs, glabrous or nearly so. Leaves entire or repand. Pedicels axillary or 2—3 together.

Calyx campanulate, subentire or minutely 5-toothed, much shorter than the fruit. Corolla rotate; lobes 5, valvate in bud. Stamens 5, attached near the base of the corolla; anthers not longer than the filaments, dehiscing longitudinally. Ovary 2-, rarely 3-celled; style linear; stigma subcapitate.

Berry very variable in form and size, many-seeded. Seeds discoid, smooth or subscabrous; embryo peripheric.

Species about 50.

Distribution :—Central and S. America, one species in Japan. Many species cultivated in tropical and subtropical regions of the globe.

1. Capsicum annum L. Hort. Cliff. (1737) p. 59; Sp. Pl. (1753) p. 188; Fingerh. Monogr. Gen. Caps. (1832) p. 12, t. 2, fig. a; Dunal in DC. Prodr. XIII, I, 412; Hooker Niger Fl. 472; Bentl. et Trim. Med. Pl. t. 189; J. Braun in Mitth. Deutsch. Schutzgeb. II (1889) 173; *var.* conoides Irish, in Rep. Missouri Bot. Gard. 1898, 65.

Capsicum conoides Mill. Gard. Dict. ed. 8, no. 8; Dunal l. c. 414; Engl. Pfl. Ost.-Afr. C. 351.

Capsicum conicum *var.* orientale Oliv. in Trans. Linn. Soc. XXIX, 118.

Valliacapo-molago Rheede Hort. Malab. IX, 65, t. 35.

Names :—Guinea Pepper, Red Pepper, Chilli, Cayenne, Tabasco.

Description :—Herbaceous, rarely suffrutescent, 2—5 feet high, branches many, erect, angular, glabrous. Leaves ovate-acuminate to oblong, 2—3 inches long, $\frac{3}{4}$—2 inches wide, pubescent on the under surface of the midrib; petiole about $\frac{1}{4}$ inch long.

Flowers solitary or in pairs; peduncle slightly enlarged upwards. Calyx cup-shaped, usually embracing the base of the fruit, obscurely toothed. Corolla about ½ inch in diameter, greenish-white; lobes 5—6, ovate, acuminate, often inflexed at the apex. Ovary ovoid attenuate, smooth.

Berry oblong-linear, acute, usually less than 1½ inches long, on peduncles of about equal length.

Locality :—Near the Flag-Staff (Defl.).

Distribution :—Widely dispersed in the tropics; probably originally from South America.

Note :—Deflers is of opinion that *C. annuum* has been brought to Aden not very long ago. As a matter of fact, no botanist before Deflers has reported this plant as growing in Aden.

XXXIV.—SCROPHULARIACEÆ.

Herbs or shrubs, rarely trees. Leaves all or the lower only opposite, rarely all alternate or whorled; stipules 0.

Flowers usually irregular. Calyx inferior, 5-, rarely 4-merous. Corolla hypogynous, more or less 2-lipped or occasionally personate, 4—5-lobed. Stamens usually 4 with or without a rudimentary 5th, less commonly 2 or 5; anthers 1—2-celled, the cells distinct or more or less confluent. Disk annular, cupular, or glandular. Ovary superior, usually 2-celled; ovules many, rarely few in each cell, anatropous or amphitropous; style simple; stigma various.

Fruit usually capsular; placentas on a free central axis or attached to the margins of the valves. Seeds small, of various shapes; hilum lateral or ventral; albumen fleshy, rarely absent; embryo straight or curved.

Genera about 200; *species* about 2,200.

Distribution :—Throughout the world.

Leaves all alternate	3. Anticharis.
Leaves the lower at least if not all opposite	
Corolla spurred or subsaccate at the base in front.	
Corolla spurred	1. Linaria.
Corolla subsaccate	2. Schweinfurthia.
Corolla not spurred nor subsaccate.	
Stamens 2	5. Campylanthus.
Stamens 4	4. Lindenbergia.

1. Linaria Juss.

Herbs, more rarely undershrubs. Lower leaves usually opposite, the upper nearly always alternate, quite entire, dentate or lobed.

Flowers axillary or in terminal racemes or spikes; pedicels ebracteolate. Calyx 5-partite; segments imbricate. Corolla-tube spurred at the base in front; upper lip erect, bilobed; lower lip spreading, 3-lobed, produced at the base into a palate, closing the throat of the corolla, or more rarely depressed, leaving the throat open. Stamens 4, didynamous, ascending, included; filaments filiform; anther-cells distinct, oblong, parallel. Style filiform; stigma small, usually emarginate. Ovules many in each cell.

Capsule ovoid or globose, dehiscing by a 3-valved pore at the apex of each cell, or by 4—10 valve-like teeth, or by circumscissile or valve-like opercula. Seeds ovoid, wingless, angular or rugose, or discoid and surrounded by a membranous wing.

Species about 150.

Distribution :—Nearly all in the northern extratropical regions of the old world.

Flowers in terminal racemes	1. L. macilenta.
Flowers axillary	2. L. sagittata.

1. Linaria macilenta Dcne. in Ann. Sc. Nat. ser. II, II, 252; DC. Prodr. X, 271.

Description :—An undershrub, 1 foot high and more, slender, branching; branches elongate, rigid, erect, subspinescent, glabrous. Lower leaves 1 inch long, 2—2½ lines broad, ovate to linear-lanceolate, acute, bidentate-sagittate at the base, attenuate into a thin short petiole, the uppermost leaves awl-shaped, entire. Bracts linear, subulate.

Racemes terminal, loose; pedicels capillary, 2—4 times as long as the calyx. Calyx 5-partite; lobes linear, half as long as the corolla. Corolla (including the spur) 1—1½ lines long, subventricose; upper lip bifid; lobes rotundate; lower lip with rotundate lobes; spur subattenuate, hamose when young, later on as long as the corolla. Style shorter than the corolla, glabrous. Ovary suboblique, subrotund, slightly puberulous at the apex.

Capsule conical, slightly shorter than the calyx, glabrous. Seeds tubercled-echinate.

Locality :—Crater and slopes of Shum Shum Range (Shweinf., Defl.); without locality (Birdw., Beevor).

Distribution :—Yemen, Sinai, Eritrea.

2. Linaria sagittata Hook. f. Bot. Mag. t. 6060; This.-Dyer Fl. trop. Afr. (1906) IV, sect. 2, 291.

Linaria heterophylla Steud. Nom. ed. 1, 482; Spreng. Syst. II, 790; Benth. in DC. Prodr. X, 270 (not of Desf.).

Linaria patula Baker in Kew Bull. (1895) 222.

Linaria Webbiana Visiani L'Orto Bot. di Torino, 142, ex Walp. Rep. III, 195.

Linaria circinnata Sweet Brit. Fl. Gard. ser. 2, III, t. 235.

Linaria Lancerottæ Delile Sem. Hort. Monsp. (1836) 26 (ex Webb.).

Antirrhinum heterophyllum Schousboe Beobacht. Gewächsr. Marrokko 181, t. 3; Willd. Sp. Pl. III, 234.

Antirrhinum sagittatum Poir. Dict. Suppl. IV, 19.

Linaria gracilis R. Br. in Salt Abyss. Append. 64 et ex Benth. in DC. Prodr. X, 269; Almagia in Ann. Istit. Bot. Roma VIII, 137.

Linaria gracilis *var*. propinqua Benth. in DC. Prodr. X, 270.

Linaria propinqua R. Br. l. c. 64.

Description:—A slender diffusely branched subscandent perennial, glabrous on the branches, leaves and peduncles; stem short, thick; branches terete, woody at the base, sometimes almost leafless. Leaves from a few lines to 2 inches long by ½ — 3½ lines broad, narrowly linear to linear-oblong or lanceolate, saggittate or hastate or sometimes cuneate or rounded at the base, entire, acute, rarely obtuse; petiole 1—6 lines long, sometimes tendril-like.

Flowers distant, axillary; peduncles 5—8 lines long. Calyx 2 lines long, glabrous or glandular-pubescent; segments lanceolate, acute or acuminate, more or less scarious on the margins. Corolla (including the spur) 9—10 lines long (1½ inches according to J. D. Hooker l. c.), yellow, pilose outside; palate clothed with long citron-yellow hairs; spur about ½ inch long. Filaments densely pilose.

Capsule shorter than the calyx, globose, glabrous. Seeds reniform, tuberculate.

Locality:—Aden (Defl.).

Distribution:—Canary Islands, N. Africa, Nubia, Eritrea, Abyssinia, Somaliland, Arabia.

Note:—This species has been included on the authority of Deflers. From the above description it is evident that *L. sagittata* is very variable in habit, shape and size of the leaves, and the length of the peduncles. Hemsley and Skan found that many of the specimens cited by them in the 'Flora of tropical Africa' (vol. IV, part 2, p. 291) had been named *L. macilenta* Dcne. instead of *L. sagittata* Hook. f. *L. macilenta* is different in habit, has much shorter peduncles, minute flowers, and much smaller capsules.

2. Schweinfurthia A. Braun.

Annual or perennial diffuse glabrous and glaucous herbs. Leaves usually alternate, quite entire.

Flowers axillary, pedunculate, small. Calyx 5-partite; segments imbricate, the posticous larger than the others. Corolla-tube subsaccate at the base; upper lip 2-lobed, erect, at length reflexed at the margin; lower lip 3-lobed, reflexed-spreading; palate rather prominent, clothing the throat. Stamens 4, didynamous, ascending; filaments glandular-pilose at the base; anther-cells diverging, at length divaricate, confluent at the apex; rudiment of the fifth stamen small. Style filiform; stigma minute. Ovules numerous in each cell.

Capsule subglobose; pericarp fragile; anticous cell many-seeded, dehiscing irregularly; posticous cell much smaller or very small and compressed, 3—4-seeded or empty, indehiscent or at length bursting irregularly. Seeds obconic-truncate, with 6 longitudinal sub-winged ridges.

Species 4.

Distribution :—Socotra and Comoro Islands, Afghanistan, Western India.

Plant up to 2 feet high; leaves usually narrowly linear; peduncles 5—8 lines long	1. S. pedicellata.
Plant 6—9 inches high; leaves elliptic-spathulate to linear-oblong; peduncles 3—5 lines long	2. S. pterosperma.

1. Schweinfurthia pedicellata Benth. & Hook. f. Gen. Pl. II (1876) p. 934 (by error pedicellaris); Balf. Bot. Socotra p. 201; Cooke Fl. Bomb. Presid. II, 284.

Anarrhinum pedicellatum T. Anders. Journ. Linn. Soc. V, Suppl. p. 26.

Antirrhinum apterum Vatke in Oest. Bot. Zeitschr. (1875) p. 96.

Schweinfurthia aptera Vatke in herb. reg. berol. ex. Vatke l. c., This.-Dyer Fl. trop. Afr. IV, 2, p. 294.

Description :—Suffruticose, erect, branched; stem and branches usually greyish, glabrous or rarely with a few scattered glandular hairs. Leaves $\frac{1}{2}$—$1\frac{1}{4}$ by $\frac{1}{30}$—$\frac{1}{12}$ inch, sessile, linear, subacute.

Flowers axillary, solitary; pedicels $\frac{1}{4}$—$\frac{1}{2}$ inch long, capillary. Calyx $\frac{1}{5}$ inch long, 5-partite, glabrous; segments $\frac{1}{10}$—$\frac{1}{8}$ inch long, ovate, acute, the upper slightly longer and broader than the other 4. Corolla 2-lipped, $\frac{1}{3}$ inch long, parallel-veined and with 2 lines of hairs in the throat at the lower side; upper lip erect, 2-lobed, the lobes $\frac{1}{12}$ inch long, oblong, rounded at the apex; lower lip 3-lobed, the lobes oblong-rounded, the middle lobe longer and narrower than the lateral ones. Stamens 4 (with a rudimentary 5th) didynamous, the lower pair the longer; filaments hairy at the base; anthers divaricate. Ovary glabrous; style glabrous.

Capsule $\frac{1}{8}$—$\frac{1}{4}$ inch in diameter, globose, fragile, 2-celled, the upper cell with few seeds or empty. Seeds $\frac{1}{20}$ inch long, obconic, truncate at both ends, strongly ribbed with longitudinal obtuse ribs.

Flowers and fruits:—Jan. 1863 (Oliver & Cl.), Febr. 1851 (Hook. & Thomson), March 1878 (Perry), April 1861 (Thomson), Nov. 1888 (Schweinf.), Dec. 1847 (Hook.), Dec. 1889 (Defl.).

Locality :—Plain of Maala, slope of Shum Shum Range (Defl.); near the coal depôt of the Messag. Marit. (Schweinf.) ; great valley between Steamer Point and town (Marchesetti); without locality (Hook., Thomson, Playfair, Oliver & Cl., Perry, Birdw., Lunt).

Distribution :—S. Arabia, Socotra, Comoro Islands, Somaliland, Sind.

2. **Schweinfurthia pterosperma** Al. Braun in Sitzungsber. Ges. Naturf. Fr. Vol. 20 (1866) 24, et in Monatsber. Akad. Wiss. Berlin (1866) 872, cum tab.; Terracciano in Ann. Istit. Bot. Roma V, 103; This.-Dyer Fl. trop. Afr. IV, sect. 2, 293.

Description :—A much-branched erect annual 6—9 inches high. Leaves up to 1 inch long and 5 lines broad, the uppermost much smaller, elliptic-spathulate to linear-oblong, obtuse, narrowed at the base; petiole from a few lines to $\frac{3}{4}$ inch long.

Peduncles solitary, 3—5 lines long, filiform. Calyx $1\frac{1}{4}$—$1\frac{1}{2}$ lines long; segments ovate-lanceolate, obtuse or subacute. Corolla 3—4 lines long, white, rose-tinted at the throat.

Capsule 3—$3\frac{1}{2}$ lines in diameter; posticous cell 1—3-seeded or quite empty.

Locality :—Path leading from Aden to top of Shum Shum Range at about 650 feet (Busse ex Krause), slope of Shum Shum Range (Ellenbeck ex Krause).

Distribution :—Nubia, Eritrea, Abyssinia, Somaliland, Arabia.

Note:—In my former list of the plants of Aden I combined *Schweinfurthia pedicellata* Renth. & Hook. with *S. pterosperma*; but there seems to be no doubt that these two names represent two distinct species. Vatke wrote in 1875 (Plantæ in itinere Africano ab J. M. Hildebrandt collectæ, in Oesterr. Bot. Zeitschr. XXV. Jahrg. (1875) p. 96): *Antirrhinum apterum* Vatke. [=*Schweinfurthia aptera* Vatke] "ab affini *A. pterospermo* A. Rich. vel *Schweinfurthia p.* A. Br. seminibus eximie differt."

3. Anticharis Endl.

Dwarf erect herbs with glandular pubescence. Leaves entire.

Peduncles axillary, solitary, 1-flowered, often with 2 small bracts. Calyx 5-partite, segments narrow, subvalvate. Corolla-tube dilated

above, limb spreading; lobes 5, flat, subequal, rounded, the two posticous lobes outside. Stamens 2, anticous; filaments filiform; anthers subtransverse, glabrous or sparingly pilose, 1-celled by confluence, horseshoe or half-moon-shaped before dehiscence, at length flattened out; staminodes 0. Style filiform, subclavate at the apex; stigma obtuse, entire or emarginate.

Capsule ovate or oblong, subacuminate, 2-furrowed, loculicidal and septicidal; valves bent inwards at the margins exposing the placentiferous column. Seeds numerous, small, oblong or obovoid, striate; embryo straight; cotyledons ovate.

Species 9.

Distribution :—8 in Tropical Africa, 2 of which extend to Arabia and Western India and 1 in S. Africa.

Leaves ovate oblong, subobtuse, densely glandular-hairy . . 1. A. glandulosa.
Leaves oblong-lanceolate to lanceolate-linear; corolla rose-coloured . . . . . 2. A. arabica.
Leaves linear, acute. Corolla pale-purple . . . . 3. A. linear
or:
Bracts inserted at or below the middle of the peduncle; basal lobes of the anthers obtuse; leaves linear-lanceolate to oblong or elliptic
(*a*) Leaves often broad, rather obtuse; capsule 1½ times as long as the calyx . . . . . 1. A. glandulosa.
(*b*) Leaves often narrow, rather acute; capsule twice as long as the calyx . . . . . 2. A. arabica.
Bracts inserted above the middle of peduncle; basal lobes of the anthers; lacuminate leaves linear, acuminate . . 3. A. linearis.

1. Anticharis glandulosa (Ehrbg. et Hempr.) Aschers. in Monatsber. Kön. Akad. Wissensch. Berlin (1866) p. 880; Boiss. Fl. Or. IV, 423; Hook. Fl. Brit. Ind. IV, 249; This.-Dyer Fl. trop. Afr. IV, 2, p. 277.

"Anticharis arabica Endl." in Anders. Journ. Linn. Soc. V, Suppl. p. 27 (not the true Anticharis arabica Endl.!).

Distemon glandulosus Ehrbg. et Hempr. ex Aschers. Monatsber. Kön. Akad. Wissensch. Berlin (1866) p. 881.

Meisarrhena tomentosa R. Br. in Salt Abyss. App. 63, *nomen tantum.*

Description :—An erect branched leafy herb, scarcely reaching 1 foot high, clothed all over with viscid glandular hairs. Leaves ⅜—¾ inch long, ovate-oblong, subobtuse, densely glandular-hairy, entire, narrowed into a short flattened often obscure petiole.

Pedicels axillary, solitary (very rarely 2 together), ⅓ inch long, slender, glandular-hairy; bracts 2 about the middle of the pedicel, reaching ¼ inch long, linear-spathulate, glandular, hairy. Calyx ¼ inch long, divided to

the base; sepals oblanceolate, acute, glandular-hairy and ciliate. Corolla scarcely ½ inch long, rose-coloured. Filaments short, filiform, glabrous; anthers versatile, curved, the segments unequal. Ovary ovoid, glabrous, seated on a somewhat cup-shaped disk; style glabrous.

Capsule ⅓ inch long, narrowly ovoid, acuminate, pubescent. Seeds about $\frac{1}{25}$ inch long, oblong, truncate, longitudinally striately ribbed.

Fruits:—Aug. 1898 (Birdw.).

Locality:—Hill of telegraph office, ravine near Steamer Point, ravine on the northern slope of the Shum Shum Range (Defl.); great valley between Steamer Point and town (Marchesetti); above the coal depôt of the Messag. Marit. (Schweinf.); along the path leading from Aden to the top of the Shum Shum Range between 500 and 1,300 feet (Busse); without locality (Edgew., Hook., Hildebrandt, Wichura, Birdw.).

Distribution:—Upper Egypt, Nubia, Abyssinia, Eritrea, northern coast of Somaliland, Socotra, S. Arabia, Sind.

2. **Anticharis arabica** Endl. Nov. Sp. Stirp. Dec. 23, et Iconogr. t. 93; Benth. in DC. Prodr. X, 347; Aschers. in Monatsber. Akad. Wiss. Berlin (1866) 881; Boiss. Fl. Or. IV, 422; Almagia in Ann. Istit. Bot. Roma VIII, 137; This.-Dyer Fl. trop Afr. IV, sect. 2, 276.

Anticharis glandulosa *var.* intermedia Terracciano in Ann. Istit. Bot. Roma V, 103.

Anticharis Schimperi Endl. Iconogr. XV (*nomen tantum*).

Capraria arabica Steud. & Hochst. ex Benth. in DC. Prodr. X, 347.

Distemon campanularis Ehrenb. & Hempr. ex Aschers. l.c. 882.

Description:—A slender erect branched shortly glandular-pubescent annual about 1 foot high. Leaves up to 14 lines long, 1¼—2½ lines broad, oblong-lanceolate to lanceolate-linear, acute or somewhat acute, attenuated to the base; petiole 1½—2½ lines long.

Peduncles 2¼—4 lines long; bracts minute, subulate, inserted at about the middle of the peduncle. Calyx 1—1½ lines long, deeply cleft; segments about ½ line broad, linear or oblanceolate, acute. Corolla rose-coloured, somewhat viscid, 3½ lines long; lobes broad, rounded. Anthers free, pilose on the back; basal lobes unequal. Style shorter than the corolla-tube.

Capsule twice as long as the calyx, narrowly ovoid, acuminate or beaked.

Flowers:—April 1890 (Defl.), April 1894 (Lunt).

Fruits:—April 1894 (Lunt).

Locality:—Goldmore Valley, 200 feet (Lunt); without locality (Defl.).

Distribution :—Nubia, Eritrea, Somaliland, Socotra, Arabia.

3. **Anticharis linearis** Hochst. ex Aschers. in Monatsber. Akad. Wiss. Berl. (1866) 882; Vatke in Oest. Bot. Zeitschr. (1875) 9; Hiern in Cat. Afr. Pl. Welw. I, 756; Hook. Fl. Brit. Ind. IV, 250; Boiss. Fl. Or. IV, 423; Almagia in Ann. Istit. Bot. Roma VIII, 136; This.-Dyer Fl. trop. Afr. IV, sect. 2, 276; Cooke Fl. Romb. Pres. II, 281.

Anticharis arabica Hochst. ex Benth. in DC. Prodr. X, 347; A. Rich. Tent. Fl. Abyss. II, 119; Schweinf. Beitr. Fl. Aethiop. 98, not of Endl.

Doranthera linearis Benth. in DC. Prodr. X, 347; Oliver in Trans. Linn. Soc. XXIX, 120; Schweinf. Beitr. Fl. Aethiop. 241.

Distemon angustifolius Ehrenb. et Hempr. ex Aschers. l. c. 883.

Gerardiopsis Fischeri Engl. Pfl. Ost.-Afr. C. 359, et in Engl. Jahrb. vol. 23, 507.

Description :—A much-branched, erect, glandular-pubescent annual, a few inches to more than 1 foot high, turning black in drying. Leaves linear, acute, 1—1¾ by $\frac{1}{12}$—$\frac{1}{8}$ inch, sessile, entire, glandular-hairy or nearly glabrous.

Pedicels ½—¾ inch long, solitary, filiform, with 2 small linear bracts $\frac{1}{10}$—⅛ inch long at or near the middle. Calyx ⅕ inch long, divided to the base; sepals linear-lanceolate, acute, glandular hairy. Corolla pale-purple, veined, divided scarcely ¼-way down; lobes 5, oblong, obtuse. Anthers versatile, curved, the segments unequal. Style glabrous.

Capsules ⅓ inch long, ovoid, acuminate, pubescent, veined. Seeds $\frac{1}{30}$ inch long, oblong, truncate, longitudinally striately ribbed.

Locality:—Neighbourhood of Aden (Hunter).

Distribution:—Bornu, Senegambia, Nubia, Kordofan, Eritrea, Abyssinia, German East Africa, Angola, Cape Verd Islands, Egypt, Arabia, Sind, Punjab.

4. Lindenbergia Lehm.

Annual or perennial herbs, hard at the base, rarely undershrubs, decumbent or ascending, villous or more rarely glabrescent. Leaves opposite or the upper alternate, dentate.

Flowers subsessile, solitary in the axils of the leaves or in terminal spikes or racemes; bracts foliaceous; bracteoles 0. Calyx 5-fid, campanulate. Corolla bilabiate; tube cylindric; posticous lip inside, short, broad, emarginate or 2-lobed, erect, spreading; anticous lip larger, 3-

lobed, spreading. Stamens 4, didynamous, included; filaments filiform; anther-cells distinct, separated, stipitate, all bearing pollen. Style filiform, subclavate at the apex.

Capsule oblong or ovoid, bisulcate, dehiscence loculicidal; valves entire. Seeds many, minute, semi-immersed in the fleshy placentas.

Species 14.

Distribution:—North-East Africa, Arabia, India, Malaya, China.

1. Lindenbergia sinaica (Dcne.) Benth. Scroph. Ind. p. 22; DC. Prodr. X, 377; Boiss. Fl. Or. IV, 425; Anders. Journ. Linn. Soc. V, Suppl. p. 27.

Bovea sinaica Dcne. in Ann. Sc. Nat. ser. II, II, 253.

Description:—A divaricately much branched densely glandular-pilose undershrub; branches up to about 1 foot long. Lower leaves suborbicular—ovate or ovate, 3—7 lines long and broad, usually shortly petiolate, coarsely crenate-dentate, acute or obtuse, rounded or cuneate at the base; uppermost leaves sessile, smaller, shorter than the calyx.

Flowers opposite in loose secund racemes 6—12 inches long; pedicels ½—1½ lines long. Calyx 1½—2 lines long, densely glandular-pilose; teeth ovate or ovate-elliptic, unequal, ½—⅔ lines long, acute. Corolla 7—8 lines long.

Capsule oblong, slightly longer than the calyx, glandular-pilose above.

Flowers and Fruits:—January 1872 (Thomson), February 1851 (Thomson), March 1878 (Perry), April 1894 (Lunt), Nov. 1888 (Schweinf.), Dec. 1847 (Hooker).

Locality:—In old wells (Hook., Anders.); Goldmore Valley, 100 feet (Lunt); Goldmore Valley, above the coal-depôt of the Messag. Marit. (Schweinf.); on the Shum Shum Range (Busse); without locality (Birdw., Hildebrandt, Perry).

Distribution:—Sinai, Egypt, Nubia, Abyssinia, highlands of Somaliland, Central and S. Arabia, Socotra.

5. Campylanthus Roth.

Shrubs. Leaves alternate, linear, subfleshy, entire.

Flowers in terminal racemes often secund; pedicels with 2 bracts near the base. Calyx deeply 5-fid or 5-partite; segments imbricate. Corolla-tube elongate, slender, incurved; lobes 5, orbicular or ovate, spreading, subequal, imbricate, the lateral exterior in bud. Stamens 2, included; filaments short; anther-cells divaricate, their tips confluent. Ovary 2-celled; ovules many in each cell; style short or long, straight or inflexed; stigma capitate.

Capsule orbicular or broadly ovoid, compressed, septicidal; valves 2-fid or 2-partite. Seeds numerous, orbicular, compressed, notched at the hilum; funicle more or less expanded into a hyaline wing which sometimes surrounds the entire seed.

Species 4.

Distribution :—Canary and Cape de Verde Islands, Arabia, Sind, Baluchistan.

1. **Campylanthus junceus** Edgew. Journ. As. Soc. Beng. XVI, 1217; Anders. Journ. Linn. Soc. V, Suppl. p. 27.

Description :—A glabrous, subglaucous undershrub, 1—3 feet high. Branches elongate, virgate, subaphyllous. Leaves linear, acute, entire; lower ones 12½ inches long, 1—2 lines broad, shortly petioled; cauline leaves small, subulate.

Flowers on elongate, virgate, terminal, ½—1 foot long racemes, alternate, pedicellate, secund; pedicels short 1—2 lines long, bibracteate at the base, 1-flowered; bracts small, ciliate. Calyx 5-partite; segments lanceolate, acute. Corolla yellowish-white, much longer than the calyx; tube elongate, incurved, 3 lines long; limb patent, subequal, 3 lines broad; lobes ovate. Stamens 2.

Seeds numerous, orbicular, compressed, marginate.

Flowers :—January 1880 (Balfour), February 1851 (Thomson), March 1850 (Madden), March 1898 (Perry), May 1859 (Anderson), Dec. 1847 (Hooker), Dec. 1888 (Schweinf.), Dec. 1889 Defl).

Fruits :—January 1880 (Balfour), February 1851 (Thomson), March 1850 (Madden), May 1859 (Anderson), June 1872 (Hildebr.), Dec. 1847 (Hooker), Dec. 1888 (Schweinf.), Dec. 1889 (Defl.).

Locality :—Plain of Maala, Koosaf Valley (Defl.); Steamer Point (Schweinf.); on gravelly slope of the Shum Shum Range (Ellenbeck); near the tanks (Busse); upper end of the great valley between Steamer Point and town (Marchesetti); abundant, Shum Shum Range (Hooker); without locality (Edgew., Thomson, Madden, Anderson, Balfour, Hildebrandt, Perry, Playfair).

Distribution :—Yemen.

XXXV.—OROBANCHACEÆ.

Annual or perennial parasitic herbs, almost perfectly destitute of chlorophyll, variously coloured, but never green. Stems usually simple, solitary or fascicled, more or less fleshy. Leaves reduced to, often fleshy, scales, few or many.

Flowers in terminal racemes or spikes, supported by bracts and often also by bracteoles, hermaphrodite, zygomorphic. Calyx inferior, gamosepalous, 2—5-toothed or -lobed, rarely truncate, or spathaceous and open in front, or consisting of 2 lateral 1—2-toothed or linear divisions which are either quite free or more or less united at the base in front. Corolla gamopetalous, tubular or funnel-shaped in the upper part, usually curved; limb oblique, 2 lipped or nearly equally 5-lobed; upper lip entire or bilobed, lower lip 3-lobed, lobes imbricate, the upper inside. Stamens 4, didynamous, usually inserted below the middle of the corolla tube and enclosed in it; filaments filiform; anthers dorsifixed, conniving or cohering (by means of hairs) in pairs; cells parallel or slightly diverging, often mucronate, longitudinally dehiscent, both fertile or one empty. Disk hypogynous, obscure or produced anticously into a nectarial gland. Ovary superior, 1-celled; carpels 2, median, rarely 3; style simple, terminal; stigma orbicular or 2—3-lobed. Placentas 4, separate or contiguous or partly fused in pairs; ovules very numerous, anatropous.

Capsule 1-celled, more or less dehiscing with 2 valves. Seeds very numerous, small; testa often foveolate-reticulate; endosperm fleshy. Embryo globose, of few cells, undifferentiated.

Genera 11, *species* about 150.

Distribution:—Almost exclusively in the northern hemisphere, particularly in the warm temperate regions.

1. Cistanche Hoffmgg. et Link.

Parasitic plants, variously coloured, destitute of chlorophyll, glabrous or cobwebby. Stems succulent, often bulbously thickened at the base, simple. Leaves reduced to fleshy scales.

Flowers bracteate and 2-bracteolate, in dense spikes, rather large, white, yellow, violet, or purplish. Calyx persistent, tubular-campanulate, 4- or 5-lobed; lobes obtuse, rounded, subequal or the two posticous narrower. Corolla tubular below, more or less funnel-shaped above, more or less curved or at length abruptly bent; limb spreading, oblique, 5-lobed, lobes broad, equal or nearly so. Stamens 4, didynamous, subexserted, inserted deep down in the corolla-tube; anthers usually densely bearded and coherent by the hairs; cells parallel, often acute or mucronate at the base. Ovary 1-celled, with 4 distinct placentas, many-ovuled; style curved at the apex; stigma large, orbicular.

Capsule 2-valved, dehiscing in the median plane. Seeds very numerous, minute, foveolate-reticulate.

Species about 12.

Distribution:—Mediterranean region, N. Africa, Western, Tropical and Central Asia.

1. **Cistanche lutea** Hoffmgg. & Link Fl. Port. I, 319, t. 63; Reichb. Pl. Crit. VII, t. 700, fig. 939; Stapf in Fl. Trop. Afr. vol. IV, sec 2, p. 463.

Lathræa Phelipæa Linn. Sp. Pl. ed. 2. II, 844; Brot. Fl. Lus. I, 184.

Orobanche tinctoria Willd. Sp. Pl. III, 353.

Phelipæa lutea Desf. Fl. Atl. II, 60, t. 146; Brunner in Flora (1840) II. Beibl. 1 und 4; Boiss. Fl. Or. IV, 500.

Phelipæa tinctoria Walp. Rep. III, 462; Reut. in DC. Prodr. XI, 13.

Phelipæa senegalensis Reut. l. c.

Phelipæa lusitanica Coss. Not. Crit. Espagne, 43.

Phelipæa Brunneri Webb in Hook. Niger Fl. 167.

Arabic name:—Hoddar, Hhedar.

Description:—Stem swollen at the base, often more than 1 inch in diameter, stout, fleshy, like the whole plant (except the stamens and the inside of the corolla-tube), glabrous, ½—1½ feet high. Scales fleshy, lurid purplish or tinged with yellow, lower crowded, triangular, caudate-acuminate or acute, upper ovate-lanceolate or lanceolate, scattered, ½—1 inch long, margins sometimes thin and more or less transparent.

Spike cylindric, rounded at the top, or when young comose by the uppermost bracts, from a few inches to 1 foot long, usually dense, rarely somewhat lax; bracts ovate-oblong or lanceolate, as long as the calyx or shorter or longer, in substance and colour like the stem-scales; bracteoles linear, about as long as the calyx. Calyx wide tubular-campanulate, 6—10 lines long, rarely longer, 5-lobed to ⅓ or almost ½ of its length; lobes broad, elliptic-oblong, rounded, more or less imbricate, margins membranous. Corolla bright yellow; tube 1—2 inches long, at first almost straight, then more or less curved, at length often abruptly bent at the middle, cylindric below the middle, wide funnel-shaped above it, more or less villous below the insertion; lobes much broader than long, 2½—3 lines long, rounded. Filaments hairy towards the base; anthers woolly, cells acute to mucronulate at the base.

Locality:—Aden. On roots of *Salvadora persica* (Yerbury).

Distribution:—Spain, Cape Verde, Senegambia, Southern Sahara, Nubia, Eritrea, Sennar, French Somaliland (?), throughout North Africa and the Orient.

Note:—The Indian *Cistanche tubulosa* Wight "scarcely differs from *C. lutea* Hoffmgg. et Link, the apiculation of the anthers being the distinctive character. This, however, in Tropical African specimens, does not seem to be always a constant one." Cooke, Fl. Bomb. Pres. II, 313.

"Our knowledge of the species of *Cistanche* leaves much to be desired, and an examination of the plants in the field is very desirable, particularly with respect to their variability." Stapf, l. c. p. 464.

XXXVI.—BIGNONIACEÆ.

Trees, shrubs or woody climbers. Leaves usually opposite, compound; leaflets opposite, rarely simple; stipules 0.

Flowers bisexual, generally zygomorphic; calyx free, gamosepalous, truncate, split or toothed. Corolla tubular or campanulate, lobes 5, imbricate, rarely valvate in bud. Stamens 2 or 4, rarely 5, often a short staminode in place of the 5th stamen. Ovary free, supported by an annular disk, 2-celled, ovules ∞ on two distinct placentas in each cell, attached to the dissepiment; style filiform, with 2 short stigmatic lobes.

Fruit often elongated, generally dehiscent, the two valves separating from the dissepiment, to which the seeds are attached; seeds winged, albumen 0.

Genera about 105; *species* about 1,550.

Distribution:—Throughout the tropics of the whole world, largely in tropical America, a few in the warm temperate zones of both hemispheres.

1. Tecoma Juss.

Shrubs or small trees, erect or scandent. Leaves usually opposite, simple or compound.

Racemes or panicles terminal. Calyx tubular-campanulate, subequally 5-toothed. Corolla tubular-ventricose, orange or red; lobes 5, round; subequal.

Capsule linear or narrow, loculicidally 2-valved, somewhat compressed at right angles to the septun. Seeds thinly discoid; wing hyaline, broad.

Species about 80.

Distribution:—Tropics of the whole world, mostly American.

Tecoma spec.—
Cultivated at Shaikh O'thman (Deflers).

XXXVII. ACANTHACEÆ.

Herbs, shrubs or trees with opposite, usually entire exstipulate leaves.

Flowers usually irregular, in cymes, racemes or spikes or solitary; bracts large or small or absent; bracteoles usually 2, sometimes more under the individual flowers, free or connate into an epicalyx. Calyx 5—4-partite. Corolla bilabiate or subequally 5-lobed; lobes imbricate or

twisted in bud. Stamens 4 or 2, epipetalous ; anthers 2—1-celled. Ovary superior, 2-celled ; ovules 1 or more in each cell, anatropous ; stigma usually bilobed.

Fruit a loculicidal capsule, the valves often elastically recurved, the septum splitting, the seeds born on each half. Seeds usually hard, often clothed with white elastic hairs (best seen when wetted), seated on hard upcurved subacute supports ; albumen 0 or scanty.

Genera about 140 ; *species* about 2,000.

Distribution :—Tropical and warm temperate regions.

Corolla without an upper lip ; lower lip large expanded, 3-lobed . .	1. Blepharis.
Corolla 2-lipped or with 5 subequal lobes :	
Corolla-lobes twisted to the left in bud	2. Ruellia.
Corolla-lobes imbricate in bud	3. Barleria.

1. Blepharis Juss.

Harsh prickly, or smooth slender undershrubs generally without stellate or gland-tipped hairs. Leaves by the adjacent pairs being drawn together appearing in whorls of 4, outer pair in each whorl often smaller, sometimes very much smaller, or reduced and almost resembling stipules.

Spikes of flowers strobilate ; bract green, ovate or obovate, veined, nearly always spinous ; bracteoles 2 or 0, linear, rarely lanceolate, 1-nerved, acute ; in many spikes all the bracts except the highest sterile. Calyx sub-4-partite to the base ; 2 anticous segments connate nearly to the tip ; posticous segment lanceolate, 3-nerved, usually longer than the anticous ; 2 interior segments, narrow, long or short. Corolla : posticous lip 0, replaced by a horny rim ; anticous lip nearly flat, 3—5-lobed, bluish, white, or fading to yellowish. Stamens 4, subsimilar ; anthers 1-celled, narrow-oblong, muticous, fringed with white hairs near the slit ; filaments of 2 anticous stamens more flattened with rudiments of missing anther more developed ; pollen longish-ellipsoid, with a few very narrow longitudinal smooth chinks not reaching the poles. Ovary 2—1 ovules in each cell, glabrous ; style glabrous (rarely with a few thin hairs below), branches 2, lanceolate ; at the apex of the ovary on the posticous face are 2 hollows filled with glands.

Capsule ellipsoid, flattened, woody, shining-brown, 2- (rarely 4-) seeded ; seeds covered with rope-like bundles of hair, which on applying water unroll into very long 1-celled hairs each furnished with a spiral band within.

Species about 50.

Distribution:—Nearly all African, many in South Africa, a few extending through Arabia and the Oriental Region to India.

1. **Blepharis edulis** (L.) Pers. Syn. II, 180; Anders. Journ. Linn. Soc. V, Suppl. p. 28; Hook. Fl. Brit. Ind. IV, 479; Oliv. Trans. Linn. Soc. XXIX, 128; This.-Dyer Fl. trop. Afr. V, 102; Boiss. Fl. Or. IV, 520.

Ruellia ciliaris L. Mant. p. 89.

Acanthus edulis Forsk. Fl. Aeg.-Arab. p. 114; Vahl. Symb. I, 48.

Ruellia persica Burm. Fl. Ind. p. 135, t. 42, fig. 1.

Acanthus imbricatus Edgew. Journ. As. Soc. Beng. XVI, 1217.

Acanthus Delilii Spreng. Syst. II, 819.

Acanthodium spicatum Del. Fl. d'Eg. p. 97, tab. 33, fig. 3.

Arabic names:—Sogaf, Soghaf, Chaferab.

Description:—Grey pubescent or nearly glabrate. Stem short, rigid, branched. Leaves in fours at the sterile nodes; upper pair 2 by ⅓ inch, oblong or narrow-elliptic, sessile, spinous-margined; lower pair smaller but similar.

Inflorescences strobilate, up to 4 inches long, sometimes short; bracts 1—1½ inches long, ovate, acuminate, recurved, spinous, puberulous, more or less hairy on the nerves without when young; bracteoles linear, ⅓—½ inch long. Posticous calyx-segment ½—⅔ inch long, broadly ovate, very hairy; 2 inmost calyx-segments ¼—⅓ inch long. Corolla ¾ inch long or rather more, blue.

Capsule ¼ inch long or rather more, 2-seeded.

Flowers:—January 1863 (Oliver & Cl.), March 1878 (Perry), March 1850 (Madden), April 1861 (Thomson), April 1894 (Lunt), December 1847 (Hooker).

Fruits:—January 1863 (Oliver & Cl.), March 1878 (Perry), April 1861 (Thomson), April 1894 (Lunt), December 1847 (Hooker).

Locality:—Crater of Shum Shum Range, between the Koosaf Valley and the Flag-Staff (Defl.); gravelly slope of Shum Shum Range (Ellenbeck); along the path leading to the top of the Shum Shum Range at about 650 feet (Busse); Wadi Maala (Schweinf.); Goldmore Valley (Lunt); great valley between Steamer Point and town (Marchesetti); in sunny valleys (Edgew., Hook., Madden, Anders.); without locality (Birdw., Zenker, Perry, Oliver and Cl.).

Distribution:—Egypt, Sinai, Nubia Abyssinia, Kordofan, Kilimanjaro, Highlands of Somaliland, S., Arabia, S Persia, Baluchistan.

2. Ruellia Linn.

Herbs or undershrubs. Leaves opposite, subentire.

Flowers sessile or subsessile, solitary or in clusters or racemes; bracts 0; bracteoles large, usually exceeding the calyx. Calyx 5-partite or 5-fid; segments subequal, narrow, acute. Corolla oblique; tube ventricose; lobes subequal, rounded, twisted to the left in bud, spreading in flower. Stamens 4, didynamous; filaments glabrous or sometimes hairy at the base; anthers subequal, 2-celled, the cells oblong, muticous, glabrous; pollen globose, reticulate or honeycombed. Ovary 2-celled; ovules 3—10 in each cell; style linear, hairy; stigma with one oblong-linear branch, the other suppressed or nearly so.

Capsule clavate, cylindric, seed-bearing upwards, solid at the base below. Seeds large, thin, discoid, margined, hygroscopically hairy; retinacula large, strong, hooked.

Species about 200.

Distribution :—All warm regions.

1. **Ruellia patula** Jacq. Misc. Bot. II, 358; Ic. Pl. Rar. I, 12, t. 119; Lam. Ill. t. 550; T. Anders. in Journ. Linn. Soc. VII, 24 et IX, 460; Oliv. in Trans. Linn. Soc. XXIX, 127; Hook. Fl. Brit. Ind. IV. 412; Engl. Hochgebirgsfl. Trop. Afr. 388; Lindau in Engl. u. Prantl. Pflanzenf. IV, 3B, 310, fig. 124 E, F.

Ruellia pilosa T. Anders. in Journ. Linn. Soc. VII, 25 (partly).

Ruellia Huttonii T. Anders. in Journ. Linn. Soc. VII, 25 (from descript.).

Ruellia prostrata Lam. Encycl. VI, 349 (from descript.); Bedd. Ic. Pl. Ind. Or. t. 282.

Ruellia matutina Hochst. et Steud. ex Presl. Bot. Bemerk. 94.

Ruellia erecta Roth Nov. Spec. 308.

Dipteracanthus patulus Nees in Wall. Pl. As. Rar. III, 82 et in DC. Prodr. XI, 126; Wight Ic. Pl. Ind. Or. t. 1505; Oersted in Vidensk. Meddel. Kjöb. (1854) 180, t. 4, fig. 19—21; Solms-Laub. in Schweinf. Fl. Aethiop. 109, 243.

Dipteracanthus matutinus Presl. Bot. Bemerk. 94.

Petalidium patulum Dalz. and Gibs. Fl. Bomb. p. 185.

Arabic name :—Usara.

Description :—A small usually pubescent suberect shrub; stems long, straggling, much-branched, terete or subquadrangular, densely softly pubescent. Leaves $\frac{1}{2}$—$1\frac{1}{2}$ by $\frac{1}{4}$—1 inch, ovate or elliptic, obtuse, often apiculate, closely pubescent on both sides, base rounded or sometimes shortly and abruptly narrowed; petioles $\frac{1}{4}$—$\frac{3}{4}$ inch long.

Flowers axillary, solitary or 2—3 together, nearly sessile; bracteoles nearly $\frac{1}{2}$ inch long (including a flat stalk $\frac{1}{16}$—$\frac{1}{12}$ inch long), foliaceous, elliptic, obtuse, densely pubescent and strongly ciliate. Calyx $\frac{1}{4}$ inch

long, divided rather more than $\frac{2}{3}$ the way down, densely pubescent; segments linear-lanceolate, very acute. Corolla purplish-blue, 1—1¼ inches long, pubescent outside; tube in the lower part narrowly cylyndric, in the upper part campanulate-infundibuliform; lobes of the limb ¼ inch long broadly elliptic or suborbicular, rounded at the apex. Filaments glabrous. Ovary glabrous; style pubescent.

Capsules ½—¾ inch long, clavate, glabrous. Seeds suborbicular, nearly glabrous on the faces, margined with hygroscopic white hairs.

Flowers:—January and February 1889 (Schweinf.), March 1884 (Beevor).

Fruits:—February 1889 (Schweinf.), March 1884 (Beevor).

Locality:—Shum Shum plateau (Beevor); without locality (Anderson, Schweinf., Birdw.).

Distribution:—Ava, tropical Africa, Arabia, Sind, Rajputana, Bundelkund, Deccan, Ceylon.

3. Barleria Linn.

Armed or unarmed small shrubs or undershrubs. Leaves opposite, entire.

Flowers showy, sessile, solitary or in dense or rather lax spikes; bracts and bracteoles large, small or 0. Calyx divided almost or quite to the base; sepals 4 in opposite pairs, the outer pair much the larger. Corolla infundibuliform, tube elongate; lobes 5, subequal, imbricate in bud. Stamens 2, fertile, with oblong 2-celled anthers; usually 2 staminodes occasionally containing a little pollen also present, and often a rudimentary 5th. Disk large, cupular, half embracing the ovary, often with a toothed margin. Ovary 2-celled; ovules 2 in each cell; style long, stigma 2-fid or subentire.

Capsule ovoid or oblong, with 2 or 4 seeds below the middle. Seeds compressed, ovoid, usually clothed with wavy silky closely appressed hairs.

Species about 120.

Distribution:—Mostly in Africa and Tropical Asia, a few in Tropical America.

1. Barleria Hildebrandtii S. Moore in Journ. of Botany XV (1877) 69; Kew Bull. (1894) 338.

Description:—Stem divaricate, lignose, terete, glabrescent; young branches densely whitish tomentose with scattered strigose, yellowish hairs. Leaves oblong, slightly obtuse, stellately whitish-tomentose, distinctly nerved on the lower surface, the nerves covered with strigose yellowish hairs, ½—¾ inch long, ¼ inch broad.

Flowers few, in the uppermost axil (at least in the specimen described by S. Moore); bracts, bracteoles and calyx-segments densely barbato-ciliate; bracteoles oblong, ⅓ inch long. Outer calyx-segments subequal, oblong, slightly obtuse or bifid, almost as long as the bracteoles; inner segments subulate, slightly smaller than the outer ones.

Corolla externally puberulous; tube slender, ⅓ inch long; limb apparently regular, ⅔ inch in diameter; lobes obovate, emarginate. Fertile stamens 2; filaments subulate, puberulous; staminodes 2, very small; style obtuse.

Locality:—Aden (ex Kew Bull. (1894) p. 338).

Distribution:—Hadramaut: Hills near Dobaibah, at 4,000 feet elevation; Somaliland: 'Ahlgebirge,' 1,500—2,000 met.

XXXVIII.—VERBENACEÆ.

Herbs, shrubs or trees, with opposite or whorled, simple or digitate exstipulate leaves.

Inflorescence cymose, racemose or spikate. Flowers usually irregular. Calyx inferior, gamosepalous, tubular or cup-shaped usually 5—4-lobed or toothed. Corolla gamopetalous, bilabiate or subequally lobed; lobes usually 5—4. Stamens usually 4, didynamous, epipetalous; anthers 2-celled, dehiscing longitudinally. Ovary superior, sessile, usually 2—4-celled, entire or lobed; ovules 2, sometimes 1, in each cell; style terminal.

Fruit more or less drupaceous, 2—4- or 1-celled; mesocarp juicy, fleshy or dry, seed erect or pendulous, separate in distinct cells; embryo straight; radicle inferior.

Genera 73; *species* about 700.

Distribution:—Chiefly tropical.

1. Bouchea Cham.

Perennial herbs or low undershrubs. Leaves opposite or subopposite, petiolate, ovate or oblong, usually toothed.

Flowers sessile or shortly pedicellate, in terminal spikes or spicate racemes, solitary in the axils of persistent bracts which are shorter than the calyx; bracteoles minute or 0. Calyx narrowly tubular, prominently 5-ribbed, obliquely truncate or shortly 5-toothed, usually becoming more or less dilated below as the fruit ripens, at length splitting longitudinally to the base. Corolla-tube long, slender, cylindric; limb spreading, oblique, with 5 subequal lobes. Perfect stamens 4, didynamous, inserted in the upper part of the corolla-tube, included; filaments very short; anthers ovate with parallel cells. Ovary 2-celled; ovules 1—2

in each cell, erect from the base of the cell; style filiform; stigma sub-2-lobed.

Fruit usually shorter than the calyx and enclosed in it, separating into two elongate-oblong 1-seeded pyrenes.

Species about 25.

Distribution:—Tropical and S. Africa, Tropical America, India.

Capsule not winged at the apex	1. B. marrubiifolia.
Capsule winged at the apex	2. B. pterygocarpa.

1. Bouchea marrubiifolia (Fenzl.) Schauer in DC. Prodr. XI, 558; Anders. Journ. Linn. Soc. V, Suppl. p. 28; Hook. Fl. Brit. Ind. IV, 564; This.-Dyer Fl. trop. Afr. V, 282.

Chascanum marrubiifolium Fenzl. in Kotschy Pl. Nub. n. 32.

Stachytarpheta cernua Br. in Salt. Abyss.

Description:—A much-branched woody perennial herb; stems and branches pubescent. Leaves $\frac{1}{2}$—$1\frac{1}{2}$ by $\frac{3}{8}$—1 inch, broadly ovate or suborbicular, coarsely toothed, pubescent on both sides, strongly nerved and rugosely reticulately veined, base truncate or shortly cuneate; petioles $\frac{1}{2}$—$\frac{5}{8}$ inch long.

Flowers sessile, in nearly continuous spikes reaching sometimes 8 inches long, closely appressed to the pubescent rhachis; bracts $\frac{1}{8}$—$\frac{1}{6}$ inch long, lanceolate, pubescent, with scarious ciliate margins. Calyx tubular, $\frac{1}{4}$—$\frac{1}{3}$ inch long, densely pubescent, 5-ribbed, ultimately splitting down one side, truncate at the top, the teeth very minute. Corolla glabrous outside; tube slender, $\frac{1}{2}$ inch long, slightly enlarged below the limb; limb $\frac{1}{6}$ inch across; lobes 5, rounded, spreading. Filaments slender, glabrous. Ovary and style glabrous.

Fruit $\frac{1}{8}$ inch long, enclosed in the calyx, rounded at the apex, consisting of 2 oblong glabrous pyrenes.

Flowers and fruits:—January 1863 (Oliver & Cl.), March 1878 (Perry), May 1873 (Hildebr.), Nov. 1888 (Schweinf.), Dec. 1847 (Hooker), Dec. 1889 (Defl.).

Locality:—Plain of Maala (Defl.); gravelly slope of Shum Shum Range (Ellenbeck); in the plains (Hook., Anders.); without locality (Birdw., Hildebrandt, Perry, Oliver & Cl.).

Distribution:—Egypt, Nubia, Kordofan, Abyssinia, S. Arabia, Sind.

2. Bouchea pterygocarpa (Fenzl.) Schauer in DC. Prodr. XI, 558; A. Rich. Tent. Fl. Abyss. II, 166; This.-Dyer Fl. trop. Afr. V, 282.

Chascanum lætum Fenzl. in Kotschy Pl. Nub. n. 230.

Description:—A much-branched perennial herb. Stems clothed with short white pubescence. Leaves ovate, obtuse, deeply toothed, 1—$1\frac{1}{2}$

inches long, cuneate or subtruncate at the base, pubescent on both sides; petiole ½ inch long.

End-spikes 6—9 inches long, moderately dense, with all the flowers finally adpressed to the pubescent rhachis; bracts lanceolate, much shorter than the calyx. Calyx cylindrical, finely pubescent, ¼—⅓ inch long; teeth very minute. Corolla-tube about ½ inch long; limb ⅙ inch in diameter.

Capsule linear-oblong, shorter than the calyx, with 2 pyrenes ending in an obtuse wing.

Locality:—Near Maala (Schweinf.).

Distribution:—Yemen, Eritrea, Abyssinia, Kordofan, Nubia, Usambara.

XXXIX.—LABIATÆ.

Herbs, rarely shrubs, often gland-dotted; branches opposite or verticillate, usually 4-angled. Leaves opposite or whorled; stipules 0.

Flowers hermaphrodite, irregular, solitary, 2-nate or fascicled and axillary, or in centrifugal spicate cymes which by union in pairs form false whorls; bracts small; bracteoles usually minute, opposite. Calyx inferior, gamosepalous, persistent, subregular or irregular, 4—5-fid or distinctly 2-lipped. Corolla gamopetalous; limb 4-5-lobed or distinctly 2-lipped; lobes imbricate. Stamens adnate to the corolla-tube, 4, didynamous or only 2 perfect; anther-cells connate, separate or confluent, dehiscing longitudinally. Disk prominent. Ovary superior, deeply 4-lobed; style simple from the centre of the ovary between the lobes, erect, filiform; stigma usually 2-fid, sometimes unequally; ovules solitary in each lobe of the ovary, erect, anatropous.

Fruit of 4 dry (rarely fleshy) 1-seeded nutlets at the base of the calyx, sometimes 1 or more suppressed. Seed solitary in the nutlets, small, erect; albumen scanty or 0; embryo conform to the seed; radicle inferior.

Genera about 140; *species* about 3,000.

Distribution:—Cosmopolitan.

Attachment of nutlets basilar.

Corolla-tube short; lower lip flat; stigma 2-fid . . .	1. Ocimum.
Corolla-tube usually long; lower lip concave, stigma entire .	2. Orthosiphon.
Attachment of nutlets slightly oblique to the outer side, the nutlets also dorsally attached to the lobes of the disk .	3. Lavandula.

1. Ocimum Linn.

Strongly scented herbs, shrubs or undershrubs.

Flowers small, in 6—10-flowered whorls, spicate or racemose pedicels with recurved tips; bracts small, caducous. Calyx ovoid or

campanulate, deflexed in fruit, 2-lipped; upper lip broad, flat, decurrent, erect in fruit; lower lip usually with 4 mucronate teeth, the 2 middle the largest. Corolla 2-lipped; tube short, not annulate within; upper lip subequally 4-fid; lower lip hardly longer than the upper, declinate, entire, flat, or nearly so. Stamens 4, didynamous, declinate, exserted; filaments free or the lower pair connate below, naked, or the upper toothed or hairy below; anther-cells confluent. Disk entire or 3—4-lobed. Ovary 4-partite; style-lobes subulate or flattened.

Nutlets 4, dry, smooth or subrugose, mucilaginous when moistened, enclosed in the enlarged, membranous, veined, strongly recurved calyx.

Species about 60.

Distribution :—Throughout the warmer regions of both hemispheres.

1. Ocimum suave Willd. Enum. Pl. Hort. Bot. Berol. 629; Benth. Lab. 7, et in DC. Prodr. XII, 35; This.-Dyer Fl. Trop. Afr. V, 338; Engl. Hochgebirgsfl. Trop. Afr. 357; Vatke in Linnæa vol. 37, 314.

Ocimum menthæfolium Hochst. ex Benth. Lab. (*ex parte*).

Ocimum anosurum Fenzl in Flora (1844) 312.

Ocimum gratissimum *var.* suave Hook. Fl. Brit. Ind. IV, 609.

Description :—A stout branching herb; stems square, with rather sharp angles, shortly and densely pilose to subglabrous; leaves spreading; petiole ½--2¼ inches long, pubescent or pilose; blade 1½—3½ inches long, ⅔—2½ inches broad, flat, ovate or ovate-lanceolate, acute, cuneate at the base, obtusely and somewhat coarsely serrate, pubescent on both sides or occasionally glabrous.

Inflorescence of 3 or more terminal spike-like racemes 3—6 inches long, bearing numerous closely-placed 6-flowered whorls of small flowers; bracts 1½—2 lines long, ovate, very acuminate, reflexed, persistent; pedicels ½—1 line long, pubescent; flowering-calyx deflexed, thinly pubescent to densely white pilose-pubescent outside, glabrous within; tube 1 line long, campanulate; upper tooth about 1 line long and broad, very broadly ovate with recurved margins; lateral teeth minute, filiform-subulate, with the mouth of the tube above them produced into a lobe or auricle under the upper tooth; lower teeth united into a deltoid body ½ line long, minutely 2-toothed at the apex; fruiting-calyx enlarged, about 2½ lines long, with the lobe formed by the lower teeth pressed against the auricles under the upper tooth and closing the mouth of the tube. Corolla scarcely exserted from the calyx, white; tube 1 line long, glabrous; upper lip ⅔ line long, subequally 4-lobed; lobes oblong, obtuse, pubescent on the back; lower lip ¾ line long, elliptic, obtuse, very concave, pubescent on the back; stamens exserted, unequal; filaments

free ; upper pair arising near the base of the corolla-tube, 2 lines long, with a stout obtuse hairy reflexed process at the knee ; lower pair inserted just below the base of the lower lip, 1⅔ lines long.

Nutlets subglobose, ⅔ line in diameter, slightly rugulose, dark brown.

Locality :—Aden (Birdw.). Not gathered by any other botanist. Doubtfully indigenous.

Distribution :—Transvaal, Natal, Tropical Africa, Tropical Asia.

2. Orthosiphon Benth.

Herbs, perennial or annual, with erect simple or branching stems ; leaves opposite or rarely whorled, gland-dotted.

Inflorescence terminal, simple or branched, sometimes with 2 or more pairs of flowerless coloured bracts at the apex ; flower-whorls separate, 2—6-flowered. Calyx campanulate or tubular-campanulate, unequally 5-toothed, upper tooth much larger than the others, suborbicular, very broadly ovate or oblong, sometimes decurrent upon the tube. Corolla distinctly 2-lipped ; tube usually exserted much beyond the calyx-teeth, rarely about equalling them, straight or nearly so ; upper lip often partly formed by the truncate mouth of the tube, very shortly 3—4-lobed ; lower lip very concave or boat-shaped. Stamens 4, exserted, directed towards the lower lip ; upper pair with free filaments, not toothed and very rarely bent like a knee near the base, inserted at various heights in the corolla-tube lower pair with their filaments free to the base or variably united, inserted at or just below the base of the lower lip ; anthers 1-celled. Disk usually unequally lobed. Ovary deeply 4-lobed ; style filiform, exserted from the corolla-tube ; stigma slightly thickened and minutely bifid or subentire or divided into 2 short filiform or subulate lobes.

Nutlets oblong, ellipsoid or suborbicular, usually slightly compressed dorsally.

Species over 100.

Distribution :—S. and Tropical Africa, Madagascar, Socotra, Arabia, India, the Malay Archipelago, Australia.

1. Orthosiphon pallidus Royle mss.; Benth. in Hook. Bot. Misc. III, 370 ; DC. Prodr. XII, 50 ; Boiss. Fl. Or. IV, 539 ; Hook. Fl. Brit. Ind. IV, 613 ; This.-Dyer Fl. trop. Afr. V, 369.

Orthosiphon verticillatus Heyne in Herb. Rottl.

Orthosiphon inodorus Kœn ; Roxb. Ic. in Herb. Kew.

Orthosiphon Ehrenbergii Vatke in Linnæa XXXVII, 316.

Ocimum reflexum Ehrenb. ex Schweinf. Beitr. Fl. Aethiop. 126.

Ocimum nepetæfolium Hochst. ex Vatke l. c. 316.

O. reflexus *var.* pallidus Terrac. in Ann. Istit. Bot. Roma V, 101.

Description:—A small undershrub; branches numerous from a woody rootstock, quadrangular, pubescent. Leaves inodorous, $\frac{1}{2}$—$1\frac{1}{2}$ by $\frac{3}{8}$—$\frac{7}{8}$ inch, ovate, usually obtuse, crenate or serrate, pubescent on both sides, gland-dotted, base shortly cuneate; petioles $\frac{1}{8}$—$\frac{3}{8}$ inch long.

Flowers in rather short racemes, the whorls 6-flowered, distant; bracts $\frac{1}{25}$ inch long, hairy; pedicels about equalling the flowering calyx, pubescent. Calyx in flower $\frac{1}{8}$ inch long, twice as long, in fruit, the lower part hairy; upper lip with 3 obtuse lobes, the middle lobe widest; lower lip strongly parallel-nerved, membranous, the 2 central teeth with a long upcurved awn from a narrow lanceolate base, longer than the upper lip, the lateral teeth broadly lanceolate with a short straight awn. Corolla $\frac{1}{4}$ inch long, white or pale lilac; tube nearly as long as the calyx; upper lip shorter than the suborbicular concave lower lip. Stamens included or scarcely exserted beyond the lower lip. Stigma clavate.

Nutlets $\frac{1}{16}$ inch in diameter, subglobose, smooth, yellowish-brown.

Flowers and Fruits:—March 1873 (Hildebr.); March 1878 (Perry).

Locality:—Plain of Maala, hill of Steamer Point, Koosaf Valley (Defl.); top of Shum Shum Range at about 1,700 feet (Busse); northern slope of Shum Shum Range (Schweinf.); without locality (Birdw., Playfair); Shum Shum Range, very rare (Perry).

Distribution:—Nubia, Abyssinia, Eritrea, Socotra, S. Arabia, Baluchistan, Sind, North-Western India, from Kashmir and the Punjab to Behar and Travancore.

Note:—" Planta variat virescens et canescens, foliis acutiusculis et obtusis " (Vatke).

3. Lavandula Linn.

Herbs or shrubs. Leaves incised or entire.

Flowers in 2—10-flowered whorls collected in simple or branched spikes; bracts persistent. Calyx erect, ovoid-tubular, shortly equally 5-toothed, 13—15-nerved. Corolla blue or purple, rarely white, oblique 2-lipped; upper lip 2-fid; lower lip 3-partite with spreading lobes. Stamens 4, didynamous, declinate, included; filaments free; anther-cells confluent. Disk equally 4-lobed, the nutlets dorsally attached to the lobes leaving a large areole on separation. Ovary 4-partite; style shortly 2-fid, the lobes flattened.

Fruit of 4 dry smooth nutlets; basal scar slightly oblique.

Species about 30

Distribution:—Chiefly Mediterranean, extending westwards to the Canary Islands and eastwards to India.

1. Lavandula setifera Anders. Journ. Linn. Soc. V, Suppl. p. 29; Defl. Bull. Soc. Bot. France XXXII, 352.

Description :—Subherbaceous, ½—1 foot high, glabrous. Stems virgate, erect, 6-costate-striate, subtetragonous, subaphyllous, with white pilose reflexed hairs, at last glabrous. Leaves oblong, attenuate into the petiole, entire rotundate or pinnatisect, slightly viscid, hairy.

Spikes 1—1½ inches long, ovate or slightly elongate, solitary, simple, terminal, dense, long-peduncled. Bracts alternate, 1-flowered, membranous, dilate at the base, long-setaceous, the lowest as long as the calyx or shorter, the uppermost almost twice as long as the calyx. Calyx oblong-cylindric, 2 lines long, 15-nerved, velutinous; teeth 5, almost equal, triangular, ciliate and shortly barbed at the apex, very short. Corolla velutinous, violet.

Flowers :—Dec. 1888 (Schweinf.), Dec. 1889 (Defl.), March to April (Defl.).

Fruits :—January 1880 (Balfour), February 1851 (Thomson), Dec. 1888 (Schweinf.), Dec. 1889 (Defl.).

Locality :—Plain of Maala on débris at the foot of the Shum Shum Range (Defl.); slope of Shum Shum Range (Ellenbeck); without locality (Hook., Birdw., Beevor, Balfour).

Distribution :—Yemen.

XL.—NYCTAGINACEÆ.

Herbs, shrubs or trees. Leaves usually opposite, entire; stipules 0.

Flowers in terminal or axillary cymes, panicles or corymbs; bracts often forming a brightly coloured involucre. Flowers hermaphrodite, rarely unisexual, regular, sometimes dimorphous. Perianth monophyllous, small, herbaceous or petaloid, persistent, often accrescent; tube short or long, sometimes circumscissile above the base; limb 3—5-toothed or lobed, persistent or deciduous; the lobes plicate in bud. Stamens 1—30, hypogynous, sometimes unilateral; filaments small, usually unequal, free or connate into a cup at the base, involute in bud; anthers 2-celled, dorsifixed, included or exserted, dehiscing longitudinally. Ovary 1-celled; ovule solitary, erect, campylotropous; style filiform, involute in bud; stigma small, simple or multifid.

Fruit membranous, indehiscent, enclosed in the persistent base of the perianth-tube, costate, sulcate, or winged, sometimes glandular. Seed erect; testa adherent; albumen soft or floury; embryo straight with convolute cotyledons or incurved; radicle inferior.

Genera about 22; *species* about 220.

Distribution :—Chiefly American, a few in Africa, India, the Mascarene and Pacific Islands.

1. Bœrhaavia L.

Erect or diffuse often divaricately branched herbs. Leaves opposite, often in unequal pairs.

Flowers small, paniculate, umbellate or subcapitate, articulated with the pedicel; bracteoles small, often deciduous, rarely whorled and involucrate. Perianth-tube long or short, ovoid below, narrowed above the ovary; limb funnel-shaped with 5-lobed margin, the lobes plicate. Stamens 1 or 2—5, connate below, exserted; filaments capillary, unequal. Ovary oblique, stipitate; ovule erect; stigma peltate.

Fruit enclosed in the ovoid, turbinate or clavate, obtuse or truncate perianth-tube, round, 5-ribbed or 5-angled, viscidly glandular. Seeds with adherent testa; embryo hooked; cotyledons thin, broad, the outer the larger, enclosing a soft scanty albumen.

Species about 30.

Distribution:—Tropical and subtropical regions.

Flowers both in terminal umbels and lateral whorls .	1. B. verticillata.
Flowers usually solitary, rarely in pairs . . .	2. B. elegans.
Flowers all in terminal umbels	3. B. repens.

1. **Bœrhaavia verticillata** Poir. Dict. V, 56; DC. Prodr.—XIII, 1, p. 454; Boiss. Fl. Or. IV, 1044; Hook. Fl. Brit. Ind. IV, 710.

Bœrhaavia scandens Ehrbg. exs. Pl. Sinai; Kotschy It. Nub. n. 144 et. It. Syr. n. 126; Anders. Journ. Linn. Soc. V, Suppl. p. 33 [*non* L. Sp. Pl. ed. 3, p. 14 et Chois. in DC. Prodr. XIII, p. 454 !].

Boerhaavia stellata Wight Ic. tab. 875.

Bœrhaavia dichotoma Vahl Enum. Pl. I, 290.

Bœrhaavia repanda Willd. Sp. Pl. I, 22.

Bœrhaavia grandiflora Rich. Hohen. in Schimp. Pl. Abyss. n. 2309.

Arabic name:—Ormol.

Description:—Decumbent or climbing among bushes; branches long, pale, terete, glabrous. Leaves thick, $1\frac{1}{2}$—$2\frac{1}{4}$ inches long, nearly as broad or sometimes broader than long, broadly ovate or suborbicular (rarely oblong), obtuse, mucronate, usually glabrous with sinuate margins, base usually cordate; petioles $\frac{1}{2}$—$\frac{3}{4}$ inch long, stout.

Flowers in long-pedunculate racemes arranged in few-flowered distant whorls along a slender rhachis; bracteoles small, ovate-oblong, acute; pedicels up to $\frac{2}{3}$ inch long, slender. Perianth $\frac{1}{4}$ inch long, white; upper part broadly funnel-shaped, 1 line long, shallowly lobed

accrescent base clavate, 2 lines long, with large globose stalked glands around the apex. Stamens 2, slightly exserted.

Fruit $\frac{1}{6}$ inch long, clavate, furnished with large glands round the crown.

"This is an exceedingly variable plant; but even in its most aberrant forms the characters of the umbellate inflorescence, exserted stamens and style, and the elongated, clavate, ecostate, glandular fruit, can always be recognized." T. Anderson.

Flowers:—From December to March (Schweinf.), January 1880 (Balfour), March 1878 (Perry).

Fruits:—March 1878 (Perry).

Locality:—Near Maala and the Flagstaff (Defl.); Shum Shum Range (Schweinf., Busse); great valley between Steamer Point and town (Marchesetti); without locality (Hook., Anders., Birdw., Perry, Balfour).

Distribution:—Senegambia, Morocco, Egypt, Sinai, Nubia, Abyssinia, Eritrea, Central and S. Arabia, Sind, Western Punjab, Salt Range, Kathiwar, Gujarat, Konkan, Mysore, Travancore, Carnatic.

2. **Bœrhaavia elegans** Chois. in DC Prodr. XIII, 2, p. 453; Boiss. Fl. Or. IV, 1045; Anders. Journ. Linn. Soc. V, Suppl. p. 35; Hook. Fl. Brit. Ind. IV, 710.

Bœrhaavia rubicunda Steud. Nom. ed. 2, I, 213.

Bœrhaavia repens *var.* elegans Aschers. & Schweinf. in Schweinf. Beitr. Fl. Aethiop. 169.

Bœrhaavia Marlothii Heimerl in Engl. Bot. Jahrb. X, 10.

Description:—Shrubby below; rootstock woody, much divided; branches erect, 1—2 feet long, glabrous, twiggy, terete. Leaves subsessile, curiously mottled with white when dry, 1—$1\frac{3}{4}$ by $\frac{1}{6}$—$\frac{3}{8}$ inch, linear-oblong or oblong-lanceolate, obtuse, often mucronulate, fleshy, rugose, and canescent beneath; petioles 0—$\frac{1}{8}$ inch long.

Flowers solitary, rarely in pairs in very large lax much-branched trichotomous glabrous leafless panicles, sometimes reaching 10 by 8 inches; branches of the panicle slender; bracts at the forks $\frac{1}{16}$ inch long, lanceolate, acute; bracteoles beneath the flowers (when present) about $\frac{1}{25}$ inch long, lanceolate, acute, deciduous; pedicels $\frac{3}{4}$—$1\frac{1}{2}$ inches long, very slender. Upper portion of the perianth very small, campanulate; accrescent base clavate, $\frac{1}{8}$—$\frac{1}{6}$ inch long, pentagonal, viscid or glabrate. Stamens 2.

Fruit $\frac{1}{8}$—$\frac{1}{6}$ inch long, clavate, with 5 obtuse strong quiteglabrous ribs, minutely hairy between the ribs.

Fruits:—November (Schweinf.).

Locality:—Wadi Maala (Schweinf.) ; plain of Maala, Shum Shum Range, Biggari and Koosaf Valley, ravines west and south-west of the Tower of Silence (Defl.); great valley between Steamer Point and town (Marchesetti); everywhere (Edgew., Hook.) ; without locality (Balfour, Birdw.).

Distribution:—Nubia, Uganda, British East Africa, Angola, German S.-W. Africa, German E. Africa, Nyasaland, Zomba, S. Arabia, Baluchistan, Sind, Punjab.

3. **Bœrhaavia repens** L. Sp. Pl. ed. I, 3; Choisy in DC. Prodr. XIII, 453 *incl. var.* glabra) ; Del. Fl. d'Egypte II, 2, t. 3, fig. 1 (*var.* minor); Schweinf. Beitr. Fl. Aethiop. 168, et in Bull. Herb. Boiss. IV, App. II, 166 ; Hiern in Cat. Afr. Pl. Welw. I, 882 (partly).

Bœrhaavia vulvarifolia Poir. Encycl. V, 55.

Arabic names:—Chaddir, Chaddar, Rogama, Rugma.

Description:—Herbaceous, much-branched. Stems slender, cylindrical, glabrous or nearly so, thickened at the nodes. Leaves in unequal pairs at each node, ovate or lanceolate, acute or obtuse, rounded at the base, slightly undulate, usually glabrous, rarely more than 1 inch long and 9 lines broad.

Peduncles axillary, slender, bearing 4—10-flowered umbels; bracts small, lanceolate. Perianth about 1 line long ; tube clavate, 5-ribbed, glandular between the ribs ; lobes very short, roundish, pinkish. Stamens 1—3, as long as or slightly longer than the perianth. Stigma peltate.

Fruit 1½ lines long, enclosed in the strongly 5-ribbed glandular basal part of the perianth.

Locality:—Shaikh O'thman (Defl.).

Distribution:—Senegal, Nubia, Kordofan, Galabat, Eritrea, Abyssinia, Angola.

XLI.—ILLECEBRACEÆ.

Annual or perennial herbs. Leaves usually opposite ; stipules scarious.

Flowers minute, usually hermaphrodite, cymose, often with scarious bracts. Perianth herbaceous or coriaceous, persistent and often indurated after flowering, 4--5-lobed or 4—5-partite. Petals 0. Stamens as many as the segments of the perianth (rarely fewer or more) and opposite to them, perigynous (rarely hypogynous) ; filaments short ; anthers didymous. Ovary free, 1-celled ; ovule solitary in each cell, erect, or pendulous from a basal funicle ; style 2—3-fid.

Utricle enclosed in the perianth. Seed globose, lenticular or reniform; testa smooth; albumen floury; embryo straight, curved or annular; cotyledons oblong; radicle inferior.

Genera 17; *species* about 90.

Distribution:—In most warm dry regions.

1. Cometes Linn.

Low annular branched herbs. Leaves opposite, sessile or narrowed into a short petiole, mucronate, entire; stipules minute, setaceous.

Flowers 3 together, the central flower only perfect, surrounded by ferruginous feathery many-partite at length elongate and squarrose bracts. Perianth herbaceous, 5-partite; segments erect, linear-oblong, awned at the back below the apex. Stamens 5, perigynous, alternating and united with 5 membranous staminodes forming a cup below; anthers didymous. Ovary ovoid-lanceolate, attenuated into a filiform curved style with 3 minute stigmas; ovule erect.

Utricle enclosed in the perianth, obovoid. Seed obovoid, erect; testa membranous, with a large lateral chalaza; embryo large, on one side of scanty albumen; cotyledons oblong, plano-convex; radicle inferior.

Species 2.

Distribution:—Tropical Africa, Oriental region, North India.

Staminodes longer than the stamens	1	C. abyssinica.
Staminodes shorter than the stamens	2	C. surattensis.

1. Cometes abyssinica R. Br. in Wall. Pl. As. rar. I, 18, tab. 18; Boiss. Fl. Or. I, 753; This.-Dyer Fl. Trop. Afr. V, 14.

Saltia abyssinica R. Br. in Salt Abyss. App. IV, 74.

Description:—An erect perennial herb. Stems ½—1 foot long, pubescent, many times dichotomously branched. Leaves sessile, spreading, lanceolate, opposite or verticellate, the lower 1—1½ inches long.

Clusters of flowers very numerous, terminal on the branchlets; bracts at first comparatively small, finally overlapping the flowers, with many stramineous pungent divisions, so that the heads look like a prickly ball about 1 inch in diameter. Perianth 2 lines long, green; segments oblong tipped with a spreading mucro which becomes as long as the blade. Staminodes lingulate, longer than the fertile stamens.

Fruits:—January 1883 (Balfour), March 1878 (Perry).

Locality:—Plain of Maala, Biggari and Koosaf Valley (Defl.); Shum Shum Range (Ellenbeck); on the way to the top of the Shum Shum Range at a height of about 670 feet (Busse); the great valley between Steamer Point and the town (Marchesetti); without locality (Perry, Balfour).

Distribution:—Central and Southern Arabia, Eritrea, Abyssinia, Nubia, Egypt, Sinai.

2. **Cometes surattensis** Burm. Fl. Ind. 39, t. 15, f. 5; Boiss. Fl. Or. I, 753; Wall. Pl. As. Rar. I, 17, t. 17; Cat. 810; Hook. Fl. Brit. Ind. IV, 712; Cooke Fl. Bomb. Pres. II, 484.

Cometes apiculata Dcne. in Ann. Sc. Nat. Ser. 2, II, 244.

Ceratonychia nidus Edgew. in Journ. As. Soc. Beng. vol. 16, p. 1215.

Cometes abyssinica T. Anders. (*non* R. Br. !) in Journ. Linn. Soc. V, Suppl. p. 32.

Description:—A low herb, 4—10 inches high, much-branched from near the base, woody below; branches numerous, erect, terete, pale, glabrous or the young ones slightly pubescent. Leaves $\frac{1}{2}$—1 by $\frac{1}{6}$—$\frac{1}{2}$ inch, elliptic, acute, mucronate, glabrous, base acute, decurrent into a short often obscure petiole $\frac{1}{10}$—$\frac{1}{4}$ inch long.

Flowers 3 together in heads $\frac{1}{2}$—$\frac{3}{4}$ inch in diameter (including the bracts), surrounded by numerous pinnatipartite feathery yellowish-red bracts whose ultimate segments are needle-like, which close and interlace over the fruit preventing the escape of the seed and causing it to germinate in the head. Stamens longer than the staminodes.

Locality:—Plain of Maala, ravine above the European cemetery of Steamer Point (Schweinf.).

Distribution:—S. Arabia, Waziristan, Baluchistan, Sind.

XLII.—AMARANTACEÆ.

Herbs or undershrubs, erect or with climbing branches. Leaves simple, entire, opposite or alternate; stipules 0.

Flowers usually hermaphrodite, rarely polygamous or diœcious, small, usually in terminal simple or paniculate spikes, cymes or clusters (the outer flowers of a cluster sometimes deformed); bracts hyaline or scarious, never leafy; bracteoles 2, scarious. Perianth usually of 5 free or slightly connate hyaline or scarious persistent sepals, imbricate in bud. Stamens 1—5, opposite the sepals, usually included; filaments usually connate below or united with intervening membranous staminodes in a hypogynous cup; anthers 1- or 2-celled. Ovary 1-celled, ovoid, ellipsoid or globose; ovules 1 or more, amphitropous, erect or suspended from short or long free basal funicles; style sometimes simple or obsolete with capitellate or small stigma, sometimes 2—3-fid with acute stigmas; or styles 2 or 3 papillosely stigmatic on the lower face, erect or recurved.

Fruit a membranous utricle, rarely a circumscissilely or irregularly rupturing capsule, very rarely a berry, inclosed in or supported by the

persistent perianth. Seed inverted or erect, orbicular, ovate or reniform, compressed; testa crustaceous; embryo horseshoe-shaped or annular, surrounding a floury albumen.

Genera about 50; *species* about 600.

Distribution :—In tropical and warm countries.

Tribe 1. *Amaranteæ*: Anthers 2-locular. Ovary 1-ovuled.
- *Euamaranteæ*: Ovule erect, funicle short. Radicle inferior. Leaves alternate . . . . . 1. Amarantus.
- *Achyranthea*: Ovule suspended from the apex of an elongated funicle. Utricle indehiscent, seed inverse.
  - Flowers diœcious . . . . . 2. Saltia.
  - With hermaphrodite flowers . . . 3. Aerua.

Tribe 2. *Celosieæ*: Anthers 2-locular. Ovary 2—∞-ovuled.
- Leaves alternate . . . . . 4. Celosia.

1. Amarantus Linn.

Annuals. Leaves alternate, simple, entire, long-petioled, tip often obtuse or emarginate, nearly always glabrous; principal nerves parallel, straight, often conspicuous.

Flowers small, monœcious or polygamous, in axillary clusters or dense terminal and axillary spikes or panicles; bracteoles two. Male flowers: Perianth of 5 (rarely 1—3) membranous equal or subequal ovate-lanceolate segments. Stamens 5 (rarely 1—3); filaments free, subulate or filiform; anthers 2-celled; staminodes 0. Female flowers: Perianth-segments oblong or spathulate, erect in fruit. Ovary ovoid, compressed, 1-celled; ovule solitary, subsessile, erect; styles 1—3 or 0.

Fruit an orbicular or ovoid compressed utricle or a circumscissile membranous or coriaceous capsule. Seed erect, orbicular, compressed; testa crustaceous; embryo annular, enclosing floury albumen; cotyledons linear; radicle inferior.

Species about 25.

Distribution :—Tropical and subtropical.

- An erect herb, leaves 1—3 inches long . . . 1. A. viridis.
- A prostrate herb, leaves ¼—1 inch long . . . 2. A. polygamus.

1. Amarantus viridis Linn. Sp. Pl. ed. 2, 1405; Grah. Cat. Bomb. Pl. 164; Hook. Fl. Brit. Ind. IV, 720; Trim. Fl. Ceyl. III, 397; Hiern in Cat. Afr. Pl. Welw. I, 888; Durand & DeWild. in Compt. rend. Soc. Bot. Belg. XXXVI, 85; Durand & Schinz Etud. Fl. Congo I, 233 (*excl. Syn.* Euxolus viridis Moquin); This.-Dyer Fl. trop. Afr. VI, sect. 1, 33; Cooke Fl. Bomb. Pres. II, 490.

Euxolus caudatus Hook. Niger Fl. 492 *in obs.;* Moq. in DC. Prodr. XIII, pt. 2, 274 (*partim*).

Chenopodium caudatum Jacq. Ic. Pl. Rar. t. 344?

Albersia caudata Boiss. Fl. Or. IV, 992; Schweinf. in Bull. Herb. Boiss. IV, Append. II, 164.

Description:—An erect, much-branched glabrous herb, 1—3 feet high; branches grooved, glabrous, often purplish. Leaves 1—3 by $\frac{1}{2}$—2 inches, ovate or deltoid-ovate, obtuse, usually notched at the apex, glabrous, base truncate or cuneate; petioles $\frac{1}{2}$—2 inches long.

Flowers shortly pedicellate, pale green, in small axillary clusters and in slender tapering terminal and axillary paniculate spike-like racemes; bracteoles ovate-oblong, acute, with a green keel, shorter than the sepals. Sepals 3, ovate-oblong, $\frac{1}{20}$—$\frac{1}{16}$ inch long, membranous, with a strong green keel.

Utricle $\frac{1}{15}$ inch long, (as long as the perianth), indehiscent, sub-orbicular, compressed, pointed, rugose; styles 2 or 3, short. Seed $\frac{1}{25}$ inch in diameter, lenticular, smooth, shining, black.

Distribution:—Widely distributed in warm countries.

Uses:—This species is a pot-herb. The tender tops are eaten.

2. **Amarantus polygamus** Linn. Amœnit. Acad. IV (1759) 294; Hook. f. Fl. Brit. Ind. IV, 721; Cooke Fl. Bomb. Pres. II, 491.

Amarantus polygonoides Roxb. Fl. Ind. III, 602; Willd. Sp. Pl. IV (1805) 389; Roxb. Fl. Ind. III (1832) 602.

Amarantus Blitum, *var.* polygonoides Moq. in DC. Prodr. XIII, 2, 263

Amblogyna polygonoides Dalz. and Gibs. Bomb. Fl. 218.

Albersia polygama Boiss. Fl. Orient. IV, 991.

Euxolus polygamus Moq. in DC. Prodr. l. c. 272; Thw. Enum. 248 (*excl. syn.* Amblogyne).

Arabic name:—Shedach.

Description:—A prostrate glabrous annual; stem striate. Leaves small, $\frac{1}{4}$—1 inch by $\frac{1}{4}$—$\frac{1}{2}$ inch, obovate, obtuse, often notched at the tip, base tapering, on the whole very variable.

Flowers in axillary clusters; bracteoles shorter than the sepals, lanceolate-oblong, awned, membranous, with a strong midnerve. Sepals 3, ovate-oblong, acute membranous, awned and with a strong mid-nerve. Stamens 3; styles 3.

Fruit urceolate, $\frac{1}{16}$—$\frac{1}{12}$ inch long, ovoid, tapering to a sharp point, rugose. Seeds $\frac{1}{20}$ inch in diameter, lenticular, smooth and shining, black.

Locality:—Aden (Boycott).

Distribution:—In all tropical countries.

Note:—Boycott's specimen in the Herbarium of Kew is named *Amarantus Blitum* Linn. We doubt whether *A. Blitum* is specifically distinct from *A. polygamus* Linn.

2. Saltia R. Br.

A small glabrous rigid shrub; branches woody, cylindric. Leaves scattered, sessile, narrowly obovate, entire, slightly fleshy, glaucous.

Flowers in lax simple or paniculately branched spikes, diœcious, bracteate. Male flowers 2-bracteolate, not supported by sterile flowers; female flowers with 3—4 irregularly inserted bracteoles, supported on each side by an imperfect flower. Perianth shortly and stoutly stipitate, papery, 5-partite; segments subequal, ovate-oblong, subacute, obscurely 3—5-nerved, sericeous on the back, unchanged when fruiting. Stamens 5, in female flowers minute, anthers empty, in male flowers inserted on a cupular ring, filaments subulate, anthers linear-oblong, 2-locular. Ovary obovoid, at the apex dilate, convex; style filiform; stigma capitellate; ovule 1, suspended from an elongate funicle.

Utricle almost equalling the perianth in length, oblong, membranous, indehiscent. Seed inverse, oblong, turgid; testa membranous, brown, adherent to the floury albumen; arillus 0; embryo peripheric; cotyledons linear-lanceolate, concave, incurved at the apex; radicle slender, erect.

Species 1.

Distribution:—S. Arabia.

1. Saltia papposa (Forsk.) Moq. in DC. Prodr. XIII, 2, p. 325; Anders. Journ. Linn. Soc. V, Suppl. p. 32.

Achyranthes papposa Forsk. Fl. Aeg.-Arab. p. 48.

Description:—A shrub up to 10 feet high, cinereous; stem erect, subterete, few-branched; branches spreading, puberulous, with green bark. Leaves alternate, subsessile, the lowest attenuate into a short petiole, linear, acute, mucronulate, nerveless, glabrous, glaucous.

Spikes short, narrow, on terminal branches. Flowers approximate, 2—4-bracteate; bracts small, carinate, mucronate, slightly villose, one persistent. Sepals 5, ovate, concave, acute, 4-nerved, villose, the inner ones 3-nerved. Stamens 5; filaments subulate, compressed, dilate at the base and forming a cupular ring. Style simple, terete, almost twice as long as the stamens; stigma capitate, globose, entire. Ovary glabrous.

Flowers:—March 1878 (Perry), April 1861 (Thomson), June 1872 (Hildebrandt), December 1847 (Hooker), December 1889 (Defl.).

Fruits:—March 1878 (Perry), March 1888 (Schweinf.), April 1861 (Thomson), June 1872 (Hildebrandt), November 1888 (Schweinf.), December 1847 (Hooker), December 1889 (Defl.).

Locality:—Above the European cemetery of Steamer Point, Goldmore Valley, valley at the foot of the Shum Shum Range, above the coal-depôt

of the Messag. Marit. in rocky places (Schweinf.); ravine west of the Tower of Silence (Defl.); near the tanks, top of Shum Shum Range (Busse); upper end of the great valley between Steamer Point and town (Marchesetti); in sandy places (Hook., Anders.); without locality (Hildebrandt, Birdw., Lunt); "on a large tree about 8 feet high and spreading" (Perry).

Distribution:—Yemen, Hadramaut near Sibeh.

3. Aerua Forsk.

Herbs or undershrubs, erect, prostrate or climbing. Leaves alternate, or opposite, or fascicled.

Flowers hermaphrodite or polygamous in simple panicled spikes; bracts and 2 bracteoles small. Perianth 5- (rarely 4-) lobed; sepals equal or the outer broader, all or only the three inner woolly. Stamens 5 (rarely 4); filaments connate, with short or long intervening staminodes, in a short hypogynous cup; anthers 2-celled. Ovary ovoid or subglobose, 1-celled; ovule solitary, pendulous from a long basal funicle; style simple, short or long; stigma capitellate, or stigmas 2.

Fruit a membranous utricle or circumscissile capsule with coriaceous crown. Seed inverse; testa coriaceous; embryo annular, surrounding floury albumen; cotyledons linear; radicle superior.

Species 10.

Distribution:—Warmer parts of Africa and Asia.

Flowers unisexual, usually diœcious, sessile in linear or oblong spikes 1—6 inches long forming panicles . .	1. A. tomentosa.
Flowers unisexual, often bisexual in small dense axillary heads	2. A. lanata.

1. **Aerua tomentosa** Forsk. Fl. Aegypt.-Arab. CXXII and 170; This.-Dyer Fl. trop. Afr. VI, 37.

Aerua ægyptiaca Gmel. Syst. Nat. 1026.

Aerua incana Mart. in Nova Acta Nat. Cur. XIII (1826) 291.

Aerua javanica Wight Ic. t. 876; Hook. Niger Fl. 492; Hook. Fl. Brit. Ind. IV, 727; Boiss. Fl. Or. IV, 922; A. Rich. Tent. Fl. Abyss. II, 214; Moq. in DC. Prodr. XIII, II, 299 (*partim*); Garcke in Peters Reise Mossamb. Bot. 504; Anders. Journ. Linn. Soc. V, Suppl. p 31; T. Thomas in Speke Nile Append. 646; Oliv. in Trans. Linn. Soc. XXIX, 141; Engl. Hochgebirgsfl. Trop. Afr. 207; Schinz in Engl. & Prantl Pflanzenfam. III, 1a, 109, in Engl. Pfl. Ost.-Afr. C. 173; Aschers. in Schweinf. Beitr. Fl. Aethiop. 174, (not of Juss.).

Celosia lanata L. Sp. Pl. ed 1, p. 298.

Iresine persica Burm. Fl. Ind. 212, t. 65, fig. 1.

Aerua Bovii Edgew. in Journ. Linn. Soc. VI, 206.

Achyranthes incana Roxb.Fl. Ind. I, 671.
Achyranthes tomentosa Tuckey Congo Voy. 249.
Uretia persica O. Kuntze Rev. Gen. Pl. I, 544 (*partim*).
Ouret persica Hiern in Cat. Afr. Pl. Welw. I, 893.
Arabic name:—Aerueh, Ra.

Description:—Suffruticose, hoary-tomentose, 2—3 feet high; stem terete, branched, as thick as a goose-quill, covered with a thick, easily detachable stellate tomentum. Leaves alternate, variable, 1—2½ by ⅛—⅝ inch, sessile or nearly so, linear-oblong or oblong-spathulate, obtuse and slightly retuse, or acute, densely tomentose.

Flowers unisexual, usually diœcious, dull-white, sessile in linear or oblong spikes 1—6 inches long arranged in naked terminal panicles; bracteoles broadly ovate, acute, white, hyaline. Male flowers: Perianth rather more than $\frac{1}{16}$ inch long; sepals elliptic-oblong, subobtuse, woolly at the back. Rudimentary ovary ovoid, acute, usually shortly stipitate with a short style and minutely bifid stigma. Female flowers: Perianth $\frac{1}{10}$ inch long, sepals oblong, subacute, apiculate; style about $\frac{1}{50}$ inch long; stigmas 2, as long as the style.

Utricle orbicular-ovoid, very thin. Seed $\frac{1}{30}$ inch in diam., lenticular, shining, brown-black.

Flowers and fruits:—February 1851 (Thomson), April 1861 (Thomson), March 1850 (Madden), March 1878 (Perry), Dec. 1847 (Hooker).

Locality:—In valleys, Shum Shum Range (Hook., Thomson, Madden); northern slope of Shum Shum Range (Schweinf.); Shum Shum Range (Ellenbeck); top of Shum Shum Range at about 1,500-1,700 feet (Busse); great valley between Steamer-Point and town (Marchesetti); without locality (Birdw., Hildebrandt, Perry).

Distribution:—Cape Verd Islands, E. and W. tropical Africa, North Africa, Yemen, India, Ceylon (not Java).

Note:—We followed Baker and Clarke (This.-Dyer Fl. trop. Afr. vol. VI, 37) in adopting Forskal's name '*Aerua tomentosa*' with preference to Jussieu's '*Aerua javanica*' "Forskal", they say, "gives the full name of this species on page CXXII, and an excellent description on page 170. Jusiseu (in Ann. Mus. Par. ii 1803, 131) mentions '*javanicum*' as a species he would transfer to *Aerua*; and, by tracing back, it is found that he meant *Iresine javanica*, Burm. (Fl. Ind. t. 65, fig. 2). It is evident, from Burmann's figures, that *Ae. tomentosa*, Forsk., is *Iresine persica*, Burm., which does not extend so far east as the Malay Peninsula and Java. If, therefore, either of Burmann's names is to be taken, it will be *persica* (as has been done by O. Kuntze and Hiern); but *Ae. tomentosa* Forsk., is not only the older name, but expresses the one characteristic on which the species stands."

2. Aerua lanata Juss. in Ann. Mus. Pr. II (1803) 131; Moq. in DC. Prodr. XIII, II, 303; A. Rich. Tent. Fl. Abyss. II, 214; Garcke in Peters Reise Mossamb. Bot. 504; Aschers. in Schweinf. Beitr. Fl. Aethiop. 174; T. Thoms. in Speke Nile, Append. 646; Oliv. in Trans. Linn. Soc. XXIX, 141; Wight Ic. t. 723; Hook. Fl. Brit. Ind. IV, 728; Boiss. Fl. Or. IV, 993; Schinz in Engl. & Prantl Pflanzenfam. III, 1a, 109, Engl. Pfl. Ost.-Afr. C. 173; Engl. Hochgebirgsfl. Trop. Afr. 207; This.-Dyer Fl. trop. Afr. VI, 39.

Achyranthes lanata Linn. Sp. Pl. ed. 1, 204.

Achyranthes villosa Forsk. Fl. Aegypt.-Arab. 48.

Illecebrum lanatum Linn. Mant. 344; Schumach. Beskr. Guin. Pl. 144.

Aerua floribunda Wight Ic. VI, t. 1776 *bis*, fig. A, et V, t. 1776 (analyses only).

Ouret lanata Hiern in Cat. Afr. Pl. Welw. I, 893 (*partim*).

Arabic name:—Shagarat-el-athleb.

Description:—Erect or prostrate with a long tap-root, branched from near the base; branches many, terete, pubescent or woolly-tomentose, striate. Leaves alternate, $\frac{3}{4}$—1 by $\frac{3}{8}$—$\frac{5}{8}$ inch on the main stem $\frac{1}{4}$—$\frac{3}{8}$ by $\frac{1}{5}$—$\frac{1}{4}$ on the branches, elliptic or obovate, or suborbicular, obtuse or acute, entire, pubescent above, more or less white with cottony hairs beneath; petioles $\frac{1}{8}$—$\frac{1}{4}$ inch long, often obscure.

Flowers greenish-white, very small, sessile, often bisexual, in small dense subsessile axillary heads or spikes $\frac{1}{4}$—$\frac{1}{2}$ inch long, often closely crowded and forming globose clusters; bracteoles $\frac{1}{20}$ inch long, membranous, broadly ovate, concave, apiculate. Perianth $\frac{1}{16}$—$\frac{1}{20}$ inch long; sepals oblong, obtuse, sometimes apiculate, silky-hairy on the back.

Utricle broadly ovoid, acute; stigmas 2. Seed $\frac{1}{30}$ inch in diameter, smooth and polished, black.

Locality:—Aden (Defl.).

Distribution:—Throughout Africa, and warm parts of Asia to the Philippines.

4. Celosia.

Herbs, usually annual; leaves alternate.

Flowers hermaphrodite, in dense terminal and axillary spikes, sessile or shortly pedicellate, white or coloured; bracts scarious, bracteoles 2, scarious. Perianth of 5 segments slightly connate below, scarious, oblong or lanceolate, acute or obtuse, striate, erect in fruit. Stamens 5; filaments connate below in a membranous hypogynous cup; anthers 2-celled; staminodes 0. Ovary 1-celled, ovoid or subglobose; ovules 2 or more, on long funicles; style 0 or short or long, sometimes elongating in fruit; stigmas simple or 2 or 3, subulate.

Fruit a circumscissilely dehiscent capsule, membranous or sometimes corky or coriaceous. Seeds 2 or more, erect, lenticular; testa crustaceous, black, shining or dull; embryo annular, surrounding floury albumen; cotyledons linear; radicle descending or ascending.

Species about 40.

Distribution :—Warmer parts of the World.

1. Celosia argentea L. Sp. Pl. (1753) p. 205; Forsk. Fl. Aegypt.-Arab. CVII; Moq. in DC. Prodr. XIII, II, 242; A. Rich. Tent. Fl. Abyss. II, 212; Oliv. in Trans. Linn. Soc. XXIX, 140; Aschers. in Schweinf. Beitr. Fl. Aethiop. 178; Engl. Hochgebirgsfl. Trop. Afr. 205; Pfl. Ost-Afr. C. 172; Schinz in Engl. u. Prantl Pflanzenfam. III, 1 A, 93, fig. D, and 99, t. 51, fig. A, B, C; in Engl. Bot. Jahrb. XXI, 180; in Bull. Herb. Boiss. IV, Append. II, 163; Cooke Fl. Bomb. Presid. II, 485.

Celosia margaritacea L. Sp. Pl. ed. II, 297.

Celosia splendens Schumach. & Thonn. Beskr. Guin. Pl. 140; Moq. in DC. Prodr. XIII, II, 244.

Description :—A glabrescent branched annual, 1—4 feet high; stem terete, simple or ascending; branches grooved. Leaves variable, 1—4 by $\frac{1}{4}$—$1\frac{1}{4}$ inches, linear-lanceolate, subnarrow, acute, entire, glabrous, base much tapering into a short petiole or leaves sessile.

Flowers at first pinkish, afterwards glistening white, crowded and imbricate, in close cylindric blunt or acuminate terminal spikes 1—3 by $\frac{3}{4}$—1 inch, sometimes branching at the apex in a cock's-comb form; bracteoles $\frac{1}{6}$—$\frac{1}{5}$ inch long, linear-lanceolate, scarious. Perianth $\frac{1}{3}$ inch long or more; sepals linear-lanceolate, acute, scarious, with 3 close parallel slender striæ on the back. Stamens short, filaments connate into a cup. Style filiform, elongate after flowering, sometimes exserted in fruit.

Capsules $\frac{1}{8}$—$\frac{1}{6}$ inch long, ellipsoid, tapering at the apex into the style, circumscissile about the middle. Seeds 4-8, subreniform, compressed, $\frac{1}{16}$ inch in diameter, black, polished, shining.

Flowers and fruits :—December (Schweinf.).

Locality :—At Shaikh O'thman (Schweinf.).

Distribution :—Tropical Africa, Arabia, India, Ceylon, South-East Asia, Malaya.

Note :—Schweinfurth mentions the variety *Celosia argentea* L. var. *vera* Moq. as occurring at Shaikh O'thman. The distinguishing characters are given with these words: "foliis lineari-lanceolatis subangustis." Considering that *C. argentea* is a very variable plant and assumes very different appearances according to the soil or situation in which it may be found we have dropt the varietal name '*vera*, Moq.'

XLIII.—CHENOPODIACEÆ.

Herbs or shrubs. Leaves alternate (rarely opposite); stipules 0.

Flowers small, usually green, hermaphrodite or 1-sexual; bracts 1 or 0; bracteoles 0 or 2. Perianth simple, sepaline; segments 3—5, free or connate, imbricate in bud (in female flowers sometimes 0). Stamens usually 5, opposite the perianth-segments, hypogynous or perigynous; filaments usually free, sometimes with intervening staminodes; anthers 2-celled. Ovary ovoid, globose or depressed, 1-celled; ovule solitary, basal or lateral, campylotropous; style terminal, short or long, stigma petiolate, 2—3-lobed; or styles 2—3; or stigmas 2—5 free or slightly united, sessile.

Fruit usually a utricle enclosed in the often enlarged fleshy perianth (when this is present). Seed erect, inverse or horizontal; testa crustaceous, coriaceous or membranous; albumen fleshy or floury or 0, embryo curved, annular, or spiral.

Genera about 80; *species* about 520.

Distribution:—Cosmopolitan.

A. Embryo not spirally twisted.
  1. Leaves flat, not very small . . . . . 1. Atriplex.
  2. Leaves $\frac{1}{10}$ inch long, obvoate, apparently perfoliate . . 2. Halopeplis.

B. Embryo spirally twisted.
  1. Bracts small, scale-like. Stamens 5 . . . . 3. Suæda.
  2. Bracts almost always as long as the perianth-leaves. Stamens 4—5
    a. Seeds usually horizontal.
      (*a*) Perianth becoming very hard and the fruit, therefore, resembling a nut . . . . 4. Traganum.
      (*b*) Perianth remaining unchanged . . . . 5. Salsola.
    b. Seeds vertical.
      (*a*) Branches articulate . . . . . 6. Anabasis.
      (*b*) Branches continuous . . . . . 7. Cornulaca.

1. Atriplex Linn.

Herbs or undershrubs, mealy, scaly or closely tomentose. Leaves alternate, undivided; blade flat, often toothed or lobed.

Flowers numerous, clustered, in cymes running into terminal spikes and panicles. Branches, and not rarely whole plants carrying flowers all of one sex. Flowers small, unisexual. Perianth of male of 5 lobes united below, without bracteoles. Stamens 5, or 4—3. Female flower without perianth, enclosed between 2 erect ovate or triangular bracteoles. Ovary ovoid, free, with one ovule on a basal stalk, oblique; style cylindric, with usually 2 branches.

Capsule dry, ovoid, flattened, enclosed between the 2 erect (often enlarged thickened or hardened) bracteoles; pericarp thin, membranous. Seed erect; embryo forming one circle round the enclosed albumen.

Species about 120.

Distribution :—Throughout the world, less numerous in the tropics.

1. Atriplex farinosa Forsk. Fl. Aeg.-Arab. p. CXXIII; Aschers. & Schweinf. in Schweinf. Beitr. Fl. Aethiop. 289; Boiss. Fl. Or. IV, 917; This.-Dyer Fl. Trop. Afr. VI, 82, not of Dumort.! nor of Moq.!

Arabic name :—Otssfai.

Description :—An undershrub, 3 feet high, not mealy (!). Leaves alternate; blade $1\frac{1}{2}$ by $\frac{1}{2}$—$\frac{2}{3}$ inch, in the middle stem-leaves cordate or auricled (sometimes with acute auricles), margin entire or sparingly toothed, under surface with dense minute white tomentum; petioles 0—$\frac{1}{5}$ inch.

Two bracteoles in fruit orbicular, $\frac{1}{5}$ inch in diameter, flattened, densely tomentose, without tubercles.

Locality :—Little Aden: on the seashore east of Jebel Ihsan. (Defl).

Distribution :—Coasts of the Red Sea, Arabia, Nubia, British East Africa, N. Africa.

Note :—Deflers reports another species of *Atriplex* as growing in Aden; but does not give any description.

2. Halopeplis Bunge.

Annuals or shrubs, glabrous or nearly so; branches not jointed.

Leaves $\frac{1}{10}$ inch long, obovate or orbicular, amplexicaul and appearing perfoliate in the specimens of tropical Africa and Arabia.

Bracts in small spikes, with usually 3 flowers under each. Flowers very small, bisexual. Perianth obconic, with 3 teeth. Stamens 1 or 2. Ovary ovoid, superior; style short, with 2 short linear branches: ovule 1, suspended on a basal funicle.

Seed erect, orbicular, compressed; embryo peripheric round the albumen.

Species 3.

Distribution :—Mediterranean region, Arabia, Persia, N.-E. Africa, Nubia.

1. Halopeplis perfoliata (Forsk.) Bunge ex Aschers. et Schweinf. Fl. Aethiop. p. 289 te ex Ung. Sternb. in Cesati, Passer et Gibelli Comp. Fl. Ital. p. 329; Boiss. Fl. Or. IV, 935; This.-Dyer Fl. Trop. Afr. VI, 84.

Salicornia perfoliata Forsk. Fl. Aeg.-Arab. p. 3, t. 1.

Halopeplis amplexicaulis Ces. Pass. & Gib. Compend. Fl. Ital. 271, t. 41, Fig. 2.

Description :—A woody branched glabrous shrub, 1—2 feet high; branches with closely placed nodes, not jointed Leaves $\frac{1}{10}$ inch long, obovate or orbicular, sessile and minutely decurrent at the base.

Spikes of flowers small, dense; floral bracts similar to the leaves, with usually 3 flowers under each bract, more or less adnate thereto.

Flowers and Fruits : —August 1898 (Birdw.).

Locality :—Eastern shore of Isthmus (Schweinf.); near Barrier-Gate (Busse); without locality (Birdw.).—Hinterland near Bir Achmed (Defl.).

Distribution :—Arabia, Coast of the Red Sea, northwards up to Jedda and Koser, Nubia, N.-E. Africa.

3. Suæda Forsk.

Herbs or shrubs usually growing in saline places. Leaves fleshy, ternate, terete (rarely flattish).

Flowers minute, axillary, usually hermaphrodite, bracteate and 2-bracteolate. Perianth short, globose or urceolate, 5-lobed or 5-partite; segments equal or unequal, simple, gibbous or almost winged. Stamens 5; filaments short; anthers large. Ovary ovoid or orbicular, usually sessile, with a wide base, adnate below to the perianth, rounded or truncate at the apex; ovule solitary, subsessile; style 0; stigmas 2—5, minute, subulate, recurved, papillose throughout.

Fruit a small membranous or spongy utricle included in the perianth. Seed erect, horizontal or oblique; testa coriaceous or crustaceous; albumen 0 or scanty; embryo slender, somewhat spiral.

Species about 10.

Distribution :—On saline shores and in deserts scattered nearly throughout the world.

Each leaf without a tubercle supporting its base.	
Upper leaves nearly 1 inch long; flowers unisexual . .	1. S. monoica.
Upper leaves much less than 1 inch long—	
Perianth in fruit fleshy . . .	2. S. fruticosa.
Perianth in fruit berry-like . . .	3. S. baccata.
Each leaf with a tubercle supporting its base . . .	4. S. vermiculata.

1. **Suæda monoica** Forsk. Fl. Aeg.-Arab. p. 70; DC. Prodr. XII, 2 p. 156; Boiss. Fl. Or. IV, 940; Hook. Fl. Brit. Ind. V, 13.

Suæda nudiflora Thwaites Enum. 246

Arabic Name :—Assal.

Description :—Usually a large shrub, 5 feet high and more, erect; branches numerous, ascending, marked with prominent leaf-scars, pale, glabrous. Leaves sessile, $\frac{1}{2}$—1 by $\frac{1}{20}$—$\frac{1}{10}$ inch, linear, obtuse or subacute, sometimes apiculate, bright-green.

Flowers polygamous, in slender lax spikes, the clusters distant, each in the axil of a short leaf; bracteoles minute, ovate, acute, entire. Perianth $\frac{1}{10}$ inch long; segments oblong, obtuse. Stigmas 2—5, short.

Seed vertical, ovoid, smooth, shining, black.

Flowers and *fruits :*—November (Schweinf.).

Locality :—Near Maala, Goldmore Valley, eastern shore of the isthmus (Schweinf.); valley near Steamer-Point, isthmus (Defl.); near the tanks (Busse); without locality (Birdw.).—Very common in the Hinterland between Aden, Shaikh O'thman and Bir Achmed (Defl.).

Distribution :—Upper Egypt, Nubia, Libya, Eritrea, Abyssinia, Arabia, Somaliland, Sansibar, South Deccan, Ceylon.

Note :—*S. monoica* is a very variable plant. On the sand of the eastern shore of the isthmus close to the highwater-work, this plant which, otherwise, forms high bushes or even small trees is a low decumbent shrub and, growing together with *Suæda fruticosa,* covers the ground as with a thick carpet.

There occurs, besides, another curious form of this species which quite resembles a branch of a Silver Fir spread out on the ground. This appearance is due to the broad-linear, flat and blunt, almost distichously arranged leaves.

Other forms of the same plant and in the same locality are distinguished by flesh-red coloured leaves, whilst the young shoots are generally light green turning dark black-green when old (Schweinf.).

Uses :—This plant, which is so common in the vicinity of Aden, is of no slight importance to the inhabitants of Aden. As fire-wood is very scarce on the peninsula, the woody stem and branches of the 'Assal' are used as fuel along with Babul-wood (*Acacia arabica*), which has to be brought from the interior. Every day groups of Arab and Somali women may be seen gathering the shrubs and carrying them in bundles to Shaikh O'thman. From there the wood is brought to Aden by donkeys or camels.

Watt (Commercial Prod. of India, p. 113) says: "There seems to exist a fairly extensive manufacture of sodium carbonate at Aden from the so-called Aden Balsam (? *Suæda nudiflora*)." We have not been able to ascertain whether the 'Aden Balsam' is *Suæda monoica* Forsk. or *Suæda fruticosa* Forsk.

Hunter (under 'Potash or Alkali-burning,' p. 82) says: "Aden balsam, which is however not found in any quantity in the place itself, is

prepared in the Abdali and Fadhly districts. The balsam is thrown into small pits, about 2 feet wide by 1 deep, and wood is added: the mass is then set fire to, and as the sap exudes from the plant, it mingles with the ashes; the mixture is stirred and allowed to cool, when it is dug up and sent to Aden on camels for sale. The price is 8 annas per maund of 28 lbs., and the potash is exported to Bombay for washing purposes."

2. Suæda fruticosa Forsk. Fl. Aegypt.-Arab. CIX and 70, Ic. 9; Moq. in Ann. Sc. Nat. ser. 1, Vol. 23, 311, t. 20 et in DC. Prodr. XIII, II, 156; Boiss. Fl. Or. IV, 939; Volk. in Engl. & Prantl Pflanzenfam. III, 1 a, 80; Schweinf. in Bull. Herb. Boiss. IV, Append. II, 157; This.-Dyer Fl. trop. Afr. VI, 91; Cooke Fl. Bomb. Pres. II, 505.

Chenopodium fruticosum Linn. Sp. Pl. ed. I, 221.

Salsola fruticosa Linn. Sp. Pl. ed. 2, 324; Sowerby Engl. Bot. t. 635.

Salsola indica Wall. Cat. 6946, C. (not of Willd.!).

Salsola láná Edgew. in Hook. Journ. Bot. II (1840) 286.

Lerchea obtusifolia Steud. Nomencl. ed. I, 187, 474; Hiern in Cat. Afr. Pl. Welw. I, 900.

Lerchea maritima γ. fruticosa O. Kuntze Rev. Gen. Pl. II, 549.

Arabic name:—Doluq, Deluq.

Description:—Shrubby, usually erect, much-branched; stem pale, glabrous. Leaves fleshy, subsessile, ½-terete, variable, $\frac{1}{8}$—$\frac{5}{8}$ by $\frac{1}{16}$—$\frac{1}{8}$ inch, linear-oblong or ellipsoid or somewhat obovate, obtuse, narrowed at the base; the floral leaves short.

Flowers hermaphrodite, axillary, solitary or 2—3-nate; bracteoles membranous, about $\frac{1}{20}$ inch long, ovate, acute, entire or with slightly denticulate margins. Perianth in fruit subglobose, $\frac{1}{10}$ inch long; segments thick, oblong, concave, obtuse, incurved.

Utricle obovoid, thickened at the top; stigmas 3, short, spreading. Seeds $\frac{1}{25}$ inch long, obliquely ovoid, somewhat beaked, slightly compressed, smooth and shining, black when ripe.

Locality:—Eastern shore of the Isthmus (Schweinf.).

Distribution:—North Africa and Europe, extending to England and through the Orient to Western India.

Uses:—The plant is eaten by camels.

3. Suæda baccata Forsk. Descr. Pl. Aegypt.-Arab. p. 69; Schweinf. in Bull. Herb. Boiss. IV, Append. II, p. 157; Volk. in Engl. & Prantl Pflanzenfam. III, 1 a, 80.

Schanginia baccata Moq. in DC. Prodr. XIII, II, 154; Boiss. Fl. Orient. V, 244.

Suæda baccata Volk. in This.-Dyer Fl. trop. Afr. VI, 91.

Description :—A shrubby diffuse plant. Leaves ovate, obtuse, semiterete, densely arranged, fleshy, shining, punctate, the lower ones sometimes subulate.

Flowers glomerate in the axils, sessile; perianth fleshy, 5-partite. Stamens 5. Pistil 1, tripartite. Stigma subulate. Perianth in fruit more fleshy, coalescent and berry-like.

Fruit a berry, 5-valved, polyspermic.

Locality :—Shaikh O'thman (Defl.).

Distribution :—Arabia, Eritrea, Egypt.

4. Suæda vermiculata Forsk. Fl. Aeg.-Arab. p. 70 et. Ic. tab. 18, fig. B; Boiss. Fl. Or. IV, 940; Batt. et Trab. Fl. d'Alg. p. 761.

Suæda mollis Del. Fl. d'Eg. p. 57.

Salsola mollis Desf. Fl. Atlant. I, 218.

Salsola globulifolia Poir. Dict. VII, 298.

Description :—A much-branched spreading shrub, sometimes 18 inches in diameter. Branches white-tomentose and in the upper part hairy. Leaves $\frac{1}{8}$—$\frac{1}{3}$ inch long, ovate, subglobose, farinose, glandular-pubescent; beneath each leaf is a tubercle decurrent on the stem. Leaves sessile, not rarely pseudopposite on some of the upper branches.

Flowers in dense spikes; bracts spirally placed, suborbicular, whitened on the margins; filaments conspicuously exserted.

Locality :—Eastern shore of the Isthmus near Barrier-Gate (Defl.).

Distribution :—Arabia, Nubia, N. Africa, Canaries.

Note :—It seems strange that Schweinfurth who appears to have closely examined the eastern shore of the Isthmus does not mention this species. Is it not possible that Deflers mistook *S. fruticosa* Forsk. for *S. vermiculata* Forsk., as these two plants resemble each other a good deal?

4. Traganum Del.

Shrubs or undershrubs, much-branched; branches not jointed. Leaves alternate.

Flowers perfect, bibracteate, axillary. Perigonium 5-fid, in fruit thickened below, nut-like, furnished in front and behind with a horn-like, conical, obtuse, hard protruberance; the lobes membranous, wingless. Disk small. Staminodes 0. Stamens 5, with broad exserted filaments. Anthers sagittate, acute. Style bifid; stigmas filiform.

Utricle somewhat depressed, included in the woody perigon; pericarp membranous. Seed horizontal; embryo conical-spiral.

Species 2.

Distribution :—Northern Africa, Arabia.

1. Traganum nudatum Del. Fl. d'Eg. p. 57; Anders. Journ. Linn. Soc. V, p. 31; Batt. et Trab. Fl. d'Alg. p. 763.

Description:—An undershrub; branches divaricate, adpressed to the ground; branchlets slender, intricate, white, glabrous or scabridulous. Leaves alternate, oblong-triquetrous or terete, short, distant, fleshy, mucronate, dilated at the base, somewhat recurved, keeled, glabrous, glaucous; axils fleecy.

Flowers solitary or 2—3 together. Bracteoles ovate-triquetrous, a little shorter than the floral leaf. Calyx 5-fid; segments membranous, oblong-lanceolate, obtuse, erect. Stamens 5, exserted; filaments compressed, deflexed; anthers sagittate, ovoid-linear; style filiform, bifid, slightly shorter than the stamens.

Utricle depressed, hidden in the hardened calyx, cylindric, ovoid-truncate, 1½ lines long.

Locality:—On the seashore (Anders., Zenker).

Distribution:—Algeria, Egypt, Sinai, Suez, Libya, Nubia, Central and S. Arabia.

5. Salsola Linn.

Annual or perennial herbs or undershrubs of various habit. Leaves alternate or rarely opposite, sometimes wide sheathing, short, long or scale-like, sometimes mucronate.

Flowers small, solitary in the axils of the upper reduced leaves of the branchlets or spicate. Flowers hermaphrodite, subtended by 2—3 bracteoles. Perianth 5-partite; segments concave, thickened on the back, in fruit furnished on the back with a large horizontal scarious wing, parts below the wing free or connate into an indurated cup. Stamens 5, usually hypogynous; anthers obtuse or with the connective variously produced. Ovary globose or ovoid; style long or short, stigmas 2, spreading, subulate; ovule subsessile or pendulous from the tip of a long funicle.

Utricle included in the persistent winged perianth. Seed usually horizontal, orbicular; testa membranous; albumen none; embryo spiral.

Species about 40.

Distribution:—Chiefly in temperate Asia and North Africa, several in South Africa, 1 in temperate North and South America, 1 in Australia.

Branchlets nearly at right angles to the branches . . .	1. S. Bottæ.
Branchlets not at right angles to the branches . . .	2. S. Forskalii.

1. Salsola Bottæ (Jaub. et Spach) Boiss. Fl. Or. IV, 964; Schweinf. in Bull. Herb. Boiss. IV, Append. II, 161; This.-Dyer Fl. Trop. Afr. VI, 90.

Var. Fauroti Franch. in Journ. de Bot. I, 134.

Halothamnus Bottæ Jaub. et Spach, Ill. Pl. Orient. II, 50, t. 136.

Caroxylon Bottæ Moq. in DC. Prodr. XIII, II, 178.

Description :—A much-branched glabrous shrub, branches patent, 3—7 inches long, virgate, pinnately branched. Leaves few, minute, fleshy, shortly deltoid, adpressed, keeled.

Flowers spaced out on the branches, sessile; bracts 3, ovate, concave, hyaline-margined. Perianth-segments 5, persistent, lanceolate, 2 lines long, $\frac{3}{4}$ line wide, very dark brown, hyaline-margined. Filaments short; anthers sagittate, about 1 line long, with a short apical appendage. Ovary ovoid; style shortly subulate; stigmas 2, subulate, divergent.

Wings of fruiting perianth inserted below the middle of the segments, 3 outer larger, 2 lines long, nearly 3 lines wide, flabellate, 2 inner slightly shorter and about half the width of the outer.

Flowers :—April 1878 (Perry), Dec. 1888 (Schweinf.).

Fruits :—Jan. 1880 (Balfour), April 1878 (Perry), Dec. 1888 (Schweinf.).

Locality :—Southern slope of Shum Shum Range, above the well of Shaikh Idris, in sandy places and on débris of volcanic rocks (Schweinf.); Koosaf Valley, ravine west of the Tower of Silence, crater of Shum Shum Range (Defl.); without locality (Balfour, Perry).

Distribution :—S. Arabia, Somaliland.

Note :—Deflers' specimens differ considerably as regards their habit from the type-specimen in the Paris Museum. The branches are much more slender and less spreading. As to the rest they agree perfectly with the detailed description given by Jaubert and Spach.

2. **Salsola Forskalii** Schweinf. in Bull. Herb. Boiss. IV, Append. II, 160; This.-Dyer Fl. trop. Afr. VI, 91.

? Caroxylon imbricatum Moq. in DC. Prodr. XIII, 2, 177.

? Salsola imbricata Forsk. Fl. Aeg.-Arab. p. 57, N. 90, et Ic. t. 8, fig. C.

Arabic Name :—Harm (Schweinf.).

Description :—A glabrous shrub. Branches erect, much divaricate, white, slender, $\frac{2}{3}$—1 foot long, $\frac{1}{24}$—$\frac{1}{16}$ inch thick; branchlets hard, very slender, almost horizontally patent, quite straight, white pubescent at the apex. Leaves in small, imbricate, globose glomerules spaced out on the branchlets, minute, $\frac{1}{48}$ inch and less in diameter, hemispherical, membranous at the edge, puberulous at the apex.

Flowers solitary, axillary, bracteoles triangular-hemispherical, cucullate, thickened in the centre of the back, membranous at the edge, ciliate towards the base; wings inserted at the centre of the back, membranous,

suborbicular. Stamens 5 ; anthers sagittate, apiculate. Disk indistinctly lobed. Ovary depressed globose; style short; stigmas 2 (rarely 3), oblong-linear.

Fruiting perigone winged, $\frac{1}{8}$ inch in diameter.

Fruits :—In December in Yemen (Schweinf.).

Locality :—At the entrance of the Goldmore Valley (Schweinf.); without locality (Birdw.).

Distribution :—S. Arabia, Nubian coast, Eritrea.

6. Anabasis Linn.

Perennial herbs or shrubs, branches jointed. Leaves opposite, fleshy or obsolete.

Flowers small, solitary or clustered, axillary, 2-sexual, female minutely 2-bracteolate. Sepals 5, scarious, fruiting winged or not. Stamens 5, on a short disk, alternating with 5 staminodes.

Utricle included or exserted, subglobose, dorsally compressed, dry or fleshy; style short, stigmas 2, subulate. Seed erect, orbicular, compressed ; testa membranous or coriaceous ; albumen 0 ; embryo spiral.

Species 17.

Distribution :—Mediterranean region, Western and Central Asia, Nubia.

1. Anabasis Ehrenbergii Schweinf. in Boiss. Fl. Or. IV, 970 ; Bull. Herb. Boiss. (1896) Append. II, 161.

Description :—A glabrous undershrub with a woody caudex. Branches prostrate, up to $1\frac{2}{3}$ feet long, rooting, very elongate, terete, subarticulate, with a whitish cortex ; branchlets abbreviate, 1—6 inches long, erect, almost uniseriate ; internodes $\frac{2}{5}$—$\frac{4}{5}$ inches long. Leaves opposite, thick, patent, decussate, semi-amplexicaul ; the younger ones up to $\frac{1}{5}$ inch long, oblong, subterete, mucronate or apiculate ; the old leaves $\frac{1}{10}$ inch long, often densely arranged at the base of the branchlets, subglobose, slightly acute or quite obtuse ; in the axils short, whitish, woolly hairs.

Flowers axillary, solitary ; bracteoles setiform, indistinct. Perigone-lobes 5, divided to the base, lanceolate, slightly obtuse at the apex, soon indurate, equal, thickened in the centre of the back, margin broadly membranous, sometimes irregularly denticulate, (wings ?). Stamens 5, included ; anthers attached at the middle ; loculi very acutely apiculate. Ovary globose-ovoid, laterally compressed ; stigmas 2, purple, rarely 3, recurved, linear, half as long as the style, always a little longer than the perigone. Ovule pendent from a long funicle.

Seed probably vertical.

Flowers :—Dec. 1888 (Schweinf.).

Locality :—Eastern shore of the Isthmus, creeping on the sand close to the highwater-mark (Schweinf., Defl.); without locality (Birdw.).

Distribution :—S. Arabia, Nubian coast.

Note :—Schweinfurth is of opinion that this plant is reproduced chiefly vegetatively. All the flowers which he examined in different localities on the shore of the Red Sea and at different seasons of the year were sterile throughout and in spite of long searching he was not able to secure a single fruit.

7. Cornulaca Delile.

Small harsh undershrubs; stem (and branches) continuous. Leaves small, alternate, when young ending in a spine.

Flowers axillary, solitary or clustered, buried in wool in all the species except *C. Ehrenbergii,* polygamous, mostly imperfect. Perianth-segments 5, united into a hard cup at the base; segments lanceolate, dilated upwards, membranous, or 1 or 2 of them spinous. Stamens 5; staminodes short, quadrate. Ovary ovoid, free or immersed in a disc; style short, with 2 branches; ovule 1, nearly sessile.

Utricle enclosed within the hardened base of the perianth; embryo spiral, without albumen; seed (where known) horizontal

Species 4 or 5.

Distribution :—From North Africa to Kabul.

1. Cornulaca monacantha Del. Fl. Egyp. 206, t. 22; Moq. in DC. Prodr. XIII, 2, 218; Schweinf. Beitr. Fl. Aethiop. 186; Zarb in Cat. Spéc. Bot. Pfund 34; Boiss. Fl. Or. IV, 984; Batt. et Trab. Fl. Alg. I, 767; Volk. in Engl. und Prantl. Pflanzenfam. III, 1a, 89, fig. 44, A-D, Durand et Barratte Fl. Libyc. Prodr. (1910) 208.

Traganium nudatum Sieb. ex Moq. in DC. Prodr. XIII, 2, 172.

Description .—A much-branched rigid low undershrub. Leaves $\frac{1}{6}$—$\frac{1}{4}$ inch long, lanceolate, curved, ending in a spine, the base ovate, many distant; in age the spine often disappears, and the base of the leaf on the old branches becomes a cushion.

Flowers clustered, buried in wool. Perianth in flower $\frac{1}{8}$ inch long; the spathulate lobes elongate in fruit, and one at least usually becomes spinescent.

Locality :—Great valley between Steamer-Point and town (Marchesetti, from manuscript note in his 'Ausflug nach Aden'). We have not seen this plant.

Distribution :—Tunis, Sahara desert in the Teda country, Egypt, Nubia, Arabia, Persia, Afghanistan.

Uses :—According to Ritchie this plant is a good purgative for man and beast.

XLIV.—ARISTOLOCHIACEÆ.

Erect or climbing herbs or shrubs. Leaves alternate, entire or lobed, exstipulate.

Flowers axillary, solitary or cymose, foetid, hermaphrodite. Perianth superior, often produced into a tube above the ovary, equally or unequally 3-lobed, or unilateral and undivided. Stamens 6 to many, epigynous, gynandrous; anthers 2-celled, dehiscing longitudinally. Ovary inferior, rarely free at the apex, perfectly or imperfectly 3—6-celled; ovules numerous, anatropous, horizontal or pendulous; style connate into a column (gynostemium), free above.

Capsule indehiscent or septicidal. Seeds often immersed in the inner layer of the endocarp, triquetrous or flattened by pressure, albuminous; raphe sometimes thickened or winged; testa hard; embryo small.

Genera 5; *species* about 200.

Distribution :—Cosmopolitan, chiefly tropical.

1. Aristolochia Linn.

Shrubs or perennial herbs, prostrate or twining. Leaves alternate, entire or lobed, often with a stipule-like leaf of an undeveloped bud in the axil.

Perianth coloured; tube inflated below, then contracted, hairy within; limb oblique, usually 2-lipped. Stamens 6 (rarely 5 or more than 6), adnate 1-seriately above the ovary, the filaments or connectives not distinguishable from the style; anthers adnate to the column; dehiscence extrorse. Ovary inferior, more or less perfectly 6-celled (rarely 5- or 4-celled); placentas parietal or intruded or conniving and connate in the axis; ovules many, 2-seriate; style or column short, thick, divided above into 3 or 6 (rarely more) obtuse or linear short lobes.

Capsule lantern-like, septicidally 6-(rarely 5-) valved or splitting through the placentas. Seeds usually many, horizontal, often covered by the remains of the placentas; albumen fleshy; embryo minute.

Species about 190.

Distribution :—Cosmopolitan, but more numerous in warm climates.

1. **Aristolochia bracteata** Retz. Obs. V, 29; Duch. in DC. Prodr. XV, I, 478; Hook. Fl. Brit. Ind. V, 75; Solereder in Engl. Bot. Jahrb. X, 441; This.-Dyer Fl. trop. Afr. VI, 136.

Aristolochia bracteolata Lam. Encycl. I, 258; Klotzsch in Monatsber. Berl. Akad. (1859) 598.

Aristolochia mauritiana Pers. Enchir. II, 527.

Aristolochia Kotschyi Hochst. ex A. Rich. Tent. Fl. Abyss. II, 237.

Aristolochia maurorum Klotzsch in Monatsber. Berl. Akad. (1859) 598.

Aristolochia abyssinica Klotzsch *ibid.*

Aristolochia crenata Ehrbg. ms. in Herb. Berol.

Aristolochia sempervirens Forsk. Fl. Aegypt.-Arab. p. 156.

Arabic Name:—Läya, Lä (Schweinfurth); Erig agrab (Kew Herb.).

Description:—A slender perennial; stems 12—18 inches long, weak, prostrate, branched, striate, glabrous. Leaves cordate-ovate, entire, 1½—2 (or even 3) inches long, with a broad basal sinus, glaucous beneath, finely reticulately veined, glabrous; petioles ½—1¼ inch long.

Flowers solitary, axillary; pedicels 2 lines long, with a large sessile orbicular or subreniform bract at the base. Perianth dark brown, 1—1¾ inches long; base subglobose; tube cylindric with a trumpet-shaped mouth; lip linear, dark purple, with revolute margins, finely reticulately veined, as long as the tube. Stamens and styles 6.

Capsule shortly pyriform or subglobose, about 9 lines long and 7 lines wide, 12-ribbed, glabrous. Seeds obcordate, flat, 3 lines long, 3 lines broad at the apex.

Every part of the plant is nauseously bitter.

Flowers and fruits:—March, on the south-coast of Arabia (Schweinf.).

Locality:—Aden (Birdw.).

Distribution:—Northern Nigeria, Eastern Chari, Nubia, Abyssinia, Kordofan, Eritrea, Jur, Uganda, British East Africa, Sennaar, Abyssinia, Arabia, Sind, Bundelkhund, Deccan, Ceylon, Sandwich Islands.

Uses:—A friction with its root is used by natives against scorpion bites. (A. F. Broun in folio Herb. Kew.).

XLV.—LORANTHACEÆ.

Chlorophyll-containing shrubs or more rarely herbs, parasitic on other plants, very rarely trees. Leaves opposite, ternate or alternate, simple, entire, exstipulate, sometimes reduced to mere scales or teeth.

Inflorescence racemose or cymose. Flowers often large and brightly coloured (*Loranthus*), or small, greenish and inconspicuous (*Viscum*), regular or zygomorphic, hermaphrodite or unisexual, 3—6-merous. Calyx superior, gamo-sepalous, lobed or truncate, sometimes obsolete. Corolla superior, polypetalous or gamopetalous, petaloid or sepaloid, valvate in bud. Stamens as many as and opposite the petals or corolla-lobes, and inserted on them; anthers usually 2-celled, sometimes divided into numerous small cells, which may be arranged irregularly (*Viscum*) or in 2 or 4 vertical rows (*Loranthus*). Disc superior, annular or absent.

Ovary inferior, usually without a distinct placenta and ovule; style simple or absent; stigma not or hardly lobed.

Fruit usually baccate, crowned by the persistent calyx when the latter is present; pericarp sticky. Seed solitary, albuminous or exalbuminous, without a distinct testa; embryo fairly large, terete or angled, with distinct hypocotyl and 2 (more rarely 3—6) cotyledons.

Genera 24; *species* about 1,000.

Distribution :—Chiefly tropical and subtropical.

1. Loranthus Linn.

Green leafy shrubs, parasitic on Dicotyledons, seldom on Coniferæ or Monocotyledons, often very brittle, even in a living state. Leaves opposite, ternate or alternate, penninerved, or several-nerved from the base.

Inflorescence usually racemose; subtending bract of each flower situated at the apex of the pedicel when the latter is present; flowers often large and brightly coloured, hermaphrodite. Calyx more or less lobed, or truncate, sometimes very short, occasionally provided inside at the base with a fleshy annular thickenning (intramarginal ring). Corolla polypetalous or, more usually, gamopetalous, regular or zygomorphic; tube often split unilaterally for some distance downwards when the flower expands. Filaments united in their lower part with the petals; anthers introrse, not versatile. Style filiform, or gradually thickened upwards in the upper part and then rather suddenly contracted into a narrow neck below the stigma (skittle-shaped); stigma truncate or more or less capitate.

Fruit baccate, usually globose, ovoid or ellipsoid, crowned by the persistent calyx. Seed albuminous; embryo straight, terete.

Species about 500.

Distribution :—Old World, mostly tropical and subtropical.

1. Loranthus curviflorus Benth. ex Oliv. in Hook. Ic. Pl. t. 1304; Engl. in Engl. Bot. Jahrb. XX, 130; Engl. Pfl. Ost Afr. C. 167; Schweinf. et Volk. in Ghika, Pays des Somalis 200; Schweinf. in Bull. Herb. Boiss. IV, App. II, 150; Sprague in This.-Dyer Fl. trop. Afr. VI, sect. 1, 279.

Plicosepalus curviflorus Van Tiegh. in Bull. Soc. Bot. France XLI, 504, 540.

Arabic name in the Tehama: Sheker.

Description :—Branches spreading; branchlets slender, more or less nodose, glabrous, soon lenticellate. Leaves opposite, subopposite or alternate, linear, oblanceolate-linear or oblanceolate (more rarely

obovate-oblong), obtuse or rounded at the apex, cuneate at the base, $\frac{3}{4}$—$2\frac{1}{2}$ inches long, 2—5 lines broad, rigidly coriaceous, glabrous, 3—5-nerved, nerves indistinct or hidden ; petiole $\frac{1}{2}$—1 line long.

Umbels solitary, 4—6-flowered ; peduncle 1—3 lines long ; pedicels 2—4 lines long ; bract elliptic-cupular, or ovate-cupular, dorsal margin $\frac{5}{8}$ line long, lateral $\frac{1}{8}$ line, ventral $\frac{1}{4}$—$\frac{3}{8}$ line long, more rarely saucer-shaped with a small dorsal lobe, conspicuously umbonate, umbo obtuse or horned. Receptacle campanulate or urceolate, $1\frac{1}{2}$—$1\frac{3}{4}$ lines long. Calyx patulous, $\frac{1}{4}$—$\frac{3}{8}$ line long. Petals fire-red, $1\frac{3}{4}$ inches long, reflexed above the middle, with 4—8 (usually 5) pairs of oblique folds arising from the adnate part of the filament. Filaments inserted 4—5 lines above the base of the petals, 6—10 lines long ; anthers linear, slightly tapering downwards, 4—5 lines long. Style broadened into the stigma in the uppermost $1\frac{1}{4}$—$1\frac{1}{2}$ lines ; stigma depressed-capitate, $\frac{3}{8}$—$\frac{1}{2}$ line in diameter.

Flowers and fruits :—In Yemen in January (Schweinf.) ; in Eritrea in February and May.

Locality :—Shaikh O'thman on *Acacia spirocarpa* in great quantities (Schweinf., Defl., Yerbury).

Distribution :—German East Africa, Nubia, Eritrea, Somaliland, Arabia.

In Yemen the plant grows on *Acacia* and *Zizyphus*.

XLVI.—EUPHORBIACEÆ.

Trees, shrubs, or herbs, often with milky juice. Leaves alternate or opposite, rarely divided or compound ; stipules usually small, caducous or persistent, rarely connate in a bud-protecting sheath ; glands sometimes at the apex of the petiole or at the base of the leaf-blade.

Flowers usually small or minute, always 1-sexual ; inflorescence various, usually compound, sometimes (*Euphorbia*) of single naked 1-staminate florets in a perianth-like involucre surrounding a solitary pistil, more commonly the main inflorescence centripetal, axillary or racemose, the subdivisions cymose, sometimes wholly cymose in terminal dichotomous panicles, or reduced to simple clusters or solitary florets. Perianth often small, sometimes obsolete, often dissimilar in the two sexes, usually simple, calycine with valvate or imbricate segments, sometimes calycine and 2-seriate imbricate, with segments all similar or occasionally dissimilar, rarely double, the inner then of 4—5 small scale-like, or very rarely conspicuous petals. Male flowers : Torus sometimes forming an intrastaminal disk or with disk-glands or-lobes alternate with the stamens of the outer series. Stamens various, sometimes solitary or fewer than, sometimes as many as the sepals or petals, sometimes

indefinite ; filaments free or connate ; anthers 2-celled, often didymous with longitudinal, transverse or porous dehiscence. Rudimentary ovary present or 0. Female flowers : Sepals usually larger and less connate than in the male. Petals sometimes smaller and less often present than in the male. Disk hypogynous or of discrete glands or 0. Ovary superior, sessile or stipitate, usually of 3 carpels more or less united ; ovules 1—2 in each carpel, pendulous from the inner angle of the cell, the funicle often thickened ; styles as many as the carpels, free or united or entire or divided ; stigmatic surface usually on the inner face of the styles or style-arms.

Fruit usually a capsule of 3 two-valved, 1—2-seeded cocci separating from a persistent axis, or a drupe with 1—3-cells or of one or more combined nuts. Seeds laterally attached at or above the middle of the cells, with or without an aril or caruncle at the hilum ; albumen fleshy ; embryo straight, enclosed in the albumen ; cotyledons flat, leafy, and radicle superior ; albumen rarely absent and cotyledons sometimes fleshy.

Genera about 200 ; *species* about 3,000.

Distribution : Chiefly tropical, rare in cold countries.

Tribe I.—Euphorbieæ : Flowers monoecious ; males numerous, consisting each of a solitary pedicelled stamen, many of which surround a single female, which consists of a solitary pedicelled tricarpellary pistil ; all enclosed in a calyx-like involucre. Raphe of ovule ventral . . 1. Euphorbia.

Tribe II.—Phyllantheæ : Sepals 1—2-seriate. Petals minute or 0. Stamens 1—2-seriate ; outer series opposite the sepals, or all in the centre of the flower. Ovary 2-to many-celled, cells 2-ovuled. Raphe of ovule ventral. Only 1 genus represented at Aden . . . . 2. Phyllanthus.

Tribe III.—Crotoneæ : Perianth single, or of the male, or of both sexes double. Stamens 1—2-seriate, outer series alternate with the sepals or central in the flower. Ovary 2-3-celled, cells 1-ovuled.

1. Flowers in androgynous 2—3-chotomous cymes ; leaves usually digitately lobed ; stamens erect . . . . . 3. Jatropha.
2. Flowers in androgynous racemes ; leaves not digitately lobed ; stamens inflexed in bud . . . . . 4. Chrozophora.
3. Flowers in terminal panicles. Staminal bundles indefinite . 5. Ricinus.

1. Euphorbia Linn.

Herbs, shrubs, or small trees of various habit, with milky juice ; stems slender and leafy or thick and fleshy and sometimes leafless or nearly so. Leaves opposite or less commonly alternate.

Flowers monoecious, combined in an inflorescence of many male florets surrounding a solitary fermale, arranged in a common 4-5-lobed perianth-like involucre with thick glands at the mouth, each gland often

bearing a petaloid spreading white or coloured limb. Male flowers a stalked stamen without floral envelope. Female flowers : Ovary 3-celled on an ultimately exserted stalk in the centre of the involucre ; ovule solitary in each cell ; styles 3, free or connate.

Fruit a capsule of 3 bivalved cocci, separating elastically from a persistent axis and dehiscing ventrally or both ventrally and dorsally. Seeds albuminous ; cotyledons broad, flat.

Species about 600.

Distribution :—Cosmopolitan.

Shrubs or undershrubs :

- Mostly aphyllous . . . . . 6. E. Schimperi.
- With leaves.
  - Leaves fascicled.
    - Leaves cuneate-oblong or cuneate ovate or linear . 7. E. cuneata.
    - Leaves obovate-oblong, mucronulate . . . 9. E. adenensis.
  - Leaves not fascicled.
    - Leaves mucronate.
      - Leaves alternate, ½—1½ inches long . . . 8. E. systyla.
      - Leaves opposite, ⅛—1 inch long . . . . 2. E. arabica.
    - Leaves acute, deflexed, ¼ inch long . . . . 5. E. Bottæ.

Herbs :

- Leaves linear, subfalcate, acute, up to ½ inch long . . 4. E. polycnemoides.
- Leaves obliquely oblong or obovate-oblong, rounded or obtuse at the apex, coriaceous, $\frac{1}{10}$—⅛ inch long . . . . . 3. E. granulata.
- Leaves obliquely and broadly or narrowly oblong, obtuse, serrulate, not coriaceous, ¼—1 inch long . . . . . 1. E. hypericifolia.

Sectio I.—Anisophyllum.

1. Euphorbia hypericifolia Linn. Hort. Cliff. 198 ; Boiss. in DC. Prodr. XV, 2, 23 ; Hook. Exot. Fl. I, t. 36 ; Thwaites Enum. 268 ; Benth. Fl. Hongk. 301 ; Hook. f. Fl. Brit. Ind. V, 249.

Euphorbia indica Lamk. Dict. II, 423 ; Boiss. in DC. Prodr. XV, 2, 22, et in Fl. Or. IV, 1086 ; Wall. Cat. 7711, excl. C ; Balf. f. Bot. Socotra, p. 264.

Euphorbia cassioides Presl Bot. Bemerk. p. 119.

Euphorbia decumbens Willd. Suppl. 27.

Euphorbia androsæmoides Dennst. Schlüss. Hort. Mal. 36.

Euphorbia parviflora Linn. Syst. ed. X, 1047 ; Roxb. Fl. Ind. II, 472 ; Boiss. in DC. Prodr. XV, 2, 22 ;

Euphorbia papilligera Boiss. Cent. Euph. 8.

Euphorbia ægyptiaca Anders. Journ. Linn. Soc. V, Suppl. p. 34 (teste Balf. f. ; non of Boiss.).

Description :—A rather slender, rarely stout, annual, 6—12 inches high, of various habit, glabrous or sparsely pubescent, erect ascending

or decumbent. Leaves opposite, obliquely broadly or narrowly oblong, obtuse, serrulate, nerves distinct, base rounded or cordate, ½—1 inch long, rarely more or less, not coriaceous. Stipules minute, setaceous, lacerate, or 0.

Involucres very minute, turbinate, glabrous, with quite entire minute bracts at the base of the pedicel, in axillary and terminal usually pedunculed and many-flowered cymes; glands very shortly stipitate; lobes usually projecting above the glands; limb of the latter white or pale pink, always small but very variable in size, sometimes 0.

Capsule subglobose; cocci more or less pubescent or glabrous. Seeds with a thin mucous coat, bluish when dry, very variable as to the amount and depth of the shallow depressions on the faces which are often obsolete.

Locality:—Aden (Hook., Anders., Marchesetti ?).

Distribution:—Tropics of both hemispheres, except Australia and the Pacific Islands, ascending to 4,000 feet in the Himalaya.

2. **Euphorbia arabica** Hochst. et Steud. in Schimp. Pl. Abyss. n. 756; DC. Prodr. XV, 2, 33; Anders. Journ. Linn. Soc. V, Suppl. p. 34.

Description:—A perennial undershrub, up to 1 foot high, erect, glabrous. Stem woody, terete, branching. Leaves opposite, remote or approximate, unequal, linear-lanceolate or ovate-lanceolate, mucronate, glabrous, 2 lines-1 inch long, 1 line broad. Stipules very narrowly lanceolate.

Flowers axillary, mostly solitary; peduncle glabrous, short; involucre pyriform, glabrous, with ovate, fimbriate-ciliate teeth; glands rotund, inside at the base ciliate. Ovary and stipe glabrous; styles divaricate, free at the base; stigmas bifid. Capsule angular; seeds smooth, yellowish-red.

Flowers and fruits:—Nov. 1888 (Schweinf.), Dec. 1847 (Hook.), Febr. 1857 (Thomson), March 1878 (Perry), March 1881 (Schweinf.), April 1894 (Lunt).

Locality:—Near the sea (Hook.); top of Shum Shum Range between 1,300 and 1,750 feet (Busse); plain of Maala (Defl.); great valley between Steamer-Point and town (Marchesetti); near the Telegraph Office, nearly sea-level (Lunt); without locality (Hildebrandt, Schweinf., Wichura, Beevor, Birdw., Perry).

Distribution:—Nubia, Abyssinia, Jidda, Yemen, Angola, Natal.

Note:—Schweinfurth (Bull. Herb. Boiss. (1899) Append. II, p. 313) calls his specimens collected at Aden **var. brevifolia** Boiss. in DC. Prodr. XV, 2, p. 33. He describes his plant as follows:

"A plant about $1\frac{1}{3}$ feet high, broom-like, with long shoots, dichotomously branched, basal parts and roots strongly woody. Leaves oblong or linear, mostly rounded at both ends, but often pointed, $\frac{1}{10}$ by $\frac{1}{4}$ or $\frac{1}{12}$ by $\frac{1}{2}$ inch, with a much rougher structure than the common form, which probably represents the annual type. The involucral glands, style, and seed correspond, in spite of the great differences in the habit of the plant, with the characteristics of the typical form."

3. **Euphorbia granulata** Forsk. Fl. Aeg.-Arab. 94; Vahl. Symb. II, 54; Boiss. Fl. Or. IV, 1087, et DC. Prodr. XV, 2, p. 33; Hook. Fl. Brit. Ind. V, 252; Cooke Fl. Bomb. Pres. II, 569.

E. Forskalii, var. β. et γ. J. Gay in Webb. Phyt. Canar. III, 242.

E. fragilis Dcne. in Ann. Sc. Nat. ser. 2, (1834), 241.

E. arillata Edgew. in Journ. As. Soc. Beng. vol. 16, 1218 (*fide* Hook. f.)

E. villosa Herb. Royle.

E. thymifolia Wall. Cat. 7710, E.

Anisophyllum Forskalii Klotzsch et Garcke in Bot. Reise Prz. Wald. Bot. 25.

var. glabrata Boiss. in DC. Prodr. XV, 2, p. 34; Schweinf. in Bull. Herb. Boiss. VII, Append. II, 314.

Arabic name:—Lébbena, Um-el-lebben (Schweinf.).

Description:—A small slightly hairy plant with a perennial root, stems many from the root, prostrate, leafy, 3—6 inches long, less brittle than the typical plant. Leaves opposite, coriaceous, $\frac{1}{10}$—$\frac{1}{5}$ by $\frac{1}{20}$—$\frac{1}{8}$ inch, obliquely oblong or obovate-oblong, rounded or retuse at the tip, quite entire, base narrow or rounded or subcordate, the upper ones glabrate; petioles short; stipules minute, ciliolate.

Involucres minute, axillary and on short leafy branchlets, subsessile, turbinate, $\frac{1}{20}$ inch long; gland usually without a limb.

Capsule $\frac{1}{15}$ inch in diameter; cocci hirsute, rounded at the back, not keeled; styles very short, 2-fid. Seeds quadrangular, bluntly pointed, $\frac{1}{20}$ inch long, faintly pitted; testa very mucous when wetted.

Flowers and fruits:—April 1894 (Lunt).

Locality:—Gravelly slope of Shum Shum Range (Ellenbeck); Plain of Maala, nearly sea-level (Lunt); without locality (Edgew.); Little Aden (Defl.).

Distribution (of the species):—Cape Verd Islands, Canaries, Morocco, Algeria, Sinai, Egypt, Nubia, Kordofan, Darfur, Central and Southern Arabia, N. Somaliland, S Persia, Afghanistan, Punjab, Sind.

4. **Euphorbia polycnemoides** Hochst. in Kotschy Pl. Nub. n. 184; DC. Prodr. XV, 2, p. 47; Schweinf. in Bull. Herb Boiss. vol. VII, Append. II, 315.

Description:—A glabrous, glaucescent, reddish herb, about 6 inches high and more; stem erect, slightly rigid, dichotomously branched. Leaves subsessile, linear, subfalcate, acute, very unequal at the base, serrulate in the upper part, the larger ones 6 lines long and scarcely 1½ lines broad at the base; stipules subulate, reddish.

Involucres axillary, red, turbinate, forming slender racemes which are intermixed with subentire leaves, the throat and triangular lobes ciliolate. Glands transversely ovate, slightly concave, with a rose-coloured equilateral 2—3-lobed appendage.

Cocci of capsule carinate; seed grey, ovate, acutely tetragonous, deeply sulcate at the base, scrobiculate on account of the furrows anastomosing with each other.

Flowers and Fruits:—March (Schweinf.).

Locality:—Above the coal-depôt of the Messag. Marit. on rocks of basaltic lava (Schweinf.); Koosaf Valley (Defl.); without locality (Birdw.).

Distribution:—Abyssinia, Kordofan, Usambara.

Sectio II.—Tirucalli.

5. **Euphorbia Bottæ** Boiss. in DC. Prodr. XV, 2, p. 95.

Description:—Shrubby, much-branched; branches ½-1 foot long, slender, virgate; leaves distant, narrowly lanceolate, acute, deflexed, early deciduous, 3 lines long.

Involucres 1-4, terminal, unequally pedunculate (6-10 lines), umbellate, supported by 2 oblong acuminate leaflets, the hemispherical lobes broadly ovate, denticulate-ciliate. Glands large, transversely ovate, styles long, bifid, with the branches revolute and scarcely thickened at the apex.

Capsules whitish, ovate, deeply trisulcate, larger than a pea, long-stipitate; cocci suberose, subcarinate; seed ovate, smooth, with the minute caruncle much depressed.

Locality:—Aden (Defl.).

Distribution:—Arabia, at Jennat and Jebel Ras (Botta).

6. **Euphorbia Schimperi** (Forsk.) Presl. Bot. Bemerk. 109; Anders. Journ. Linn. Soc. V, Suppl. p. 34; Boiss. in DC. Prodr. XV, 2, 96.

Euphorbia Tirucalli Forsk. Fl. Aeg.-Arab. 112.

Euphorbia Larica Boiss. Cent. Euph. 24, et in DC. Prodr. XV, 2, 96.

Arthrothamnos Schimperi Schweinf. in Herb. Nub. n. 924.

Arabic name :—Rummid.

Description :—A shrub, generally aphyllous, fleshy, pale-green. Branches erect, patulous, terete, fleshy, trichotomous. Leaves rarely present, deciduous, 1—3 at the end of the branchlets, minute, 3—5 lines long, 2 lines broad, herbaceous, glabrous, ovate, acute, entire.

Peduncles 4—5, at the end of the branches, short, 3 lines long, terete, thick-fleshy, 4-flowered. Involucre green, campanulate; teeth obtuse, fimbriate, shorter than the glands ; glands 5, yellow, concave. Flowers short-pedicelled, umbellate, bibracteate ; bracts ovate, acute, truncate at the base, subherbaceous, entire. Stamens 20, some of them exserted ; anthers yellow. Ovary stipitate, glabrous; styles united below the middle ; stigmas thickened, bifid.

Locality :—Plain of Maala, Koosaf Valley (Defl.) ; Shum Shum Range at about 850 feet (Busse, Ellenbeck ex Krause) ; without locality (Hook., Thomson, Anders.).—Forms densely branched bushes of 3—5 feet in height.

Distribution :—Nubia, Abyssinia, C. and S. Arabia, Persia, Socotra, coast of Somaliland.

Note :—There are three specimens from Aden in the Herb. Kew labelled '*Euphorbia Schimperi* Presl.,' which evidently do not belong to this species. One was collected by Balfour in Jan. 1880, the second by Schweinfurth in March 1881, and the third by the same botanist in Dec. 1888.

Mr. N. E. Brown of the Royal Botanic Gardens, Kew, informed me that the specimens do not belong to any of the tropical African species ; but the materials are not sufficient to describe a new species.

Sectio III.—Lyciopsis.

7. Euphorbia cuneata Vahl. Symb. II, 53 ; DC. Prodr. XV, 97 ; Anders. Journ. Linn. Soc. V, Suppl. p. 35.

Euphorbia fruticosa Edgew. Journ. Asiat. Soc. Beng. XVI, 1219.

Description :—An arborescent shrub, 6—10 feet high, glabrous. Stem woody ; cortex cinereous-glabrous ; branches rectangular, spinescent, few-leafed, puberulous when young. Leaves in fascicles on tubercles, 2—8 lines long, 1—3 lines broad, cuneate-oblong, cuneate-ovate or linear, obtuse at the apex or obscurely bilobed, attenuate at the base, sessile, sometimes petiolate, puberulous on both sides.

Peduncles arising from the leaf-bearing tubercles, fleshy, terete, puberulous, 3—4-bracteate, 4-flowered ; involucre green, campanulate, tomentose, with 5 cuneiform fimbriate teeth ; glands 5, yellow, concavepeltate, glabrous. Flowers umbellate, 1 central and sessile, 3

pedicellate; pedicels as long as the peduncle but more slender. Stamens numerous. Ovary stipitate, tomentose; styles half-way up united, subentire at the apex.

Flowers and fruits:—Jan. 1863 (Oliver and Cl.), Jan. 1872 (Thomson), Jan. 1880 (Balf.), April 1861 (Thomson), May 1850 (Madden), Nov. 1888 (Schweinf.), Dec. 1847 (Hook.), Dec. (Defl.).

Locality:—Goldmore Valley (Defl.); ravine above the European cemetery of Steamer-Point (Schweinf.); along the path leading to the Shum Shum Range (Busse); without locality (Edgew., Hook., Madden, Anders., Hildebrandt, Balfour, Birdw., Kuntze).

Distribution:—Yemen, Eritrea, N. Somaliland.

Note:—Schweinfurth (in Bull. Herb. Boiss. VII (1899), Append. II, 317) calls his specimens which he collected in the ravine above the European cemetery of Steamer-Point in the year 1888: *Euphorbia cuneata* Vahl. var. β. *Perrottetii* Jaub. et Spach.

As a matter of fact, the plant described as *Euphorbia Perrottetii* Jaub. et Spach (Illustr. Pl. Or. vol. V, tab. 464) was found at Aden: "Arabia Felici, prope oppidum Aden, legit cel. Perrottet, Martio anni 1854 (Herb. Mus. Par.)."

Sectio IV.—Pseudacalypha.

8. Euphorbia systyla Edgew. Journ. Asiat. Soc. Beng. XVI, 1218; Anders. Journ. Linn. Soc. V, Suppl. p. 35; DC. Prodr. XV, 98.

Description:—An undershrub, 2-3 feet high, erect, dichotomous, striate, subglaucous, more or less leafed. Branches angular, ascending. Leaves alternate, petiolate, lanceolate or linear-lanceolate, entire mucronate, puberulous, ½—1½ inches long, 1—3 lines broad; petiole 6 lines long.

Flowers axillary, solitary, sessile; involucre tubular, persistent, 4-dentate; teeth fimbriate, alternate, with 4 concave glands. Ovary pubescent; stipe thickened, tomentose; styles united up to the apex; stigmas bifid.

Capsule erect, subglobose, puberulous; cocci bisulcate, angular, angles rounded. Seeds conical, compressed, constricted; testa crustaceous, punctate, olivaceous.

Flowers and fruits:—February 1851 (Thomson), March 1850 (Madden), April 1861 (Thomson), June 1872 (Hildebr.), Dec. 1847 (Hook.), Dec. 1889 (Defl.).

Locality:—From the seashore up to 1,000 feet of the Shum Shum Range (Edgew., Hook., Thomson, Madden); plain of Maala (Schweinf., Defl.); Biggari Valley (Defl.); upper end of the great valley between

Steamer-Point and town (Marchesetti); without locality (Hildebrandt, Balfour, Birdw., Kuntze); common (ex Krause).

Distribution:—Tehama, coast of N. Somaliland.

Sectio V.—Trithymalus.

9. Euphorbia adenensis Defl. Bull. Soc. Bot. France IX, 67; Schweinf. Bull. Herb. Boiss. VII, App. II, 329.

Description:—A shrub, 4—5 feet high, glabrous, dichotomously branched from the base. Branches terete, thick, woody-fleshy, entirely denudate, unarmed, remotely cicatricose; cortex grey-cinereous. Leaves deciduous, in terminal fascicles, alternate, sessile, exstipulate, entire, obovate-oblong, obtuse, mucronulate, attenuate at the base, 8—9 lines long, 2—3 lines broad, pale-green.

Involucre terminal, subsessile, campanulate; lobes 5, orbicular, small, fimbriate; glands 5, patent, transversely ovate, plane, exappendiculate, with the margin sometimes subrevolute. Flowers diœcious (by abortion?). Male flowers ∞-capitate in the involucre, pedicellate, bracteolate; pedicel 1½ lines long; bracteoles paleæform, palmately laciniate, fimbriate, as long as the pedicels; perianth obsolete; filaments thick, 3—4 times shorter than the pedicel. Female flower 1, solitary in the centre of the involucre, sessile, surrounded by 1 minute, annular, fimbriate bracteole. Ovary glabrous; styles united, dividing at the middle into 2 circinate lobes.

Capsule spherical, 3—4 lines in diameter, apiculate with the persistent styles, finally very shortly stipitate; cocci crustaceous, rotundate on the back. Seeds globose, 1 line in diameter, smooth, yellow, ecarunculate.

Flowers and fruits:—December (Schweinf.).

Locality:—Goldmore Valley, near the Flagstaff, rare (Defl.); near the top of the Shum Shum Range at about 1,700 feet (Schweinf.); without locality (Birdw.).

Distribution:—Yemen, Hadramaut.

Note:—As to the systematic position of Euphorbia adenensis Deflers says: "Species insignis in sectione 'Trithymalo' inter 'Pachycladas' ut videtur collocanda, sed ramis denudatis crassis et cymis terminalibus ad capitula solitaria reductis ad sectionem Euphorbium, subsect. Tirucalli Benth. et Hook. accedens."

2. Phyllanthus Linn.

Herbs, shrubs or trees. Leaves bifarious or distichous, alternate, entire, the branchlets with their leaves often resembling pinnate leaves, stipules usually narrow or 0.

Flowers small, monœcious, rarely diœcious, axillary or on old nodes; males usually many, fascicled, subsessile or pedicellate, rarely few or solitary; females in the same or distinct axils with longer pedicels, solitary or few. Perianth simple. Male flowers: Sepals 4—6, free or very shortly connate, imbricate and more or less 2-seriate. Disk glandular, (rarely 0). Stamens 3 (rarely 4—5), in the centre of the flower; filaments free or connate; anthers 2-celled, oblong or didymous (rarely reniform), the cells parallel or diverging; dehiscence extrorse, vertical or transverse. Pistillode 0. Female flowers: Sepals as in the male. Petals 0. Ovary usually 3-celled; ovules 2 in each cell; styles free or connate, usually bifid, with slender arms, rarely dilated.

Fruit of 3 crustaceous or coriaceous (rarely bony) 2-valved cocci with or without a separable coriaceous (rarely fleshy) epicarp, sometimes a 4-celled berry or a drupe with a 3—4-celled bony endocarp. Seeds 3-gonous; testa crustaceous; hilum without a strophiole; albumen fleshy; cotyledons flat or flexuous.

Species about 400.

Distribution :—In all warm countries.

1. Phyllanthus maderaspatensis L. Sp. Pl. p. 982; Müll.-Arg. in Linnæa XXXII, 19 et. DC. Prodr. XVI, 362; Benth. Fl. Austr. IV, 103; Hook. Fl. Brit. Ind. I, 293.

Phyllanthus andrachnoides Willd. Sp. Pl. IV, 575.
Phyllanthus obcordatus Willd. Enum. Hort. Berol. Suppl. p. 65.
Phyllanthus javanicus Poir.; Spreng. Syst. III, 21.
Pbyllanthus anceps Herb. Heyne.
Phyllanthus linearis Herb. Madr.
Phyllanthus malabaricus Herb. Wight.
Phyllanthus niruri Wall. Cat. 7894.
Arabic name:—Cholf.

Description :—Annual, but sometimes woody at the base, very variable in habit; stems glabrous, 1—3 feet long, erect, ascending or decumbent. Leaves scattered, variable, $\frac{1}{4}$—$1\frac{1}{4}$ by $\frac{1}{8}$—$\frac{5}{8}$ inch, glabrous, obovate-cuneate, rounded, truncate or somewhat obcordate at the apex, mucronate, much tapering into a very short petiole, glaucous and with a few lateral nerves conspicuous beneath; stipules peltate, lanceolate, very acute.

Flowers axillary, the male flowers minute in small clusters, subsessile, the female larger, solitary, shortly pedicellate. Sepals 6, obovate, obtuse, green with white margins. Stamens 3; filaments connate. Styles 3, distinct, very small, 2-lobed.

Capsules $\frac{1}{8}$ inch in diameter, depressed-globose, glabrous, 3-lobed. Seeds $\frac{1}{16}$ inch long, 3-gonous, rounded on the back, muriculate in five lines.

Flowers and fruits :—November 1888 (Schweinf.).

Fruits :—March 1878 (Perry).

Locality :—Goldmore Valley (Defl.); near the Telegraph-Office of Steamer-Point (Schweinf.); without locality (Birdw.).

Distribution :—Cape Verd Islands, Senegambia, Guinea, Angola, Nubia, Abyssinia, Eritrea, Kordofan, Somaliland, S. Arabia, drier parts of India, Ceylon, Java, China, Australia.

Note :—Schweinfurth (in Bull. Herb. Boiss. Vol. VII, Append. II, p. 304) considers his specimens collected at Aden as representing the variety β. Thonningii Müll.-Arg. in Linnæa, Vol. 32, p. 19.

Müller gives the following characteristics of his variety : "foliis basi minus cuneato-angustatis apiceque minus abrupte terminatis superioribus interdum fere linearibus."

Müller's variety β. Thonningii is identical with the following :

Phyllanthus Thonningii Schum. & Thonn. Beskr. Guin. Pl. 418.

Phyllanthus arabicus Hochst. ex Steud. Nom. ed. 2, II, 326.

Phyllanthus venosus Hochst. ex A. Rich. Tent. Fl. Abyss. II, 254.

Phyllanthus longifolius E. Mey., *non* Lam.

3. Jatropha Linn.

Herbs, shrubs or trees, often glandular or prickly. Leaves alternate, often digitately lobed ; stipules often ciliate.

Flowers monœcious, in terminal cymes, the central flowers in the cyme or its forks usually female. Perianth usually double. Male flowers : Calyx 5-lobed or-partite, the segments often coloured, imbricate. Petals 5, free or connate. Disk entire or of 5 glands. Stamens numerous ; filaments of all or of the interior only connate below ; anthers erect, ovate or oblong, the cells parallel, contiguous. Pistillode 0. Female flowers : Calyx as in the male. Petals sometimes absent. Ovary 2—4-celled ; ovules solitary in each cell ; styles connate below, 2-fid above, the lobes entire or again 2-lobed.

Fruit a capsule of 2—4 cocci ; cocci 2-valved ; endocarp crustaceous or hard. Seeds ovoid or oblong ; testa crustaceous ; albumen fleshy ; cotyledons broad, flat.

Species about 160.

Distribution :—Warmer regions, chiefly American and African.

Stipules aculeate-indurate	1. J. spinosa.
Stipules not aculeate-indurate	2. J. lobata.

1. Jatropha spinosa (Forsk.) Vahl Symb. I (1790) 79; Anders. Journ. Linn. Soc. V, Suppl. p. 36; Pax in Engler's Regni Veg. Consp. 42. Heft (IV, 147) p. 55.

Croton spinosus Forsk. Fl. Aeg.—Arab. (1775) p. 163.

Jatropha aculeata F. G. Dietr. Lexicon Gaertn. u. Bot. Nachtr. IV (118) 76; Muell.-Arg. in DC. Prodr. XV, 2, (1866), 1083.

Adenoropium spinosum Pohl Pl. Bras. Ic. et Descr. I (1827), 15.

Arabic name:—Badr-es-Simssim.

Description:—An arborescent shrub, 7—8 feet high, erect, glabrous, with a milky juice. Branches thick-fleshy, terete; cortex cinereous-glaucous or purplish. Petioles slender, 1—$1\frac{3}{5}$ inches long. Leaves $1\frac{1}{2}$—$2\frac{2}{5}$ inches long and broad, often broader than long, alternate, petiolate, rotundate, 5—7-nerved, subtruncate-cordate at the base, glaucescent, glabrous, 3—5-lobed or obscurely 7-lobed; lobes rotundate-obtuse, emarginate or subretuse, entire or spinulose-denticulate, stipules sharp-spinose, $\frac{1}{6}$—$\frac{1}{3}$ inch long, black or glaucous.

Cymes with elongate peduncles, terminal, dichotomous, lax, glabrous, multiflowered, 4—5 inches long. Bracts small, dilate at the base, acute, scarious, entire, $\frac{1}{12}$ inch long. Flowers yellowish-green (Forskal calls them '*coccineos*'), mostly subsessile, monœcious. Sepals 5, glabrous, lanceolate-ovate, obtuse, in the male flowers $\frac{1}{12}$ inch long, in the female only slightly longer. Petals 5, twice or thrice as long as the calyx. Glands of the disk free. Stamens 8, monadelphous. Ovary sessile, glabrous; styles convolute, 3, free; stigmas peltate.

Capsules $\frac{2}{5}$ inch long, greyish-yellow, glabrous, verruculose, woody, tricoccous. Cocci monospermic. Seeds light brown; caruncle palmate-lacerate.

Var. α. genuina Pax in Engler's Regni Veg. Consp. Heft 42 (IV, 147) p. 56.

The leaves are larger, $1\frac{3}{5}$—$2\frac{2}{5}$ inches long and longer and as broad; lobes obtuse or retuse, entire.

Locality:—Goldmore Valley (Schweinf., Lunt); Shum Shum Range at 650—1,650 feet (Ellenbeck, Busse); without locality (Balfour, Hildebrandt).

Distribution:—S. Arabia, N. African Steppe-province.

Var. β. crenulata Pax l. c. p. 56.

Lobes rotundate or acute, crenulate-dentate.

Locality:—Maala (Hirsch, Schweinf.).

Distribution:—S. Arabia, N. African Steppe-province.

Flowers and fruits:—Nov. 1888 (Schweinf.), Dec. 1847 (Hook.), Dec. 1889 (Defl.), Jan. 1880 (Balfour), Febr. 1851 (Thomson), March 1881 (Schweinf.).

2. **Jatropha lobata** (Forsk.) Müll.-Arg. in DC. Prodr. XV, 2 (1886) 1085. **Subsp. I. glauca** (Vahl) Pax in Engler's Pflanzenreich Heft 42 (IV, 147) p. 32.

Croton lobatus Forsk. Fl. Aegypt.-Arab. (1775) 162.

Jatropha glauca Vahl Symb. I (1790) 78 (*ex parte*); Rich. Tent. Fl. Abyss. II (1851) 250; Schweinf. Beitr. Fl. Aethiop. (1867) 37.

Jatropha ricinifolia Fenzl in Kotschy Pl. Aethiop. n. 251.

Jatropha lobata var. genuina Müll.-Arg. in DC. Prodr. XV, 2 (1866) 1085.

Jatropha lobata var. Richardiana Müll.-Arg. in DC. Prodr. XV, 2 (1866) 1086.

Adenoropium glaucum Pohl Pl. Bras. Ic. et Descr. I (1827) 15.

Arabic name:—Tambakshi ghulghul (Hille); Mjershe (Pax l. c.)

Description:—Shrub or undershrub, about 3—8 feet high; branches ascending, woody, overhanging towards the ends. Petioles $1\frac{3}{5}$—2 inches long, eglandular; limb cuneate-acute or subtruncate at the base, glabrous or glabrescent, $2\frac{2}{5}$ inches broad and slightly shorter, 3—5-lobed almost to the middle, glaucous; lobes acute or rotundate-obtuse, irregularly and rather coarsely dentate, the central lobe $1\frac{1}{5}$—$1\frac{3}{5}$ inches broad; stipules of the shape of glanduliferous laciniæ, simple or bipartite.

Cymes shortly pedunculate, small-flowered; bracts lanceolate or triangular-ovate, glanduloso-subciliate or subentire, eglandular. Flowers small, about $\frac{1}{6}$ inch long, lutescent or yellow. Sepals of male flowers ovate, crenate or entire, of female flowers lanceolate, acuminate, glanduloso-ciliate; filaments 8, the outer ones shorter, the inner ones longer and monadelphous. Ovary glabrous.

Capsule glabrous, rough-tuberculate, about $\frac{2}{5}$ inch long. Seed smooth, grey, brown-marbled; caruncle palmate-sulcate.

Fruits:—March (Schweinf.).

Locality:—Plain of Maala (Schweinf.).

Distribution (of the subspecies):—Kordofan, Nubia, Abyssinia, British Somaliland, Eritrea, Arabia.

Subspecies II *senegalensis* (Müll.-Arg.) Pax is confined to Senegambia and Benguela, whilst

Subspecies III *aceroides* Pax et K. has been found in Nubia only between Suakin and Berber.

Note :—The plant is full of a colourless astringent juice which stains white blotting-paper red and iron black (Schimper).

4. Chrozophora Neck.

Diffuse densely hispid or stellately tomentose herbs. Leaves alternate, sinuate-toothed or lobed, wavy or plicate, 2-glandular at the base.

Flowers monœcious, in axillary bracteate racemes, the males crowded in the upper part of the raceme, the females solitary, pedicellate, in the lower part. Male flowers: Calyx globose or ovoid, splitting into 5 valvate segments. Petals 5, short. Disk obscure. Stamens 5—15; filaments connate below in a column in 1—3 series; anthers oblong, the cells parallel, contiguous. Pistillode 0. Female flowers: Sepals 5, narrow. Petals 5, very narrow, sometimes setaceous or obsolete. Disk of 5 short broad glands alternating with the petals. Ovary 3-celled; ovule solitary in each cell; styles erect or spreading, 2-fid.

Capsule of 3 hispid, tomentose or lepidote, 2-valved, almost fleshy cocci. Seeds estrophiolate; testa shining; albumen fleshy; cotyledons broad, flat.

Species about 6.

Distribution :—Mediterranean, Asiatic, and African.

1. Chrozophora obliqua (Forsk.) Juss. Monogr. Euph. p. 28; DC. Prodr. XV, 749; Boiss. Fl. Or. IV, 1141; Hook. Fl. Brit. Ind. V, 409.

Chrozophora tinctoria Muell.-Arg. in DC. Prodr. XV, 2, 749.

Chrozophora oblongifolia A. Juss., Spreng. Syst. III, 850; Anders. Journ. Linn. Soc. V, Suppl. p. 36.

Croton obliquus Vahl Symb. I, 78.

Croton oblongifolius Del. Fl. d' Eg. p. 139, t. 51, fig. 1.

Croton argenteus Forsk. Fl. Aeg.-Arab. p. 75.

Croton tinctorius Wall. Cat. 7716, G.

Arabic name :—Tenun.

Description :—Shrubby, erect or suberect, much-branched, thickly stellately tomentose. Leaves 1—2 by $\frac{1}{2}$—$\frac{3}{4}$ inch, ovate or ovate-lanceolate, sinuate-toothed, subobtuse, clothed on both sides with stellate tomentum, base rounded or cuneate, usually 2-glandular; main nerves few, prominent beneath; petioles $\frac{1}{4}$-1 inch long; stipules linear, soon falling.

Flowers in axillary bracteate racemes, the males in the upper part sessile, the females in the lower part pedicellate; bracts linear, hairy, $\frac{1}{10}$ inch long. Male flowers: Calyx $\frac{1}{8}$—$\frac{1}{6}$ inch long, densely stellately

tomentose. Petals thin, membranous, $\frac{1}{10}$ inch long. Stamens 5. Female flowers : Sepals $\frac{1}{10}$ inch long by $\frac{1}{30}$ inch wide at the base, triangular, very acute, stellately tomentose. Petals as the sepals but much narrower and shorter, stellately tomentose. Ovary clothed with stellate tomentum and silvery scales ; styles 3, erect, $\frac{1}{10}$ inch long, 2-fid to about $\frac{1}{2}$ way down, stellately tomentose outside.

Capsules $\frac{1}{4}$ inch in diameter, clothed with stellate tomentum and silvery scales. Seeds roughly tuberculate.

Locality :—Plain of Maala, ravine near the mosque of Shaikh Idrus (Schweinf.); Biggari Valley (Defl.); upper end of the great valley between Steamer-Point and town (Marchesetti); without locality (Hook., Hildebrandt, Birdw.).

Distribution :—Sinai, Egypt, Nubia, Libya, Abyssinia, Kordofan, Somaliland, Socotra, Central and S. Arabia, Muscat, Sind, Punjab, Kashmir.

5. Ricinus Linn.

A tall glabrous annual, sometimes shrubby or subarboreous. Leaves alternate, broad, palmately 7-many-lobed, serrate.

Flowers large, in terminal subpanicled racemes, monœcious, apetalous upper male crowded, lower female. Disk 0. Male flowers : Calyx membranous, splitting into 3—5 valvate segments. Stamens very many, filaments crowded, variously connate or in branching clusters ; anther-cells distinct, distant, subglobose, divergent. Pistillode 0. Female flowers : Calyx spathaceous, caducous. Ovary 3-celled ; styles short or long, spreading, often very large, entire 2-fid or 3-partite, feathery papillose ; cells 1-ovuled.

Capsule of 3 bivalved cocci. Seeds oblong ; testa crustaceous ; albumen fleshy ; cotyledons broad, flat.

Species.

Distribution :—Tropics generally, probably indigenous in Africa.

1. Ricinus communis L. Sp. Pl. 1007 ; Muell.-Arg. in DC. Prodr. XV, 2. 1017.

Ricinus inermis Jacq. Ic. Rar. I, t. 195.

Ricinus lividus Jacq. Ic. Rar. I, t. 196.

Ricinus speciosus Burm. Fl. Ind. 307, t. 63, f. 2.

Ricinus spectabilis Blume Bijd. 623.

Ricinus viridis Willd. Hort. Berol. t. 49.

Croton spinosus Linn. Sp. Pl. 1005.

Names :—Khirva, Gar (Arabic), Castor-oil Plant, Palma Christi, Ricin de Palma Christi.

Locality :—Shaikh O'thman (Defl.). Probably naturalized.

We mention in this place a plant which Deflers found in the central part of the crater, south of the path leading to the Flagstaff in a ravine opening on the great reservoirs.

Having seen one specimen only, and this very incomplete, Deflers is doubtful even with regard to the natural order to which this plant might belong. Judging from the position and form of the inflorescence he thought, the specimen looked very much like a certain *Antidesma* of Kordofan, of which he had seen specimens in Schweinfurth's herbarium. But Baillon, who also examined the plant, seems to have detected some better founded analogies with the genus *Acalypha*, without, however, arriving at a definite conclusion. In order to draw the attention of botanists to this probably undescribed species, we do not consider it superfluous, to repeat here Deflers' description.

" Suffruticosa, dumulosa, a collo ramosissima ; ramis erectis, elongatis, inermibus, lignosis, foliosis, adpresse sericeis, cortice rubro ; foliis sparsis, exstipulatis, breviter petiolatis, lineari-ellipticis, obtusis, basi attenuatis, uninerviis, integris, velutinis, ad nervum et petiolum purpurascentibus ; floribus (masculis ?) bracteatis, in spicas tenues amentiformes, folio oppositas et eo 2—3-plo longiores, dispositis ; rhachide filiformi, velutino, purpurascenti ; bracteis crebris minutis, sessilibus, orbiculatis, valde concavis, hirtis, persistentibus.

" $1\frac{1}{4}$-pedalis ; folia 3—5 lin. long, $\frac{1}{2}$—$\frac{3}{4}$ lin. lat.; petioli vix $\frac{1}{3}$—$\frac{1}{2}$ lin. longi."[1]

XLVII.—URTICACEÆ.

Herbs, shrubs, or trees. Leaves usually alternate, often oblique ; stipules various.

Flowers cymose or clustered, usually minute, monœcious or diœcious, 1-sexual, hermaphrodite, or rarely polygamous, often crowded on the surface of a fleshy flat concave or globose receptacle, sometimes hollow and closed ; bracts usually small or 0, sometimes 2—4 or more, involucrate. Perianth simple, calycine, regular or irregular, equally or unequally toothed, lobed or partite ; segments imbricate or valvate. Disk hypogynous, obscure or 0. Stamens as many as and opposite to the perianth-lobes, sometimes adnate to their base (rarely fewer or more) ; filaments free or rarely connate at the base ; anthers 2-celled. Pistillode in male flowers small or 0. Ovary superior, 1-celled ; ovule solitary ; style often excentric, simple or 2-fid with stigmatic arms, or stigma sessile, plumose or penicillate.

Fruit simple, indehiscent, a drupe or samara, or of free achenes, or compound in a confluent mass of perianths and pericarps. Seed erect,

[1] Deflers, A. In Bull. Soc. Bot. de France, Vol. 34, p. 68.

lateral or pendulous ; testa membranous ; albumen copious, scanty or 0 ; embryo straight or curved.

Genera 109 ; *species* about 1,500.

Distribution :—Throughout both hemispheres.

1. Forskohlea Linn.

Herbs, sometimes woody at the base. Leaves alternate, toothed, 3-nerved, often hoary beneath ; stipules lateral, free.

Flowers monœcious, aggregated in a tubular or campanulate 3—6-partite androgynous involucre which is densely woolly within, the male flowers numerous on the periphery of the involucre, the female flowers 1—5 in its centre. Male flowers : Perianth clavate in bud, in flower irregularly split, 3-lobed or 3-toothed, 1 lobe inflexed. Stamen 1. Pistillode 0. Female flowers : Perianth 0. Ovary straight ; ovule erect ; stigma filiform, hispid, persistent.

Achenes enclosed in the involucre, enveloped in wool, ovate, compressed ; testa membranous ; albumen scanty or 0 ; cotyledons broad.

Species 5.

Distribution :—Spain, Africa, Arabia, India

Suffruticose, with rhombic, elliptic, orbicular or obovate leaves .	. 1. F. tenacissima.
An annual green herb with ovate lanceolate or lanceolate leaves .	. 2. F. viridis.

1. Forskohlea tenacissima L. Mant. p. 72 ; DC. Prodr. XVI, 1. 235[55] ; Anders. Journ. Linn. Soc. V, Suppl. p. 36 ; Boiss. Fl. Or. IV, 115 ; Hook. Fl. Brit. Ind. V, 593 ; Batt. et Trab. Fl. d'Alg. p. 812.

Forskohlea latifolia Retz. Observ. p. 51.

Caidbeya adhærens Forsk. Fl. Aeg.-Arab. p. 82.

Arabic Name :—Lessike.

Description :—Suffruticose ; stem 6—24 inches high. Leaves $\frac{1}{2}$—$1\frac{3}{4}$ by $\frac{3}{8}$—$1\frac{1}{2}$ inches, variable in shape and size, rhombic, elliptic, orbicular, or obovate, obtuse, toothed or serrate, softly hairy with hooked hairs above, white-wooly beneath, base cuneate ; petioles $\frac{1}{4}$—$1\frac{1}{4}$ inches long ; stipules ovate, acute, scarious, ciliate.

Flowers monœcious, in axillary androgynous membranous involucres, the males at the margin, the females 1—4 in the centre of the involucre ; bracts usually 5, foliaceous, lanceolate, hispid above, silky below, reaching nearly $\frac{1}{4}$ inch long. Male flowers : Perianth unequally 3-lobed. Stamen 1. Female flowers : Perianth 0.

Achenes $\frac{1}{10}$—$\frac{1}{8}$ inch long, ovoid, compressed, tapering into the filiform style.

Flowers :—March 1878 (Perry), August 1898 (Birdw.), Dec. 1847 (Hooker).

Fruits :—March 1878 (Perry), Dec. 1847 (Hooker).

Locality :—Goldmore Valley, above the coal depôt of the Messag. Marit. (Schweinf.); "in locis depressis, rarissime" (Hook.); without locality (Defl., Birdw.); common on rocks (Perry).

Distribution :—S.-E. Spain, Teneriffe, N. Africa, Arabia, Afghanistan, Western Punjab, Sind.

2. **Forskohlea viridis** Ehrbg. in Wedd. Monogr. Urtic. p. 537; DC. Prodr. XVI, 1,235[56]; Franch. Sert. Somal. in Miss. Révoil. p. 65; Hiern Cat. Afr. Pl. part IV, p. 994.

Chamaedryfolia viridis O. Kuntze Rev. Gen. Pl. II, p. 625, (1891).

Description :—An annual, erect, herbaceous-green or intensely green herb, 1—3 feet high, patently branched from the base upwards, with the habit of *Mercurialis*, *Parietaria*, or *Urtica*. Leaves $\frac{2}{5}$—2 inches long and $\frac{1}{4}$—1 inch broad, ovate-lanceolate or lanceolate, attenuate at both ends or acuminate, entire towards the base, as to the rest coarsely and irregularly crenate-serrate or rarely subentire, of the same colour on both sides, or slightly paler on the under surface, nerves on the lower surface slightly pilose; petiole half the length of the blade or shorter, puberulous or glabrate. Stipules ovate, acuminate, subscarious, pilose on the margins.

Capitula distinct, not imbricate, $\frac{1}{5}$—$\frac{1}{3}$ inch long, turbinate. Flowers whitish to greenish, immersed in whitish woolly hairs.

Flowers and fruits :—March 1878 (Perry).

Locality :—Goldmore Valley (Defl.); near the tanks and other places very common, in shady ravines and on volcanic rocks (Schweinf.); top of Shum Shum Range at about 1,700 feet and more, gravelly slope near the Hindoo temple at about 300 feet (Busse); without locality (Perry).

Distribution :—S. Arabia, Socotra, Abyssinia, Eritrea, Soturba, Mossamedes.

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