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LAHORE DISTRICT FLORA

By

the late **SHIV RAM KASHYAP,**

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FOREWORD

Professor Shiv Ram Kashyap died on the 26th November, 1934 For the last several years before his death, he was working on this 'Flora', for in India there are very few small local floras, specially in those districts which are seats of University instruction. It is not possible for all students of the B.Sc. (Pass) or even for B.Sc. (Honours School) classes to consult a work like 'Flora of British India'. They need a smaller volume which could be used both in the classroom and in the field. It was to meet this difficulty that the late Professor took up the writing of the Lahore District Flora.

Prof. Kashyap made the collection of plants on which this book is based and also made all the sketches illustrating this volume ; but before he could complete the book his life was suddenly and prematurely cut short by the cruel hand of death. He had written out the descriptions of plants from the *Ranunculaceæ* to *Leguminoseæ*. Mr. Amar Chand Joshi, an old student of ours, now Assistant Professor of Botany, Benares Hindu University, who had been helping the late Professor during his holidays in the preparation of the manuscript, readily agreed at my request to check, revise and complete the manuscript of the 'Flora'. Mr. Joshi checked by comparing with the specimens not only in the Panjab University Herbarium but also in the Herbarium of the Royal Botanical Gardens, Sibpur, Calcutta. Mr. Joshi followed the plan adopted by Professor Kashyap in describing the plants.

The book deals with all the flowering plants found wild in the Lahore District except the grasses and the sedges. The more important cultivated plants are also mentioned at the end of the families to which they belong. Sometimes a brief description of these is given in smaller types, but no attempt has been made to describe them fully. Vernacular names of the plants are given when these are more or less definite and are in common use.

Though the authors have consulted all the important Indian floras published so far, special mention should be made of Hooker's Flora of British India, Duthie's Flora of the Upper Gangetic Plain and Parker's Forest Flora of the Punjab with Delhi and Hazara. The descriptions of the genera are largely based on the first work.

In conclusion, I have to thank Mr. Joshi for completing the volume ; Mr. K. P. Biswas, Curator of the Herbarium, Royal Botanical Gardens,

Sibpur, Calcutta, for the facility given to Mr. Joshi for work in the Herbarium and the Syndicate of the Panjab University for the special grant to meet the cost of the publication of the volume.

Kashyap Research Laboratory,
Panjab University Botany Department,
Lahore, *November* 26, 1936.

H. CHAUDHURI

SYNOPSIS OF THE FAMILIES.

The families of flowering plants in the present account are mostly arranged according to Bentham and Hooker's 'Genera Plantarum,' the arrangement which has been followed by the writers of most of the other Indian Floras. According to this system of classification, the various families are divided into the following main groups :—

I. **Angiosperms.** Ovules present inside a closed ovary. Pollination takes place through the stigma and the style.

A. **Dicotyledons.** Vascular bundles in the transverse section of a young stem arranged in a circle. Stem, when perennial, with concentric layers of wood and a separable bark, growing in thickness by means of a cambium. Leaves net-veined. Perianth mostly 4- or 5-merous. Embryo with 2 cotyledons; radicle elongates to form the primary root.

i. **Polypetalæ.** Flowers with both calyx and corolla [1]; petals free [2].

a. **Thalamifloræ.** Flowers mostly regular and bisexual; sepals mostly free; sepals, petals and stamens hypogynous; disk mostly absent; ovary superior [3]. *Families : I–XVI.*

b. **Disciflorae.** Sepals free or united; torus generally expanded into a cushion-like or cupular disk between the petals and the ovary; disk rarely of glands; ovary often immersed in the disk [4]. *Families : XVII–XXII.*

c. **Calycifloræ.** Flowers regular or irregular; sepals mostly connate, superior or inferior; disk mostly absent; stamens perigynous or epigynous [5]; ovary superior or inferior. *Families : XXIII–XXXIV.*

ii. **Gamopetalæ.** Flowers with both calyx and corolla; petals united [6]. *Families : XXXV–L.*

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[1] Corolla is sometimes wanting in the *Cruciferæ*, *Caryophyllaceæ*, *Lythraceæ* and *Ficoideæ*.

[2] Flowers with petals more or less united at the base occur in *Malvaceæ* and *Cucurbitaceæ*.

[3] Calyx and ovary are ½-inferior in *Portulaca*.

[4] Disk is absent in *Oxalis*.

[5] Stamens obscurely perigynous in *Papilionaceæ*, *Cæsalpiniaceæ*, and *Mimosaceæ*.

[6] Limb of the calyx is suppressed in many *Compositæ*; free petals sometimes occur in *Campanulaceæ*; corolla scarious in *Plantaginaceæ*.

iii. **Monochlamydeæ.** Perianth 1-seriate, rarely entirely absent, or if 2-seriate, both series sepaloid [1]; flowers often uni-sexual. *Families : LI–LVIII.*

B. **Monocotyledons.** Generally herbs. Vascular bundles in a transverse section of the stem mostly scattered and without cambium. Secondary growth in thickness in the stem generally absent. Leaves largely parallel-veined. Perianth generally trimerous. Embryo with a single cotyledon ; radicle not growing into a tap root, but soon stopping its growth, its function being taken up by adventitious roots from the base of the stem. *Families : LIX–LXXI.*

II. **Gymnosperms.** Ovules not present inside a closed ovary. Pollination takes place through the direct contact of the pollen grains with the ovules. *Family : LXXII.*

I. ANGIOSPERMS.

A. DICOTYLEDONS.

i. Polypetalæ.

a. Thalamifloræ.

1. Pistil apocarpous (carpels embedded in the receptacle in *Nymphæaceæ*). Flowers regular, bisexual (unisexual in *Menispermaceæ*).

I. **Ranunculaceæ** (*Ranunculus*). Herbs with radical and alternate leaves. Calyx often petaloid ; stamens and carpels indefinite. Fruit a head of achenes.

II. **Menispermaceæ.** Twining shrubs with alternate exstipulate leaves. Flowers small, dioecious or polygamous, usually 3-merous ; stamens 6, in two series, opposite the petals ; staminodes present or 0 in the female flowers ; carpels 3.

III. **Nymphaeaceæ.** Aquatic herbs with usually large peltate leaves. Sepals 4-5 ; petals and stamens many ; carpels many, in pits of the torus or confluent with it. Fruit a spongy berry or of nuts sunk in the pits of a turbinate torus.

2. Pistil syncarpous, 1-celled (2-celled in *Polygala*) ; placentas parietal (meeting in the middle to form a 2-celled fruit in *Cruciferæ*).

IV. **Papaveraceæ.** Herbs with milky or coloured latex. Leaves alternate, exstipulate. Flowers regular ; sepals 2 or 3, caducous ; petals 4 or 6 ; stamens indefinite, free ; ovary 1-celled ; ovules many, on parietal placentas which project into the ovary. Fruit a capsule.

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[1] Corolla is present in some *Euphorbiaceæ* and *Illecebraceæ*.

V. **Fumariaceæ.** Herbs with watery juice and much divided leaves. Flowers small, zygomorphic; sepals 2, small, scale-like; petals 4, in usually two very dissimilar pairs; 2 outer large, one gibbous or spurred; stamens 2, tripartite; ovary 1-celled; ovules 2 or more on parietal placentas. Fruit indehiscent, 1-seeded.

VI. **Cruciferæ.** Herbs with alternate, exstipulate leaves. Flowers regular; sepals 4; petals 4, arranged in a cruciform manner, rarely 0; stamens tetradynamous, sometimes less; ovary usually 2-celled by the projection inwards of the parietal placentas; ovules generally many. Fruit a siliqua or silicula, rarely indehiscent or transversely septate.

VII. **Capparidaceæ.** Herbs, shrubs or trees, with alternate, simple or compound leaves; stipules modified into spines in *Capparis*. Flowers regular or irregular; sepals 4; petals 4; stamens 4-many, at the base of or on a long or short gynophore; ovary sessile or stalked, 1-celled; ovules many, on 2–4 parietal placentas. Fruit capsular or baccate.

VIII. **Resedaceæ** (*Oligomeris*). Herbs with linear fascicled leaves. Flowers small, in spikes; calyx 4-partite; petals 2, free or connate; stamens 3–8; ovary 4-lobed, open above; ovules many, on 4 parietal placentas. Fruit a capsule.

IX. **Violaceæ.** Herbs with alternate, usually stipulate leaves. Flowers irregular; sepals 5, imbricate, persistent; petals 5, lowest largest, spurred or saccate at the base; stamens 5; ovary 1-celled with 3 parietal placentas. Fruit a 3-valved capsule.

X. **Polygalaceæ.** Herbs with simple entire alternate exstipulate leaves. Flowers irregular; sepals 5, unequal, the 2 inner petaloid; petals 3, the anterior keel-shaped and generally crested; stamens 8, united in their lower half; ovary 2-celled, with one pendulous ovule in each cell. Capsule 2-celled, 2-seeded.

3. Ovary syncarpous, 1-celled; ovules on free central or basal placentas.

XI. **Caryophyllaceæ.** Herbs. Leaves opposite, simple; stipules 0 or scarious. Flowers regular, in dichasial cymes; sepals 4–5, free or connate; petals 4–5, rarely 0; stamens usually twice the petals, sometimes less; ovary usually unilocular, at least in the lower part; styles 2–5; ovules 2–many, on basal funicles or on a free central column. Fruit a 2–6-valved capsule. Embryo curved round the mealy perisperm.

XII. **Portulacaceæ.** Succulent herbs with entire leaves having scaly or hairy nodal appendages. Flowers regular; sepals 2, connate below, the free portion deciduous; petals 4–6, perigynous; stamens 4–many, perigynous; ovary ½-inferior. Fruit a capsule dehiscing transversely.

XIII. **Tamaricaceæ.** Shrubs or trees with minute alternate exstipulate leaves. Flowers bisexual or unisexual, regular; sepals and petals and stamens mostly 5; ovary 1-celled; ovules many, basal. Fruit a 3-valved capsule. Seeds with a tuft of hairs.

4. Ovary syncarpous, 2–many-celled; placentation axile.

XIV. **Elatinaceæ.** Herbs or undershrubs. Leaves opposite. Flowers minute, regular; sepals and petals 5; stamens 5 or 10; ovary 3–5-celled; cells many-ovuled. Fruit a 3–5-valved septicidal capsule.

XV. **Malvaceæ.** Herbs, shrubs or trees, generally with stellate hairs and mucilaginous juice. Leaves alternate, stipulate. Flowers regular, usually bisexual; sepals 5, valvate, free or connate; epicalyx often present; petals 5, twisted; stamens many, monadelphous; anthers 1-celled; ovary 2–many-celled; ovules 1, 2 or many in each cell, axile. Fruit schizocarpic or capsular.

XVI. **Tiliaceæ.** Herbs or shrubs. Leaves usually alternate, simple, stipulate. Flowers mostly bisexual, regular; sepals 5 or 4, free or connate; petals 5 or 4; stamens usually many, free; anthers 2-celled; ovary 2–5-celled; ovules 2–many in each cell; style simple. Fruit capsular.

b. **Discifloræ.**

XVII. **Zygophyllaceæ.** Herbs with alternate or opposite leaves. Flowers regular, bisexual; sepals and petals 4-5, free, imbricate; stamens 10–15, inserted at the base of the lobed disk; ovary 2–12-lobed and -celled; ovules 2–many in each cell. Fruit schizocarpic or capsular.

XVIII. **Geraniaceæ** (*Oxalis*). Herbs with 3-foliolate leaves and acid taste. Flowers regular, bisexual; sepals 5, imbricate; petals 5, contorted; stamens 10; disk 0; ovary 5-celled; cells few- or many-ovuled. Fruit a capsule.

XIX. **Rutaceæ.** Trees or shrubs. Leaves simple or compound, exstipulate, dotted with pellucid glands. Flowers bi- or uni-sexual, regular; sepals and petals generally 4-5; disk large or small; stamens definite or many; ovary 4–10-celled; ovules 1, 2 or many in each cell. Fruit fleshy.

XX. **Meliaceæ.** Trees with alternate exstipulate compound leaves. Flowers regular, bisexual; calyx 5-6-lobed; petals 5-6; stamens 5-12, monadelphous or free; disk annular; ovary 3–6-celled; ovules 1–many in each cell. Fruit capsular or drupaceous.

XXI. **Rhamnaceæ.** Trees or shrubs. Leaves alternate, simple, with 3–5 main nerves; stipules spinose. Flowers bisexual, regular; calyx 4-5-lobed, segments valvate; petals 4-5, small, sometimes 0;

disk lining the calyx-tube; stamens 4-5, opposite the petals; ovary 2–4-celled, with 1 ovule in each cell. Fruit indehiscent.

XXII. **Anacardiaceæ.** Trees with alternate, simple, exstipulate leaves. Flowers male and bisexual; calyx 4-5-partite; petals 4-5; disk fleshy, 5-lobed; stamens 4-5, one only perfect; ovary 1-celled, 1-ovuled. Fruit a drupe.

c. Calycifloræ.

1. Ovary superior, of 1-many free carpels.

XXIII. **Papilionaceæ.** Herbs, shrubs or trees, often climbing. Leaves, alternate, stipulate, simple or compound. Flowers bisexual, zygomorphic; sepals 5, generally more or less connate; petals 5, imbricate, posterior outermost and usually largest, two anterior innermost and connate; stamens 10 or 9, diadelphous or monadelphous, rarely free; carpel 1; ovules 1–many on the ventral suture. Fruit a legume, sometimes indehiscent or lomentaceous. Endosperm generally absent.

XXIV. **Caesalpiniaceæ.** Like *Papilionaceae*, but petals sometimes fewer by abortion and the posterior innermost in bud (just the reverse of what is found in the *Papilionaceae*); stamens 10 or fewer by abortion, sometimes many, free or variously connate.

XXV. **Mimosaceæ.** Trees or shrubs. Leaves bipinnate. Flowers small, bisexual, rarely polygamous, regular, actinomorphic, 4- or 5-merous; calyx generally tubular; lobes valvate; petals also usually valvate and connate below; stamens as many or twice as many as petals or numerous, free or connate below, usually exserted; gynæcium, fruit and seeds as in *Papilionaceae*.

XXVI. **Rosaceæ** (*Potentilla*). Herbs with alternate, compound, stipulate leaves. Flowers regular, bisexual; calyx 5-lobed; petals 5; stamens many, free; carpels few to many, free; ovules solitary. Achenes on a dry receptacle.

2. Ovary inferior or included in the calyx-tube, syncarpous; style simple.

XXVII. **Cactaceæ.** Stems flattened, jointed, succulent, prickly, apparently leafless. Flowers large, regular; sepals and petals alike, in several series; stamens numerous; ovary inferior, 1-celled; placentas 3 or more, parietal. Fruit a succulent berry.

XXVIII. **Combretaceæ.** Trees or shrubs with simple exstipulate leaves. Flowers regular, bisexual; sepals 5, superior; petals 5 or 0; stamens 10, 2-seriate; ovary 1-celled, inferior; ovules 1-5, pendulous from the top. Fruit indehiscent, generally angled or winged.

XXIX. **Myrtaceæ.** Trees or shrubs with simple, entire, usually gland-dotted leaves. Flowers regular, bisexual; calyx 4-5-lobed; petals

4-5, free or united in a cap ; stamens many, epigynous ; ovary inferior, 2–4-celled ; cells many-ovuled ; style simple. Fruit capsular or fleshy.

XXX. **Lythraceæ.** Herbs, shrubs or trees. Leaves commonly opposite, exstipulate. Flowers bisexual, regular ; calyx-tube free, persistent, 3–6 or more-lobed ; petals 3–6 or 0, inserted near the top of the calyx-tube ; stamens 4–many, inserted on the calyx-tube ; ovary free, in the bottom of the calyx-tube, 2–6-celled ; ovules numerous ; style simple. Fruit generally a many-seeded capsule.

XXXI. **Onagraceæ** (*Trapa*). Floating herbs. Leaves alternate. Flowers regular, bisexual ; calyx-lobes 4, valvate ; petals 4 ; stamens 4, epigynous ; ovary ½-inferior, 2-celled ; ovules solitary in each cell. Fruit indehiscent, 1-seeded.

3. Ovary inferior or superior, syncarpous (apocarpous in *Gisekia*), 1–5-celled ; styles free or only connate below.

XXXII. **Cucurbitaceæ.** Large, weak, cirrose herbs. Leaves alternate, simple, lobed or compound. Flowers regular, unisexual ; calyx-tube short, 5-lobed ; petals 5, usually connate ; stamens 3, on the calyx-tube ; anthers free or connate ; cells usually conduplicate ; ovary inferior, 1-celled ; placentas 3, fleshy, often meeting in the centre ; stigmas 3 ; ovules many. Fruit fleshy.

XXXIII. **Ficoideæ.** Herbs with simple, opposite or whorled leaves. Flowers regular, bisexual ; sepals 5 ; petals 0 ; stamens perigynous or [illegible] 3–20 ; ovary free, 1–5-celled with many ovules or of 5 free 1-ovuled carpels. Fruit capsular or of 5 achenes. Seeds reniform ; embryo curved round the mealy perisperm.

XXXIV. **Umbelliferæ.** Herbs with alternate, simple or compound, exstipulate leaves, usually with sheathing bases. Flowers in simple or compound umbels, bisexual, regular or corolla of outer flowers of an umbel rayed ; calyx superior, limb 5-fid or 0 ; petals 5, often inflexed, free ; stamens 5, epigynous, free ; ovary 2-celled, crowned with a large epigynous disk ; styles two ; ovules solitary in each cell, pendulous. Fruit of two indehiscent mericarps, pendulous from the summit of the carpophore.

ii. Gamopetalæ.

1. Ovary inferior.

XXXV. **Rubiaceæ** (*Galium*). Herbs with simple, entire leaves, in whorls of 3–8. Flowers bisexual, regular ; corolla 4-5-lobed ; stamens 4-5, epipetalous ; ovary inferior, 2-celled ; ovules solitary in each cell ; styles 2.

XXXVI. **Compositæ.** Herbs or shrubs. Flowers arranged in a head on a common receptacle and surrounded by an involucre of bracts,

all tubular, or the outer or all ligulate ; calyx superior, limb of hairs, scales or 0 ; corolla tubular in disk flowers, with 4 or 5 valvate lobes, ligulate in ray flowers ; stamens 5, epipetalous, syngenesious ; ovary inferior, 1-celled ; ovule 1, basal, erect. Fruit an achene, with or without pappus.

XXXVII. **Campanulaceæ.** Herbs. Leaves simple, alternate, exstipulate. Flowers regular, bisexual ; calyx superior or ½-superior, limb 5-partite ; corolla 5-lobed, lobes valvate ; stamens 5, epipetalous ; anthers free or connate ; ovary 2-3-celled, many-ovuled ; stigma 2-3-lobed. Fruit a many-seeded capsule.

2. Ovary superior ; placentation free central.

XXXVIII. **Primulaceæ.** (*Anagallis*). Herbs with opposite, exstipulate leaves. Flowers regular, bisexual ; calyx 5-lobed, persistent ; corolla 5-lobed, lobes imbricate ; stamens 5, epi- and anti-petalous ; ovary 1-celled ; ovules many, on a free central column. Fruit capsular.

3. Ovary superior ; placentation not free central ; flowers regular ; leaves opposite (see also *Solanaceæ* and *Plantaginaceæ*).

XXXIX. **Salvadoraceæ.** Trees or shrubs with opposite, entire, exstipulate leaves. Flowers small, bisexual or functionally unisexual ; calyx 4-partite ; corolla 4-lobed ; stamens 4, epipetalous ; ovary 1-celled, with a solitary erect ovule. Fruit a 1-seeded drupe.

XL. **Asclepiadaceæ.** Herbs or shrubs with milky juice, often twining. Leaves opposite, exstipulate, entire. Flowers regular, bisexual ; calyx with 5 imbricate lobes ; corolla 5-lobed ; corona simple or of 5 or more scales, either corolline or staminal ; stamens 5, epipetalous ; filaments usually connate into a fleshy tube ; anthers 2-celled, coherent round the stigma ; pollen forming a pollinium in each cell, rarely granular ; pollinia of contiguous cells of different anthers attached to glands at the angles of the stigma ; carpels 2, free, enclosed in the staminal-tube, many-ovuled ; styles 2 ; stigma 1, disk-like. Fruit of two follicles. Seeds crowned with a large tuft of hairs.

XLI. **Gentianaceæ.** Herbs with opposite exstipulate leaves. Flowers regular, bisexual ; calyx 4-5-partite ; corolla 4-5-lobed ; stamens 4-5, epipetalous ; ovary 1-celled ; ovules many, on two parietal placentas ; style simple ; stigmas 2. Fruit a many-seeded capsule.

4. Ovary superior ; placentation not free central ; flowers regular ; leaves alternate.

XLII. **Boraginaceæ.** Herbs, shrubs or trees. Leaves alternate (sub-opposite in *Cordia Rothii*), mostly entire, exstipulate. Flowers,

bisexual, regular; calyx 4–8, usually 5-, lobed, persistent; corolla generally 5-lobed, lobes imbricate; stamens as many as the corolla-lobes, epipetalous; ovary 2-celled, with 2 ovules in each cell, or 4-celled, with 1 ovule in each cell; style commonly gynobasic. Fruit drupaceous or of 2–4 nutlets.

XLIII. **Convolvulaceæ.** Herbs or shrubs, generally twining. Leaves alternate (absent in *Cuscuta*). Flowers regular, bisexual; calyx of 5 sepals or 5-partite, persistent; corolla campanulate or funnel-shaped, plaited or contorted in bud; stamens 5, epipetalous; ovary often surrounded by an annular disk, 2-celled, with 2 ovules in each cell, or 4-celled with one ovule in each cell; style simple or 2-fid; stigmas 2. Fruit capsular, opening by valves or a lid, or indehiscent.

XLIV. **Solanaceæ.** Herbs or under-shrubs. Leaves alternate (rarely in unequal pairs), simple. Calyx 5-cleft, persistent, often accrescent; corolla 5-lobed; stamens 5, epipetalous; ovary 2-celled or 4-celled; ovules many on large axile placentas. Fruit many-seeded, a berry or capsule.

5. Ovary superior; placentation not free central; flowers zygomorphic.

XLV. **Scrophulariaceæ.** Herbs. Leaves opposite or all or the upper alternate. Flowers zygomorphic, bisexual; calyx 5-fid or -partite; corolla 4-5-lobed, generally 2-lipped, lobes imbricate; stamens 4, or 2, or 5; ovary 2-celled; ovules many; placentas axile, generally large; style simple; stigmas 2. Fruit a many-seeded capsule.

XLVI. **Orobanchaceæ.** Herbaceous root-parasites of a yellowish colour. Leaves only scaly. Flowers on a scape, bisexual, zygomorphic; calyx 5-partite or spathulate; corolla-tube funnel-shaped, with 5 imbricate lobes; stamens 4, didynamous; anthers cohering in pairs, 1- or 2-celled; ovary 1-celled; ovules many, on 2 or 4 parietal placentas. Fruit a many-seeded capsule, opening by valves.

XLVII. **Acanthaceæ.** Herbs with opposite, exstipulate, simple leaves. Flowers zygomorphic, bisexual, generally with conspicuous bracts and bracteoles; calyx 4-5-partite; corolla 2-lipped; stamens 4 or 2, epipetalous; anthers 2-celled; ovary 2-celled; ovules 1 or more, superposed in each cell; stigmas often of unequal size. Fruit a loculicidal capsule. Seeds often on hook-like processes (retinaculæ).

XLVIII. **Verbenaceæ.** Herbs, shrubs or trees with generally opposite or whorled, exstipulate leaves. Flowers zygomorphic, bisexual, in heads, spikes or racemes; calyx persistent, usually 4-5-toothed; corolla 4-5-lobed, bilabiate or not; stamens generally 4, didynamous; disk present; ovary 2–4-celled (sometimes 1-celled in *Verbena*); ovules 1 or 2 in each cell (4 in *Verbena*). Fruit drupaceous, rarely capsular.

XLIX. **Labiatæ.** Usually aromatic herbs or undershrubs. Leaves opposite, exstipulate. Flowers zygomorphic, bisexual, usually in axillary cymose clusters; calyx persistent, 4-5-cleft or bilabiate; corolla mostly bilabiate; stamens 4, didynamous, or 2; disk present; ovary 4-lobed, 4-celled; ovule 1 in each cell; style gynobasic. Fruit of 4 small indehiscent nutlets.

6. Ovary superior; placentation not free central; calyx, corolla and androecium 4-merous; corolla scarious.

L. **Plantaginaceæ.** Scapigerous herbs with radical leaves. Flowers in spikes, bisexual, regular; sepals 4, imbricate, persistent; corolla scarious, tubular, 4-lobed; stamens 4, epipetalous; filaments long, flexuous; ovary 2-celled; ovules many in each cell. Fruit a capsule opening transversely.

iii. Monochlamydeæ.

LI. **Nyctaginaceæ** (*Boerhaavia*). Herbs with opposite, exstipulate leaves. Flowers small, bisexual; perianth 5-lobed, coloured, tube persistent; stamens 1–5, hypogynous, exserted; ovary 1-celled, with 1 erect ovule. Fruit membranous, enclosed in the hardened perianth-tube.

LII. **Illecebraceæ** (*Herniaria*). Small, tufted herbs. Leaves opposite or upper alternate, narrow, with scarious stipules. Flowers minute, in green axillary clusters; calyx 4-5-partite, persistent, closing over the fruit; petals 4-5, minute, setaceous or 0; disk annular; stamens 5; ovary superior, 1-celled, with 1 erect ovule; style 2-fid. Fruit a small nut. Embryo annular, enclosing the mealy perisperm.

LIII. **Amarantaceæ.** Herbs or undershrubs. Leaves opposite or alternate, exstipulate, simple. Flowers uni- or bisexual, generally with scarious bracts or bracteoles; perianth-leaves 3–5, generally scarious, imbricate, persistent; stamens mostly 3–5, opposite the perianth leaves, filaments free or connate, or united with intervening staminodes into a hypogynous cup; anthers 1- or 2-celled; ovary superior, 1-celled; ovule 1; styles 1–3. Fruit a small nut, occasionally opening by a lid. Embryo annular, enclosing the mealy perisperm.

LIV. **Chenopodiaceæ.** Herbs or shrubs with simple, alternate, exstipulate leaves. Flowers small, 1- or 2-sexual; perianth-segments 3–5, rarely in female flowers 0, free or connate, imbricate, generally herbaceous, persistent; stamens mostly as many as and opposite the perianth-segments, hypogynous or perigynous; ovary superior, 1-celled, 1-ovuled; stigmas 2–5. Fruit a small nut or achene enclosed within

the perianth. Seeds with or without perisperm ; embryo annular or spirally coiled.

LV. **Polygonaceæ.** Herbs with alternate, usually ochreate leaves. Perinath-segments 5 or 6, often coloured, persistent ; stamens 5–8 : ovary superior, 2-3-gonous, 1-celled ; ovule 1, basal, orthotropous ; styles 2 or 3. Fruit a small nut, generally enclosed in the perianth.

LVI. **Euphorbiaceæ.** Herbs, shrubs or trees, often with milky juice. Leaves alternate or opposite, simple or rarely compound. Flowers small or minute, always 1-sexual (in *Euphorbia*, the males consisting of single naked stamens surround a female consisting of a solitary pistil and the whole surrounded by a perianth-like involucre formed by united bracts) ; perianth single, rarely double or 0 ; disk often present ; stamens 1 or more ; ovary superior, generally 3-celled ; ovules 1 or 2 in each cell, axile. Fruit schizocarpic, rarely drupaceous. Seeds albuminous, with or without an aril.

LVII. **Urticaceæ.** Shrubs or tree, often with milky juice. Leaves alternate, stipulate. Flowers unisexual, small or minute, often sunk in a fleshy disk or enclosed in a fleshy receptacle ; perianth gamophyllous, lobed or partite ; stamens as many as and opposite the perianth-segments or fewer ; ovary superior, 1-celled, 1-ovuled. Fruit simple achenial, or compound of confluent pericarps, perianths and the inflorescence axis.

LVIII. **Salicaceæ.** Dioecious trees or shrubs. Leaves alternate, stipulate. Flowers in catkins, bracteate ; perianth 0 ; disk of glands or cupular ; stamens 2–many ; ovary 1-celled, with many ovules on 2–4 parietal placentas. Fruit a capsule opening by 2–4 valves. Seeds with a basal tuft of long silky hairs.

B. Monocotyledons.

1. Ovary inferior.

LIX. **Hydrocharitaceæ.** Aquatic herbs. Flowers monoecious or dioecious, enclosed in an entire or toothed spathe ; sepals 3, green or petaloid ; petals 3 or 0 ; stamens 3–12 ; anthers 2-celled ; ovary inferior, 1-celled, with 3–6 parietal placentas ; styles or style-arms 3–6. Fruit fleshy or membranous. Seeds exalbuminous.

LX. **Orchidaceæ.** Terrestrial herbs. Flowers zygomorphic, bisexual ; perianth-segments 6, in two series, inner or both petaloid, one of the inner greatly modified and different from the rest ; stamen 1, confluent with the style in a column ; anther 2-celled ; pollen grains cohering into pollinias ; ovary inferior, 1-celled, with 3 parietal placentas, generally resupinate. Fruit a loculicidal capsule. Seeds minute ; embryo not differentiated before germination.

LXI. **Scitamineæ.** Perennial herbs, sometimes quite large. Flowers zygomorphic, bisexual; perianth in two whorls, inner or both petaloid; fertile stamens 1–5; ovary inferior, generally 3-celled; style not adnate to any stamen, generally long; ovules a few or many. Fruit capsular or baccate.

2. Ovary superior.

LXII. **Liliaceæ.** Terrestrial herbs. Flowers bisexual, regular; perianth-segments 6, free or connate, 2-seriate, petaloid; stamens 6, hypogynous or on the perianth; ovary superior, 3-celled; cells 2- or more-ovuled. Fruit capsular. Seeds albuminous.

LXIII. **Pontederiaceæ.** Aquatic herbs. Leaves generally with spongy swollen petioles. Flowers bisexual, zygomorphic; perianth in 2 whorls; inner larger, corolline; stamens 6; ovary superior, 3-celled; ovules many. Capsule 3-valved.

LXIV. **Commelinaceæ** (*Commelina*). Terestrial herbs. Leaves alternate, sheathing at the base. Flowers more or less zygomorphic, bisexual; perianth-segments 6, corolline, 2-seriate, inner larger; stamens 6, only 3 perfect; filaments often bearded; ovary superior, 3-celled; cells 1- few-ovuled. Fruit a loculicidal capsule.

LXV. **Juncaceæ** (*Juncus*). Herbs. Leaves terete or compressed, sheathing, often reduced to mere sheaths. Flowers bisexual, bracteate, green, or whitish and membranous, or brown and coriaceous; perianth-segments 6, 2-seriate, persistent; stamens 6, rarely 3; ovary superior, 3-celled, rarely 1-celled; ovules many. Fruit a 3-valved loculicidal capsule.

LXVI. **Palmæ** (*Phoenix*). Dioecious trees with a columnar stem and a crown of pinnate leaves. Inflorescence large, at first enclosed in coriaceous spathes. Flowers 1-sexual, regular; perianth-segments 6, 2-seriate; stamens 6, at the base of perianth-segments; anthers versatile; ovary superior, of 3 free carpels. Fruit a berry.

LXVII. **Typhaceæ.** Marshy perennial herbs. Leaves linear, erect, distichous, thick and spongy. Flowers monoecious, minute, densely crowded in cylindrical bracteate spikes; perianth of fine hairs or 0; stamens in male flowers 2–5; filaments capillary; anthers erect, 2-celled; ovary in female flowers 1-celled, 1-ovuled. Fruits minute.

LXVIII. **Araceæ.** Perennial herbs with radical leaves, sometimes scandent and leaves alternate. Flowers 1- or 2-sexual, sessile on a spadix enclosed in a green or coloured spathe, when 1-sexual, the female flowers in the lower part of the spadix; perianth 0 or not prominent; stamens in male flowers 1–8, free or connate; anthers 2-4-celled; ovary in female flowers sessile, 1–3-celled; cells 1- or more-ovuled. Fruit a 1- or a few-seeded berry.

LXIX. **Lemnaceæ.** Small or minute, floating, green, thalloid plants, rootless or with a few simple roots. Flowers monoecious, very minute, in fissures of the frond, naked or in a sheath; perianth 0; stamens in male flowers 1 or 2; anther 1- or 2-celled; ovary in female flowers 1-celled; ovules 1 or more. Fruit a membranous utricle.

LXX. **Alismaceæ.** Marsh or aquatic herbs, with radical, erect or floating leaves. Flower 2- or 1-sexual or polygamous; perianth-segments 6, 2-seriate, outer sepaloid, inner petaloid; stamens 6 or more, free, hypogynous; carpels 3, 6 or many, free, 1-ovuled. Fruit a cluster of small achenes.

LXXI. **Naiadaceæ.** Aquatic herbs. Root-stock creeping. Stems elongate, branched. Leaves with sheathing bases; stipules 0 or axillary within the sheath. Flowers inconspicuous, 1- or 2-sexual; perianth tubular, or of 2–4 segments, or 0; stamens mostly 1–4, hypogynous; anthers 1–4-celled; ovary superior, of 1–4 one-ovuled free carpels. Fruit of 1–4 one-seeded achenes or drupelets.

II. GYMNOSPERMS.

LXXII. **Gnetaceæ.** (*Ephedra*). Erect or scandent shrubs with jointed stems. Leaves minute, generally scaly, sometimes green, sheathing at the base, in whorls of 2 or 3. Flowers small, 1-sexual; male in small bracteate spikes, with 2-lobed perianth and 2–8 2-celled stamens sessile on a central column; female mostly in groups of 2, bracteate, 1-ovuled, enclosed by perianth which becomes fleshy in fruit.

I. RANUNCULACEÆ.

Annual or perennial herbs, rarely climbing shrubs. Leaves radical or alternate, rarely opposite, simple or compound; stipules 0 or adnate to the petiole. Flower regular or irregular, usually 2-sexual, hypogynous; sepals usually 5, free, petaloid when the petals are wanting, or rudimentary, imbricate, rarely valvate; petals 0, or 3–5 or more, imbricate; stamens numerous, free; anthers dehiscing by longitudinal slits; carpels usually many, free, 1-celled; stigma simple; ovules 1 or more on the ventral suture, pendulous or erect. Fruit of numerous 1-seeded achenes or many-seeded follicles, rarely a capsule or berry. Seed albuminous; embryo minute.—*Genera about* 30, *species about* 300, *distributed chiefly in cold parts of the world.*

Ranunculus *Linn.*

Annual or perennial herbs. Leaves entire, lobed or dissected; stipules membranous or 0. Flowers usually panicled, yellow; sepals 3–5, green, reflexed, caducous, imbricate in bud; petals usually 5, with pocket-like nectaries at the base on the upper surface, rarely 0; stamens many; carpels many, with short style and a solitary ascending ovule. Fruit a head or spike of beaked or apiculate achenes.

Key to the species.

Heads of achenes oblong, achenes turgid	1.	*R. sceleratus.*
Heads of achenes globose, achenes flattened.		
Achenes smooth or granular; plant very hairy	2.	*R. pensylvanicus.*
Achenes tuberculate or spinous, rarely smooth; plant glabrous or slightly hairy.		
Radical leaves not divided to the rachis	3.	*R. muricatus.*
Radical leaves divided to the rachis	4.	*R. sardous.*

1. **R. sceleratus** *Linn.*; *Fl. Brit. Ind., I, p.* 19. An erect glabrous annual. Stem 2 ft. or more high, much divided, succulent, hollow. Radical leaves long-stalked, 3-partite, segments lobed, obtusely toothed near the top; cauline shortly stalked or sessile, 3-fid, with linear segments. Achenes numerous, small, in oblong cylindrical heads, turgid, glabrous, 1/25 in. long, beak small; fruiting receptacle pilose. (Fig. 1.)

Common, particularly near water. Flowers: Feb.–April.

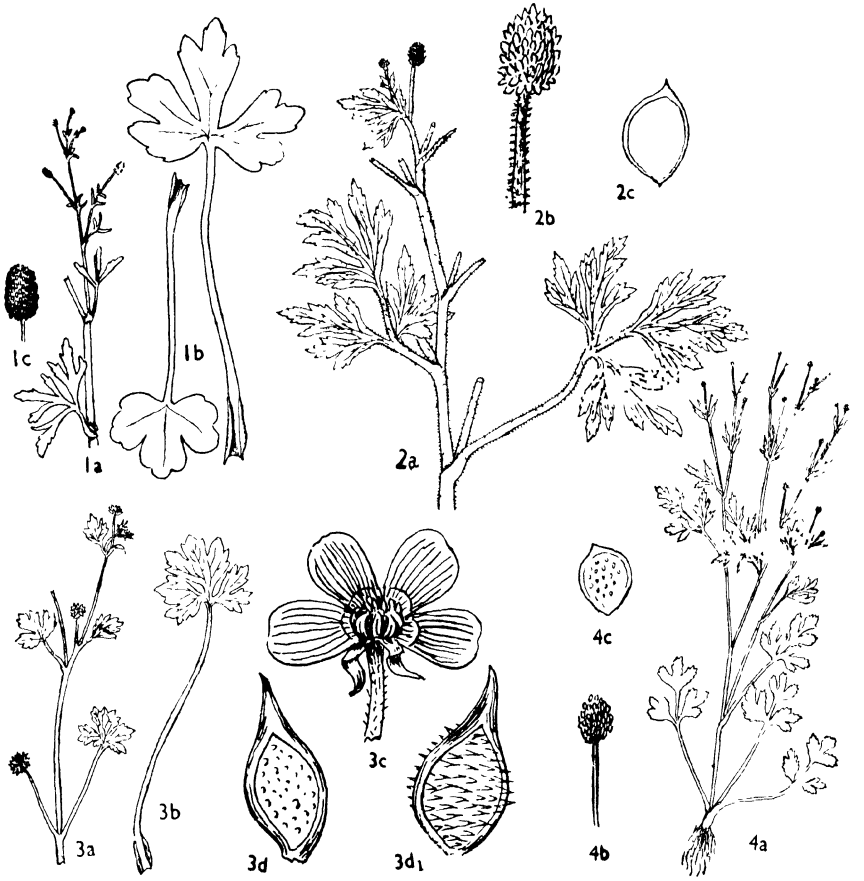

Fig. 1, *Ranunculus sceleratus*, (*a*) a twig, $\times \frac{1}{4}$, (*b*) two leaves, $\times \frac{1}{2}$, (*c*) a head of achenes, $\times 2$; Fig. 2, *Ranunculus pensylvanicus*, (*a*) a twig, $\times \frac{1}{4}$, (*b*) a head of achenes, $\times 1$, (*c*) a single achene, $\times 4$; Fig. 3, *Ranunculus muricatus*, (*a*) a twig, $\times \frac{1}{3}$, (*b*) leaf, $\times \frac{1}{3}$, (*c*) a flower with one petal removed, $\times 2$, (*dd'*), two achenes, $\times 3$; Fig. 4, *Ranunculus sardous*, (*a*) a plant, $\times \frac{1}{6}$, (*b*) a head of achenes, $\times 1$, (*c*) achene, $\times 4$.

2. **R. pensylvanicus** *Linn.*; *Fl. Brit. Ind.*, *I*, *p.* 19. An erect very hairy annual; hairs spreading. Stem up to 2 ft. tall, branched.

Radical leaves long-stalked, up to 1 ft. in length including the petiole, ternatisect, segments stalked and again deeply 3-lobed, lobes irregularly divided; upper cauline leaves sessile. Peduncles leaf-opposed, up to about 1 in. long. Head of achenes globose or ovoid, 1/2 to 2/5 in. in diameter; achenes 1/10 in. across, suborbicular or ovoid, with an intramarginal rib; surface smooth or granular; beak very short; fruiting receptacle oblong, hairy. (Fig. 2.)

Very common. Flowers: March-April.

3. **R. muricatus** *Linn.*; *Fl. Brit. Ind., I, p.* 20. An erect glabrous annual, 1 ft. or more high. Radical leaves long-stalked, up to 6 in. long including the petiole; lamina 1-2 in. broad, 3-fid, segments irregularly and shortly lobed, base more or less cordate. Peduncles leaf-opposed, about 1 in. long. Heads of achenes globose, 1/2 to 3/4 in. in diameter; achenes large, flat, 1/5 in. by 1/8 in. without the beak; beak hooked, 1/10 in. long; surface tuberculate or spinous near the margin or all over, rarely smooth; fruiting receptacle small, hairy. (Fig. 3.)

Very common. Flowers: Feb.–April.

4. **R. sardous** *Crantz.*; *Strip. Austr., ed. I, fasc. ii,* 84. An erect branched annual, up to 1½ ft. high, sparsely hairy or glabrous; hairs particularly conspicuous at the sheathing leaf-bases. Radical leaves long-stalked, up to 7 in. including the petiole, ternatisect, with the terminal pinna long-stalked and the lateral pinnæ sessile or shortly-stalked, the terminal and sometimes the lateral pinnæ also deeply 3-lobed, lobes irregularly divided; upper cauline sessile or shortly-stalked. Peduncles leaf-opposed, up to 2 in. long. Head of achenes globose; achenes 1/10 in. in diameter, flat, suborbicular, with an intramarginal rib, tuberculate; beak almost absent; fruiting receptacle oblong, hairy. (Fig. 4.)

Common in grass plots. Greatly resembles *R. pensylvanicus*, but quite or nearly glabrous and with tuberculate achenes.

Flowers: March-April.

II. MENISPERMACEÆ.

Climbing, rarely erect, shrubs or small trees. Leaves alternate, entire or lobed, usually palmi-nerved; stipules 0. Flowers small, hypogynous, dioecious or polygamous; sepals usually 6, imbricate, in 2 series, the outer often minute; petals usually 6, in 2 series; stamens as many as and opposite to the petals, hypogynous; filaments free or united in a column; reduced to staminodes or wanting in female flowers; carpels distinct, 3 or more, or only 1; ovule 1 in each carpel. Fruit drupaceous; style scar subterminal or by excentric growth near the base. Seed

hooked or reniform, often horse-shoe-shaped.—*Genera about* 30, *species about* 100, *mostly tropical.*

Cocculus *DC.*

Climbing or sarmentose shrubs, rarely sub-erect. Petiole not dilated at the base. Flowers panicled ; sepals 6, 2-seriate, outer smaller ; petals 6, smaller, usually auricled ; stamens (in male flowers) embraced by the petals, anthers subglobose, cells bursting transversely ; staminodes (in female flowers) 6 or 0 ; carpels 3–6 ; styles usually cylindric. Drupes laterally compressed ; endocarp horse-shoe-shaped, dorsally keeled and tubercled, sides excavate. Seed curved ; albumen fleshy ; embryo annular.

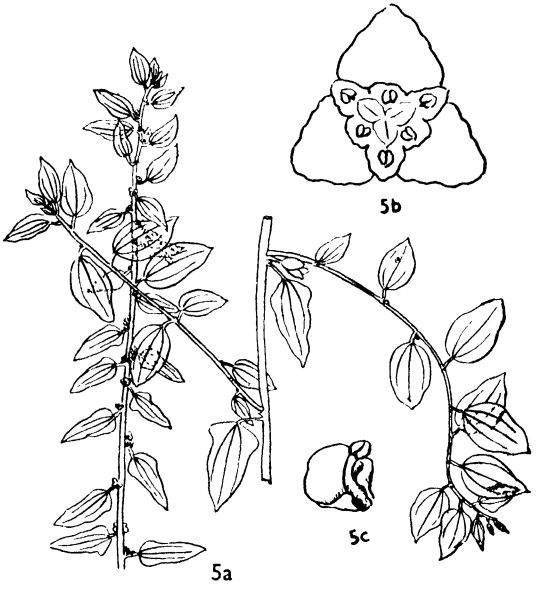

Fig. 5, *Cocculus Laeba*, (*a*) two twigs, $\times \frac{1}{2}$, (*b*) male flower, $\times 8$, (*c*) a petal and a stamen, $\times 10$.

C. Leæba *DC.* ; *Fl. Brit. Ind., I, p.* 102. A climbing shrub, grey pubescent. Leaves 1/2–2 in. long, ovate, ovate-oblong or narrowly oblong, sometimes lobed, cuneate or rounded at the base, mucronate. Flowers minute ; the male in dense axillary clusters ; the female axillary, solitary (rarely paired). Drupe obovoid, compressed, black. (Fig. 5.)

Not common. Flowers practically throughout the year.

Tinospora cordifolia *Miers.* ; *Fl. Brit. Ind., I, p.* 97. Vern., *Galo*, is sometimes cultivated.

III. NYMPHAEACEÆ.

Large aquatic herbs possessing perennial rootstock. Leaves usually floating, often peltate, margins involute before unfolding. Flowers solitary on long leafless scapes ; perianth parts and stamens all free,

hypogynous, or adnate to a fleshy disk surrounding or enveloping the carpels ; sepals 3–5 ; petals 3–5 or many ; stamens many ; carpels 3 or more, in one whorl, free or connate, or irregularly sunk in pits on the disk ; stigmas as many as the carpels, peltate or decurrent ; ovules 1-many, scattered over the walls of the cells. Fruit a berry formed from connate carpels, or of an enlarged top-like fleshy receptacle containing nut-like carpels in its crown. Seeds with or without an aril, albuminous or exalbuminous.—*Genera* 8, *species about* 40, *distributed in temperate and tropical countries.*

Key to the genera.

Leaves floating ; seeds albuminous	1. *Nymphaea.*
Leaves and flowers raised above water ; seeds exalbuminous	2. *Nelumbium.*

1. Nymphaea *Linn.*

Rootstock short, suberect or creeping. Leaves and flowers floating. Flowers large ; sepals 4 ; petals many-seriate, gradually passing into stamens ; all adnate to the disk ; filaments petaloid ; anthers small, linear, dehiscing lengthwise, introrse ; carpels many, sunk in the fleshy disk and with it forming a many-celled ovary crowned by connate radiating stigmas ; ovules many. Fruit a spongy berry, ripening under water. Seeds small, buried in the pulp.

Key to the species.

Leaves sharply toothed ; anthers without appendages	1. *N. Lotus.*
Leaves entire or obtusely toothed ; anthers with long appendages	2. *N. stellata.*

1. **N. Lotus** *Linn.* ; *Fl. Brit. Ind.*, *I*, *p.* 114. Leaves 6–12 in. across, on long cylindrical submerged petioles up to 7 ft. long, sharply sinuate-toothed, downy and mostly purple beneath, sagittate and entire when young. Flowers 4–10 in. in diameter , white or pink ; sepals oblong, obtuse, 5–10-ribbed ; petals oblong ; filaments broadly dilated at the base ; anthers without appendages. Fruit 1½ in. in diameter ; stigmatic rays with clubbed appendages. Seeds broadly ellipsoid, rough.—Vern., *Nilofar.*

At Kala Shah Kaku and near Shahdara.

2. **N. stellata** *Willd.* ; *Fl. Brit. Ind.*, *I*, *p.* 114. Leaves orbicular or elliptic, quite entire or obtusely sinuate-toothed, often blotched with

purple beneath. Flowers 5–10 in. in diameter, blue, white, rose or purple, slightly scented ; sepals not ribbed, but often streaked with short purple lines ; petals 10–30, linear-oblong or lanceolate, acute or acuminate ; stamens 10–50 ; anthers with long appendages ; stigmatic rays without appendages.

Not collected from the neighbourhood of Lahore so far, but may be expected to occur within the district.

2. Nelumbium *Juss.*

Large water herbs with milky juice. Rhizome stout, elongated, creeping. Leaves raised high above the water, peltate. Flowers rose-red or white, raised above water ; sepals 4–5, caducous ; petals hypogynous, many-seriate, caducous ; stamens many ; anthers with a club-shaped appendage ; carpels many, sunk in the flat top of an obconic fleshy receptacle ; styles shortly exserted ; stigmas terminal, dilated ; ovules 1-2 in each carpel, pendulous. Fruiting carpels ovoid, loose in the cavities of the enlarged spongy receptacle, 1-seeded ; pericarp bony, smooth. Seed exalbuminous ; testa spongy ; cotyledons fleshy, thick, enclosing the large folded plumule.

N. speciosum *Willd.* ; *Fl. Brit. Ind., I, p.* 116. Petiole 3–6 ft. long, smooth or with scattered prickles ; leaves 2-3 ft. in diameter, cup-like, smooth, shining. Flowers 4–10 in. in diameter, white or rose. Fruiting torus 2–4 in. in diameter—Vern., *Kanwal.*

Commonly cultivated in tanks. The rhizomes and the seeds are eaten. Flowers during the hot months.

Occasionally the pits containing the carpels are so shallow that the carpels are situated practically on the surface, thus showing clearly the apocarpous nature of the pistil.

IV. PAPAVERACEÆ.

Annual or perennial laticiferous herbs. Leaves radical or alternate, exstipulate. Flowers generally large, showy, nodding in bud, hermaphrodite ; sepals 2-3, hypogynous, caducous ; petals 4–6, in two whorls, crumpled in bud ; stamens indefinite ; filaments slender ; anthers erect, dehiscing by lateral slits ; ovary superior, 1-celled ; style short or 0 ; stigmas 2–8, free or connate into a radiating structure, above or alternating with the placentas ; placentas parietal, generally 2–8, protruding into the ovary ; ovules many-seriate. Fruit a capsule dehiscing by pores or valves. Seeds many, small, albuminous ; embryo minute.—*Genera* 17, *species about* 70, *chiefly natives of the north temperate zone.*

Key to the genera.

Not spinous ; perianth bimerous ; capsule opening by pores under the stigmatic lobes ..	1. *Papaver.*
Spinous all over ; perianth trimerous ; capsule opening by valves	2. *Argemone.*

1. **Papaver** *Linn.*

Annual or perennial, unarmed herbs ; juice milky. Leaves lobed or cut. Flowers large, on long peduncles, markedly nodding in the bud ; perianth bimerous ; ovary 1-celled ; stigma discoid or pyramidal, with radiating lobes above the large protruding placentas. Capsule opening by small pores under the persistent stigma-lobes. Seeds small, pitted.

1. **P. somniferum** *Linn.* ; *Fl. Brit. Ind.*, *I*, *p.* 117. An erect, glaucous annual, 2–4 ft. tall. Stem simple, rarely branched. Leaves ovate-oblong or linear-oblong, amplexicaul, lobed ; lobes dentate or serrate. Flowers generally white, or purple or scarlet. Capsule globose, glabrous, 1 in. in diameter, stalked ; stigmatic rays 5–12. Seeds white or black.—*The opium poppy* ; Vern., *Post.* (Fig. 6.)

Cultivated in fields.

P. Rhoeas *Linn.*; the field poppy of England with usually scarlet single or double flowers is commonly grown during winter as an ornamental annual.

2. **Argemone** *Linn.*

Erect glaucous spiny herbs ; juice yellow. Flowers large ; sepals generally 3 ; petals 6 ; stamens many ; ovary 1-celled ; style very short ; stigma 3–6-lobed ; ovules many on parietal placentas. Capsule prickly, dehiscing by short valves at the top. Seeds small.

A. mexicana *Linn.* ; *Fl. Brit. Ind.*, *I*, *p.* 117. 1-2 ft. high, simple or sparingly branched, spinous all over. Leaves sessile, half-amplexicaul, sinuate-pinnatifid, spiny-toothed, variegated green and white. Flowers yellow ; sepals horned at the top, prickly. Capsule 1-1½ in. long, elliptic or oblong, prickly. Seeds globose, pitted, beaked.—*Mexican or prickly poppy ;* Vern., *Kandiari* or *Kandiali.* (Fig. 7.)

Introduced from America, but common in fields and waste places. Flowers largely during March and April, but a few flowering specimens can be found practically throughout the year.

V. FUMARIACEÆ.

Annual or perennial herbs ; juice watery. Leaves usually divided. Flowers small, in racemes, irregular, transversely zygomorphic, herma-

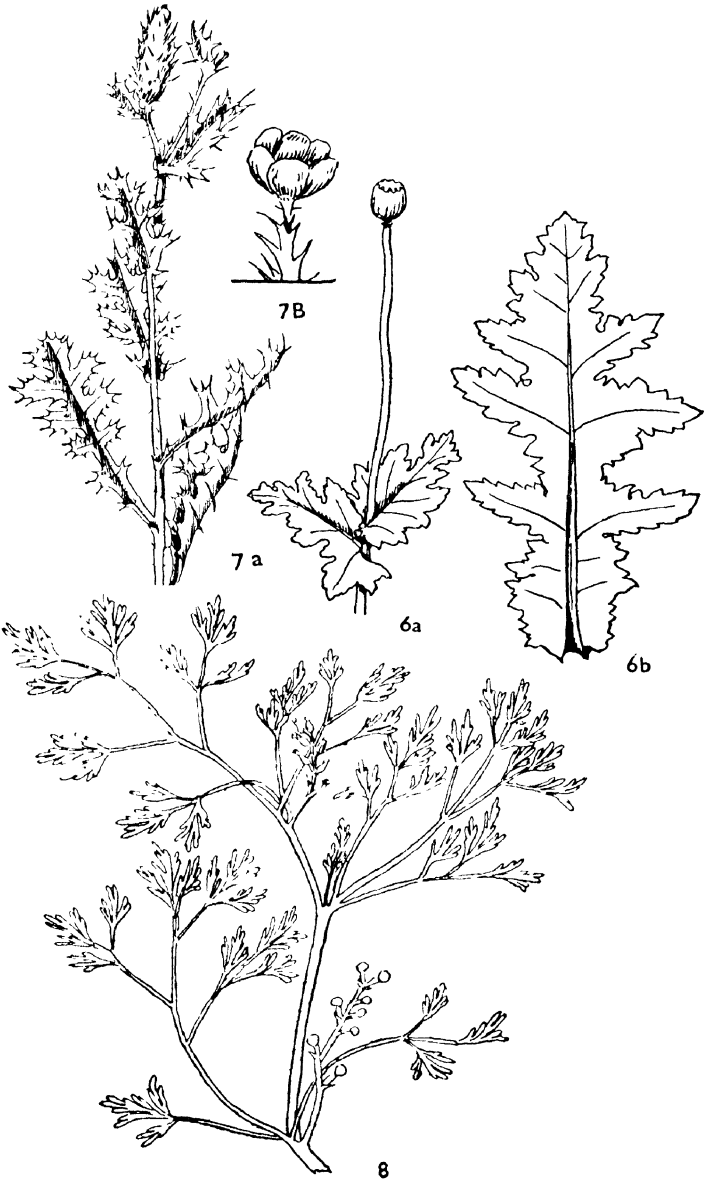

Fig. 6, *Papaver somniferum*, (*a*) a twig with a young capsule, $\times \frac{1}{3}$, (*b*) leaf, $\times \frac{1}{3}$; Fig. 7, *Argemone mexicana*, (*a*) a branch with rather small leaves and a fruit, $\times \frac{1}{3}$, (*b*) flower, $\times \frac{2}{3}$; Fig. 8, *Fumaria indica*, A branch bearing flowering and fruiting racemes, $\times \frac{2}{3}$.

phrodite ; sepals 2, small, scale-like, deciduous ; petals 4, in usually very dissimilar pairs ; 2 outer large, one or both gibbous or spurred ; 2 inner smaller, erect, tips often coherent ; stamens 2, opposite to the outer petals, tripartite ; anther of the central lobe 2-celled, of lateral lobes 1-celled ; ovary superior, 1-celled ; style long or short ; stigma obtuse or lobed ; ovules 2 or more, parietal. Fruit a 2-valved, few- or many-seeded capsule, or an indehiscent 1-seeded nut. Seed albuminous ; embryo minute.—*Genera* 7, *species about* 100, *distributed in the northern hemisphere.*

Fumaria *Linn.*

Annual, often scandent, usually branched herbs, rarely perennial. Leaves much divided, segments very narrow. Flowers small, white, rose-coloured or purplish, in terminal or leaf-opposed racemes ; two outer petals dissimilar, one flat or concave, the second gibbous or spurred at the base ; 2 inner clawed, tips free or cohering, keeled ; one of the stamens with a basal nectariferous spur enclosed in the petal-spur ; ovary 1-celled ; style filiform ; stigma entire or shortly lobed ; ovules 2, on 2 parietal placentas. Fruit indehiscent, globose, 1-seeded.

F. indica *Pugsley* ; *Jour. Linn Soc. Lond. Bot.*, 1919. Syn. **F. parviflora** *Lamk.* sub-sp. **Vaillantii** *Lois. ; Fl. Brit. Ind., I, p.* 128. Diffuse, pale-green, much branched annual. Leaf-segments flat. Racemes lax, 1-2 in. long. Flowers 1/4-1/3 in., whitish or pinkish, tips purple ; pedicels exceeding the bracts ; sepals much smaller than the petals. Fruit globose, rugose when dry, rounded at the top and with 2 pits.—Vern., *Pitapara* or *Papra.* (Fig. 8.)

Abundant in fields as a weed of cultivation. Flowers : Dec.–April.

VI. CRUCIFERÆ.

Annual or perennial herbs, rarely somewhat woody ; juice watery, often pungent. Leaves radical or alternate, exstipulate. Inflorescence racemose, often corymbose. Flowers bisexual, generally ebracteate ; sepals 4, in two series, free, imbricate or rarely valvate, two lateral often larger ; petals 4 or rarely 0, hypogynous, free, placed cross-wise, often long-clawed, imbricate ; stamens 6, tetradynamous, 2 outer shorter to the inside of the lateral sepals, 4 inner longer in median pairs, very rarely stamens fewer ; disk-glands commonly present opposite the sepals ; ovary superior, with two parietal placentas and divided by a false membranous septum into two cells, sometimes 1-celled, or transversely many-celled ; ovules generally many, 1- or 2-seriate ; style short or 0 ; stigma simple or 2-lobed. Fruit 2-celled, 2-valved, long (siliqua) or short

(silicula); valves on dehiscence leaving the seeds on the margins of the false septum (replum); sometimes fruit indehiscent or transversely jointed. Seeds small, mostly exalbuminous; radicle turned up on the back of one cotyledon (incumbent) or facing the edges of both (accumbent).—*Genera about* 175, *species about* 1200, *distributed largely over the north temperate regions of the Old World.*

Key to the genera.

Fruit dehiscent.
  Fruit elongate, or if short not compressed.
    Flowers pink .. .. .. 2. *Farsetia.*
    Flowers purple or white .. .. 3. *Malcomia.*
    Flowers yellow.
      Seeds biseriate in the fruit .. .. 1. *Nasturtium.*
      Seeds mostly uniseriate in the fruit.
        Fruit without a beak; cotyledons flat .. 4. *Sisymbrium.*
        Fruit with an indehiscent 1-seeded beak; cotyledons not flat .. .. 5. *Brassica.*
      Flowers yellow, veined with violet or lilac 6. *Eruca.*
  Fruit short, compressed laterally.
    Fruit many-seeded, valves not winged .. 7. *Capsella.*
    Fruit few-seeded, valves winged .. 9. *Lepidium.*
Fruit long or short, indehiscent.
  Fruit small, broader than long; flowers minute 8. *Senebiera.*
  Fruit elongate, beaked.
    Beak long, acuminate .. .. 10. *Raphanus.*
    Beak broad, flat .. .. .. 11. *Goldbachia.*

1. Nasturtium *R. Br.*

Terrestrial or aquatic, glabrous or hairy herbs, with entire, lobed or pinnatifid leaves. Flowers small, yellow; sepals short, spreading, equal at the base; petals short, narrowed at the base, hardly clawed, or 0; stamens 2, 4 or 6. Fruit long or short, cylindric; valves faintly 1-nerved; replum thin, transparent; style short or long; stigma 2-lobed. Seeds small, turgid, mostly biseriate; cotyledons accumbent.

N. indicum *DC.*; *Fl. Brit. Ind.*, *I*, *p.* 134. An erect annual herb up to 2 ft. tall, glabrous or hairy. Radical leaves stalked, mostly deeply pinnatifid, lobes usually toothed; cauline with small lateral lobes and a large terminal lobe, irregularly toothed. Racemes long, many-

flowered. Fruit 1/2-1 in. long, shortly stalked, horizontal or ascending. Seeds very numerous, small, dark brown, transversely wrinkled. (Fig. 9.)

Common along drains and other moist places. Flowers in winter and spring. Towards the end of the flowering season, in April and May, many flowers develop no petals or only rudimentary ones.

2. Farsetia *Desv.*

Hoary much-branched undershrubs or herbs, with small, linear-oblong, entire leaves. Flowers pink, borne in spikes or racemes ; sepals erect, connivent, lateral saccate at the base ; petals long-clawed. Fruit sessile, linear or elliptic, much flattened ; valves convex, plane or with a midrib ; replum membranous. Seeds 1-2-seriate, sub-orbicular, broadly winged ; cotyledons accumbent.

F. Jaquemontii *H. f. & T.* ; *Fl. Brit. Ind., I, p.* 140. An erect rigid much branched hoary perennial, hairs closely adpressed, attached in the middle. Leaves 1/4–1 in. long, linear or linear-oblong. Sepals strigose ; petals half as long again as the sepals, pink. Fruit 1-1/2–2 in. by 1/8–1/6 in., compressed ; valves flat, with adpressed hairs, nerveless or with a faint median nerve, slightly constricted between the seeds. Seeds biseriate, with a broad annular wing. (Fig. 10.)

In waste places.

3. Malcolmia *Br.*

Branching herbs with simple or stellate hairs. Leaves entire or pinnatifid. Flowers in lax racemes, white or purple ; sepals erect, equal at the base ; petals linear, long-clawed ; filaments free, the longer ones sometimes united in pairs. Fruit elongate, cylindric, hard and dehiscing late ; peduncle usually thickened ; valves 3-nerved ; replum membranous ; stigma erect, lobes often united into an acute cone or decurrent along the short style. Seeds bi-seriate towards the base of the pod, oblong, not margined ; cotyledons incumbent.

M. africana *Br.* ; *Fl. Brit. Ind., I, p.* 146. An erect stout branched leafy annual. Stem woody at the base and rough with stiff forked and simple hairs. Leaves stalked, 1–6 in. long, oblong or lanceolate, distantly and irregularly toothed, scabrid. Petals twice as long as the sepals, purple or white. Fruit 2-3 in. long, straight, cylindrical, linear, very rough. Seeds bi-seriate towards the base, brown, oblong, plano-convex. (Fig. 11.)

Common in waste places. Flowers : Feb.–March.

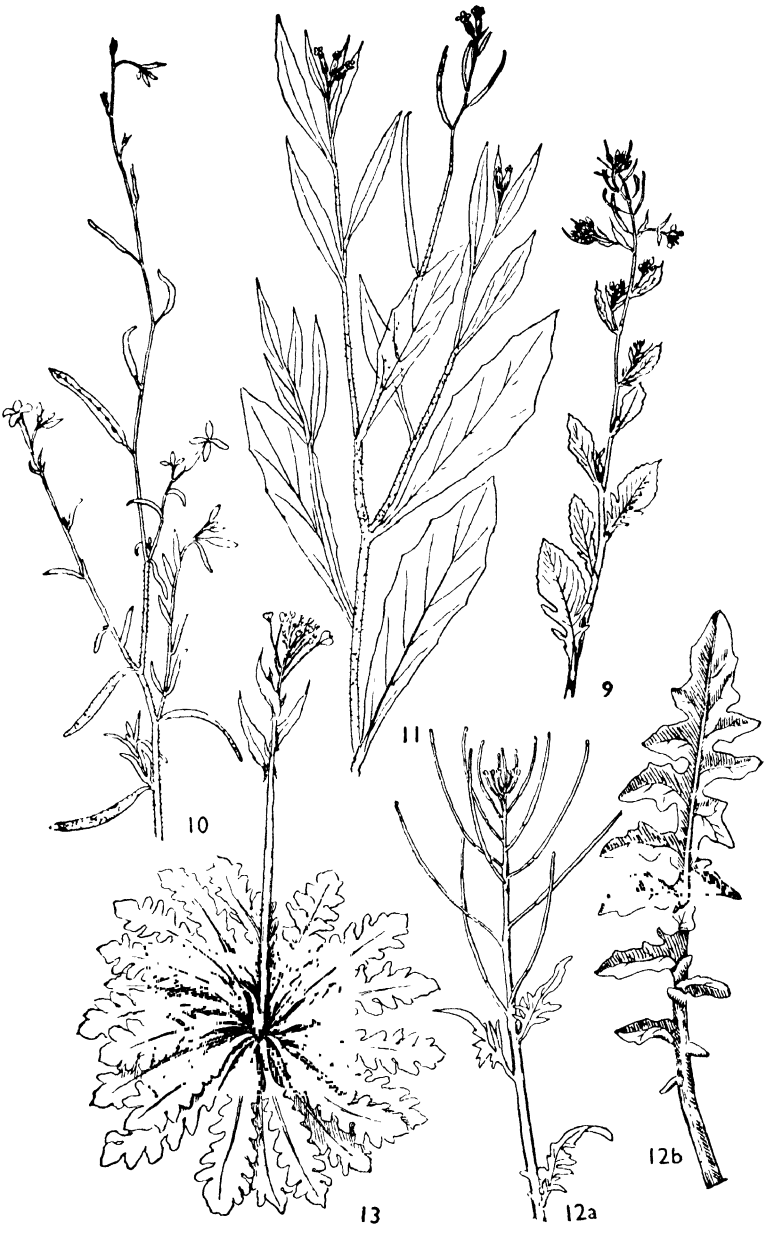

Fig. 9, *Nasturtium indicum*, $\times \frac{1}{4}$; Fig. 10, *Farsetia Jacquemonti*, $\times \frac{1}{2}$; Fig. 11, *Malcolmia africana*, $\times \frac{1}{2}$; Fig. 12, *Sisymbrium Irio*, (*a*) a twig with flowers and fruits, $\times \frac{1}{2}$, (*b*) leaf, $\times \frac{1}{2}$; Fig. 13, *Capsella Bursa-pastoris*, A small plant, $\times \frac{1}{2}$.

4. Sisymbrium *Linn.*

Glabrous or hairy, annual or biennial herbs. Leaves entire or pinnately lobed. Flowers yellow, white or rose-coloured, in lax often bracteate racemes; petals long-clawed. Fruit elongate, cylindric or compressed; valves convex, usually 3-nerved; replum membranous; style short; stigma 2-lobed. Seeds generally numerous, uniseriate, not margined, with filiform cords; cotyledons incumbent.

S. Irio *Linn.*; *Fl. Brit. Ind., I, p.* 150. An erect annual, 1–3 ft. high, glabrous or slightly pubescent below. Leaves long-stalked, runcinate-pinnatipartite; segments spreading, toothed; terminal large, sometimes hastate. Flowers yellow, very small. Fruit 1½-2 in. long, erect, slender, glabrous, subtorulose; fruiting pedicel 1/4–1/2 in. long. Seeds small, brown, grooved lengthwise.—Vern., *Khúb Kalán.* (Fig. 12).

Very common everywhere. Flowers: Feb.-March.

5. Brassica *Linn.*

Glabrous or hispid herbs, often woody below. Lower leaves pinnatifid or lyrate, the upper nearly entire. Flowers yellow, in long racemes; sepals erect or spreading, lateral usually saccate at the base. Fruit elongate, cylindric, or somewhat compressed, often with an indehiscent 1-seeded beak extending beyond the valves. Seeds uniseriate; cotyledons incumbent, concave or conduplicate, the radicle within the longitudinal fold.

No species of this genus is truly wild within the area, but many forms are cultivated. The following are the species usually cultivated in the neighbourhood of Lahore. For fuller information about this genus reference may be made to a paper by Dr. Prain, entitled 'A note on the mustards cultivated in Bengal', published in Bulletin No. 4 (1898) of the Department of Land Records and Agriculture, Bengal.

Key to the species.

Stem-leaves tapering to the base, not amplexicaul	1. *B. juncea.*
Stem-leaves broad-based, the upper ones amplexicaul.	
Stem simple or branched only in the upper part	2. *B. campestris*, var. *sarson.*
Stem branched from the base ..	3. *B. Napus*, var. *dichotoma.*

1. **B. juncea** *Hk. f. & T.*; *Fl. Brit. Ind., I, p.* 157, *in part.* A tall erect annual, 3–6 ft. high, much branched. Stems often tinged with purple, especially at the joints. Leaves large, pinnatifid, without

basal lobes, terminal lobe much the largest ; lower leaves stalked, their blade 6–8 in. long, toothed ; upper decreasing in size, toothed or the uppermost entire. Flowers 1/2 in. in diameter. Fruit less than 2 in., usually 1½ in. long including the beak, 1/5 in. thick, slender, torulose ; beak narrowly conical, nearly 1/3 in. long. Seeds mostly about 20 in a pod, up to 40, globose, brown, finely rugose.—Vern., *Arhon.*

Flowers in spring.

2. **B. campestris** *Linn.*, var. **sarson** *Prain* ; *Fl. Brit. Ind., I, p.* 156, *under B. campestris, sub-sp. Napus, in part.* A tall annual, up to 4 or 5 ft. high, simple or branched near the top, sometimes near the base also. Leaves large, glabrous, all except the lowest with stem-clasping auricles ; the lower pinnatipartite, terminal lobe much the largest, 6 to 8 in. by 2 to 3 in. ; the upper smaller, oblong or lanceolate, entire or a little undulate. Fruit a little flattened, erect or pendent, 2 to 3-1/4 in. long including the beak, usually 2-celled and 2-valved, sometimes shorter, beak conical. Seeds usually 20 to 24, up to 80, nearly smooth, dingy-white, yellow or brown.—Vern., *Sarson.*

Flowers in spring.

3. **B. Napus** *Linn.*, var. **dichotoma** *Prain* ; *Fl. Brit. Ind., I, p.* 156, *under B. campestris, sub-sp. Napus., in part.* A much branched annual, 1–3 ft. high. Leaves small, all except the lowest with stem-clasping auricles ; basal leaves not exceeding 4 by 2 in., more or less pinnatifid, terminal lobe much the largest ; upper triangular-lanceolate, smaller, entire. Flowers about 1/2 in. in diameter. Fruit about 2 in. long including the beak, 1/3 in. broad, much flattened, ascending, 2-valved ; beak conical, about 1/2 in. long. Seeds about 20 in each pod, bright brown, finely rugose.—Vern., *Toria.*

Flowers in spring.

Besides the mustards described above, a number of common vegetables also belong to the genus *Brassica* and are largely grown in fields. Cauliflower (Vern., *phul-gobi*), cabbage (Vern., *band-gobi* or *pat gobi*), knol-khol (Vern., *ganth gobi*), and brussels-sprouts are all different varieties of *Brassica oleracea* Linn., a native of S.W. coasts of Europe. Turnip (Vern., *shalgam*) is *Brassica Napus* Linn.

6. **Eruca** *Tourn.*

Erect branching herbs. Leaves lyrate-pinnatifid. Flowers lilac or yellow, veined with violet ; sepals erect, lateral saccate at the base. Fruit closely adpressed to the axis, ovoid-oblong, turgid, terete, with a large seedless ensiform beak ; valves concave, 3-nerved ; stigma simple. Seeds numerous, biseriate, globose ; cotyledons conduplicate.

E. sativa *Lamk.* ; *Fl. Brit. Ind., I, p.* 158. An erect branching herb, up to 5 ft. in height, glabrous or slightly hairy. Leaves lyrate-

pinnatifid, up to 10 in. long, segments coarsely toothed. Fruit about 1 in. long including the beak ; beak flat, pointed, seedless, half the length of the valves. Seeds in two rows.—Vern., *Taramira.*

7. Capsella *Moench.*

Small, branched, annual or perennial herbs, with entire or pinnatifid leaves. Flowers small, white, racemed ; sepals spreading, equal at the base ; petals short. Fruit obcordate-cuneate, laterally compressed ; valves convex or boat-shaped ; replum very narrow ; style short. Seeds numerous, biseriate, narrowly margined ; cotyledons incumbent.

C. Bursa-pastoris *Medic.* ; *Fl. Brit. Ind., I, p.* 159. An erect annual herb, up to 1½ ft. tall, glabrous or more or less covered with forked hairs. Radical leaves in a rosette, usually pinnatifid, with a triangular terminal lobe ; cauline little divided, with basal lobes. Flowers 1/10 in. in diameter. Fruit 1/4-1/3 in., nearly flat, triangular or obcordate. Seeds oblong, punctate.—*Shepherd's Purse.* (Fig. 13.)

A common weed. Flowers in the cold season.

8. Senebiera *DC.*

Annual or biennial branching prostrate herbs. Leaves entire or divided. Flowers minute, white, in leaf-opposed racemes ; sepals short, spreading ; petals minute, sometimes absent ; stamens 2, 6 or 4. Fruit small, didymous, indehiscent, laterally compressed ; lobes subglobose, rugose or crested ; style short or 0. Seed 1 in each cell ; cotyledons incumbent, induplicate.

S. didyma *Pers.* (**S. pinnatifida** *DC.*). A slightly hairy, branched and leafy, prostrate or ascending annual. Leaves finely cut, deeply 1-2-pinnatifid, lobes small, obovate, spreading. Flowers very minute, in leaf-opposed racemes ; petals minute, tapering upwards, pointed ; stamens 2. Fruit 1/12 in. broad, separating into 2 indehiscent hard lobes ; pedicels spreading. Seeds reniform, punctate-striate. (Fig. 14.)

Believed to be a native of tropical America and introduced into India quite recently. Not included in Fl. Br. Ind. Common everywhere. Flowers for a very large part of the year ; Nov.–June.

9. Lepidium *Linn.*

Diffuse or erect herbs, rarely shrubs. Leaves entire or divided. Flowers small, white, ebracteate ; sepals short, equal at the base ; petals short or 0. Fruit more or less orbicular, laterally much compressed, tip notched or entire ; valves boat-shaped, keeled or winged ; replum

Fig. 14, *Senebiera didyma*, $\times \frac{1}{2}$; Fig. 15, *Goldbachia laevigata*, (*a*) a twig with flowers and fruits, $\times \frac{1}{4}$, (*b*) a lower leaf, $\times \frac{1}{4}$, (*c*) siliqua, $\times 1$.

narrow, membranous. Seed solitary in each cell; cotyledons incumbent.

L. sativum *Linn.*; *Fl. Brit. Ind.*, *I*, *p.* 159. A glabrous erect annual up to 2-1/2 ft. high. Radical leaves long-petioled, bipinnatisect; cauline quite sessile, entire or pinnatifid. Flowers small, white, in long racemes. Fruit orbicular-ovate, deeply notched at the top; margins winged. —*Garden cress*; Vern., *Halim* or *Halon*.

Cultivated or self-sown during cold weather.

10. Raphanus *Linn.*

Rough or glabrous, annual or biennial herbs, often with tuberous, conical or fusiform root. Radical leaves lyrate. Flowers large, in long racemes ; sepals erect, lateral saccate at the base. Fruit indehiscent, elongate, coriaceous, constricted or continuous within, or filled with pith separating the seeds. Seeds globose ; cotyledons conduplicate.

R. sativus *Linn.* ; *Fl. Brit. Ind., I, p.* 166. Root fleshy, variable in size and form. Leaves roughly pilose. Flowers white, or lilac with purple veins. Pods terete, variable in length.—*Radish*, Vern., *Muli.*

Cultivated in the cold season. The ordinary plant bears small pods known as *mungras*, while a variety (*R. caudatus*) has whip-like pods as long as the entire plant which are known as *sungras*.

11. Goldbachia *DC.*

Glabrous shining branched annual. Lower leaves petioled, upper auricled. Flowers small, pale rose, in elongate ebracteate racemes ; sepals erect, equal at the base. Fruit coriaceous, indehiscent, tetragonal, slightly constricted between the seeds, but scarcely jointed, curved, tapering above into a broad flattened beak ; cells 2 or 3, superimposed in one row, each 1-seeded. Seeds oblong ; cotyledons incumbent.

G. laevigata *DC.* ; *Fl. Brit. Ind., I, p.* 166. An erect annual, about 1 ft. high. Radical leaves many, 4-5 in. long, ovate-oblong, sinuate-toothed ; cauline lanceolate, usually slightly toothed, shortly auricled. Fruits pendulous, 1/3 in. long, reticulately veined, costate at the angles ; pedicels rather slender, shorter than the pods. (Fig. 15.)

In fields or waste places. Not very common.

VII. CAPPARIDACEÆ.

Erect or climbing, herbs, shrubs or trees, with simple or digitately compound leaves. Stipules present or not, sometimes spinescent. Flowers regular or irregular, usually bisexual and tetramerous ; sepals 4, free or connate ; petals 4, hypogynous or seated on a disk, imbricate or open in bud ; stamens 4 to many, hypogynous, or at the base of or on a long or short gynophore ; ovary superior, sessile or stalked, 1-celled ; placentas 2 or 4, parietal ; ovules numerous ; style short or 0 ; stigma depressed or capitate. Fruit a capsule or a globose berry. Seeds exalbuminous.—*Genera about* 25, *species nearly* 300, *chiefly tropical.*

Key to the genera.

Herbs ; fruit capsular.		
Stamens sessile on the disk	1.	*Cleome.*
Stamens raised on a gynophore	2.	*Gynandropsis.*
Shrubs or trees ; fruit a berry.		
With spines ; leaves simple, on young shoots only	3.	*Capparis.*
Unarmed ; leaves trifoliolate	4.	*Crataeva.*

1. Cleome *Linn.*

Herbs with simple or digitately 3–9-foliolate leaves. Flowers in racemes ; sepals 4, spreading ; petals 4 ; stamens 4 to many, sessile on the disk ; ovary sessile or on a short gynophore ; style short or 0 ; ovules many on 2 parietal placentas. Capsule oblong or linear, valves separating from the seed-bearing placentas. Seeds reniform.

Key to the species.

Stamens 6	1.	*C. brachycarpa.*
Stamens 12–24	2.	*C. viscosa.*

1. **C. brachycarpa** *Vahl ex DC.* ; *Fl. Brit. Ind., I, p.* 169. A much branched coarse musky-scented glandular viscid perennial herb, up to 18 in. tall. Leaves 3–5-foliolate, lower long-stalked, floral sub-sessile ; leaflets 1/4–1/2 in. long, obovate or elliptic-oblong. Flowers in leafy racemes, yellow ; pedicel about 1/2 in. long ; stamens 6. Capsule 1/3 in. long, rough. Seeds minute, smooth. (Fig. 16.)

Common. Flowers in summer.

2. **C. viscosa** *Linn.* ; *Fl. Brit. Ind., I, p.* 170. An annual erect viscidly pubescent herb, 1–4 ft. high. Leaves stalked, 3–5-foliolate ; petiole up to 1–1/4 in. long ; leaflets sessile, up to 1¼ in. by 3/4 in., ovate or obovate, lateral oblique. Flowers on long pedicels, yellow, sepals ovate-oblong, acute ; petals clawed, limb ovate, reflexed ; stamens 12–24. Capsule 2–3½ in. long, long-stalked, densely glandular-pubescent, striate, narrowed above, with persistent glabrous style. Seeds small, dark brown, with numerous transverse ridges connected by faint longitudinal ridges.

A common weed. Flowers in the rainy season.

2. Gynandropsis *DC.*

An annual glandular-pubescent or glabrate herb. Leaves 3–5-foliolate, long-petioled. Flowers in leafy racemes ; sepals 4, spreading ;

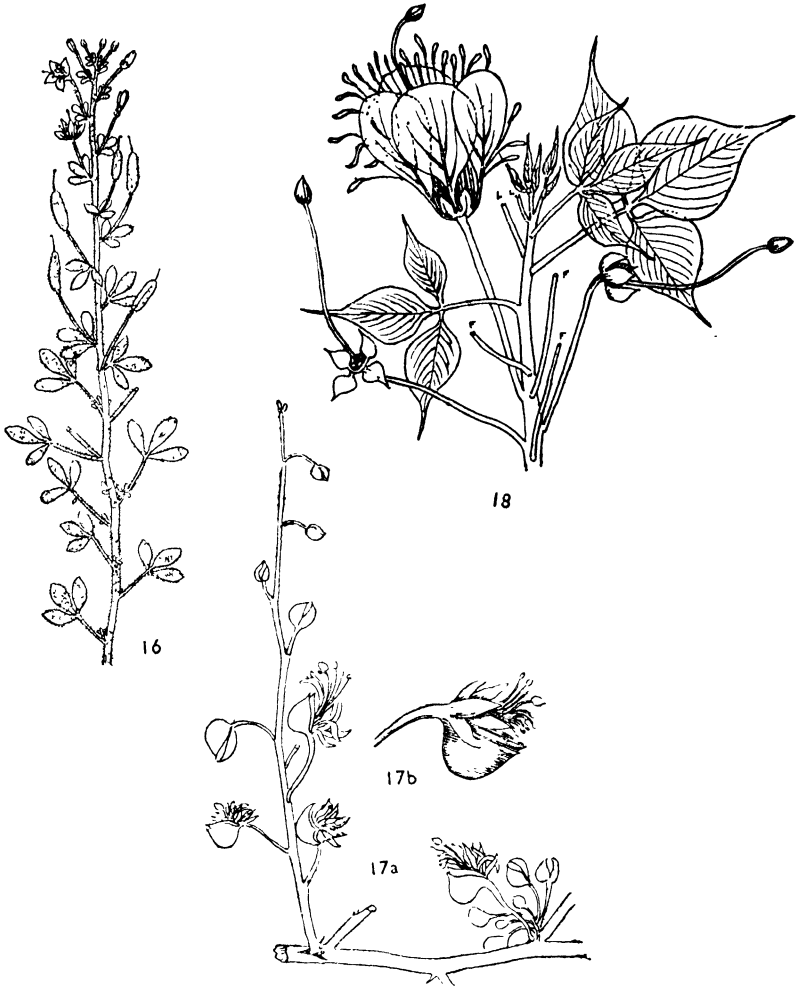

Fig. 16, *Cleome brachycarpa*, × ⅔; Fig. 17, *Capparis aphylla*, (*a*) a flowering twig, × ⅔, (*b*) flower, × ⅘; Fig. 18, *Crataeva religiosa*, × ⅔.

petals 4, spreading, long-clawed ; stamens 6, inserted on the gynophore ; ovary on a long gynophore ; ovules many on two parietal placentas. Capsule elongate, stalked ; valves 2, separating from the seed-bearing placentas. Seeds reniform, black, rough.

G. pentaphylla *DC.* ; *Fl. Brit. Ind.*, *I*, *p.* 171. An erect glandular-pubescent herb, 1–3 ft. high. Leaves long-stalked, 3–5-foliolate ; leaflets sessile, broadly obovate or elliptic-oblong, acute or obtuse, entire or

serrulate. Racemes corymbose ; flowers white or purplish, very viscid ; bracts leafy, 3-foliolate. Capsule 2–4 in. long, striated, rough, viscid.

Common in fields during the rainy season.

3. Capparis *Linn.*

Erect, decumbent or climbing shrubs or trees. Leaves simple or 0 ; stipules usually spiny. Racemes often corymbose ; flowers often showy ; sepals 4, free, in 2 series ; petals imbricate ; stamens many, inserted on the disk at the base of the long gynophore ; ovary stalked, 1–4-celled ; stigma sessile ; ovules many on 2–6 parietal placentas. Fruit fleshy. Seeds many, embedded in pulp.

C. aphylla *Roth* ; *Fl. Brit. Ind., I, p.* 174. A much branched glabrous shrub or a small tree, leafless or nearly so. Twigs smooth, green, with nearly straight paired spines about 1/6 in. long. Leaves on young shoots only, up to 1/2 in. long, linear-oblong, acute, caducous, sessile or nearly so. Flowers red, rarely yellow, nearly 1 in. in diam., in corymbs or elongated racemes ; pedicel 1/2 in. long, slender ; sepals unequal, outer sub-valvate, inner very saccate ; petals narrowly oblong ; stamens 18–20 ; gynophore as long as the stamens. Berry 1/2–2/3 in. in diameter, globose, glabrous, red when ripe.—Vern., *Krir.* (Fig. 17.)

Common. Often occurs with *Salvadora oleoides*. Flowers in March-April and occasionally at other times. The fruit is known as *dela*. The flower buds and young and ripe fruits are pickled.

4. Crataeva *Linn.*

Trees. Leaves digitately trifoliolate. Flowers large, yellow or purplish, in corymbose clusters ; sepals 4, inserted below on a large lobed disk ; petals 4, long-clawed, open in bud ; stamens many, inserted on the base of the gynophore ; ovary on the gynophore, 1-celled ; ovules many, on 2 parietal placentas ; stigma sessile, depressed. Fruit a berry.

C. religiosa *Forst.* ; *Fl. Brit. Ind., I, p.* 172. A small unarmed deciduous tree. Leaves long-stalked, 3-foliolate, exstipulate, appearing with the flowers ; leaflets 2–6 in. long, ovate or ovate-lanceolate, acuminate, entire, glabrous, lateral oblique. Flowers 2-3 in. in diameter, greenish-yellow, in corymbs ; stamens longer than the petals ; gynophore short. Berry 1-2 in. in diameter, many-seeded, globose, woody ; seeds imbedded in pulp.—Vern., *Barna.* (Fig. 18.)

Cultivated, especially near tombs. Flowers : April-May.

VIII. RESEDACEÆ.

Generally herbs, with alternate, entire or pinnatisect leaves ; stipules 0 or small and gland-like. Flowers small, mostly zygomorphic, in spikes or racemes, bracteate ; calyx persistent, 4–7-partite, lobes generally irregular, imbricate ; petals 2–7, hypogynous, entire or lobed, equal or the posterior larger, open in bud ; disk present or 0 ; stamens 3-many, free or connate, equal or unequal ; ovary superior, of 2–6 connate carpels, 1-celled, often lobed at the top and open between the lobes which bear the sessile stigmas ; ovules numerous, on 2–6 parietal placentas. Fruit an open capsule, rarely fleshy. Seeds many, reniform, exalbuminous ; embryo curved or folded ; cotyledons incumbent.—*Genera* 6, *species about* 20, *in Europe, Asia and Africa.*

Oligomeris *Camb.*

Herbs with linear fascicled leaves. Flowers small, in spikes ; calyx 4-partite ; petals 2, free or connate ; disk 0 ; stamens 3–8, free or monadelphous ; ovary 4-lobed, open at the top ; placentas 4 ; ovules many. Capsule subglobose, angled, 4-pointed.

O. glaucescens *Cambess.* ; *Fl. Brit. Ind.*, *I*, *p.* 181. A much branched annual up to 18 in. high ; branches erect. Leaves 1-2 in. long, narrowly linear, glaucous ; stipules minute, subulate. Spikes long, terminal. Flowers small, greenish-white ; petals 2, united, alternating with the posterior sepal. Capsule deeply 4-lobed, membranous, 1/10–1/8 in. in diameter. Seeds minute, shining black, deeply notched. (Fig. 19.)

Common in waste places. Flowers in the cold season.

Reseda odorata *Linn., the Mignonette,* is commonly grown in gardens as a winter annual.

Fig. 19, *Oligomeris glaucescens*, × ⅔.

IX. VIOLACEÆ.

Annual or perennial herbs or shrubs. Leaves alternate, simple, entire or pinnately divided, stipulate. Flowers arranged variously, regular or irregular, bisexual, rarely polygamous, sometimes cleistogamous ;

sepals 5, persistent; petals 5, equal or unequal, imbricate or contorted in bud; stamens 5; filaments short, broad; anthers free or connate, connective broad, produced beyond the cells; ovary superior, sessile, 1-celled; style simple; ovules numerous, inserted on 3 parietal placentas. Fruit a 3-valved capsule, rarely fleshy. Seeds small, albuminous.—*Genera about* 20, *species nearly* 250, *in the temperate and tropical countries.*

Viola *Linn.*

Herbs, rarely woody below. Flowers on 1- rarely 2-flowered peduncles, often dimorphic, some with large petals and producing few seeds, others with small-petals or apetalous and very prolific; sepals produced at the base; petals erect or spreading, lower largest, spurred or saccate at the base; style clavate or truncate, tip straight or oblique; stigma obtuse, lobed or cupular. Capsule 3-valved. Seeds many, ovoid or globose.

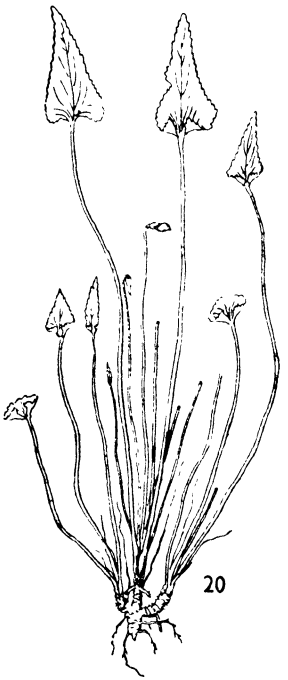

Fig. 20, *Viola Patrinii*, ×½.

V. Patrinii *DC.*; *Fl. Brit. Ind.*, *I*, *p.* 183. A glabrous or pubescent perennial herb with a short root-stock. Leaves all radical, petioled, triangular, usually narrowly elongate, 1½–3 in. long, coarsely crenate, base hastate or cordate; petiole 2–4 in., sometimes up to 8 in. in plants growing in dense grass, often winged; stipules entire, adnate. Flowers lilac, 1/3–1/2 in., peduncles up to 7 in. long; spur saccate; stigma 3-lobed. Capsule 1/4–1/2 in.; valves narrow, acute. (Fig. 20.)

In grassy places. Flowers in the cold season.

V. tricolor *Linn.*, the *Pansy* or the *Heartsease*, is commonly grown in gardens during winter.

X. POLYGALACEÆ.

Herbs, erect or scandent shrubs, or rarely small trees. Leaves alternate, rarely whorled or opposite, simple, quite entire, exstipulate. Flowers irregular, bisexual, 3-bracteate; sepals 5, imbricate, unequal, 2 inner larger often petaloid, wing-like; petals 5 or 3, unequal, the anterior usually keel-shaped; stamens 8, rarely less, hypogynous; filaments united into a sheath, rarely distinct; anthers opening by terminal

pores, rarely by slits; ovary superior, generally 2-celled; ovules solitary or more in each cell; style commonly curved; stigma capitate. Fruit generally a 2-celled, 2-seeded, loculicidal capsule. Seeds usually with a conspicuous strophiole, albuminous.—*Genera* **16**, *species nearly* **500**, *chiefly in warm countries.*

Polygala *Linn.*

Herbs with alternate leaves. Sepals usually persistent; 2 inner larger, usually petaloid; petals 3, united at the base with the staminal sheath, the anterior keel-shaped and generally crested; stamens 8; filaments united in their lower half; anthers opening by pores; ovary 2-celled; ovules solitary, pendulous.

P. chinensis *Linn.*; *Fl. Brit. Ind.*, *I*, *p.* 204. A glabrous or pubescent, erect or diffuse annual; branches 3–12 in. long. Leaves sessile, 3/4–1½ in. long, linear to oblong, obtuse, rather thick, coriaceous. Flowers yellow, crowded in short axillary racemes, 1/5–1/4 in., outer sepals small, ovate; wings oblique; crest of keel small. Capsule orbicular-oblong, notched at the apex, pubescent, fringed along the margins, obscurely winged. Seeds silky; strophiole with 3 very short appendages. (Fig. 21.)

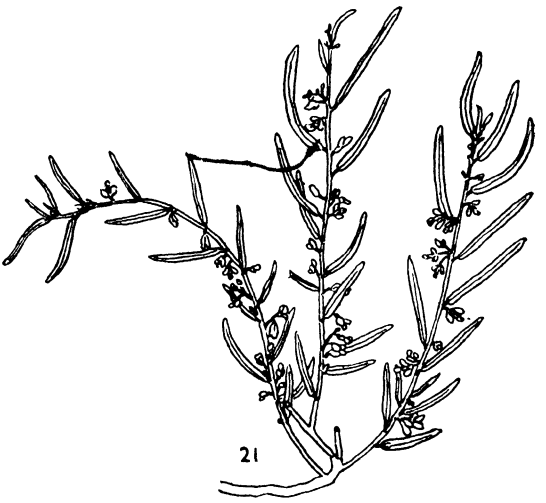

Fig. 21, *Polygala chinensis*, ×⅔.

Not very common. Flowers in the cold season.

XI. CARYOPHYLLACEÆ.

Herbs. Stem often with swollen nodes. Leaves opposite, simple; stipules 0 or scarious. Flowers bisexual, rarely unisexual, regular, solitary or in cymes; sepals 4-5, free or connate, imbricate; petals 4-5 (absent in *Sagina*), free; stamens 8 or 10, rarely fewer, inserted with the petals; anthers 2-celled, opening lengthwise; ovary superior, sessile

or shortly stalked, 1-celled or imperfectly 3–5-celled; placentation free central; ovules mostly numerous; styles 2–5, free or connate. Fruit a capsule opening by valves equal in number or double that of the styles, rarely indehiscent or opening irregularly. Seeds few or many, sometimes with prominent funicles; albumen mealy, rarely fleshy; embryo more or less curved, surrounding the albumen.—*Genera* 35, *species nearly* 800, *cosmopolitan but chiefly in cold parts, many arctic or alpine.*

Key to the genera.

Calyx gamosepalous; petals clawed.
- Styles 2 .. .. .. 1. *Saponaria.*
- Styles 3 .. .. .. 2. *Silene.*

Sepals free; petals subsessile.
- Stipules 0.
  - Petals present.
    - Capsule cylindric .. .. .. 3. *Cerastium.*
    - Capsule ovoid .. .. .. 4. *Stellaria.*
  - Petals absent; very small herb .. .. 5. *Sagina.*
- Stipules scarious .. .. .. 6. *Spergula.*

1. Saponaria *Linn.*

Herbs. Flowers in dichotomous cymes; sepals 5, connate, tube cylindric in flower; petals 5, clawed, limb entire or notched, with or without a basal scale; stamens 10; ovary 1-celled or imperfectly 2-3-celled, on a short stalk; styles 2, rarely 3; ovules many. Capsule ovoid or oblong, rarely subglobose, 4-toothed. Seeds reniform or subglobose; embryo annular.

S. Vaccaria *Linn.*; *Fl. Brit. Ind.*, *I*, *p.* 217. An erect annual, up to 2½ ft. high. Leaves 1–3 by 1/3–3/4 in., connate at the base, lower oblong, upper oblong-lanceolate. Flowers erect; pedicel about 1-1/2 in. long; calyx 1/2 in., tubular in flower, with 5 broad green nerves, ventricose in fruit; petals obovate, without basal scales, irregularly dentate at the margin, rosy. Capsule included, broadly ovoid. Seeds large, globose, deep brown or blackish, granulate. (Fig. 22.)

Common in fields, etc. Flowers in the cold weather. Juice is said to be used as a substitute for soap.

2. Silene *Linn.*

Herbs. Flowers solitary or in cymes; sepals 5, connate, tube more or less inflated, ovoid or tubular, 10-many-nerved; petals 5, narrowly clawed; limb entire, bifid or laciniate, usually with 2 basal scales;

stamens 10, 5 usually adnate to the petals ; ovary incompletely 3-celled, rarely 1-celled, mostly on a long gynophore ; styles 3, rarely 5 ; ovules numerous. Capsule 3–6-toothed or valved. Seeds reniform, usually tubercled ; embryo annular.

S. conoidea *Linn.* ; *Fl. Brit. Ind., I, p.* 218. An erect glandular-pubescent annual, 6–18 in. high, dichotomously branching. Leaves connate at the base, 2–4 in. long, lowermost spathulate, upper oblong- to linear-lanceolate, acute. Calyx 1 in. long, inflated, ovoid in fruit, finely grooved, 30-ribbed ; teeth 1/3 of the length of the tube, linear-lanceolate ; petals pink, small, auricled at the base ; limb obovate, entire or toothed. Capsule sessile, ovoid, contracted above, crustaceous, shining. Seeds brown, cochleate, with 5-6 dorsal and as many lateral rows of tubercles. (Fig. 23.)

Common in fields. Flowers : March-April.

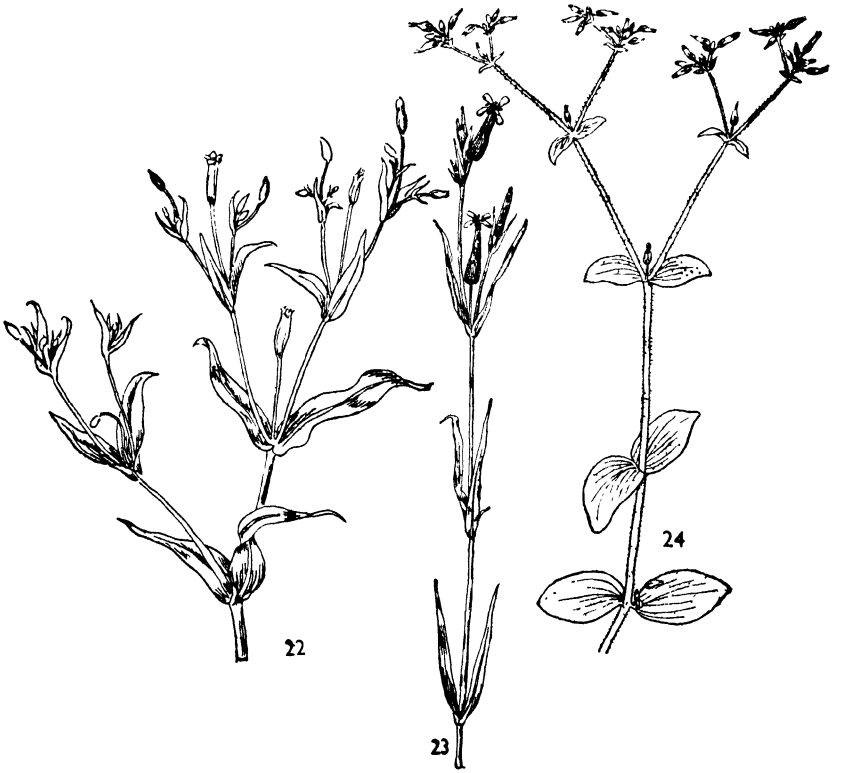

Fig. 22, *Saponaria Vaccaria*, ×½ ; **Fig. 23,** *Silene conoidea*, ×½ ; **Fig. 24,** *Cerastium vulgatum*, ×½.

3. Cerastium *Linn.*

Pubescent, rarely glabrous, herbs, often glandular, annual or perennial. Leaves usually small. Flowers white, in terminal dichotomous cymes; sepals 5, rarely 4, free; petals as many, rarely 0, notched or bifid, rarely quite entire or more cut; stamens 10, rarely 5 or fewer, hypogynous; ovary 1-celled; styles usually 3–5; ovules many. Capsule cylindric, often curved, with twice as many teeth as styles. Seeds compressed, not arillate; embryo annular.

C. vulgatum *Linn.*; *Fl. Brit. Ind., I, p.* 228. An erect hairy annual, glandular above, simple or branched, 6–12 in. high. Lower leaves spathulate, upper oblong-ovate or lanceolate, obtuse. Cymes at first sub-umbellate; pedicels 1/10 in. long, in fruit shorter than the sepals; sepals acute, very hairy; petals sometimes 0; stamens 10, rarely 5. Capsule nearly double the length of the calyx, 3/10 in. long, cylindrical, slightly curved, teeth very small. Seeds minute, brown, finely tuberculate. (Fig. 24.)

In cultivated places. Not very common. Flowers about March.

4. Stellaria *Linn.*

Usually slender herbs. Flowers in dichotomous cymes, white; sepals free; petals 5, rarely 4, bifid or bipartite, or 0; stamens 10, rarely 8 or fewer, hypogynous or perigynous; ovary 1-celled, rarely 3-celled; styles mostly 3, ovules many, rarely few. Capsule short, splitting to below the middle or to the base into as many entire or bifid valves as there are styles. Seeds compressed; embryo annular.

S. media *Linn.*; *Fl. Brit. Ind., I, p.* 230. A decumbent much branched annual, stems 6 in. to 2 ft. long, glabrous except for a line of hairs on either side, flaccid, green. Leaves entire, 1/2 to 1-1/2 in. by 3/4 in.; lower petioled, ovate-cordate, acuminate; upper sessile, ovate, oblong or lanceolate. Flowers 1/4–1/3 in. in diameter, in axillary and terminal cymes; pedicel slender, glabrous or glandular-pubescent, 1 in. long; sepals free to the base, elliptic-oblong, obtuse or sub-acute, glandular hairy or covered with minute points; petals shorter than the sepals or 0; stamens 5–10; styles 3. Capsule ovoid, longer than the sepals. Seeds brown, flat, reniform, acutely tubercled. (Fig. 25.)

An extremely common weed. Flowers in the cold season.

5. Sagina *Linn.*

Small annual or perennial herbs. Leaves subulate, connate at the base; stipules 0. Flowers solitary, axillary and terminal, pedi-

Fig. 25, *Stellaria media*, $\times \frac{1}{3}$; Fig. 26, *Sagina apetala*, (*a*) a plant, $\times \frac{2}{3}$, (*b*) fruit, $\times 3$; Fig. 27, *Spergula pentandra*, $\times \frac{1}{2}$; Fig. 28, *Spergula rubra*, $\times \frac{1}{2}$.

celled ; sepals 4-5, free ; petals 4-5, entire, or 0 ; stamens 4, 5, 8 or 10, perigynous ; ovary 1-celled ; styles 4-5 ; ovules numerous. Capsule 4-5-valved to the base ; valves opposite to the sepals. Seeds reniform.

S. apetala *Linn.* (*Not included in Fl. Brit. Ind.*). A slender wiry annual tufted herb ; branches ascending, 4–10 in. long. Leaves 1/10–1/4 in., subulate, connate at the base. Flowers 1/12 in. in diameter, green, usually 4-merous ; pedicels capillary ; petals 0. Seeds minute. (Fig. 26.)

Introduced. Very common in flower-beds, grass plots and even in flower-pots. Flowers in the cold season.

6. Spergula *Linn.*

Annual or perennial herbs, with forked or fascicled branches. Leaves opposite, often with leafy buds in their axils, hence the foliage commonly appears to be whorled; stipules small, scarious. Flowers on peduncled panicled cymes; sepals 5, free; petals 5, entire; stamens 5 or 10, rarely fewer, inserted on a perigynous disk; ovary 1-celled; styles 3 or 5; ovules many. Capsule with 3 or 5 entire valves. Seeds compressed, margined or winged.

Key to the species.

Leaves apparently whorled.		
Seeds granulate, with a narrow wing	1.	*S. arvensis.*
Seeds smooth; wing often as broad as the seed	2.	*S. pentandra.*
Leaves opposite, not apparently whorled	3.	*S. rubra.*

1. **S. arvensis** *Linn.*; *Fl. Brit. Ind., I, p.* 243. A green sparingly pubescent annual herb, branching from the base; branches 1/2–1½ ft. long. Leaves 1/2 to 2 in. long, in false whorls, linear-subulate, spreading, half-terete, grooved beneath, rather fleshy. Flowers 1/6–1/4 in. in diameter, in sub-umbellate cymes; sepals ovate, obtuse; petals obtuse, white; styles 5 or 3. Seeds keeled or narrowly winged, granulate or papillose, black.

In cultivated places. Flowers in the cold season.

2. **S. pentandra** *Linn.*; *Fl. Brit. Ind., I, p.* 243. A glabrous prostrate or ascending annual, branched from the root; branches 6–18 in. long. Leaves 1/2 to 2 in. long, in apparent whorls, linear-subulate, half-terete, rather fleshy. Sepals ovate, obtuse, petals ovate to oblong, acute, often faintly dentate at the apex, shorter than the sepals, white. Seeds black, smooth, winged, 1-1½ mm. in diameter with the wing; wing broad, with radial striations. (Fig. 27.)

Very common in cultivated places. Flowers during the cold season.

3. **S. rubra** *Linn.*; *Fl. Brit. Ind., I, p.* 244. A sub-erect or prostrate gland-pubescent annual herb. Branches up to 9 in. long. Leaves simply opposite, 1/2 to 1-1/2 in. long, flat, linear, fleshy, 1-nerved; stipules broad, silvery. Flowers 1/4 to 1/3 in. across; sepals lanceolate, with scarious margins; petals oblong, white; stamens 5 or 10, often 2 or 3, some or all rudimentary. Seeds not winged, more or less flat, ovate, brown to black, rough. (Fig. 28.)

Common in cultivated places. Flowers during the cold season.

XII. PORTULACACEÆ.

Herbs with opposite or alternate, entire leaves; often succulent; nodes generally with scarious or hairy stipular appendages. Flowers bisexual, regular; sepals 2, imbricate, free or connate at the base; petals 4-5, hypogynous or perigynous, free or united at the base, fugacious; stamens 4-many, inserted with or upon the petals; filaments slender; anthers 2-celled; ovary superior or half-inferior, 1-celled; ovules 2-many, on a basal placenta; style 2–8-fid. Capsule dehiscing transversely or by 2-3 valves. Seeds 1-many, globose-reniform; embryo curved, surrounding the mealy albumin.—*Genera about* 17, *species about* 225, *mainly American.*

Portulaca *Linn.*

Diffuse, usually succulent, annual or perennial herbs. Leaves with scaly or hairy stipular appendages at the nodes. Flowers terminal, surrounded by a whorl of leaves, solitary or clustered; sepals connate below, the free part deciduous; petals 4–6, perigynous; ovary half-inferior; ovules many; style 3–8-fid. Capsule crustaceous, dehiscing transversely. Seeds many, reniform.

Key to the species.

Leaves generally more than 1/2 in. long; petals 5 .. 1. *P. oleracea.*
Leaves less than 1/2 in. long; petals 4 .. .. 2. *P. quadrifida.*

1. **P. oleracea** *Linn.*; *Fl. Brit. Ind.*, *I*, *p.* 246. A stout succulent glabrous annual, with prostrate or ascending branches 6–12 in. long. Leaves alternate or sub-opposite, clustered at the ends of the branches, 1/4–1½ in. long, very shortly stalked, thick, cuneate-oblong or spathulate, truncate or retuse at the apex; stipular appendages minute or 0. Flowers sessile, in terminal clusters; sepals persistent, fleshy, acute; petals 5, bright yellow; stamens 8–12; style 3–5-fid. Seeds minute, many, dark-brown, tubercled-punctate.—Vern., *Kulfa*, *Salunak*, *Lunak.* (Fig. 29.)

A very common weed, flowering through the greater part of the year. Flowers open during noon. Used as a pot-herb, particularly the variety mentioned below.

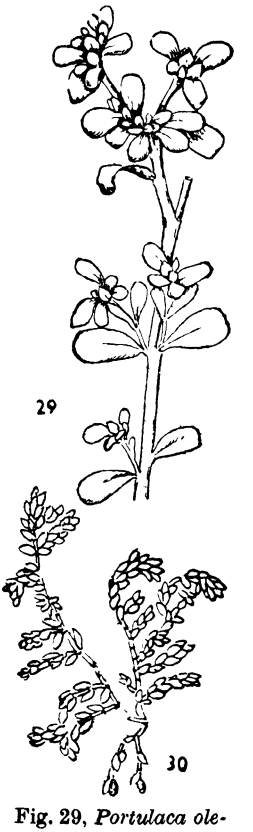

Fig. 29, *Portulaca oleracea*, × ⅔; Fig. 30, *Portulaca quadrifida*, × ⅔.

Var. **erecta**; branches erect, leaves spathulate-linear, bright green.—Cultivated.

2. **P. quadrifida** *Linn.*; *Fl. Brit. Ind.*, *I*, *p.* 247. A glabrous annual, with numerous prostrate slender branches rooting at the nodes up to 8 in. long. Leaves opposite, 1/4–2/5 in. long, shortly stalked, ovate, oblong or lanceolate, fleshy; stipular appendages copious, of long white hairs. Flowers solitary, terminal; calyx-tube 1/2-immersed in the extremity of the axis, surrounded by a 4-leaved involucre and long silky hairs; petals 4, yellow; stamens about 8; style 4-fid to the middle. Seeds dark-brown, minutely tubercled. (Fig. 30.)

A common weed. In dry places the nodal hairs become long and shaggy and the whole plant becomes stunted.

XIII. TAMARICACEÆ.

Shrubs or small trees with alternate, minute, usually scale-like, exstipulate leaves. Flowers in spikes or racemes, regular, bisexual or unisexual; sepals and petals each 5, rarely 4 or 6, imbricate, free; stamens 5–10, inserted on the disk, free or connate below; anthers 2-celled, opening lengthwise, versatile; ovary superior, 1-celled or imperfectly septate; styles 2–5, free or united below; stigmas 2–5; ovules many, ascending, on basal placentas. Fruit a capsule opening generally by 3 valves. Seeds erect, plumed or winged; endosperm present or 0; embryo flat.—*Genera* 5, *species about* 100, *in temperate and subtropical countries.*

Tamarix *Linn.*

Shrubs or small trees. Leaves minute, scale-like. Flowers in lateral or terminal spikes or dense racemes, white or pink; stamens 4, 5, 8 or 10 (5 in the following species); anthers apiculate; disk more or less lobed; styles 3-4, short, dilated into the stigmas. Seeds plumed at the apex, exalbuminous.

Key to the species.

Dioecious shrub; flowers in dense spikes ..	1. *T. dioica.*
Hoary tree; flowers polygamous, scattered along slender spikes	2. *T. articulata.*

1. **T. dioica** *Roxb.*; *Fl. Brit. Ind.*, *I*, *p.* 249. A shrub or a small tree, with long spreading or drooping branches. Leaves with a tubular sheath, closely adpressed acuminute apex and broad white margins. Flowers dioecious, purple or pink, in compact cylindrical loosely panicled

spikes; bracts triangular, acuminate, nearly as long as the flowers; stamens in the male flowers 5, inserted in the notches of the 5-lobed disk, abortive in the female flowers, forming hastate staminodes; styles as long as the ovary.—Vern., *Pilchi*. (Fig. 31.)

Common on the riverside. Flowers in the rainy season. Branches used for making brooms and baskets. Insect galls in the form of swellings of various parts of the shoot are extremely common on this plant.

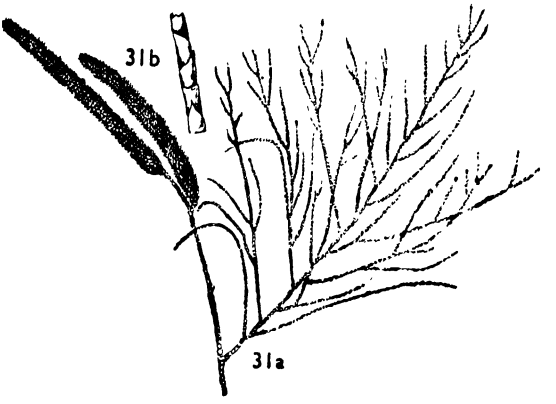

Fig. 31, *Tamarix dioica*, (*a*) branch with flowering spikes, $\times \frac{1}{2}$, (*b*) portion of a twig, $\times 2$.

2. **T. articulata** *Vahl*; *Fl. Brit. Ind.*, *I*, *p.* 249. A middle-sized tree with articulated branches. Leaves sheathing, the free portion consisting of a minute triangular tooth, impressed-punctate and often hoary with saline efflorescence. Flowers pink, monoecious or bisexual, scattered on long slender spikes arranged in terminal loose panicles; bracts sheathing, shorter than the flowers; stamens 5, inserted in the alternate notches of the 10-lobed disk; styles half as long as the ovary.—Vern., *Farash*, *Pharwan*.

Very common. Flowers in the rainy season. Insect galls are found on this tree also, but not in such large numbers as in the above.

T. gallica *Linn.*, a shrub or a small tree, with non-sheathing leaves and long slender spikes of bisexual white or pink flowers arranged in large terminal panicles may be met with within the area. The flowers have 5 stamens.

XIV. ELATINACEÆ.

Marshy or terrestrial herbs or undershrubs. Leaves opposite or whorled, entire or serrate, stipulate. Flowers small, axillary, solitary or cymose, bisexual, regular; sepals and petals each 2–5, free, imbricate in bud; stamens as many or twice as many as the sepals, hypogynous, free; anthers versatile; ovary superior, 2–5-celled; placentation axile; ovules many; styles 2–5; stigmas capitate. Fruit a septicidal capsule. Seeds straight or curved, exalbuminous; cotyledons small.—*Genera* 2, *species about* 30, *in tropical and temperate parts of the world.*

Bergia *Linn.*

Erect, decumbent or diffusely branched annual herbs or undershrubs. Leaves opposite, serrate or quite entire. Flowers solitary or in more or less dense axillary clusters, minute, usually 5-merous; sepals with a herbaceous midrib and more or less membranous margins, acute; stamens 3–6 or 10; ovary ovoid. Capsule sub-crustaceous.

Key to the species.

A small shrub	.. ..	1. *B. aestivosa.*
A small semi-aquatic herb	.. ..	2. *B. ammanioides.*

1. **B. aestivosa** *W. & A.*; *Fl. Brit. Ind., I, p.* 251. A small glabrous much branched shrub; branches long slender, divaricate. Leaves narrowly obovate or oblong, linear on the flowering branches, faintly serrate; lower 1/2 in. or more in length; stipules long, setaceous. Flowers solitary or 2–4 together, pink; sepals lanceolate, acute, denticulate, with membranous margins.

Rare within the area.

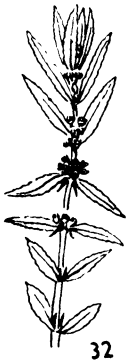

Fig. 32, *Bergia ammanioides*, ×⅔.

2. **B. ammanioides** *Roxb.*; *Fl. Brit. Ind., I, p.* 251. An annual herb, up to a foot high, the lower branches decumbent, thinly hispid. Leaves 1/2–3/4 in. long, sessile, oblong-lanceolate or oblanceolate, sharply serrate, acute. Flowers small, in dense, sub-verticillate, more or less globose clusters of a reddish colour, sessile or nearly so; sepals 4-5, lanceolate, denticulate; petals and stamens 4-5; ovary oblong, deeply grooved. Capsule 4-5-celled; valves with incurved edges, separating from a central axis. Seeds minute, yellowish, smooth, oblong, slightly curved. (Fig. 32.)

Common in moist places. Flowers in summer.

XV. MALVACEÆ.

Herbs, shrubs or rarely soft-wooded trees, usually mucilaginous in all parts; young parts generally more or less densely covered with stellate hairs. Leaves alternate, stipulate, simple, lobed or rarely compound, mostly palmately veined. Flowers axillary or terminal, solitary, fascicled or cymoso-panicled, regular, hermaphrodite or rarely unisexual; bracteoles 3 or more, often forming an epicalyx; sepals 5, valvate, free or connate; petals 5, twisted; stamens many, rarely definite, adnate to the base of the petals, monadelphous; anthers oblong or

reniform, ultimately 1-celled, opening lengthwise ; pollen globose, muricate ; ovary superior, 2-many-celled, entire or lobed ; styles connate below or throughout their length ; ovules 1, 2 or many in each cell, attached to the inner angle. Fruit dry, breaking into 1- or more-seeded cocci, or a loculicidal capsule. Seeds reniform or ovoid, glabrous, hairy, silky or woolly, albuminous or not ; embryo curved ; cotyledons leafy, usually folded or crumpled.—*Genera about* 60, *species about* 100, *mostly in hot countries.*

Key to the genera.

Ripe carpels separating from the axis.
  Styles as many as the carpels.
    Carpels 1-seeded.
      Bracteoles 6–9 .. .. .. 1. *Althaea.*
      Bracteoles 3.
        Stigmas linear .. .. .. 2. *Malva.*
        Stigmas capitate .. .. 3. *Malvastrum.*
      Bracteoles 0 .. .. .. 4. *Sida.*
    Carpels 2- or more-seeded .. .. 5. *Abutilon.*
  Styles twice as many as carpels .. .. 6. *Urena.*
Fruit capsular.
  Stigmas spreading ; bracteoles 7–10 .. 7. *Hibiscus.*
  Stigmas connate ; bracteoles 3 .. .. 8. *Gossypium.*

1. Althaea *Linn.*

Erect or prostrate, pubescent or villous herbs, with generally more or less deeply divided leaves. Flowers peduncled, axillary, solitary or clustered, or sometimes in long terminal racemes ; bracteoles 6–9, connate at the base ; ovary many-celled ; styles as many as the cells, filiform, stigmatose on the inner surface ; ovule solitary in each cell. Fruiting carpels many, ultimately separating from a short torus, 1-seeded. Seed ascending.

A. Ludwigii *DC.* ; *Fl. Brit. Ind., I, p.* 319. Prostrate or ascending, hispid annual ; branches 6–12 in. long. Leaves long-petioled, orbicular, deeply 5–7-lobed ; lobes cuneate, 3-fid. Flowers shortly peduncled, in small axillary clusters, whitish, 1/2–3/4 in. in diameter. Carpels wrinkled at the sides, glabrous.

Ravi-side, in open ground. Flowers during winter.

A. rosea *Linn.*, the *Holly-hock*, is commonly cultivated in gardens as a winter annual.

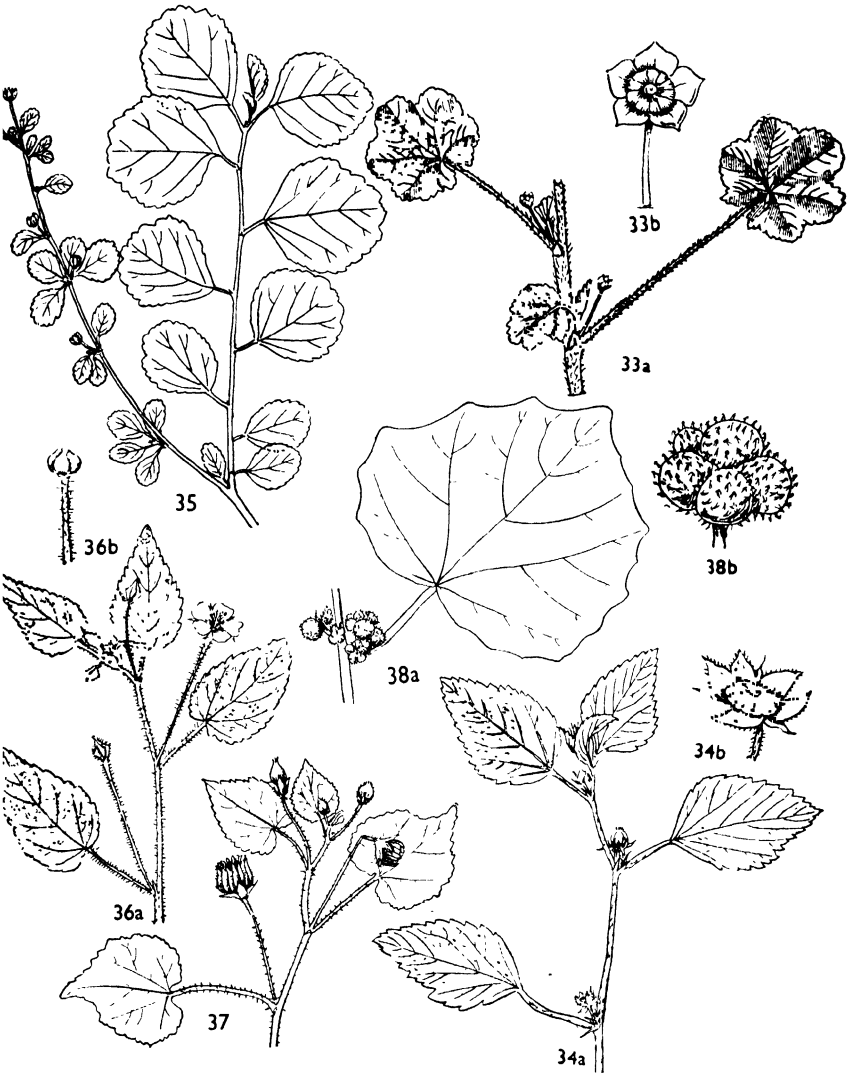

Fig. 33, *Malva parviflora*, (*a*) a twig, $\times \frac{1}{3}$, (*b*) fruit, $\times 1$; Fig. 34, *Malvastrum tricuspidatum*, (*a*) a twig, $\times \frac{2}{3}$, (*b*) fruit, $\times 1$; Fig. 35, *Sida spinosa*, $\times \frac{1}{2}$; Fig. 36, *Sida cordifolia*, (*a*) a twig with flower, $\times \frac{2}{3}$, (*b*) fruit, $\times 1$; Fig. 37, *Abutilon indicum*, $\times \frac{1}{2}$; Fig. 38, *Urena lobata*, (*a*) portion of a twig showing a leaf and cluster of flowers, $\times \frac{1}{2}$, (*b*) fruit, $\times 2$.

2. **Malva** *Linn.*

Downy herbs. Leaves lobed. Flowers in axillary tufts; bracteoles 3, free; sepals 5, connate at the base; petals emarginate, connate just at the base; staminal-tube without sterile teeth, bearing anthers to the top; ovary many-celled; styles as many as the cells; stigmas linear; ovule solitary in each cell. Ripe carpels 1-seeded, indehiscent, separating from a short conical torus. Seeds solitary, ascending.

M. parviflora *Linn.*; *Fl. Brit. Ind., I, p.* 321. A small spreading herb, sparsely stellately hairy. Leaves reniform, 5–7-lobed, lobes dentate; petiole up to 4 in. long. Pedicels up to 1/2 in. long, spreading after flowering; bracteoles linear; sepals accrescent; petals white, notched, nearly as long as the sepals; claw glabrous. Carpels wrinkled, reticulate on the back. (Fig. 33.)

Very common. Flowers in the cold season.

3. **Malvastrum** *A. Gray.*

Herbs or undershrubs. Leaves entire or divided. Flowers in axillary or terminal inflorescences; bracteoles 3, narrow; calyx 5-parted; petals longer than the sepals; staminal-tube without any sterile teeth at the summit and bearing anthers to the top; ovary 5- or more-celled; styles as many as the carpels; stigmas capitate. Ripe carpels separating from a short torus, indehiscent, 1-seeded, beaked or not. Seeds ascending.

M. tricuspidatum *A. Gray.*; *Fl. Brit. Ind., I, p.* 321. An erect branched herb or undershrub, 2-3 ft. tall. Most parts with coarse stellate or simple hairs. Leaves up to 2–1/2 in. long, ovate to oblong-lanceolate, coarsely toothed, 3–5-nerved at the base; nerves prominent only below; petiole up to 1–1/4 in., usually less. Peduncles 1/4–1/2 in. long; calyx campanulate, segments triangular, acute; corolla 1/2 in. across, yellow; petals oblique, obcordate. Carpels 8–13, reniform, hispid on the top and with 3 projecting points. (Fig. 34.)

An introduced American plant. Very common in cultivated places. Flowers nearly all the year round.

4. **Sida** *Linn.*

Perennial herbs or undershrubs. Leaves simple or lobed. Bracteoles 0; sepals 5, valvate, tubular below; petals 5, free above, connate below and adnate to the tube of the stamens; staminal-tube divided at the summit into numerous anther-bearing filaments; carpels 5–10; styles as many as the carpels; stigmas terminal. Ripe carpels separating,

1-seeded, generally 2-awned at the summit and dehiscing irregularly or by a small chink. Seeds pendulous or horizontal.

Key to the species.

Branches and petioles covered with stellate hairs ; under-surface of leaves whitish-grey ..	1. *S. spinosa.*
Branches and petioles covered with long spreading hairs ; under-surface of leaves green ..	2. *S. cordifolia.*

1. **S. spinosa** *Linn.* ; *Fl. Brit. Ind., I, p.* 323. A sub-erect branched shrub. Stem covered with minute grey stellate pubescence. Leaves 1/2 to 1 in. long, very variable, ovate or obovate, cordate or cuneate at the base, crenate-serrate, green and finely and thinly stellate-pubescent above, densely stellate-pubescent and whitish-grey below, 3-nerved ; petiole 1/3 to 1/4 in. long. Peduncles solitary or clustered, jointed below the middle, 1/5 in. or less. Calyx stellately hairy, 10-angled, lobes triangular, acute or acuminate ; corolla pale-yellow. Ripe carpels 5 or fewer, membranous, equalling the calyx ; awns about half as long as the carpels. (Fig. 35.)

Common in the mulberry plantation on the river-side. Flowers nearly all the year round.

2. **S. cordifolia** *Linn.* ; *Fl. Brit. Ind., I, p.* 324. A small erect shrub. Branches covered with long spreading hairs. Leaves 1 to 2 in. long, broadly ovate, cordate, acute, thin, membranous, sparsely or densely covered with stellate hairs with or without long simple ones, crenate-serrate, green on both surfaces, 5–7-nerved at the base ; petiole shorter than the blade, covered with long spreading hairs. Peduncles 1/2 to 1-1/2 in. long, solitary or a few together, jointed usually a little above the middle. Calyx 10-angled, hairy, lobes triangular, acute ; corolla yellow, slightly exceeding the calyx. Ripe carpels hairy on the back ; awns variable, usually long and two to each carpel (sometimes 1), covered with stiff hairs. (Fig. 36.)

Common in the mulberry plantation on the river-side and other places. Flowers nearly all the year round.

5. Abutilon *Gaertn.*

Tomentose herbs or shrubs. Leaves ovate, cordate, toothed, angled or palmately-lobed, long-petioled. Peduncles axillary, solitary, usually 1-flowered ; bracteoles 0 ; calyx of 5 valvate sepals, tubular below ; corolla of 5 petals, free above, connate below and adnate to the tube of the stamens ; staminal-tube divided at the summit into numerous anther-bearing filaments ; carpels 5–25 ; styles as many as the carpels.

Ripe carpels separating from the axis, dehiscent, awned or not, 2–5-seeded. Seeds reniform.

Key to the species.

Ripe carpels 1/3 to 1/2 in. long	.. ..	1. *A. indicum.*
Ripe carpels 1/4 to 1/3 in. long	.. ..	2. *A. bidentatum.*

1. **A. indicum** *G. Don.* ; *Fl. Brit. Ind., I, p.* 326. An erect branched shrub ; branches with spreading hairs. Leaves up to 3–1/2 by 3 in., broadly ovate, cordate, acuminate, irregularly and coarsely toothed, rarely sub-3-lobed, pale and densely stellate-pubescent on both sides, 7–9-nerved at the base; petiole 1–1/2 to 2–1/2 in. long ; stipules linear, deflexed. Peduncles about as long as the petiole or longer, jointed near the top ; sepals 1/3 to 1/2 in. long, ovate, apiculate ; corolla 1 in. in diameter, yellow; staminal-tube stellately hairy at the base ; carpels 15–20, sometimes more, longer than the calyx, with short spreading awns, densely stellately tomentose. Seeds reniform, minutely stellately hairy. (Fig. 37.)

Common in the mulberry plantation on the river-side and elsewhere.

2. **A. bidentatum** *Hochst.* ; *Fl. Brit. Ind., I, p.* 326. Erect, branched. Stem green. Leaves ovate, cordate, 1–1/2 to 3 in. by 2 in., downy on both surfaces, crenate ; petiole 2–1/2 in. or more ; stipules short, linear. Peduncle shorter than the petiole, jointed near the top. Carpels 1/4 to 1/3 in. long, awns spreading. Seeds reniform, minutely stellate-pubescent.

Very similar to the above, but has shorter carpels and stems green up to the base. According to Parker, the carpels dehisce before breaking away from the central axis, while in *A. indicum* the carpels dehisce after breaking away from the central axis.

6. Urena *Linn.*

Herbs or undershrubs, more or less covered with rigid stellate hairs. Leaves angled or lobed. Flowers clustered ; bracteoles 5, adnate to the 5-cleft calyx, sometimes coherent at the base into a cup ; petals 5, often tomentose at the back, free above, connate below and united to the base of the tube of stamens ; staminal-tube truncate or minutely toothed ; anthers nearly sessile ; ovary 5-celled ; cells 1-ovuled, opposite to the petals ; styles twice as many as the cells ; stigmas capitate. Ripe carpels covered with hooked bristles or smooth, indehiscent, separating from the axis when ripe. Seeds ascending ; cotyledons bent and folded.

U. lobata *Linn.* ; *Fl. Brit. Ind., I, p.* 329. A tall erect herb or undershrub. Stem and branches densely covered with stellate hairs. Leaves stalked, rounded or ovate, usually broader than long, up to 3 in. by 4 in., 3–10-lobed ; lobes small, sometimes obsolete, distantly serrate, softly stellately hairy on both sides ; upper surface green ; lower whitish-grey ; base 5–7-nerved, nerves prominent beneath, the central one or

the middle three with elliptic glandular pores ; petiole 1/2 to 6 in. long ; stipules minute, linear. Flowers clustered, sub-sessile ; bracteoles united at the base into a cup, oblong or lanceolate, adnate to the calyx, clothed with rigid hairs ; corolla 1/2 to 1 in. across, bright pink with a dark centre. Carpels rounded at the back, densely stellately hairy and with numerous hooked spines ; hooks usually 4-5 to each spine. (Fig. 38.)

Flowers in the rainy and early part of the cold seasons. Fairly common.

7. Hibiscus *Linn.*

Herbs or shrubs. Leaves stipulate, more or less palmately lobed. Inflorescence axillary ; bracteoles 5 or more, rarely fewer or 0, free or connate at the base ; calyx 5-toothed or 5-fid, sometimes spathaceous and circumciss ; petals 5, connate at the base with the staminal-tube ; staminal-tube truncate or 5-toothed at the summit ; filaments many ; anthers reniform ; ovary generally 5-celled ; cells opposite the sepals, each with 3-many ovules ; styles 5, connate below ; stigmas capitate or sub-spathulate. Capsule loculicidally 5-valved, sometimes with false septa forming a spuriously 10-celled fruit. Seeds glabrous, hairy or woolly.

Key to the species.

Calyx 5-cleft	1. *H. cannabinus.*
Calyx elongate, spathaceous, circumciss ..	2. *H. esculentus.*

1. **H. cannabinus** *Linn.* ; *Fl. Brit. Ind., I, p.* 339. A tall annual or perennial prickly herb. Stem glabrous. Lower leaves cordate, entire ; upper deeply palmately lobed ; lobes narrow, linear-oblong, serrate ; middle nerve glandular beneath ; petiole prickly, in the lower leaves longer than the blade ; stipules linear or subulate. Peduncles axillary, very short ; bracteoles 7–10, linear, shorter than and not adnate to the calyx ; sepals bristly, lanceolate, connate below the middle, with a gland at the back of each ; corolla large, spreading, yellow, with a crimson centre. Capsule globose, pointed, bristly. Seeds nearly glabrous.—Vern., *Sankukra* or *Sanukra.*

The stem furnishes fibre which is used for making ropes, etc. Flowers in the rainy season.

2. **H. esculentus** *Linn.* ; *Fl. Brit. Ind., I, p.* 343. An annual herb, rough with hairs but not prickly. Leaves cordate, 3–5-lobed, lobes coarsely toothed, scabrous ; petiole about as long as the blade, more or less bristly ; stipules subulate, often 2 or more on one or both sides of the leaf. Peduncle shorter than the petiole ; bracteoles 8–10, linear-subulate, equalling the calyx, deciduous ; calyx elongate, spathaceous, splitting along one side ; corolla large, yellow with a crimson centre.

Capsule 6–10 in. long, pyramidal-oblong, acute, smooth or hairy. Seeds numerous, round, striate, smooth or hairy.—Vern., *Bhindi.*

Cultivated for the sake of the unripe capsules which are used as a vegetable.

8. Gossypium *Linn.*

Herbs, shrubs or small trees. Leaves palmately lobed. Peduncles axillary, 1-flowered, jointed. Flowers large, yellow, with or rarely without a crimson centre, or wholly purplish ; bracteoles 3, large, leafy, cordate, sprinkled like the calyx with black glandular dots ; calyx cup-shaped, truncate or slightly 5-toothed ; petals convolute or spreading ; staminal-tube truncate or 5-toothed at the summit ; filaments many ; anthers reniform ; ovary 3–5-celled ; style clavate, 3–5-grooved ; stigmas 3–5 ; ovules many in each cell. Capsule loculicidally 3–5-valved. Seeds densely clothed with woolly hairs ; cotyledons leafy, plicate, sprinkled with black dots.

The classification of the cottons is very difficult owing to their having been cultivated from very ancient times, their great variability due to hybridization and other causes like soil, climate, etc. Different writers have adopted different systems and a great deal has been written on the subject. It is impossible to enter into details in this book. The student who wants more information should refer to larger books on the subject. It is believed that nearly all the commercial cottons of India are hybrids. The following three species are described as occurring within this part of the country to give some idea of their characters and the characters of the hybrids. The descriptions are taken from Duthie's 'Flora of the Upper Gangetic Plain.'

1. **G. arboreum** *Linn.* ; *Fl. Brit. Ind., I, p.* 347. Arborescent. Leaves 5–7-lobed, with an extra tooth in the left-side sinus (or on both sides) of the central lobe, sub-glabrous ; lobes bristle-tipped. Inflorescence axillary, usually 1-flowered. Flowers small, reddish-purple ; bracteoles with rounded ears at the base, toothed or sub-entire at the apex. Ovary rounded. Seeds with greyish-black velvet under the floss.

2. **G. neglectum** *Todaro* ; *Fl. Brit. Ind., I, p.* 346, *under G. herbaceum* (*in part*). Sub-herbaceous. Leaves 3–5–7-lobed, extra tooth in sinus less distinct than in *G. arboreum* ; lobes narrowly lanceolate, rarely bristle-tipped, densely clothed with long spreading hairs ; and if hybridized with *G. Wightianum*, with stellate hairs as well. Inflorescence on short lateral branches, 2–4-flowered. Flowers yellow with a purple centre or yellow tinged with purple ; bracteoles large, with greatly elongated lateral ears, toothed at the apex ; ovary pointed. Seeds with green velvet below the floss.

3. **G. Wightianum** *Todaro* ; *Fl. Brit. Ind., I, p.* 346, *under G. herbaceum* (*in part*). Stems erect, somewhat hairy. Leaves when

young densely matted with short stellate hairs, which fall off in patches, leaving a few scattered all over both surfaces, ovate-rotund, almost obsoletely cordate, 3–5-, rarely 7-, lobed ; lobes ovate-oblong, acute, constricted at the base into the rounded sinus which in the young leaves rises up as a fold ; stipules on the peduncles almost ovate, the others linear-lanceolate, acuminate. Flowers yellow with a deep purple patch at the base, becoming reddish on the outside on passing maturity ; bracteoles small, ovate, cordate, acute, shortly toothed. Seeds with very short firmly-adhering velvet ; wool white or tinged with red.

The cottons cultivated in the neighbourhood of Lahore may be divided into two groups, *Desi kapas* and *Narma*.

Desi kapas. Long simple and stellate hairs variously mixed ; lobes of the leaf going half-way down or more, broadly ovate-oblong to oblong-lanceolate, usually with an extra tooth on one or each side of the middle lobe ; the middle one, or the 2 or 3 central veins with a gland on the under surface, though the gland is absent in rare cases. Bracteoles cordate, with rounded basal auricles, and slightly toothed or sub-entire towards the apex. Seeds greyish-black under the cotton. The characters are intermediate between those of *G. arboreum* and *G. Wightianum*. Flowers reddish-purple (usually with glands on the veins), yellow with a purple centre, light yellow with a purple centre, yellowish-white with a purple centre.

Narmas. Long simple and stellate hairs ; leaf-lobes going less than half-way down, broad, more or less triangular, without any extra tooth in the sinus, usually acuminate ; central vein usually with a gland on the under surface ; bracteoles cordate, with rounded basal auricles, deeply laciniate almost along the whole margin with linear-lanceolate teeth ; seeds greenish beneath the cotton. The *narmas* thus possess the characters of *G. arboreum* or *G. neglectum* and *G. Wightianum*. Flowers reddish-purple. Cotton brownish (*khaki narma*) or white (*safed narma*).

For more information consult ' The Wild and Cultivated Cotton Plants of the World ' by Watt.

Kydia calycina *Roxb.*, a small deciduous tree with simple leaves, panicles of white flowers and the staminal-tube divided into 5 branches is cultivated in gardens.

Bombax malabaricum *DC., the silk-cotton tree.* A tall deciduous tree ; stem covered with prickles which disappear with age ; leaves digitately 5–7-foliolate ; flowers large, crimson ; stamens arranged in 5 bundles.—Vern., *Simal, Simbal.*

Common in gardens. Flowers during spring. Flower-buds are eaten and the cotton outside the seeds is used for stuffing pillows, etc.

XVI. TILIACEÆ.

Trees, shrubs or herbs. Leaves alternate, rarely opposite, simple or lobed ; stipules free, often caducous. Flowers regular, bi- or uni-sexual, usually arranged in cymes ; sepals 3–5, free or connate, valvate ; petals as many as the sepals, rarely absent, imbricate or valvate ; stamens numerous, rarely definite, usually springing from a prolonged or dilated torus, free or sometimes 5-adelphous ; anthers 2-celled ; ovary superior, 2–10-celled ; style columnar or divided into as many parts as there are

cells of the ovary ; stigmas usually distinct, rarely confluent or sessile ; ovules attached to the inner angle of the cells, pendulous or ascending if few, or in two or more ranks if numerous. Fruit dry or fleshy, dehiscent or indehiscent, 2-10- or by abortion 1-celled, cells sometimes divided by false septa. Seeds 1 to many ; albumen fleshy or wanting.—*Genera about* 35, *species about* 375, *most abundant in warmer parts of the world.*

Corchorus *Linn.*

Herbs or undershrubs, more or less covered with stellate hairs. Leaves simple. Peduncles axillary or leaf-opposed, 1–5-flowered. Flowers small, yellow ; sepals 4-5, without any glands ; stamens many or definite, springing from a short torus ; ovary 2–5-celled ; style short ; stigma cup-shaped ; ovules many. Capsule elongated or sub-globose, smooth or prickly, loculicidally 2–5-valved, sometimes with transverse partitions. Seeds many, albuminous, pendulous or horizontal.

Key to the species.

Capsule sub-globose .. .. .. 1. *C. capsularis.*
Capsule cylindrical.
  Beak of capsule entire and erect.
    Erect herbs.
      Stamens many, capsule long.
        Capsule glabrous, beak long .. 2. *C. olitorius.*
        Capsule scabrous or hispid, beak short 3. *C. trilocularis.*
      Stamens 5–10 ; capsule short .. .. 4. *C. fascicularis.*
    A prostrate undershrub .. .. 5. *C. antichorus.*
  Beak of capsule 3-fid, tips spreading.
    Capsule long, slender, without wings .. 6. *C. tridens.*
    Capsule short, stout, winged .. .. 7. *C. acutangulus.*

1. **C. capsularis** *Linn.* ; *Fl. Brit. Ind., I, p.* 397. An erect glabrous annual. Leaves 2–4 in. long, ovate-lanceolate, acuminate, serrate, rounded at the base, the two lowest serratures produced into filiform deflexed tails ; petiole 1-1/2 in. long ; stipules filiform, as a long as the petiole. Flowers less than 1/2 in. across, shortly stalked. Capsule sub-globose, depressed at the apex, 1/2 in. in diameter, ridged and muricate, 5-celled ; valves woody, without transverse partitions. Seeds few in each cell, wedge-shaped, smooth, brown.—*Jute.*

Recorded from Lahore but not seen recently within this area. Yields the well-known fibre.

2. **C. olitorius** *Linn.*; *Fl. Brit. Ind., I, p.* 397. Annual or perennial. In other respects similar to the preceding, but capsule elongated, 3–6-valved and valves with transverse partitions between the seeds.

Also yields jute. Specimens have been collected from Panjab by Thomson, Edgeworth, Stewart, and Aitchison.

3. **C. trilocularis** *Linn.*; *Fl. Brit. Ind., I, p.* 397. An erect annual herb up to 4 ft. high. Stem thinly downy. Leaves 1–4 in. long, ovate, ovate-oblong to oblong-lanceolate, crenate-serrate, the two lowest serrations produced into long hair-like processes or not, thinly hairy; petiole 3/10 to 2/5 in., pilose; stipules long, setaceous, up to 2/5 in., shorter than the petiole. Peduncles leaf-opposed, very short, 1–3-flowered; petals yellow; stamens about 20. Capsule 2-3 in. long, straight or curved, usually 3-angled, 3-valved, scabrous; valves with transverse partitions between the seeds; beak short. Seeds black, ovate or ovate-oblong, with both ends truncate, or one end oblique-pointed. (Fig. 39.)

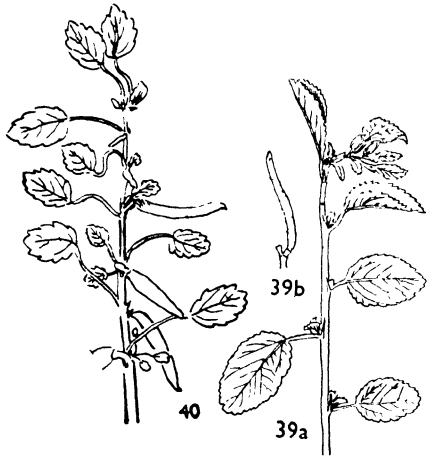

Fig. 39, *Corchorus trilocularis*, (*a*) a branch, $\times \frac{1}{2}$, (*b*) fruit, $\times \frac{1}{2}$; Fig. 40, *Corchorus antichorus*, $\times 1$.

In waste places. Pretty common. Flowers in the rainy season.

4. **C. fascicularis** *Lamk.*; *Fl. Brit. Ind., I, p.* 398. Annual or perennial. Leaves 1-2 in. long, oblong-lanceolate, serrate; petiole very short, pilose. Peduncles 2–5-flowered; stamens 5–10. Capsules 3 or 4 together, short, sub-cylindric, hairy, shortly beaked; valves nearly destitute of internal partitions. Seeds trigonous, black.

Not seen recently within the area, but may be met with. The plant is mucilaginous and is used medicinally.

5. **C. antichorus** *Rœusch.*; *Fl. Brit. Ind., I, p.* 398. A prostrate glabrous much branched perennial undershrub; branches many, tortuous, woody when old. Leaves 1/2–3/4 by 1/4–2/5 in., roundish, elliptic or elliptic-oblong, plicate, crenate-serrate; petiole long, slender, up to 1 in., pilose; stipule minute. Peduncles very short, leaf-opposed, usually 2-flowered; petals yellow; stamens 8–10. Capsule glabrous, cylindric

straight or slightly curved, about 1/2 in. long, slightly beaked, 4-valved; valves without any partitions between the seeds. Seeds obliquely truncate at both ends, oblong, trigonous.—Vern., *Boh-phali.* (Fig. 40.)

Not very common. Used medicinally. Flowers in the rainy season.

6. **C. tridens** *Linn.*; *Fl. Brit. Ind., I, p.* 398. Annual herb. Leaves 1–3 in. long, 1/2 to 1 in. broad, linear-oblong or lanceolate, serrate, with or without bristle-like prolongations of the basal serrations; petiole 1/3 to 2/5 in. long, pilose; stipules linear, subulate, 1/8 in. long. Peduncles 1–4-flowered; flowers yellow; petals oblong-oblanceolate; stamens about 10. Capsule cylindric, 1-2 in. long, terminated by 3 spreading points, slightly scabrid; valves without partitions between the seeds. Seeds oblong, truncate at both ends, black.

Occasionally met within the area. Flowers in the rainy season.

7. **C. acutangulus** *Lamk.*; *Fl. Brit. Ind., I, p.* 398. Annual. Leaves 1–3 in. long, more or less hairy, ovate and acute or oblong and acuminate, serrate, with or without basal lobes; stipules linear-subulate, shorter than the petiole. Peduncle 2-3-flowered. Capsule short, 6-angled, 3 of the angles winged; beak 3-fid, divisions spreading horizontally; valves with or without partitions. Seeds uniseriate in each cell, truncate at both ends.

Grewia asiatica *Linn.*,—Vern., *Falsa*; a small tree, is cultivated.

XVII. ZYGOPHYLLACEÆ.

Herbs or shrubs, rarely trees. Leaves opposite or alternate, stipulate, 2-3-foliolate, pinnate or multifid, not gland-dotted; stipules usually paired, persistent, sometimes spiny. Flowers hermaphrodite, usually regular; sepals 4-5, free or rarely connate at the base; petals 4-5, free, usually imbricate, rarely 0; disk generally present, rarely 0, without glands; stamens as many as or double or 3 times as many as the petals, inserted at the base of the disk, often alternately longer and shorter, those opposite to the petals often connate at the base with them; filaments often with a scale on the inside at the base or middle; anthers versatile, opening lengthwise; ovary superior, sessile or shortly-stipitate, usually 4-5-, sometimes more-celled; style short or absent; ovules 2 or more in each cell, axile. Fruit various, schizocarpic or septicidally dehiscent capsule, not fleshy. Seeds usually pendulous and solitary, rarely more; albument scanty, rarely 0.—*Genera about* 20, *species nearly* 100, *chiefly tropical and subtropical.*

Key to the genera.

Stamens 10.
- Plant without spines; leaves pinnate; fruit spinous .. .. .. 1. *Tribulus.*
- Plant with 4 spines at each node; leaves 1-3-foliolate; fruit not spinous .. .. 2. *Fagonia.*

Stamens 12–15, leaves multifid .. .. 3. *Peganum.*

1. Tribulus *Linn.*

Prostrate herbs, usually silky. Leaves stipulate, opposite, paripinnate. Flowers solitary, on pseudo-axillary peduncles; sepals 5, imbricate; petals 5, fugacious, spreading, imbricate; disk annular, 10-lobed; stamens 10, inserted at the base of the disk, 5 longer opposite to the petals, 5 shorter with a little gland on the outside; filaments filiform, naked; ovary sessile, hirsute, 5–12-lobed and -celled; style short; stigmas 5–12; ovules superposed. Fruit 5-angled, of 5–12-winged or spinous or tuberculate indehiscent cocci. Seeds 2 or more in each cell, exalbuminous.

T. terrestris *Linn.*; *Fl. Brit. Ind., I, p.* 423. A prostrate branched annual or biennial herb; branches 1–3 ft. long, hirsute or silky hairy. Leaflets 5–7 pairs, sub-equal, oblong, mucronate, very variable in size, 1/4–3/4 in. by 1/12–3/10 in., both surfaces with silky hairs, upper sparsely so and green, lower densely so and whitish. Flowers 1/3–3/4 in. across, yellow, on peduncles shorter than the leaves. Cocci with 2 long and 2 short spines, coarsely hairy.—Vern., *Bhakhra.* (Fig. 41.)

2. Fagonia *Linn.*

Woody herbs. Leaves opposite, 1–3-foliolate; stipules usually spiny. Flowers on peduncles arising from between the stipules; sepals 5, deciduous, imbricate; petals 5, caducous; disk short; stamens 10, inserted on the disk; filaments filiform, naked; anthers oblong; ovary sessile, 5-cornered, 5-celled, tapering into a subulate style; stigma simple; ovules 2, collateral, at the base of each cell, pendulous from ascending funicles. Fruit 5-cornered, of five 1-seeded cocci, which dehisce along the ventral suture and separate from a horny endocarp. Seeds erect, compressed, broadly oblong; testa mucilaginous; albumen horny.

F. cretica *Linn.* (**F. arabica** *Linn.*); *Fl. Brit. Ind., I, p.* 425. A small green spiny woody herb with stiff erect glandular branches. Leaflets elliptic or linear, acute; petiole often leaflike, very variable in length; stipules modified into spines (spines 4 at a node), up to 1/2 in. long. Flowers small, pale rose-coloured; sepals half as long as the

petals. Capsule pubescent. Seeds flat, punctate.—Vern., *Jawan, Jawansa.* (Fig. 42.)

Fig. 41, *Tribulus terrestris*, $\times \frac{2}{3}$; Fig. 42, *Fagonia cretica*, $\times \frac{2}{3}$; Fig. 43, *Peganum Harmala*, $\times \frac{1}{2}$.

3. Peganum *Linn.*

Perennial-rooted erect herbs. Leaves alternate, entire or multifid; stipules setaceous. Flower solitary, on sub-terminal leaf-opposed peduncles, white; sepals 4-5, often foliaceous and pinnatifid, persistent; petals 4-5, sub-equal, imbricate; stamens 12–15, inserted at the base of the disk, some anther-less; filaments dilated below; anthers linear; ovary globose, deeply 2-3-lobed; styles basal, twisted, 2-3-keeled above, the keels stigmatose; ovules many in each cell, axile. Fruit globose, 3-4-celled, dry, 3-4-valved; cells many-seeded. Seeds angled; testa spongy, rough; albumen fleshy.

P. Harmala *Linn.*; *Fl. Brit. Ind., I, p.* 486. A glabrous densely leafy herb, 1–3-ft. high, with a thick perennial rootstock. Stem dichotomously and corymbosely branched. Leaves 2-3 in. long, several times divided; segments linear, acute. Flowers 1/2 to 3/4 in. across, solitary, sessile or pedicelled, white; sepals very narrow, much exceeding the corolla, persistent. Capsule globose, depressed at the apex, about 1/3 in. in diameter—Vern., *Harmal.* (Fig. 43.)

Very common. Flowers mostly in April-May.

XVIII. GERANIACEÆ.

Herbs or undershrubs, rarely trees. Leaves opposite or alternate, digitately or pinnately compound ; leaflets spirally coiled when young, usually closing at night ; stipules present or 0. Peduncles usually solitary, axillary, 1- or more-flowered. Flowers usually showy, hermaphrodite, regular or irregular ; sepals generally 5, free or united to the middle, usually imbricate ; petals usually 5, free or shortly connate at the base, contorted or imbricate, disk with 5 glands alternating with the petals or without glands ; stamens 5–15, hypogynous ; filaments filiform, dilated below or connate into a ring ; anthers 2-celled, opening lengthwise ; ovary superior, usually 3–5-lobed and 3–5-celled ; styles free or united ; ovules 1-2, rarely more in each cell, axile. Fruit mostly capsular. Seeds with or without an aril ; albumen present or 0.—*Genera about* 15, *species about* 1,000, *in tropical and temperate countries.*

Oxalis *Linn.*

Herbs with acid taste. Leaves radical or alternate, stipulate or exstipulate, 3-foliolate. Flowers on axillary 1- or more-flowered peduncles, regular ; sepals 5, imbricate ; petals 5, hypogynous, contorted ; disk without glands ; stamens 10, free or united at the base, all anther-bearing ; ovary 5-lobed ; styles 5, distinct ; stigmas terminal, capitate, bifid or laciniate ; ovules 1 or more in each cell. Capsule with loculicidal dehiscence ; valves persistent to the axis. Seeds with an outer fleshy coat which bursts elastically ; testa crustaceous ; albumen fleshy ; embryo straight.

Key to the species.

Flowers yellow.		
Corolla up to 1/4 in. long	1.	*O. corniculata.*
Corolla 3/4 in. long	2.	*O. Pes-caprœ.*
Flowers rose-pink	3.	*O. corymbosa.*

1. **O. corniculata** *Linn.* ; *Fl. Brit. Ind., I, p.* 436. A diffuse creeping annual herb with appressed hairs and long slender branches rooting at the nodes. Leaflets obcordate, up to 1/2 in. broad ; stipules adnate to the petiole ; petiole up to 3 in. long. Flowers yellow, about 1/2 in. across, up to 1/4 in. long, on 2-many-flowered peduncles, sub-umbellate ; bracts setaceous ; petals obcordate. Capsule sub-cylindric, 3/4 in. long ; cells many-seeded. Seeds dark brown, rugose.—Vern., *Khatti-buti.* (Fig. 44.)

Very common everywhere. Flowers : Feb.–June.

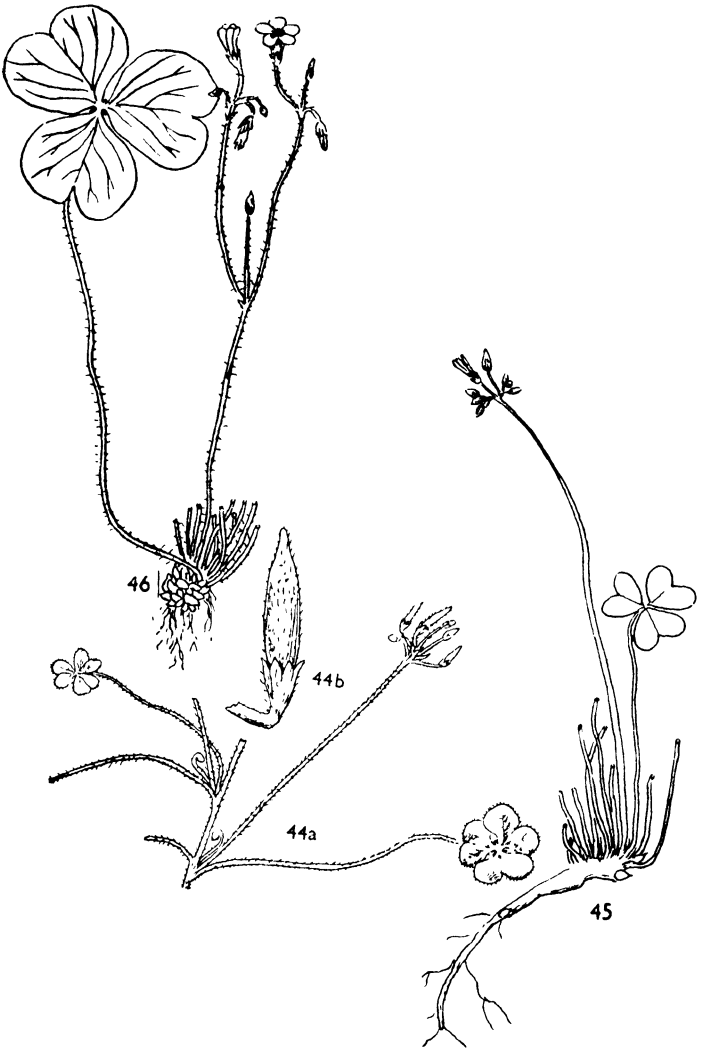

Fig. 44, *Oxalis corniculata*, (*a*) portion of a branch, × ½, (*b*) capsule, × ⅔; Fig. 45, *O. Pes-caprae*, × ⅓; Fig. 46, *O. corymbosa*, × ½.

2. **O. Pes-capræ** *Linn.*; *not included in Fl. Brit. Ind.* An annual herb with an underground rhizome bearing bulbils and a tuft of radical leaves. Leaves long-stalked, spotted with purple on upper surface; leaflets obcordate, slightly hairy, ciliate, 1/2–1 in. broad; petiole 4–7 in. long. Peduncles many-flowered, up to 1 ft. long; flowers sub-umbellate, yellow, 3/4 in. long; sepals lanceolate, acute, each with 2 oblong yellow

spots at its tip ; petals entire. Does not produce fruits and seeds at Lahore. (Fig. 45.)

Met with very commonly as an escape. Flowers : Feb.–May.

3. **O. corymbosa** *DC.* ; *not included in Fl. Brit. Ind.* An annual herb with compound bulbs (formed by clustering of simple bulbils) and very large leaves. Leaves all radical, in a tuft ; petiole up to 15 in. long ; leaflets broadly obcordate, up to 2–1/2 in. broad, pubescent on the under side. Flowers rose-pink, in sub-umbellate clusters on peduncles slightly longer than the petioles, a little less than 3/4 in. long ; sepals lanceolate, with usually 2 oblong yellow spots at the tips ; petals entire. Fruits and seeds not produced at Lahore. (Fig. 46.)

Very commonly met with as an escape. Flowers : March–May.

XIX. RUTACEÆ.

Trees or shrubs, rarely herbs. Leaves opposite or alternate, simple or compound, exstipulate, dotted with pellucid glands filled with essential oil. Flowers in axillary or terminal cymes or panicles, usually bisexual and regular ; sepals 4-5, free or connate, imbricate ; petals 4-5, free, hygynous, valvate or imbricate ; stamens as many as or twice as many as the petals, rarely many, free or united, hypogynous ; anthers 2-celled, introrse, opening lengthwise ; connective often glandular at the apex ; disk within stamens, crenate or lobed, sometimes large or long ; ovary superior, of 4-5 or more, sometimes free, but more generally connate carpels ; styles as many, free or connate ; stigma terminal, entire or lobed ; ovules usually 2, sometimes more, in each cell, axile. Fruit generally a berry or drupe, rarely dry and dehiscent. Seeds with or without endosperm ; embryo straight or curved.—*Genera nearly* 100, *species about* 800, *in tropical and warm temperate countries.*

Citrus *Linn.*

Usually spinous evergreen shrubs or trees. Leaves alternate, unifoliolate ; petiole often winged. Flowers axillary, solitary, fascicled or in small cymes, white or pinkish, sweet-scented ; calyx cupular or urceolate, 3–5-fid ; petals 4–8, linear-oblong, thick, imbricate ; stamens 15–60, inserted round a large cupular or annular disk, polyadelphous ; ovary many-celled ; style stout, deciduous ; stigma capitate ; ovules 4–8, biseriate in each cell. Berry large, oblong or globose, fleshy, many-celled ; septa membranous ; cells few-seeded and filled with fusiform horizontal cells developed from the endocarp and distended with juice. Seeds horizontal or pendulous, commonly polyembryonous.

Key to the species.

Young shoots and leaves glabrous.
Young shoots purple ; fruit usually mammillate at the apex .. .. .. 1. *C. medica.*
Young shoots greenish-white ; fruit not mammillate .. .. .. 2. *C. Aurantium.*
Young shoots and leaves beneath pubescent .. 3. *C. decumana.*

1. **C. medica** *Linn.* ; *Fl. Brit. Ind., p.* 514. A shrub or small tree. Young shoots glabrous, purple. Leaflets 3–6 in. long, elliptic-ovate or ovate-lanceolate, glabrous ; petiole naked or winged. Flowers white, often tinged with pink, frequently unisexual ; stamens 20–40. Fruit globose, ovoid or oblong, mammillate at the apex.

This species includes the following varieties : The citron, Vern., *Galgal* ; the sour lime, Vern., *Kagzi nimbu* ; the sweet lime, Vern., *mitha nimbu*, etc.

2. **C. Aurantium** *Linn.* ; *Fl. Brit. Ind., I, p.* 515. Usually a small tree, with the young shoots glabrous and greenish-white. Leaflets elliptic or ovate, obtuse, acute or acuminate ; petiole often broadly winged. Flowers pure white, bisexual. Fruit globose, generally flattened at both ends, not nammillate.

This species includes the various kinds of oranges ; the *santra*, with loose skin ; the ordinary *narangi*, with dark coloured clinging rind ; the *malta*, etc.

3. **C. decumana** *Linn.* ; *Fl. Brit. Ind., I, p.* 516. A tree with the young shoots more or less pubescent. Leaflet large, ovate-oblong, frequently emarginate, usually downy beneath ; petiole broadly winged. Flowers large, white ; stamens 16–44. Fruit often very large, pale, globose or pear-shaped ; rind thick ; pulp yellow, pink or crimson, sweet or acid ; vesicles distinct.—*The pumelo, the shaddock* ; Vern., *Chakotra.*

The following plants of this family are also sometimes cultivated :—

Aegle Marmelos *Correa.* A small deciduous tree with long axillary spines. Leaves 3-foliolate. Flowers in axillary panicles, white ; stamens many. Berry 2–6 in. in diam., globose, grey or yellow on the outside ; pulp orange-coloured, sweet.—Vern., *Bel.*

The pulp is commonly used in medicine, especially for intestinal troubles.

Feronia elephantum *Correa.* A small deciduous tree with axillary spines. Leaves imparipinnate. Flowers polygamous, pale green stained with red. Berry 3-4 in. in diam., globose.—Vern., *Kaith.*

Murraya exotica *Linn.* A small evergreen tree with pinnate leaves. Flowers pure white, very fragrant. Berry ovoid, 1/2–3/4 in. long, red or deep orange when ripe.—Vern., *Marua.*

XX. MELIACEÆ.

Trees or shrubs. Leaves alternate, exstipulate, mostly pinnate; leaflets usually quite entire and more or less oblique at the base, without transparent dots. Flowers usually hermaphrodite, regular, in cymose axillary panicles; calyx usually 4–6-lobed; petals 4–6, free or rarely connate at the base; stamens 4–12, inserted outside the base of the hypogynous disk; filaments united in a tube or rarely free; anthers erect, usually sessile on the tube, included or exserted, opening lengthwise; disk annular, tubular or 0, free or connate with the ovary; ovary usually superior, 2–6-celled; rarely 1-celled; style single; stigma disciform or capitate; ovules 2 in each cell, rarely more. Fruit capsular, drupaceous or a berry. Seeds with or without endosperm, often enclosed in an aril.—*Genera about* 40, *species nearly* 600, *in warmer parts of the world.*

Key to the genera.

Filaments united into a cylindrical tube; fruit drupaceous	1. *Melia.*
Filaments free; fruit a capsule	2. *Cedrela.*

1. Melia *Linn.*

Trees. Leaves pinnate or 2-3-pinnate; leaflets toothed or entire. Flowers in axillary panicles; calyx short, 5-6-lobed; lobes imbricate; petals 5-6, free, spathulate-oblong, imbricate; staminal-tube cylindrical, dilated at base and apex, 10- or 12-striate and -toothed; anthers 10 or 12, included or partly exserted, short, inserted near apex; disk annular; ovary 3–6-celled; style slender, nearly as long as the tube; stigma capitate; ovules 2 in each cell, superposed. Fruit drupaceous.

The following two species of the genus are commonly cultivated:—

M. Azadirachta *Linn.*; *Fl. Brit. Ind., I, p.* 544. A large tree. Leaves once pinnate. Flowers white, honey-scented. Drupe 1-celled, 1-seeded.—Vern., *Nim.*

All parts of the plant are used medicinally. Flowers: April-May.

M. Azedarach *Linn.*; *Fl. Brit. Ind., I, p.* 544. Leaves 2-, occasionally 3-pinnate. Flowers lilac. Fruit mostly 5-celled.—Vern., *Dek, Dhrek, Bukain.* (Fig. 47.)

Flowers: March-April.

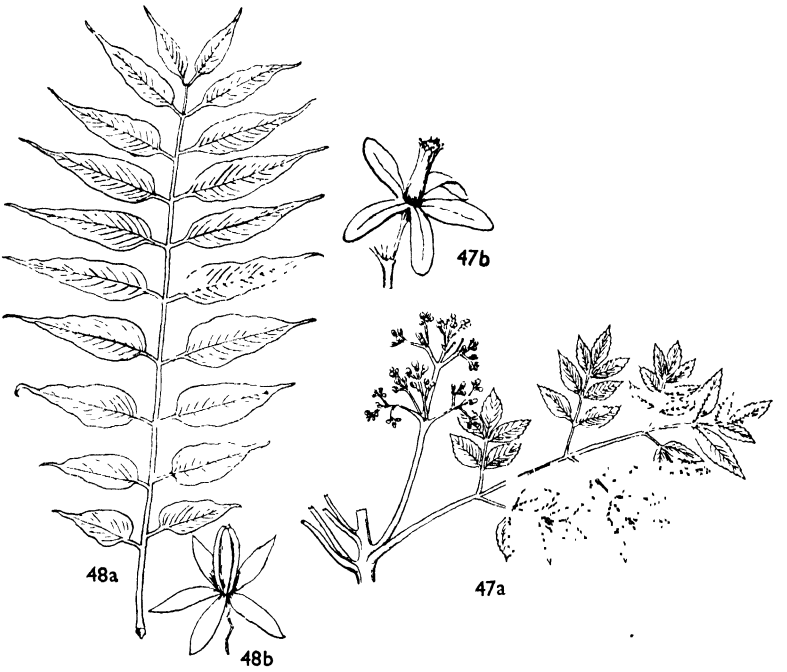

Fig. 47, *Melia Azedarach*, (*a*) portion of a twig bearing leaf and an inflorescence, $\times \frac{1}{6}$, (*b*) flower, $\times 1$; Fig. 48, *Cedrela Toona*, (*a*) leaf, $\times \frac{1}{8}$, (*b*) capsule, $\times \frac{1}{2}$.

2. **Cedrela** *Linn.*

C. Toona *Roxb.*; *Fl. Brit. Ind., I, p.* 568. A deciduous tree. Leaves once pinnate. Flowers in terminal and sub-terminal panicles, cream-coloured, 5-merous; stamens free. Fruit 5-valved, septifragal capsule.—Vern., *Tun.* (Fig. 48.)

Sometimes cultivated on road-sides.

XXI. RHAMNACEÆ.

Shrubs and trees, sometimes scandent, often prickly. Leaves simple, alternate or opposite, usually coriaceous and 3-nerved; stipules small, deciduous or modified into prickles. Flowers hermaphrodite or polygamous, small, greenish, in lax or dense axillary cymes; calyx 4–6-fid, lobes triangular, usually carinate within, valvate; petals 4–6, small, rarely 0, inserted on the throat of the calyx-tube; stamens 4-6, opposite to the petals and often enclosed within their folds; anthers versatile, 2-celled, dehiscing lengthwise; disk fleshy and filling the calyx-tube or thin and lining it, entire or lobed; ovary sessile, free or sunk in the disk, wholly free from the calyx-tube or more or less adherent to it, 2–4-celled; style short, simple or shortly lobed; ovules mostly solitary, erect, anatropous. Fruit various, commonly drupaceous. Seeds usually

with fleshy endosperm ; embryo large, straight.—*Genera about* 40, *species nearly* 500, *in most parts of the world.*

Zizyphus *Juss.*

Trees or shrubs, usually armed with pairs of stipular spines, one usually recurved and the other straight. Leaves alternate, with 3–5 basal nerves. Flowers clustered in axillary cymes, small, 5-merous, mostly bisexual ; calyx 5-fid, lobes spreading, keeled within, tube broadly obconical ; petals 5, rarely 0, hooded, usually deflexed ; disk 5–10-lobed, margin free ; stamens 5 ; ovary sunk in the disk and confluent with it at the base, 2–4-celled ; styles 2–4, free or partly connate. Fruit fleshy or dry, with a woody or bony 1–4-celled, 1–4-seeded stone. Seed without or with very scanty endosperm.

Key to the species.

Tree ; leaves glabrous above	.. ..	1. *Z. Jujuba.*
Shrub ; leaves pubescent above	.. ..	2. *Z. nummularia.*

1. **Z. Jujuba** *Lamk.* ; *Fl. Brit. Ind., I, p.* 632. A moderate-sized tree or a large shrub, almost evergreen, usually armed ; young branches softly tomentose. Leaves 1–2¼ in. long, sub-orbicular, ovate, or ovate-oblong, rounded at the apex, slightly unequal at the base, entire or serrulate, glabrous above, usually densely clothed beneath with white or buff tomentum, strongly 3-nerved ; petiole up to 1/2 in. long ; stipular spines usually in pairs, one straight, the other shorter and recurved, rarely wanting. Flowers very small, greenish-yellow, in sessile or shortly peduncled axillary cymes ; calyx pubescent or woolly without, glabrous

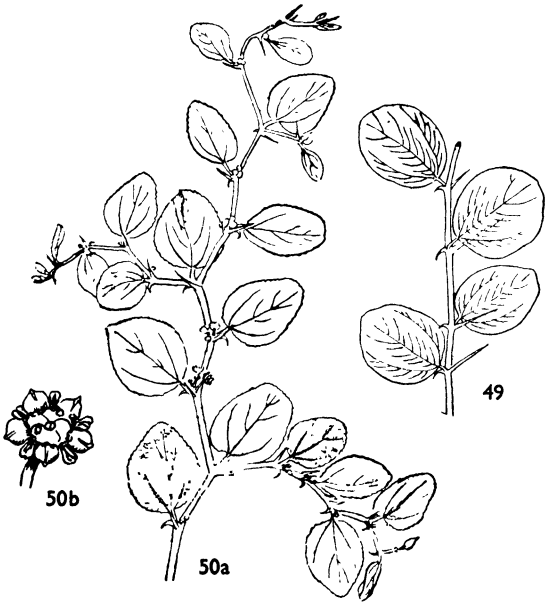

Fig. 49, *Zizyphus Jujuba*, ×½ ; Fig. 50, *Z. nummularia*, (*a*) a branch, ×⅔, (*b*) flower, ×4.

within ; petals clawed ; limb oblong, hooded ; disk with 10 grooved lobes ; ovary 2-celled ; styles 2, connate to the middle. Drupe 1/2 to 1½ in. long, orange or red when ripe, globose or ovoid ; stone tubercled and irregularly furrowed, usually 2-celled.—Vern., *Ber.* (Fig. 49.)

Cultivated or self-sown. Fruit (*Ber*) is edible.

Flowers : Sept.–November. Fruit ripens during winter.

2. **Z. nummularia** *W. & A.* ; *Fl. Brit. Ind., I, p.* 633. A thorny tomentose bush ; branches flexuous, divaricate ; young branches grey-pubescent or tomentose ; spines in pairs ; one long, straight, sharp ; the other small, much narrowed. Leaves 1/3–1 in. long, elliptic or orbicular, very shortly stalked, more or less densely pubescent above, grey velvety-tomentose beneath, entire or serrate, 3-nerved. Flowers in axillary short compact sessile cymes ; pedicel up to 1/4 in. long ; petals clawed, with a roundish limb ; disk 10-lobed, with a pit opposite each lobe ; ovary 2-celled ; styles 2, united to above the middle. Drupe globose, 1/3 in. in diameter, red or black when ripe.—Vern., *Malha.* (Fig. 50.)

Common in dry places. Fruit is known as *kokan ber* and is edible. Flowers : Sept.-October.

XXII. ANACARDIACEÆ.

Mangifera indica *Linn.* ; *Fl. Brit. Ind., II, p.* 13. A large ever-green tree. Leaves alternate, simple, exstipulate, 6–12 by 1–4 in., oblong or oblong-lanceolate, coriaceous, glabrous, shining, entire, acute, acuminate or obtuse, crowded at the ends of the branches, purplish when young ; petiole swollen at the base, 1-2½ in. long. Flowers very small, yellowish-green, male and bisexual, in terminal panicles ; pedicel jointed ; calyx 4-5-partite ; lobes ovate, concave, pubescent on the outside, imbricate, deciduous ; petals 4-5, oblong, with 3 strong orange-coloured ridges on the inner face, imbricate ; disk fleshy, 5-lobed ; stamens 4-5, inserted on the disk, one only perfect and longer than the rest, others with imperfect anthers or reduced to teeth ; ovary superior, sessile, 1-celled, glabrous ; style lateral ; ovule solitary, pendulous from nearly a basal funicle, rarely horizontal. Fruit a large fleshy drupe, 2–6 in. long ; stone compressed, fibrous. Seed large, compressed ; testa papery ; endosperm absent ; cotyledons plano-convex.—*The mango* ; Vern., *Ám.*

Cultivated for the sake of the delicious fruit. Flowers : March-April. Fruit ripens during the rainy season.

XXIII. PAPILIONACEÆ.

Herbs, shrubs or trees, commonly climbing. Leaves usually alternate, pinnate, bipinnate, digitate or simple, stipulate, often stipellate, sometimes the tip of the rachis and some leaflets modified into tendrils. Flowers mostly bisexual, zygomorphic, in racemes, spikes, heads or panicles, rarely cymose ; sepals 5, sometimes free, generally more or less connate ; petals 5, imbricate, dissimilar and unequal, free except the two anterior ones, the upper (posterior) outermost and forming the *standard*,

the two lateral more or less parallel with each other and forming the *wings*, the two anterior (lower) innermost and connate, forming the *keel*; stamens inserted with the petals, normally 10, monadelphous or diadelphous, rarely free, mostly all perfect; anthers dehiscing usually lengthwise; carpel 1, superior; style simple, cylindrical; stigma capitate, terminal or oblique; ovules one to many on the ventral suture. Fruit a legume (a pod dehiscing along both the sutures), sometimes indehiscent or lomentaceous (separating into 1-seeded joints). Seeds without or with scanty endosperm; cotyledons foliaceous or thick and fleshy.—*A very large group, species about* 6,000, *cosmopolitan.*

Key to the genera.

I. Stamens monadelphous.
- A tall tree; stamens 9 .. .. 28. *Dalbergia.*
- A large climber .. .. .. 22. *Canavalia.*
- Erect, low or tall, herbs or undershrubs.
  - Leaves simple .. .. .. 1. *Crotalaria.*
  - Leaves trifoliolate.
    - Pod 8–12-seeded .. .. 7. *Cyamopsis.*
    - Pod mostly 2-seeded, dehiscent; leaves without glands .. .. 1. *Crotalaria.*
    - Pod 1-seeded, indehiscent; leaves gland-dotted beneath .. .. 9. *Psoralea.*

II. Stamens diadelphous.

A. Leaves simple.
- Spinous undershrub .. .. 13. *Alhagi.*
- Unarmed.
  - Pod not jointed .. .. 8. *Indigofera.*
  - Pod breaking up into 1-seeded joints.
    - Pod twisted .. .. 14. *Uraria.*
    - Pod not-twisted.
      - Joints turgid .. .. 15. *Alysicarpus.*
      - Joints flattened .. .. 16. *Desmodium.*

B. Leaves 3-foliolate.
- Leaflets exstipellate.
  - Not gland-dotted beneath, usually toothed.
    - Leaves digitately 3-foliolate; flowers in axillary heads .. .. 2. *Trifolium.*
    - Leaves pinnately 3-foliolate; flowers racemed.
      - Racemes long .. .. 4. *Melilotus.*

Racemes short.
Pod straight or curved .. 3. *Trigonella.*
Pod spiral .. .. 5. *Medicago.*
Leaflets gland-dotted beneath, usually entire.
Twining or trailing herbs.
Pods 2-seeded .. .. 27. *Rhynchosia.*
Pods 3- or more-seeded .. 26. *Atylosia.*
An erect undershrub ; pod 1-seeded, indehiscent .. .. 9. *Psoralea.*
Leaflets stipellate.
Pod breaking up into 1-seeded joints.
Pod twisted .. .. 14. *Uraria.*
Pod straight .. .. 16. *Desmodium.*
Pod not jointed.
Keel spiral .. .. .. 23. *Phaseolus.*
Keel not spiral.
Stigma oblique .. .. 24. *Vigna.*
Stigma terminal .. .. 25. *Dolichos.*

C. Leaves neither simple nor 3-foliolate.
Leaf rachis not ending in a bristle or tendril.
Leaflets 5.
Pod dehiscent, not jointed .. 6. *Lotus.*
Pod breaking into 3–6 1-seeded indehiscent joints .. .. 14. *Uraria.*
Leaflets more than 5.
Pod breaking into 3–6 1-seeded indehiscent joints .. .. 14. *Uraria.*
Pod not breaking into 1-seeded joints.
Pod 6–9 in. long, narrow, septate between the seeds 11. *Sesbania.*
Pod about 2 in. long, linear, flattened .. .. 10. *Tephrosia.*
Pod 1 in. or less long.
Pod more than 4-seeded .. 12. *Astragalus.*
Pod mostly 1–3-seeded .. 17. *Cicer.*
Leaf-rachis ending in a bristle or tendril.
Leaflets 0 or 2 .. .. 19. *Lathyrus.*
Leaflets more than 2, toothed .. 17. *Cicer.*

Leaflets more than 2, entire or nearly so.
Pod 1-2-seeded .. .. 20. *Lens.*
Pod more than 2-seeded.
Leaves without twisted tendrils.
Pod 1 in. or less long .. 12. *Astragalus.*
Pod 6–9 in. long .. 11. *Sesbania.*
Leaves with twisted tendrils.
Staminal-tube with oblique mouth .. .. 18. *Vicia.*
Staminal-tube truncate at the mouth .. .. 21. *Pisum.*

1. Crotalaria *Linn.*

Herbs or shrubs with simple or digitately 3-foliolate leaves. Flowers in terminal or leaf-opposed racemes, generally yellow; calyx-tube short; teeth linear or lanceolate, free or shortly connate in 2 lips; corolla as long or longer than the calyx; standard rounded or ovate, shortly clawed; wings obovate-oblong, shorter; keel broad, as long as the wings, its petals united, much incurved, distinctly beaked; stamens monadelphous; anthers dimorphous; ovary sessile or stipitate, linear, usually many-ovuled; style long, abruptly incurved at the base, bearded upwards; stigma minute, oblique. Pod sessile or stipitate, straight, linear or oblong, turgid or inflated, continuous within, usually many-seeded.

Key to the species.

Leaves simple.
A rigid much branched deciduous undershrub; pod 3-4-seeded .. .. .. 1. *C. Burhia.*
A much branched diffuse herb; pod 1/2 in. long, 12–20-seeded .. .. .. 2. *C. prostrata.*
An erect cultivated shrub; pod 1 to 1–1/2 in. long, 10–15-seeded .. .. .. 3. *C. juncea.*
Leaves 3-foliolate .. .. .. 4. *C. medicaginea.*

1. **C. Burhia** *Buch-Ham.*; *Fl. Brit. Ind., II, p.* 66. An erect or procumbent shrub with many slender tangled branches, which are stiff when old and sometimes spinescent; ultimate branches striate and of a greyish colour owing to a dense tomentum. Leaves simple, distant, sub-sessile, 1/2 to 1½ in. long, oblong, entire, pale-green, covered on both sides with silky hairs; stipules 0. Flowers in elongated terminal racemes of 6–12 flowers; pedicels very short, 2-bracteolate; calyx

densely silky, teeth lanceolate ; corolla yellow, scarcely exserted. Pod scarcely exceeding the calyx, oblong, hairy, 3-4-seeded. (Fig. 51.)

Not common. Flowers in the cold season.

2. **C. prostrata** *Roxb.* ; *Fl. Brit. Ind., II, p.* 67. A much branched diffuse perennial herb. Stems many from the base, slender, clothed with brown silky hairs. Leaves simple, 1/2 to 1 in. by 1/4 to 1/2 in., nearly sessile, obovate-oblong or oblong, apex rounded, covered on both sides with brown adpressed hairs ; stipules 0. Racemes 2–4-flowered ; pedicels 1/12 to 1/8 in. ; calyx densely silky, teeth linear ; corolla small, yellow, scarcely exserted. Pod shortly-stalked, glabrous, oblong, 1/2 in. long, 12–20-seeded.

Common in waste places. Flowers in summer.

3. **C. juncea** *Linn.* ; *Fl. Brit. Ind., II, p.* 79. A tall stiff shrub ; branches slender, ridged, sulcate, thinly silky. Leaves simple, rather distant, shortly-stalked, 2–5 in. long, linear or oblong, entire, mucronate or acute, with silky hairs on both sides ; petiole 1/6–1/5 in. ; stipules minute and subulate or 0. Racemes lateral and terminal, about 1 ft. long, loosely 12–20-flowered ; bracts minute, linear ; calyx 1/2 to 3/4 in. long, reddish-velvety, deeply toothed ; corolla bright yellow, glabrous, exserted. Pod 1 to 1-1/2 in. long, clothed with short thick spreading persistent hairs, 10–15-seeded.—Vern., *San.*

Cultivated for the sake of fibre. Flowers in the rainy season.

4. **C. medicaginea** *Lamk.* ; *Fl. Brit. Ind., II, p.* 81. A diffuse perennial herb, with sometimes ascending or erect stems, thinly silky. Leaves trifoliolate ; petiole 1/6 to 2/5 in. ; stipules minute, deciduous ; leaflets sub-sessile, 1/4 to 3/4 in. long, obovate-oblong or oblanceolate, entire, retuse, glabrous above, minutely silky beneath. Racemes terminal or leaf-opposed, 4–15-flowered ; bracts minute, linear. Flowers very small ; calyx clothed with adpressed silky hairs ; teeth linear ; corolla twice the calyx. Pod oblique, sub-globose, 1/8 to 1/5 in., pointed, clothed with adpressed hairs, 2-seeded. Seeds deep brown, shining, flat.—Vern., *Gulabi.*

Not common. Used medicinally.

2. Trifolium *Linn.*

Annual or perennial herbs. Leaves with stipules adnate to the petiole and digitately 3-foliolate. Flowers small, copious, in dense axillary heads ; calyx-tube turbinate ; teeth mostly 5, sub-equal ; corolla adnate to the staminal-tube and fading without falling ; standard and wings narrow ; keel straight, obtuse ; stamens diadelphous ; filaments

Fig. 51, *Crotalaria Burhia*, ×½; Fig. 52, *Trigonella Foenum-graecum*, ×½; Fig. 53, *T. polycerata*, ×½; Fig. 54, *Melilotus parviflora*, ×¾; Fig. 55, *M. alba*, ×1; Fig. 56, *Medicago lupulina*, (*a*) a twig, ×¾, (*b*) fruit, ×4; Fig. 57, *M. laciniata*, (*a*) branch, ×¾, (*b*) fruit, ×2; Fig. 58, *M. denticulata*, (*a*) a twig, ×¾, (*b*) fruit, ×½.

more or less dilated; anthers uniform; ovary sessile or stalked, few-ovuled; style filiform, incurved above the base; stigma oblique. Pod minute, included, membranous, indehiscent, 1- or few-seeded.

T. repens *Linn.*; *Fl. Brit. Ind., II, p.* 86. A prostrate herb. Stems slender, glabrous, wide-creeping. Stipules narrow; petiole up to 2½ in. long, ascending; leaflets obovate, emarginate, distinctly toothed, about

3/4 in. by about 2/5 in. Heads globose, on long naked peduncles up to 3 in. long; flowers finally deflexed, 2/5 in. long; pedicel 1/10 in.; calyx glabrous; teeth sub-equal, shorter than the tube; corolla white or with a pink tinge. Pod minute, linear, 3-4-seeded.

Rare. Occasionally met with on the canal side.
Flowers in spring.

3. Trigonella *Linn.*

Annual herbs. Leaves pinnately 3-foliolate; leaflets toothed. Flowers racemed, whitish- or lemon-yellow; calyx-tube campanulate; teeth distinct, sub-equal; petals free from the staminal-tube; standard and wings narrow; keel shorter, obtuse; stamens diadelphous; filaments not dilated; anthers uniform; ovary sessile, many-ovuled; style glabrous; stigma terminal. Pod linear or linear-oblong, compressed or subterete, not spiral, usually exserted, many-seeded, continuous within.

Key to the species.

Pod long-beaked; reticulations distant, not transverse	1. *T. Fœnum-græcum.*
Pod not beaked, with close transverse reticulations	2. *T. polycerata.*

T. Fœnum-græcum *Linn.*; *Fl. Brit. Ind., II, p.* 87. A slightly hairy erect annual. Leaves long-stalked, stalk variable in length, up to 2 in.; stipules triangular-lanceolate, not toothed; leaflets about 1 in. long, obovate to oblanceolate-oblong, toothed. Flowers 1-2, axillary, sessile; calyx-teeth linear; corolla much exserted, whitish. Pod 2-3 in. long, with a long persistent beak, often falcate, hairy, 10–20-seeded, without transverse reticulations.—Vern., *Methi.* (Fig. 52.)

Cultivated as a cold weather crop. Used as a pot-herb and also as fodder for the cattle. Also used medicinally.

2. **T. polycerata** *Linn.*; *Fl. Brit. Ind., II, p.* 87. A slender branched diffuse annual, slightly covered with adpressed hairs. Leaf-stalk 1/2 to 3/4 in.; stipules linear, semi-sagittate with long points; leaflets obovate, sharply and deeply toothed towards the apex, about 1/2 in. long; base deltoid, entire. Flowers 1–6, sessile or on very short axillary peduncles; calyx 1/6 in.; teeth setaceous, shorter than the sub-cylindrical tube; corolla yellow, slightly exserted. Pod 1-2 in. long, falcate, with close transverse reticulations, 10–20-seeded, thinly covered with adpressed hairs.—Vern., *Maini.* (Fig. 53.)

Common in cultivated places. Flowers in the cold season. Sometimes used as fodder.

4. Melilotus *Juss.*

Annual or biennial herbs. Leaves pinnately 3-foliolate; leaflets toothed. Flowers in long racemes; calyx campanulate; teeth 5, sub-equal, deltoid or lanceolate; corolla caducous, free from the staminal-tube; standard and wings narrow; keel straight, obtuse; stamens diadelphous; filaments not dilated; anthers uniform; ovary sessile or stipitate, few-ovuled; style filiform, glabrous, much incurved; stigma terminal. Pod oblong, exserted, indehiscent.

Key to the species.

Flowers yellow	..	..	1. *M. parviflora.*
Flowers white	..	..	2. *M. alba.*

1. **M. parviflora** *Desf.* (**M. indica** *All.*); *Fl. Brit. Ind., II, p.* 89. A slender erect annual, up to 3 ft. high. Leaf-stalks variable, 1/2 to 1–1/2 in.; stipules linear, acuminate; leaflets obovate or oblanceolate, retuse or emarginate. Racemes dense-flowered, 1–3 in. long including the peduncle in fruit. Flowers ascending or spreading; calyx-teeth deltoid; corolla yellow; standard exceeding the wings and keel. Pod 1/12 to 1/8 in., usually 1-seeded, glabrous.—Vern., *Senji.* (Fig. 54.)

A very common weed in the fields during the cold weather. Also cultivated. Used as fodder.

2. **M. alba** *Lamk.*; *Fl. Brit. Ind., II, p.* 89. A tall herb very similar to the last. Stipules and leaflets similar. Racemes in fruit 3–5 in. long. Flowers recurved; corolla white. Pod as in the last but larger, often 2-seeded. (Fig. 55.)

A common weed of cultivation, flowering during the cold season. Sometimes used as fodder for cattle.

5. Medicago *Linn.*

Herbs. Leaves pinnately 3-foliolate; leaflets toothed. Calyx-tube campanulate; teeth 5, sub-equal; corolla more or less exserted, free from the staminal-tube; standard and wings oblong; keel straight, obtuse; stamens diadelphous; filaments filiform; anthers uniform; ovary sessile, usually many-ovuled; style short, little incurved; stigma oblique. Pod usually spirally twisted, many-seeded (in *M. lupulina* 1-seeded), indehiscent, rarely sickle-shaped.

Key to the species.

Pod unarmed; stipules entire or faintly toothed			1. *M. lupulina.*
Pod spinous; stipules laciniate.			
Peduncle ending in an awn	..	..	2. M. *laciniata.*
Peduncle not ending in an awn	..	..	3. *M. denticulata.*

1. **M. lupulina** *Linn.*; *Fl. Brit. Ind., II, p.* 90. A finely downy procumbent herb with many stems from the base about 1 ft. long. Petiole 1/4 to 3/5 in.; stipules entire or faintly toothed, with long acuminate tips; leaflets about 3/10 in. long, obovate, faintly toothed above, apiculate; base deltoid, entire. Flowers very small, yellow, in ovoid heads, on peduncles longer than the leaves, up to 1–1/4 in. in fruit; calyx teeth setaceous, as long as the tube; corolla yellow, slightly exserted. Pod minute, falcate, with coiled tip, glabrous or downy, unarmed, 1-seeded. (Fig. 56.)

A common weed in the fields in the cold weather.

2. **M. laciniata** *All.*; *Fl. Brit. Ind., II, p.* 90. A glabrous or slightly hairy slender annual up to 1 ft. long. Petiole equal to or exceeding the leaflets; stipules laciniate; leaflets 1/4 to 1/2 in. long, obovate-cuneate, usually sharply toothed. Peduncle filiform, 1-2-flowered, ending in an awn. Calyx narrowly turbinate, 1/8 in., teeth setaceous; corolla yellow, scarcely exserted. Pod 1/8 in. broad, globose, with 4-5 sharply spinous coils. (Fig. 57.)

A common weed in the fields in the cold weather. It is not so common however as the last or the next.

3. **M. denticulata** *Willd.*; *Fl. Brit. Ind., II, p.* 90. A nearly glabrous prostrate or procumbent annual. Stems 6–24 in. long, furrowed. Stipules laciniate; leaflets 1/2 to 3/4 in. long, obovate-cuneate, faintly toothed. Peduncles short, about 1/4 in. long, closely 2–6-flowered, not produced into an awn. Calyx 1/12 in.; teeth lanceolate, as long as the tube; corolla yellow, twice the calyx. Pod flattened, of 2–4 spirals; margin with a double row of spines; face 1/6 to 1/4 in. without spines, strongly reticulate; spines 1/12 to 1/8 in., but sometimes reduced to mere tubercles.—Vern., *Maina.* (Fig. 58.)

A very common weed in the cold season. Used as fodder for the cattle.

M. sativa *Linn.*, called *lucerne* or *alfalfa*, is a valuable fodder plant and is sometimes cultivated. Stems 1-2 ft., erect. Leaflets narrowly obovate-oblong, tip notched and apiculate. Flowers 1/3 to 1/2 in., in short dense racemes. Pod spirally twisted with 2-3 open coils, downy.

6. Lotus *Linn.*

Herbs. Leaves usually 5-foliolate, the lowest pair of leaflets arising from the base of the petiole like stipules. Calyx-tube campanulate, teeth sub-equal; corolla caducous, free from the staminal-tube; standard obovate, clawed, exceeding the wings; keel incurved, shortly beaked; stamens diadelphous; filaments dilated at the apex; anthers uniform; ovary sessile, many-ovuled; style long, abruptly inflexed; stigma terminal. Pod linear, turgid, septate between the seeds.

L. corniculatus *Linn.*; *Fl. Brit. Ind., II, p.* 91. A small prostrate perennial herb. Stems many from the base, glabrous or obscurely silky, slender, 3–7 in. long. Leaflets 5, the upper 3 remote from the lower 2 and close to each other, the lower 2 stipule-like, at the base of the petiole, linear, entire, 1/5 to 1/2 in. long. Flowers 1 or 2, very shortly pedicelled, subtended by a reduced 3-foliolate leaf at the end of an axillary or terminal peduncle 1 to 1–3/4 in. long in fruit; calyx 1/4 in.; teeth lanceolate; corolla yellow, often streaked with crimson, twice as long as the calyx. Pod cylindrical, straight, 3/4 to 1 in. long. (Fig. 59.)

Found on the river-side. Not common. Flowers in summer.

7. Cyamopsis *DC.*

Erect annuals with 3-foliolate leaves and small purplish flowers in axillary racemes. Calyx-tube oblique; teeth unequal, the lowest elongated, setaceous; petals caducous; standard and wings narrow; keel obtuse, slightly incurved; stamens monadelphous; anthers uniform, apiculate; ovary sessile, linear, 6–8-ovuled; style short, filiform, much incurved; stigma capitate. Pod linear, straight, subtetragonous, 2-valved, septate between the seeds.

C. psoralioides *DC.*; *Fl. Brit. Ind., II, p.* 92. A robust erect annual, 2–6 ft. high, clothed with adpressed grey hairs attached by the middle. Leaves up to 10 in. long; petiole 1-2 in.; stipules linear-setaceous, 1/3 to 1/2 in. long; stipels minute; stalk of terminal leaflet about 1 in., that of lateral leaflets up to 1/5 in.; leaflets 2-3 in. long, ovate, acute, densely covered with adpressed hairs on both sides, coarsely toothed. Flowers 6–30, about 1/3 in. long, in copious close very short-peduncled axillary racemes up to 5 in. long; pedicels very short; calyx 1/6 to 1/5 in.; corolla pale purple. Pod thick, fleshy, straight, flat, densely covered with adpressed hairs, 1–1/2 to 3 in. by 1/3 in., erect, 3-keeled on the back, 8–12-seeded.—Vern., *Guara.*

Cultivated in the rainy season.

8. Indigofera *Linn.*

Herbs or shrubs, more or less densely clothed with adpressed hairs attached by their middle. Leaves simple or odd-pinnate. Flowers in copious axillary racemes; calyx minute, campanulate; teeth 5, sub-equal or the lowest longest; corolla caducous; standard obovate; keel straight, not beaked, spurred on each side near the base; stamens diadelphous; anthers uniform, apiculate; ovary sessile, usually many-ovuled; style short, incurved; stigma capitate, usually penicillate. Pod usually linear-cylindrical or oblong or globose, turgid, rarely flattish, sometimes crescent-shaped.

Key to the species.

Pod globose, 1-seeded	1.	*I. linifolia.*
Pod elongated, 8–12-seeded	2.	*I. tinctoria.*

1. **I. linifolia** *Retz.*; *Fl. Brit. Ind., II, p.* 92. A procumbent silvery-pubescent perennial herb, with thick woody rootstock. Stems many from the base, up to 8 in. long. Leaves simple, sessile, 1/2 to 4/5 in. long, linear or linear-oblong, acute at both ends, silvery on both sides; stipules minute, setaceous. Flowers in very short dense subsessile axillary racemes 1/4 to 1/2 in. long; calyx-teeth setaceous, much longer than the tube; corolla 2-3 times the calyx, bright red or white. Pod minute, globose, 1-seeded, silvery-white, under 1/12 in. in thickness, apiculate. (Fig. 60.)

Fairly common in dry places.

2. **I. tinctoria** *Linn.*; *Fl. Brit. Ind., II, p.* 99. A much branched shrub, 4–6 ft. high; branches slightly silvery with adpressed hairs. Leaves odd-pinnate, 2-3 in. long, turning greyish-black when dried; leaflets 7–13, 3/4–1 in. long, ovate, oblong or oblanceolate, glabrous above, very thinly adpressed-hairy beneath, very shortly stalked; stipels minute, subulate. Flowers in stalked, erect, spike-like, axillary racemes shorter than the leaves; calyx silvery outside; teeth triangular, acute, as long as the tube; corolla exserted; standard greenish-yellow; wings pink. Pod straight or slightly curved, glabrous when mature, 1 to 1–1/2 in. long, 8–12-seeded.—Vern., *Nil.*

Met with sometimes as an escape. Flowers in the rainy season. Yields the well-known dye, indigo. According to Prain and Baker *I. tinctoria* Linn. may be considered as representing three distinct forms, one of which is found in a semi-wild state near Agra and Muttra as well as in Rajputana. Another form, *I. sumatrana* Gærtn., is the cultivated plant of the Punjab.

9. Psoralea *Linn.*

Herbs or undershrubs. Leaves simple, 3-foliolate or odd-pinnate, conspicuously gland-dotted. Calyx-tube campanulate; teeth 5, distinct; corolla little exserted; petals clawed; keel obtuse, the tip slightly incurved; upper stamen free or connate, the tube in an early stage often closed; anthers small, uniform or slightly dimorphous; ovary sessile or shortly stalked, 1-ovuled; style long, filiform, incurved; stigma minute, terminal. Pod ovoid or oblong, 1-seeded, indehiscent, the pericarp adhering to the seed.

P. plicata *Delile*; *Fl. Brit. Ind., II, p.* 103. A much branched low undershrub, 1-2 ft. high; stems canescent and striate when young, dotted with scattered glandular tubercles. Leaves 3-foliolate; petiole

1/5 to 1/2 in. ; stipules minute, oblong, acute ; leaflets irregularly sinuate, adpressed hairy on both sides, gland-dotted beneath ; terminal oblong, shortly stalked, 1/2 to 1 in. long ; lateral oblong-obovate, subsessile, 1/5 to 1/2 in. long. Flowers solitary or in fascicles of 2 or 3, on axillary peduncles 2–4 in. long, very shortly pedicelled ; bracts minute, ovate ; calyx 1/8 in., clothed with adpressed white hairs, accrescent in fruit, clasping tightly the included pod ; teeth triangular, shorter than the tube ; corolla slightly exserted ; standard yellow ; wings and keel yellow with purplish tips. Pod 1/5 in., ellipsoid, densely hairy. (Fig. 61.)

Found in dry places. Not very common. Flowers about April.

10. Tephrosia *Pers.*

Herbs or undershrubs. Leaves usually odd-pinnate ; leaflets opposite, sub-coriaceous. Flowers in leaf-opposed racemes or solitary or in pairs in the axils of the leaves ; calyx-tube campanulate ; teeth distinct, sub-equal ; petals clawed ; standard suborbicular ; keel incurved, not beaked ; stamens diadelphous ; anthers obtuse, uniform ; ovary sessile, linear, many-ovuled ; style much incurved, filiform or flattened, glabrous or bearded ; stigma capitate, often penicillate. Pod linear, flattened, many-seeded, 2-valved, continuous or obscurely septate between the seeds.

T. pumila *Pers.* ; *Fl. Brit. Ind., II, p.* 113 (under **T. purpurea** *Pers.* Var. **pumila**). A small herbaceous perennial, about 18 in. high, much branched, persistently downy ; branches greyish. Leaves 3-4 in. long, stalked ; stalk 1/2 to 3/4 in. ; stipules linear-lanceolate, 1/10 in. ; leaflets 9–11, the lateral opposite, oblong-oblanceolate, entire, retuse or mucronate, 1/2 in. to 1–1/4 in. long, glabrous and dull green mottled with white above, greyish and densely finely silky beneath ; petiole 1/20 in. long. Flowers in fascicles of 2–4, on terminal, apparently leaf-opposed peduncles 4–7 in. long ; the lowest, rarely the lowest two fascicles in the axils of well-developed or small leaves ; pedicel 1/10 in. ; bracts minute ; calyx 1/6 in., densely silky ; corolla 1/4 to 1/3 in., red ; standard thinly silky on the back ; style flattened, glabrous ; stigma penicillate. Pod 1–3/4 to 2 in. by 1/6 to 1/5 in., slightly recurved, densely covered with fine silky hairs, 5–7-seeded. Seeds oblong, mottled.—Vern., *Jhana.*

Collected at Kamoki. May be met with in the neighbourhood of Lahore also. Flowers in the rainy season.

11. Sesbania *Pers.*

Soft-wooded shrubs, trees or herbs. Leaves long, narrow, abruptly-pinnate, with very numerous deciduous linear-oblong obtuse mucronate

leaflets. Flowers in axillary racemes; calyx campanulate, shallowly 2-lipped or 5-toothed; corolla much exserted; petals all with long claws; standard broad; keel obtuse and straight or recurved and sub-rostrate; stamens diadelphous; anthers uniform; ovary stalked, linear, many-ovuled; style filiform, incurved, glabrous; stigma capitate. Pod very long and narrow, dehiscent, with distinct septa between the very numerous seeds.

Key to the species.

Perennial, unarmed	..	..	1. *S. aegyptiaca.*
Annual, prickly	..	..	2. *S. aculeata.*

1. **S. aegyptiaca** *Pers.*; *Fl. Brit. Ind., II, p.* 114. An unarmed soft-wooded shrub or small tree of rapid growth and short duration, reaching 15 ft. in height. Young shoots striate, canescent. Leaves 3–6 in. long, rachis shortly produced above the last pair of leaflets, not spinescent; stipules linear, 1/5 in. long, caducous; leaflets 9–15 pairs, opposite, 1/2 to 1 in. by 1/6 to 1/4 in., linear-oblong, entire, pale green, very shortly stalked. Flowers 1/2 to 3/5 in. long, in 3–6-flowered slender axillary racemes 2-3 in. long; bracts and bracteoles minute, fugacious; calyx 1/5 in., with short broad deltoid sub-equal teeth; corolla pale yellow, often dotted or tinged with purple; standard furnished at the base on the upper surface with 2 keel-like appendages; wings falcate-oblong, with a minute auricle at the top of the claw; keel-petals with small recurved auricles above the claw. Pod 6–9 in. long, torulose, flexible, twisted, sharply beaked; sutures not much thickened. (Fig. 62.)
Seeds 20–30.—Vern., *Jaint* or *Jaintar.*

Very often grown in hedges on account of its remarkably rapid growth. Its fibre is made into ropes and the foliage is used as fodder. Flowers mostly during the cold season.

Three distinct forms may be recognized by the flower-colour:—

1. **typica** *Prain*, in which the corolla is uniformly yellow.
2. **picta** *Prain*, with the standard dotted with purple on the back.
3. **bicolor** *W. & A.*, with the standard dark-maroon or purple on the back.

2. **S. aculeata** *Pres.*; *Fl. Brit. Ind., II, p.* 114. A large erect shrub-like glabrous annual, reaching 12 ft. in height; branches and underside of leaf-rachis beset with small hooked prickles. Leaves 6–15 in. long; leaf-rachis ending in a minute bristle or not; leaflets 30 to 96, lower often alternate, upper opposite, 1/3 to 3/4 in. by 1/10 to 1/6 in., very shortly stalked; stipules linear, 1/5 in. long. Flowers 2/5 in. long, yellow, in 3–6-flowered lax racemes. Pod 6–9 in. long by 1/8 in., narrowly

linear and slightly falcate, beaked, not twisted, slightly torulose, glabrous.

Dr. Prain recognizes the following two varieties :—

1. **elatior** *Prain.* Stems green, sparingly prickly, tall, lax and slender. A common weed, flowering in summer and the rainy season. Killed in winter. Vern., *Jhijhan.*

2. **typica** *Prain.* Stems reddish, rather densely armed with minute prickles. Not met with within the area of this book.

12. Astragalus *Linn.*

Herbs or undershrubs. Leaves pinnate ; rachis often ending in a spine. Calyx tubular or campanulate, equal or gibbous at the back ; teeth sub-equal ; corolla usually distinctly exserted ; petals sub-equal or wings and keel shorter than the standard ; keel incurved, obtuse ; stamens diadelphous ; anthers uniform ; ovary sessile or stalked, many-ovuled ; style incurved ; stigma capitate. Pod linear or oblong, usually turgid, 1-celled or more or less completely longitudinally 2-celled from the introversion of the inferior suture.

Key to the species.

Stigma penicillate ; pod much recurved ..	1.	*A. subumbellatus.*
Stigma glabrous.		
Heads peduncled ; pod straight densely pubescent, 6–8-seeded	2.	*A. prolixus.*
Heads sessile ; pod slightly recurved, densely pubescent, 10–12-seeded	3.	*A. tribuloides.*
Heads peduncled ; pod much recurved, glabrous, 16–18-seeded	4.	*A. hamosus.*
Heads short-peduncled ; pod much recurved, downy, 20–30-seeded	5.	*A. contortuplicatus.*

1. **A. subumbellatus** *Klotzsch* ; *Fl. Brit. Ind., II, p.* 119. A slender annual. Stems diffuse, branched, 1/4 to 1 ft., clothed with short ascending deciduous white hairs. Leaves 1-2 in. ; leaflets 13–21, distant, oblong, glaucous, 1/8–3/8 in., thinly or densely pilose or nearly glabrescent ; stipules minute, lanceolate, cuspidate. Racemes distinctly peduncled, 6–10-flowered, lax or close ; pedicels very short ; bracts very minute, setaceous ; calyx 1/8 in., thinly pubescent ; teeth setaceous, as long as the tube ; corolla 3/8 in., yellow tinged with purple ; blade of wings lanceolate, shorter than the standard and keel ; stigma penicillate. Pod

1/2 to 3/4 in., cylindrical, much recurved, shortly pubescent, almost completely bilocular, 20–24-seeded.

Very rare. Only one small specimen has been seen so far from the neighbourhood of Lahore.

2. **A. prolixus** *Sieber.*; *Fl. Brit. Ind., II, p.* 121. An annual procumbent much branched herb; branches many from the base, very slender, 3–18 in. long, densely clothed with adpressed white hairs. Leaves distinctly petioled, 1/2 to 1–1/2 in. long; leaflets distant, glaucous, 11–17, oblong, obtuse, 1/8 to 1/4 in., clothed with fine adpressed white hairs; stipules minute, lanceolate, free. Heads densely 6–12-flowered; peduncles 1/2 to 1 in.; calyx under 1/12 in., densely matted; teeth linear-setaceous, nearly as long as the tube; corolla little exserted, yellow; stigma glabrous. Pod sessile, turgid, 1/4 to 3/8 in., straight, oblong, acute, densely pubescent, nearly bilocular, 6–8-seeded.

Not very common.

3. **A. tribuloides** *Delile*; *Fl. Brit. Ind., II, p.* 122. A small procumbent annual herb; branches many from the base, caespitose, slender, 3–12 in., densely clothed upwards with ascending white hairs. Leaves distinctly petioled, 1 to 2–1/2 in.; leaflets 13–15, oblong-lanceolate, acute, 1/5 to 2/5 in. long, densely clothed with long white hairs on both sides; stipules minute. Heads dense, sessile, 6–10-flowered; calyx tubular, 1/8–1/6 in., densely hairy; teeth setaceous, shorter than the tube; corolla pale yellow, little exserted; stigma glabrous. Pods 1/4 to 3/8 in. long, turgid, linear-oblong, densely pubescent, a little recurved, often spreading, sub-bilocular, 10–12-seeded. (Fig. 63.)

A common weed, in flower and fruit about April.

4. **A. hamosus** *Linn.*; *Fl. Brit. Ind., II, p.* 122. A robust annual, not so hairy as the other species; the stems 1-2 ft. long. Leaves distinctly petioled, 3–6 in. long; leaflets distinctly stalked, pale green, 13–25, oblong, emarginate, 1/2 to 3/4 in. long, glabrescent above or thinly matted with silvery hairs on both sides. Heads peduncled, densely 8–20-flowered; peduncles much shorter than the leaves; calyx 1/6 in., matted with mixed black and white hairs; teeth subulate, as long as the tube; corolla pale yellow, half as long again as the calyx; stigma glabrous. Pod 1/2 to 1 in. long, cylindrical, glabrous, firm, much recurved, nearly bilocular, 16–18-seeded.

Has been recorded by earlier collectors from Lahore, but has not been seen recently.

5. **A. contortuplicatus** *Linn.*; *Fl. Brit. Ind., II, p.* 122. An annual herb. Stems suberect, 6-18 in. long, densely clothed with short soft spreading white hairs. Leaves distinctly petioled, 3-4 in. long; leaflets

1/4 to 1/2 in., distant, greenish, 13–17, oblanceolate-oblong, emarginate, densely pilose on both sides. Heads very dense, many-flowered, on pilose peduncles much shorter than the leaves; calyx 1/6 in., densely pilose; teeth setaceous, plumose, exceeding the tube; corolla little exserted, the lanceolate acute wings shorter than the standard and keel. Pod 1/2 in. long, cylindrical, downy, membranous, rugose, very much recurved so as to be completely conduplicate, nearly bilocular, 20–30-seeded.

Not so far collected from within the area, but may be met with.

13. Alhagi *Desv.*

Low shrub. Leaves simple. Flowers on axillary spines; calyx campanulate; teeth distinct, minute; corolla exserted; standard broad; keel obtuse; stamens diadelphous; anthers uniform; ovary linear, sessile, 6-8-ovulate; style filiform, incurved; stigma minute, capitate. Pod linear, subcontinuous or moniliform; joints oblong, small, smooth, turgid.

A. maurorum *Desv.*; *Fil. Brit. Ind., II, p.* 145. Syn. **A. camelorum** *Fisch.* A low shrub 2-3 ft. high, armed with copious axillary spines 1/2 to 1-1/2 in. long. Root very deep. Stem very woody; twigs woody, glabrous or puberulous. Leaves simple, coriaceous, glabrous or puberulous, entire, obtuse, obovate or oblong, up to 1 in. long, shortly stalked; petiole 1/15 to 1/10 in.; stipules minute. Flowers 1–6, on the spines, red; pedicels about 1/10 in.; calyx glabrous, 1/10 in. long; corolla 2 to 3 times as long as the calyx. Pod glabrous, up to 1 in. long, curved or straight, more or less indented along the ventral suture or actually contracted between the seeds. Seeds 1-several.—Vern., *Jawan, Jawansa.* (Fig. 64.)

Very common on the Ravi-side beyond the railway bridge and in other places. Flowers in May. Used as fodder for camels.

14. Uraria *Desv.*

Suffruticose perennials. Leaflets 1–9, stipellate. Flowers very numerous, minute, racemose; calyx-tube very short; teeth unequal, two upper short, three lower usually elongated, setaceous; standard broad; wings adhering to the obtuse keel; stamens diadelphous; anthers uniform; ovary sessile or short-stalked, few-ovuled; style inflexed, filiform; stigma terminal. Pod of 2–6 small turgid 1-seeded indehiscent joints.

U. picta *Desv.*; *Fl. Brit. Ind., II, p.* 155. An erect undershrub, about 3 ft. high. Stems robust, pubescent, scabrous; branches few. Leaves 4–12 in. long, the lower 1–3-, the upper 5-9-foliolate; stipules

Fig. 59, *Lotus corniculatus*, ×½; Fig. 60, *Indigofera linifolia*, ×⅔; Fig. 61, *Psoralea plicata*, (*a*) a flowering and fruiting branch, ×⅓, (*b*) leaf, ×1; Fig. 62, *Sesbania aegyptiaca*, (*a*) a flowering twig, ×½, (*b*) pod, ×¼; Fig. 63, *Astragalus tribuloides*, ×½.

1/2 in. long, triangular-lanceolate, acuminate; leaflets 3–8 in. long, 1/2 to 1 in. broad, linear-lanceolate, firm, sub-coriaceous, blotched with white along the middle and glabrous above, minutely pubescent beneath, very shortly stalked; stipels longer than the stalk of the leaflets, subulate. Flowers 1/3 in. long, in fascicles, on a spicate, cylindrical,

erect, terminal raceme 6–12 in. long ; bracts scarious, caducous ; pedicels downy and bristly with hooked hairs abruptly upcurved at the tip after flowering ; calyx 1/5 in. long ; corolla exserted, purplish, 1/4 in. long. Pod glabrous, pale lead-coloured or whitish, 3–6-jointed.

Rare. Found on the Shalamar side. Flowers in the rainy season. The hairs on the various parts of the plant are hooked which make it scabrid and by which it can cling to clothes, etc.

15. Alysicarpus *Neck.*

Diffuse annuals, biennials or perennials. Leaves simple, stipellate, subcoriaceous. Flowers in copious leaf-opposed or terminal racemes or spikes ; calyx glumaceous ; teeth deep, often imbricate, the two upper often connate ; corolla not exserted ; standard broad ; keel obtuse, adhering to the wings ; stamens diadelphous ; anthers uniform ; ovary subsessile or sessile ; ovules many ; style incurved ; stigma capitate. Pod terete or turgid, composed of several indehiscent 1-seeded joints.

Key to the species.

Calyx not longer than the first joint of the pod ..	1.	*A. monilifer.*
Calyx much longer than the first joint of the pod, its teeth imbricate in the fruiting stage.		
Calyx ciliate only ; joints of pod neither veined nor rugose	2.	*A. bupleurifolius.*
Calyx slightly pubescent and ciliate ; joints of pod finely reticulately veined ..	3.	*A. longifolius.*

1. **A. monilifer** *DC.* ; *Fl. Brit. Ind., II, p.* 157. A prostrate perennial. Rootstock woody ; stems many from the base, spreading, clothed with spreading deciduous hairs. Leaves all simple, 1/3 to 2/5 in. long, sub-rotund to oblong, usually mucronate, entire, veins distinct, glabrous above, finely hairy on the veins beneath ; petiole 1/10 to 1/5 in. ; stipules scarious, lanceolate-acuminate, 1/6 to 1/4 in. long. Flowers shortly stalked, about 4–8, in close erect pedunculate racemes ; calyx obscurely hairy, nearly as long as the first joint of the pod ; teeth very narrow, rigid. Pod 1/2 to 3/4 in. long, distinctly moniliform, 2–6-jointed, densely clothed with short hooked hairs, not reticulate-veined. (Fig. 65.)

Pretty common in dry places. Flowers in summer and rainy season.

2. **A. bupleurifolius** *DC.* ; *Fl. Brit. Ind., II, p.* 158. A diffuse herb. Stems many from the base, ascending, stiff, glabrous except for a line of hairs on a ridge formed by the continuation of the leaf-base downwards, 3–8 in. long. Leaves all simple, shortly stalked, 1/2 to 1 in.

Fig. 64, *Alhagi maurorum*, ×½; Fig. 65, *Alysicarpus monilifer*. Two twigs, one with fruits, ×1; Fig. 66, *A. bupleurifolius*, ×½; Fig. 67, *Desmodium triflorum*, ×1.

by 1/10 to 1/6 in., linear-oblong, acute at both ends, glabrous, veins distinct; stalk 1/20 in.; stipules lanceolate, acuminate, 1/5 in. long. Flowers in 2–6 pairs on rigid spike-like lax racemes 1/2 to 3 in. long; pedicel 1/20 in.; calyx 1/4 in., much longer than the lowest joint of the pod; tube funnel-shaped; teeth imbricate, ciliate, not hairy on the back, twice as long as the tube; corolla pink. Pod 1/4 to 1/2 in. long, stalked, cylindric, apiculate, glabrous; joints 2–6, as broad as long, neither veined nor rugose. (Fig. 66.)

Not common.

3. **A. longifolius** *W. & A.*; *Fl. Brit. Ind., II, p.* 159. Stems stout, ascending, sub-glabrous, reaching 4–5 ft. Leaves all simple, shortly petioled, 2–6 in. long, oblong or lanceolate, subcordate, mucronate,

hairy on the veins beneath ; stipules large, lanceolate, acuminate, scarious. Flowers in long densely spicate racemes, closely pressed against the finely hairy axis ; bracts large, broadly ovate, cuspidate, concealing the buds, soon falling ; calyx 3/8 to 1/2 in., much longer than the lowest joint of the pod, pubescent ; tube funnel-shaped, plicate ; teeth ciliate, much longer than the tube. Pod 3/8 to 1/2 in., shortly stalked, apiculate, moniliform ; joints 4–6, glabrous, faintly reticulate.

Not seen within the area so far, but may be met with.

16. Desmodium *Desv.*

Shrubs or herbs. Leaves 3-foliolate or simple, stipellate. Flowers small, in copious usually dense racemes ; calyx campanulate or turbinate ; teeth longer or shorter than the tube, the 2 upper often subconnate ; corolla exserted ; standard broad ; wings more or less adhering to the usually obtuse keel ; upper stamen entirely or partially free, the other 9 united ; ovary sessile or stalked, few or many-ovuled ; style incurved ; stigma minute, capitate. Pod usually composed of several 1-seeded indehiscent joints.

Key to the species.

Leaves 3-foliolate.		
Flowers 1–3 in the leaf-axils	1.	*D. triflorum.*
Flowers in racemes	2.	*D. parvifolium.*
Leaves 1-foliolate	3.	*D. gangeticum.*

1. **D. triflorum** *DC.* ; *Fl. Brit. Ind., II, p.* 173. A trailing perennial herb, often rooting at the joints. Root slender, woody. Stems 2–12 in. long ; branches many, clothed with fine white spreading hairs. Leaves 3-foliolate, rarely 1-foliolate ; 2/5 to 1/2 in. long ; petiole 1/5 in. ; stipules ovate-lanceolate, acuminate, persistent ; leaflets 1/5 to 1/4 in., subrotund or obovate-cuneate, retuse or truncate, membranous, glabrous above, sparsely hairy beneath ; petiole and petiolules densely covered with spreading white hairs. Flowers axillary, 1–3 together ; pedicels about 1/4 in. ; calyx 1/10 in., clothed with long white hairs ; teeth long, setaceous ; corolla 1/5 in., pink or white. Pod 1/3 to 1/2 in., indented on the lower suture ; joints 3–5, reticulate-veined, pubescent. (Fig. 67.)

Found in dry places. It is a good soil-binder on account of its peculiar habit of growth. It is said to be much liked by cattle.

2. **D. parvifolium** *DC.* ; *Fl. Brit. Ind., II, p.* 174. A much-branched procumbent wide-trailing herb ; young parts pubescent. Leaves 3-foliolate ; stipules about as long as the petiole, linear-setaceous, persistent ; leaflets 1/8 to 1/2 in., oval or obovate, obtuse or sub-acute, mucronate, glabrous above, pubescent beneath. Racemes lax, usually

terminal, more than 1/2 in. long; flowers 6–8, 1/2–1 in., hairy; pedicels filiform; bracts lanceolate-cuspidate, loosely imbricate in bud, soon deciduous; calyx 1/6 in., hairy, teeth acuminate; corolla purple. Pod about 1/2 in.; both sutures indented; joints 3–4, suborbicular, minutely pubescent.

Not seen in the neighbourhood of Lahore so far, but may perhaps be met with. Flowers in the rainy season. Said to be much eaten by cattle.

3. **D. gangeticum** *DC.*; *Fl. Brit. Ind., II, p.* 168. A nearly erect undershrub, 2–4 ft. high. Stems somewhat angular, glabrescent; branches clothed with adpressed white hairs. Leaves 1-foliolate; petiole 1/2 to 1 in.; stipules 1/4 in., linear, sub-persistent; leaflet 2-1/2–6 in. long, ovate-oblong, acute, rounded, subcordate or truncate at the base, membranous or subcoriaceous, scabrid above, grey-puberulous beneath. Flowers in close-set fascicles on numerous axillary and terminal axes 6–12 in. long; axes and pedicels puberulous; bracts minute, setaceous; calyx very small, finely downy; teeth longer than the tube; corolla about 1/6 in., white or tinged with lilac. Pod 1/2 to 3/4 in., sickle-shaped, deeply indented on lower suture; joints 6–8, indehiscent, a little longer than broad, covered with minute hooked hairs.

Met with very occasionally. Flowers during the rainy season.

17. Cicer *Linn.*

Annual herbs with pinnate leaves. Leaflets deeply toothed. Flowers axillary, solitary; calyx-tube oblique; teeth lanceolate, sub-equal; corolla exserted; standard broad, exceeding the wings and keel; stamens diadelphous; anthers uniform; ovary sessile, 2- or more-ovuled; style incurved, beardless; stigma capitate. Pod sessile, oblong, turgid, narrowed into the persistent style.

C. arietinum *Linn.*; *Fl. Brit. Ind., II, p.* 176. An erect annual, mostly about 2 ft. tall. Leaves 1-2 in. long, with usually a terminal leaflet; stipules small, obliquely ovate, toothed; leaflets about 1/4 in. long, ovate-oblong or obovate, sharply toothed. Peduncle 1/2 to 3/4 in. long, jointed about the middle, deflexed after flowering; calyx 1/4 to 1/3 in., teeth narrow; corolla 1/3–1/2 in. long, pink, blue or white. Pod 3/4 to 1 in., turgid, pubescent, topped by the persistent base of the style. Seeds mostly 1–3, subglobose, beaked, reddish brown, black or white.—*The gram*; Vern., *Chana*.

Cultivated during the cold season. Four different varieties are met with, as distinguished by the seed colour and size; (1) with small reddish seeds; (2) with small nearly black seeds; (3) with small light yellowish brown seeds; (4) with large white seeds, known as *kabuli chana*.

Fig. 68, *Vicia tetrasperma*, $\times\frac{2}{3}$; Fig. 69, *Vicia hirsuta*, $\times\frac{2}{3}$; Fig. 70, *Vicia sativa*, $\times\frac{1}{2}$; Fig. 71, *Lathyrus Aphaca*, $\times\frac{2}{3}$; Fig. 72, *L. sativus*, $\times\frac{1}{3}$; Fig. 73, *Rhynchosia minima*, $\times\frac{2}{3}$; Fig. 74, *Dalbergia Sissoo*, $\times\frac{1}{3}$.

18. Vicia *Linn.*

Herbs with equally pinnate leaves ending in a twisted tendril. Flowers sub-sessile or on peduncled axillary racemes; calyx-tube campanulate, often oblique; teeth long, often unequal; corolla more or less exserted; standard broad; keel shorter than the wings; stamens diadelphous, the mouth of the staminal-tube very oblique; anthers uniform; ovary nearly sessile, 2-many-ovuled; style short, filiform or slightly flattened; stigma capitate. Pod flattish, continuous within.

The name *rari* is applied indifferently to the species described below.

Key to the species.

Style finely downy all round near the tip; flowers on long peduncles.		
Peduncles 1–2-fld; pod glabrous, 3-4-seeded	1.	*V. tetrasperma.*
Peduncles 2–6-fld; pod hairy, 2-seeded ..	2.	*V. hirsuta.*
Style conspicuously bearded on the lower side at the tip; flowers 1-2 in each axil, on short pedicels.		
Pod 8–10-seeded; flowers 1-2 in each axil ..	3.	*V. sativa.*
Pod 5-6-seeded; flowers solitary ..	4.	*V. peregrina.*

1. **V. tetrasperma** *Moench.*; *Fl. Brit. Ind., II, p.* 177. A small annual glabrous herb. Stems slender, a ft. or so long, much branched. Leaves 3/4 to 1–1/4 in. long up to the last pair of leaflets, sub-sessile, the stalk being less than 1/10 in.; leaflets 3 to 6 pairs, linear, 2/5 to 7/10 in. long, mucronate, sub-sessile; stipules semi-sagittate, linear-lanceolate, acuminate. Peduncles axillary, numerous, about as long as the leaves, 1- or 2-flowered; pedicels about 1/16 in.; flowers about 1/6 in.; calyx 1/12 in.; corolla lilac, distinctly exserted; style downy all round near the tip. Pod 1/2 to 1 in. long, thin, flat, linear-oblong, 3-4-seeded. (Fig. 68.)

A common weed in fields. Flowers in the cold season and spring.

2. **V. hirsuta** *S. F. Gray.*; *Fl. Brit. Ind., II, p.* 177. A hairy climbing annual. Stems much branched, up to 18 in. or so. Leaves 1-2 in. up to the last pair of leaflets, subsessile; stipules semi-sagittate, often toothed at the base; leaflets 5–8 pairs, 1/2 to 1 in. long, linear, more or less truncate. Peduncles 1–1/2 in. long, 2–6-flowered at the top; flowers close to each other, small, 1/10 in. long; corolla very slightly exserted, bluish; style downy all round near the tip. Pod 1/4 to 3/8 in. long, oblong-rhomboid, turgid, hairy, 2-seeded. (Fig. 69.)

A very common weed in fields in winter.

3. **V. sativa** *Linn.*; *Fl. Brit. Ind., II, p.* 178. A glabrous or obscurely downy annual herb, with suberect slender stems 18 in. or more. Leaves 1–1/2 to 2–1/4 in. long up to the last leaflet; petiole up to 1/5 in.; stipules small, 1/5 in. long, obliquely lanceolate, deeply toothed; leaflets alternate or opposite, 4–6 pairs; of upper leaves 3/4 to 1–1/4 in. by 1/6 to 1/5 in., linear, shortly 3-toothed at the apex; of lower shorter and broader. Flowers solitary or two together in the axils of leaves, very shortly pedicelled; calyx 3/8 in., hairy; teeth lanceolate-subulate; corolla reddish-blue, twice as long as the calyx; style bearded below the stigma on the lower side. Pod 1–1/2 to 2 in., glabrescent, 8–10-seeded. (Fig. 70.)

A very common weed of cultivation in the cold season.

Var. **angustifolia** *Linn.* Smaller and more diffuse; leaflets shorter, those of the lower leaves deeply emarginate. Flowers and pod smaller.

4. **V. peregrina** *Linn.*; *Fl. Brit. Ind., II, p.* 178. An annual herb. Stems slender, glabrous, diffuse. Leaflets 10–12, alternate or opposite, 1/2 to 1 in. long; stipules minute, bifid, with linear divisions. Flowers solitary, on short pedicels in the axils of leaves; calyx 1/4 in.; teeth lanceolate, the upper shorter, curved upwards; corolla purplish-red, twice the calyx; style bearded on the lower side at the tip. Pod linear-oblong, deflexed, glabrescent, rather recurved, 1 to 1–1/4 in. long, 5-6-seeded.

V. Faba *Linn.*; *Fl. Brit. Ind., II, p.* 179. An annual erect glabrous herb up to 3 ft. or more high. Stipules semi-sagittate, lacerate-toothed, 3/4 in. long; rachis up to 3 in. long, ending in a green bristle nearly 1 in. long; leaflets 2 pairs (lower leaves with only one pair); lower alternate, upper alternate or opposite, elliptic-oblong, 2 to 3 in. by 3/4 to 1–3/4 in. entire, acute. Peduncles axillary, 2-3-flowered; flowers very shortly stalked, 1 in. long; calyx 1/2 in.; tube as long as the teeth; anterior teeth lanceolate, acuminate; posterior short, triangular; standard whitish with blackish veins and spots; wings with blackish patches in the middle; keel whitish; stigma with a tuft of hairs on the under side. Pod minutely velvety hairy, especially when young, cylindrical, up to 5 in., beaked, 3- or 4-seeded.—The garden or broad bean; Vern., *Bakla.*

Commonly cultivated during winter.

19. Lathyrus *Linn.*

Leaves equally pinnate, ending in a tendril or bristle. Flowers arranged in racemes or solitary; calyx-tube campanulate, oblique; teeth all or lower only long; corolla more or less exserted; standard broad; keel shorter than the wings; stamens diadelphous, the mouth of the tube not oblique; anthers uniform; ovary sub-sessile or stalked; ovules many; style flattened, bearded on the inner side; stigma capitate. Pod terete or somewhat flattened, continuous within.

Key to the species.

Leaf wholly changed into a tendril ; leaflets 0 ; stem not winged	1. *L. Aphaca.*
Leaflets 2 ; stem winged	2. *L. sativus.*

1. **L. Aphaca** *Linn.* ; *Fl. Brit. Ind., II, p.* 179. A small much-branched glabrous annual herb reaching up to 2 ft., with wingless stems. Leaf wholly transformed into a tendril, without any leaflets ; stipules in pairs, adpressed to the stem, large, leaf-like, broadly ovate, hastate, entire, up to 1 in. long. Peduncles 1-2 in. long, carrying 1-2 flowers ; pedicel 1/6 in. ; calyx 1/4 in. ; teeth equal, lanceolate, exceeding the tube ; corolla yellow, twice the calyx. Pod linear-oblong, 3/4 in. to 1–1/4 in. long, 4–6-seeded.—Vern., *Gagla.* (Fig. 71.)

A very common weed everywhere in the cold season. Each of the first 2 or 3 leaves after the cotyledons in the seedling bears a pair of very small leaflets which are however not developed in later leaves.

2. **L. sativus** *Linn.* ; *Fl. Brit. Ind., II, p.* 179. A glabrous much-branched annual with winged stems reaching up to 2 ft. or so. Leaf ending in a 3-fid tendril ; petiole 3/4 to 1 in., winged ; stipules lanceolate, semi-sagittate, entire, 2/5 to 3/4 in. long ; leaflets 2, opposite, 1-2 in. long, linear, entire, acuminate. Peduncle 1-flowered, 1-2 in. long ; calyx 1/3 in. long ; teeth spreading in flower, lanceolate, twice as long as the tube ; corolla 3/4 in., reddish-purple or blue, rarely white ; standard rather broader than long, emarginate. Pod 1 to 1–1/2 in. long, oblong, with a conspicuous wing on either side of the dorsal suture, 4-5-seeded. Seeds compressed, brown or yellowish, marked with red.

A common weed of cultivation in the cold season. The seeds, when used as food, have a reputation for causing paralysis and horses and cattle also suffer in a similar manner.

L. odoratus *Linn., the sweet pea,* is commonly grown during winter in the gardens.

20. Lens *Gren. & Godr.*

Erect or sub-scandent herbs. Leaves pinnate, the rachis ending in a bristle or tendril or in a terminal leaflet ; stipules semi-sagittate ; leaflets 2-many pairs, entire ; stipels 0. Flowers solitary or racemed, on axillary peduncles ; calyx lobes elongate, sub-equal ; standard broad ; wings adherent to the keel ; keel shorter than the wings ; staminal-tube with an oblique mouth ; ovary sub-sessile, 2-ovuled ; style inflexed, bearded with minute hairs on its inner face. Pod compressed, continuous within, 1-2-seeded.

L. esculenta *Moench.* ; *Fl. Brit. Ind., II, p.* 179. Syn. **Ervum lens** *Linn.* A small erect herb, softly pubescent, branching from the

base. Leaf-rachis ending in a short bristle; leaflets 4–6 pairs, sessile, lanceolate, often mucronate. Racemes 2–4-flowered; peduncles about as long as the flowers; calyx-teeth linear, twice as long as the tube, silky; corolla a little longer than the calyx-teeth, pale purple. Pod rhomboid-oblong, about 1/2 in. long, smooth. Seeds usually 2, compressed, grey, with minute spots; cotyledons red.—*The Lentil*; Vern., *Masur*.

Cultivated as a cold-weather crop.

21. Pisum *Linn.*

Characters of *Lathyrus*, but style thick, laterally compressed, dilated and leaflets 4–6.

Key to the species.

Seeds compressed, marbled	1. *P. arvense.*
Seeds globose, of uniform colour	2. *P. sativum.*

1. **P. arvense** *Linn.*; *Fl. Brit. Ind., II, p.* 181. A smooth glabrous annual. Stipules large, ovate, semi-cordate, irregularly toothed at the base; leaflets 4–6; rachis ending in a branched tendril. Peduncles 1-few-flowered, as long or longer than the stipules; standard pink; wings deep purple. Pod reticulate. Seeds angled, smooth, greenish-yellow, mottled with red.—Vern., *Desi matar, Chota matar*.

2. **P. sativum** *Linn., Fl. Brit. Ind., II, p.* 181. A more robust plant than *P. arvense*. Flowers usually white, on larger peduncles. Pods broader. Seeds round, uniformly whitish.—Vern., *Matar*.

Regarded by some authors as a mere variety or sub-species of the preceding modified by culture. Cultivated during winter.

22. Canavalia *DC.*

Large twining perennials or biennials. Leaves 3-foliolate, stipellate. Flowers showy; calyx 2-lipped; upper lip projecting, entire or emarginate; the lower shortly 3-toothed; corolla much exserted; standard large, roundish; wings shorter, equalling the incurved obtuse keel; stamens monadelphous; anthers uniform; ovary sub-sessile, many-ovuled; style incurved, beardless; stigma terminal. Pod large, linear or oblong, flattish, with a distinct rib on each valve near the upper suture.

C. ensiformis *DC.*; *Fl. Brit. Ind., II, p.* 195. Stems and branches sparsely and shortly pubescent. Leaves 10–15 in. long; petiole 5-6 in.; stipules minute, deciduous; leaflets 5–8 in. long, ovate, acute, rounded at the base, membranous, very soon glabrous; stipels subulate, caducous. Peduncles 4–6 in., axillary, carrying loose many-flowered racemes 3–8

in. long; flowers solitary or in pairs from swollen nodes; bracteoles minute, ovate, caducous; calyx 1/2-nearly 1 in. long, sparsely hairy; upper lip 1/3 the length of the tube; corolla 1–1/2 in. long, lilac or white. Pods few, linear-oblong, slightly curved, varying in length from 6–24 in.; dorsal suture strongly 3-keeled. Seeds 1–1/4 by 3/4 in., white, grey or more usually red.—*The sword-bean*; Vern., *Bara sem.*

Cultivated for the sake of the edible pods.

23. Phaseolus *Linn.*

Usually herbaceous twiners. Leaves 3-foliolate, stipellate. Flowers in copious axillary racemes; bracteoles usually conspicuous and persistent; calyx campanulate, the lowest tooth usually longer than the rest, the 2 uppermost sub-connate; corolla much exserted, the keel prolonged into a very long beak which forms a complete, or in some cases nearly complete, spiral; stamens diadelphous; anthers uniform; ovary sessile, many-ovuled; style filiform, twisted round the keel, conspicuously bearded below the very oblique stigma. Pod linear, rarely oblong, sub-terete or sub-compressed, more or less distinctly septate between the seeds.

Key to the species.

Stipules small, basifixed; pod compressed.
- Pod broad, scimitar-shaped, 2–4-seeded .. 1. *P. lunatus.*
- Pod linear, straight, 4–6-seeded .. 2. *P. vulgaris.*

Stipules inserted above their bases; pod cylindrical.
- Pod glabrous .. .. .. 3. *P. aconitifolius.*
- Pod hairy.
  - Leaves dark green; pods spreading .. 4. *P. radiatus.*
  - Leaves yellowish green; pod ascending or sub-erect .. .. .. 5. *P. Mungo.*

The above nomenclature and classification of the species met with within the area of this book is adapted from Duthie (Fl. Upper Gang. Pl.), who has followed the views of Dr. Prain as regards this difficult genus (Jour. Asiat. Soc. Beng., Vol. LXVI).

1. **P. lunatus** *Linn.*; *Fl. Brit. Ind., II, p.* 200. A tall biennial twining plant. Stems at first minutely downy, soon glabrescent. Stipules basifixed. Flowers in laxly arranged fascicles on a short-peduncled axis up to 6 in. long; the lower fascicles distant, with 2–4 flowers to a node; pedicels finally 1/4–1/3 in. long; bracteoles minute; calyx 1/12 in.; teeth all very short; corolla 3-4 times the calyx, greenish-yellow; petals hairy outside; the keel prolonged into a complete spiral.

Pod 2-3 in. by 5/8–3/4 in., flat, oblong, the upper suture recurved, the lower broadly rounded. Seeds 2–4, large, white or mottled.—*Lima bean.*

Occasionally cultivated in gardens. Eaten as a vegetable. Believed to be a native of Brazil.

2. **P. vulgaris** *Linn.*; *Fl. Brit. Ind., II, p.* 200. A sub-glabrous, sub-erect or twining annual. Stipules small, basifixed. Racemes lax, sub-sessile, few-flowered; much shorter than the leaves; pedicels finally 1/4–1/3 in.; bracteoles ovate or roundish, persistent. Flowers white or lilac-purple; petals glabrous outside; keel prolonged into a complete spiral. Pod 4–6 in. by 1/2 in., linear, recurved, glabrous, rostrate, turgid, 4–6-seeded.—*French bean* or *kidney bean.*

Occasionally cultivated in gardens.

3. **P. aconitifolius** *Jacq.*; *Fl. Brit. Ind., II, p.* 202. A slender diffuse much-branched hairy annual; hairs spreading. Stipules oblong-ovate to lanceolate, 1/3 in. long, coarsely hairy on the outside, fixed above the base; petiole 1–3 in., hairy; stipels linear-subulate, 1/10–1/5 in.; leaflets 3-lobed nearly to the base, segments linear, some of them again lobed, hairy on both surfaces; stalk of terminal leaflet 1/3–2/5 in., that of lateral leaflets 1/10 in. long. Flowers yellow, in a capitate raceme, minute; peduncles up to 3 in. long in fruit, hairy; bracts and bracteoles linear, the latter twice as long as the calyx, ciliate; pedicels 1/15 in.; calyx 1/10 in., glabrous; teeth small, lower ciliate; keel prolonged into a complete spiral. Pod cylindrical, 1-2 in. long, very shortly hairy, slightly constricted between the seeds; suture thickened. Seeds oblong.—Vern., *Moth.*

4. **P. radiatus** *Linn.*; *Fl. Brit. Ind., II, p.* 203 (under *P. Mungo*, var. *radiatus*). A much branched stout sub-erect annual clothed with deciduous rough spreading hairs. Leaves 9–14 in. long; stipules attached slightly above the base, oblong, acute, 1/4–1/2 in. long; petiole up to 9 in. long, with spreading hairs; stipels small; stalk of terminal leaflet 1 to 1–1/2 in., of lateral leaflets 1/4 in.; leaflets deep green, 2–4 in. long, broadly ovate or roundish, entire, acute, the lateral oblique, deltoid or rounded at the base, hairy on both sides. Racemes capitate; peduncles up to 2 in. long, usually much shorter; flowers about 1/2 in. long, yellow; keel produced into a complete spiral. Pod 1–1/2 to 2–1/2 in. by 1/5 in., cylindrical, more or less clothed with long coarse hairs. Seeds green.—Vern., *Mung.*

Cultivated as a rainy season crop. Three varieties can be distinguished by the seed-colour, green, yellow and black.

5. **P. Mungo** *Linn.* Stems scandent or sub-scandent; seeds black.

This is the typical and wild form of *urd* as named by Linnaeus and in the opinion of Dr. Prain may not be varietally distinct from the next.

Form **Roxburghii** *Prain.*; *P. Mungo*, var. *radiatus*, *Fl. Brit. Ind.*, *II*, *p.* 203, *in part.* Stems longer and more trailing than those of *P. radiatus*; whole plant much more hairy, with reddish-brown pubescence, which gives the foliage a lighter tint; leaves larger; the pods are nearly erect, very hairy. Seeds larger and longer than those of *mung*, and usually dark brown, sometimes of a dull greenish grey colour.—Vern., *Urd*, *Mash*, *Manh.*

Cultivated as a rainy season crop.

24. Vigna *Savi.*

Twining herbs or shrubs. Leaves pinnately 3-foliolate, stipellate. Flowers in copious axillary racemes; bracts small, deciduous; bracteoles conspicuous; calyx campanulate; teeth short or long, the upper often connate; corolla much exserted; keel truncate or prolonged into a beak, not spirally twisted; stamens diadelphous; anthers uniform; ovary sessile, many-ovuled; style long, filiform, bearded along the inner face below the oblique stigma. Pod linear, sub-terete, sub-septate.

V. Catiang *Walp.*; *Fl. Brit. Ind.*, *II*, *p.* 205. A sub-erect or twining annual with glabrous stems. Leaves up to about 6 in. long; stipules 1/3 to 1/2 in., ovate, acuminate, attached above the base, persistent; petiole 1-2 in., glabrous; stipels minute; stalk of terminal leaflet up to 1 in., that of lateral leaflets 1/5 in.; leaflets 3–6 in. long, broadly or narrowly ovate, lateral oblique, glabrous, sub-coriaceous, entire or slightly lobed. Flowers in sub-capitate racemes; fruiting peduncle up to 6 in.; bracts attached above the base, deciduous; calyx under 1/2 in.; corolla yellow or reddish, twice as long as the calyx. Pod 3–12 in. long, slightly depressed between the seeds.—Vern., *Rawas*, *Rawan*, *Raung.*

Cultivated as a rainy season crop.

25. Dolichos *Linn.*

Twining herbs. Leaves 3-foliolate, stipellate; stipules minute, sub-persistent. Flowers racemed; bracts and bracteoles sub-persistent; calyx-tube campanulate, long- or short-toothed; corolla much exserted, petals usually equally long; keel obtuse or rostrate, not spiral; stamens diadelphous; anthers uniform; ovary nearly sessile; ovules many; style filiform or thickened upwards, bearded on the inner face or round the terminal stigma. Pod flat, linear or oblong, recurved.

D. Lablab *Linn.*; *Fl. Brit. Ind.*, *II*, *p.* 209. A large twiner, slightly hairy, perennial or under cultivation annual. Leaves up to 8 in. or more long; stipules lanceolate, basifixed; petiole up to 4 in. or more, softly hairy; stipels linear-lanceolate, about 1/6 in.; stalk of terminal leaflet

about 1 in., that of lateral leaflets about 1/7 in.; leaflets 2–6 in. long, broadly ovate, entire, acuminate, thinly and shortly hairy on both sides; lateral leaflets oblique. Racemes and peduncles each reaching 6–9 in.; pedicels fascicled, on nodes 1/2 to 3/4 in. apart; bracteoles oblong; calyx 1/4 in.; teeth short, deltoid; corolla reddish or white, 1/2 to 3/4 in.; keel narrow, rostrate; style thickened upwards, narrowed towards the base, bearded down the inner edge. Pod 1–1/2 to 2 in. by 1/2 to 3/4 in., tipped with the hooked persistent base of the style, downy, 3–5-seeded.—Vern., *Sem.*

Cultivated for the sake of the pods, which are cooked as a vegetable. Flowers during winter.

26. Atylosia *W. & A.*

Erect or twining herbs or shrubs. Leaves 3-foliolate, often exstipellate, gland-dotted beneath. Flowers axillary or racemed; calyx-teeth longer or shorter than the tube, the lowest longest; corolla more or less exserted, caducous or not; keel not beaked; stamens diadelphous; anthers uniform; ovary sessile, 3- or more-ovuled; style filiform, incurved, glabrous; stigma capitate. Pod linear or oblong, turgid, marked with transverse lines between the seeds. Seeds conspicuously strophiolate.

A. scarabaeoides *Benth.*; *Fl. Brit. Ind., II, p.* 215. A herbaceous twiner with slender densely grey-pubescent stem. Leaves 1–1/2–2 in. long, sub-digitately 3-foliolate; stipules minute; stipels absent; leaflets obovate-oblong, obtuse or sub-acute, 3-nerved towards the base, sparsely pubescent above, pubescent below; petiole 1/2 in. long. Peduncles short, axillary, densely pubescent, 2–6-flowered; calyx densely grey-silky, teeth longer than the tube; corolla yellow, 1/3–3/8 in. long; keel incurved at the tip. Pod 3/4–1 in. long, straight, 4–6-seeded, with fine brown silky tomentum.

27. Rhynchosia *Lour.*

Twining or erect herbs or shrubs with pinnately 3-foliolate leaves, gland-dotted on the lower surface, stipellate or not; stipules and bracts caducous. Flowers racemed; calyx-tube short; teeth equalling or much exceeding it, usually not accrescent, the upper often more or less connate; corolla included or exserted; keel not incurved, not distinctly beaked; stamens diadelphous; anthers uniform; ovary nearly sessile; ovules usually 2; style long, filiform, much incurved; stigma capitate. Pod round or oblong, flattish or turgid, usually continuous between the seeds.

Key to the species.

A trailing herb ; seeds with a waxy aril .. 1. *R. aurea.*
A twining herb ; seeds without aril .. .. 2. *R. minima.*

R. aurea *DC.* ; *Fl. Brit. Ind., II, p.* 221. An annual with slender wide-trailing stems clothed with long spreading hairs. Leaves up to 3 in. ; stipules minute, lanceolate, caducous ; petiole 1-2 in., with spreading hairs ; leaflets exstipellate, the lateral sub-sessile, the terminal with a stalk 1/4 to 3/10 in. long, rhomboid or roundish-obovate, entire, 3/4 in. to 1½ in. long, glabrous above, sparsely hairy below. Racemes short-peduncled, shorter than the leaves, 6–10-flowered ; calyx densely hairy ; segments setaceous, 3–4 times as long as the tube, forming short hooked points to the flower-buds ; corolla yellow, a little exserted. Pod round, flattened, 3/8–1/2 in., apiculate, marked with delicate transverse lines, thinly covered with long spreading hairs, 2-seeded. Seeds with a waxy aril.

R. minima *DC.* ; *Fl. Brit. Ind., II, p.* 223. A twining annual with slender stems, nearly or quite glabrescent. Leaves up to 3 in. long, exstipellate ; stipules minute, lanceolate, caducous ; petiole up to 2 in. ; leaflets 1/4 to 1 in., sub-coriaceous or membranous, ovate, entire, acute conspicuously gland-dotted beneath ; lateral sub-sessile ; terminal with a stalk 1/4 in. long. Racemes exceeding the leaves, 4–6-flowered ; bracts minute, linear ; pedicels very short ; calyx 1/8 to 1/6 in., pubescent ; lowest teeth setaceous, twice the tube ; corolla yellow, twice the calyx. Pod 1/2 to 5/8 in. long, under 1/4 in. broad, oblong, glabrescent, turgid, slightly recurved, 2-seeded. Seeds without an aril. (Fig. 73.)

28. Dalbergia *Linn.*

Trees or climbing shrubs. Leaves with alternate sub-coriaceous leaflets, imparipinnate. Flowers numerous, small, in terminal or lateral panicles ; calyx campanulate, shortly toothed ; corolla exserted ; standard broad ; keel obtuse, its petals free below, joined at the tip ; stamens monadelphous ; anthers minute, basifixed, opening mostly by short and apical slits ; ovary stalked, few-ovuled ; style short, incurved, glabrous ; stigma capitate. Pod oblong or strap-shaped, usually thin and flat, 1–4-seeded, indehiscent, not thickened or winged at the sutures.

D. Sissoo *Roxb.* ; *Fl. Brit. Ind., II,* p. 231. A tall deciduous tree with young parts downy. Leaves 4-5 in. ; stipules caducous, linear, 1/6 in. ; petiole 3/4 to 1 in. ; leaf-rachis zig zag ; leaflets 3–5, with stalk 1/6 to 1/5 in., roundish or ovate, acute or acuminate, 1–3 in. long, firm, soon glabrescent. Peduncles axillary, much shorter than the leaves, with densely pubescent branches ; calyx 1/6 in. long, downy ; corolla yellowish, twice the length of the calyx ; standard with a long claw and

round limb ; stamens 9, in one bundle, the sheath being slit only along the top. Pod straight, thin, strap-shaped, pale brown, glabrous, 1–1/2 to 2 in. by 1/4 to 1/2 in., obtuse, with a short stalk, 1–4-seeded.—Vern., *Shisham, Tali.* (Fig. 74.)

Cultivated. Flowers : March to May.

XXIV. CÆSALPINIACEÆ.

Mostly trees or shrubs, rarely herbs. Leaves stipulate, generally alternate, pinnate, bipinnate or simple, usually exstipellate. Flowers commonly showy, in racemes, spikes or rarely cymose, generally bisexual, irregular, zygomorphic, rarely nearly regular and actinomorphic ; sepals 5 or 4 by the union of the two posterior ones, generally free, imbricate, rarely valvate ; petals 5 or fewer by abortion, sometimes 0, imbricate, the posterior innermost in bud (just the reverse of what is found in the *Papilionaceæ*) ; stamens 10 or fewer by abortion, sometimes numerous, free or variously connate ; gynæcium and fruit and seeds, similar to that of *Papilionaceæ.—Mainly tropical and sub-tropical.*

Key to the genera.

Leaves bipinnate.		
Pod not moniliform	1.	*Cæsalpinia.*
Pod moniliform	2.	*Parkinsonia.*
Leaves simply pinnate.		
Petals 5 ; stamens free	3.	*Cassia.*
Petals 3 ; stamens monadelphous	4.	*Tamarindus.*
Leaves simple, shortly or deeply 2-lobed ..	5.	*Bauhinia.*

1. Cæsalpinia *Linn.*

Trees, shrubs or woody prickly climbers. Leaves large, abruptly bipinnate. Flowers showy, yellow, in copious axillary racemes ; calyx deeply-cleft, lobes imbricate, the lowest the largest, hoodlike ; petals spreading, usually orbicular, with a distinct claw, the uppermost smaller than the others ; stamens 10, free, declinate ; anthers oblong, uniform, versatile ; ovary shortly stalked or not; ovules few ; style filiform, sometimes clubbed at the tip ; stigma terminal. Pod thin and flat, or thicker and sub-turgid, indehiscent or dehiscent, smooth or spiny.

C. Bonducella *Fleming* ; *Fl. Brit. Ind., II, p.* 254. A scandent shrub, with small hard yellow prickles on stems, petioles and the axis of the inflorescence. Leaves 12–18 in. long, with a pair of reduced bifid pinnæ at the base ; pinnæ 6–8 pairs ; leaflets opposite, 6–10 pairs,

about 1/2 in. long, oblong, mucronate, rather downy beneath, very shortly stalked. Racemes long-peduncled, simple or panicled, denser towards the top; pedicels downy; bracts linear, recurved at the apex; calyx 1/4 to 1/3 in. long, rusty-tomentose; petals twice as long as the calyx, oblanceolate, yellow. Pod 2-3 in. long, oblong, densely armed on the faces with sharp wiry prickles, dehiscent. Seeds 1-2, lead-coloured, shining.—*Fever nut*; Vern., *Katkaranja*.

Sometimes found in hedges, etc. Flowers in the rainy season. Used medicinally.

2. Parkinsonia *Linn.*

Spiny shrubs or small trees. Leaves bipinnate. Flowers yellow, in short racemes; calyx deeply cleft; segments sub-equal, lanceolate, sub-valvate; petals exserted, broad, the upper with a long claw; stamens 10, included, villous; anthers versatile; ovary short-stalked; ovules many; style filiform; stigma terminal. Pod turgid, dry, moniliform, finally dehiscing.

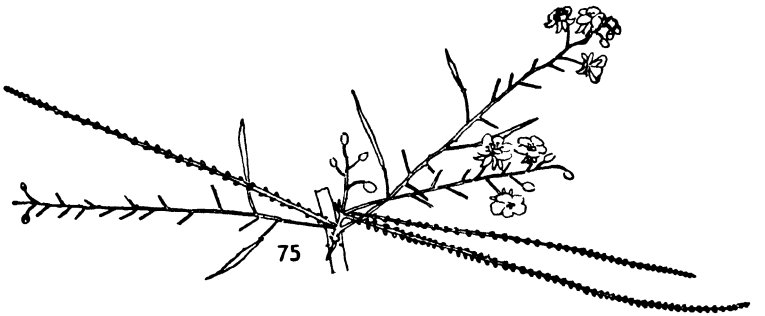

Fig. 75, *Parkinsonia aculeata*, ×½.

P. aculeata *Linn.*; *Fl. Brit. Ind., II, p.* 260. A glabrous bush or low tree, armed with sharp woody spines formed by the modification of the primary rachis of a bipinnate leaf; pinnæ 2–6, congested at the base of the primary rachis, 6–12 in. long; rachis much flattened; pinnules 25–30 pairs, up to 1/5 in. long, oblong-obovate or obovate, subsessile. Racemes lax, shorter than the leaves; pedicels long, slender; corolla yellow, 3/8 to 1/2 in. across. Pod 1–4 in. long. Seeds 1–6, oblong, smooth, mottled. (Fig. 75.)

Often cultivated. A native of tropical America. Flowers: April and May.

3. Cassia *Linn.*

Shrubs or trees, rarely herbs. Leaves paripinnate. Flowers usually large and showy, in axillary racemes and terminal panicles;

sepals connate for a very short distance, broad or narrow, imbricate; petals 5, imbricate, sub-equal, usually broad; stamens 10, but generally many abortive, 3–5 being often reduced to staminodes or altogether absent; anthers usually basifixed, opening by terminal pores or short slits; ovary sessile or stalked; ovules many; style incurved; stigma terminal. Pod very variable, terete or flat, usually septate, dehiscent or not. Seeds flattened, albuminous.

Key to the species.

Tree; pod 1-2 ft. long, cylindrical	1. *C. fistula.*
Shrub or undershrub; pod 4-5 in. long, flattened	2. *C. occidentalis.*
Annual herb, pod 6–9 in. long, narrow, nearly cylindrical	3. *C. obtusifolia.*

1. **C. fistula** *Linn.*; *Fl. Brit. Ind., II, p.* 261. A small or medium-sized tree; twigs finely pubescent when young. Leaves 12–18 in. long; rachis sub-glabrous, terete; stipules minute; leaflets 4–8 pairs, opposite, 2–7 in. long, ovate, ovate-oblong or oblong-lanceolate, entire, usually acute and the apex bent downwards, glabrous above, very finely pubescent beneath, sub-coriaceous, with stalks 1/6 to 1/3 in. long. Racemes drooping, axillary, 1 to 3-1/2 ft. long. Flowers large, yellow; bracts caducous, linear, 1/8 in., tomentose; bracteoles caducous, ovate-lanceolate, 1/12 in., tomentose; pedicels 1-2 in. long, slender, spreading, jointed near the top; sepals 2/5 to 1/3 in., almost free to the base, oblong, obtuse; petals oblong-obovate, shortly stalked; stamens 10, all anther bearing, the lowest three with long curved filaments and large anthers dehiscing by long slits, the 4–6 lateral shorter, with anthers dehiscing by pores, the uppermost 1–3 very small, with indehiscent anthers; ovary shortly stalked, curved. Pod 1-2 ft. long, about 1 in. in diameter, cylindric, smooth, dark brownish-black when ripe, septate. Seeds flat, parallel with the septa, 40–100, immersed in a dark coloured sweetish pulp.—Vern., *Amaltas.*

Commonly cultivated in gardens. Flowers: April–June, sometimes as late as September. Pulp of the pod used medicinally.

2. **C. occidentalis** *Linn.*; *Fl. Brit. Ind., II, p.* 262. A sub-glabrous undershrub, a few feet high, usually of annual duration. Leaves 6–8 in. long, stalk about 2 in., with one gland near the base; stipules about 2/5 in., acuminate, caducous; leaflets 3–5 pairs, opposite, ovate to oblong-lanceolate, 1 to 3-1/2 in. long, entire, acuminate, sub-sessile, membranous, fœtid when bruised. Flowers about 1/2 in. across, yellow, in axillary corymbose racemes; bracts 1/3 to 2/5 in., ovate, oblique, acuminate, glabrous, caducous, white tinged with pink; sepals almost free,

oblong, obtuse, glabrous, white tinged with pink; petals oblong-obovate, sub-equal; stamens, three upper reduced to staminodes, the three lower longer and with larger anthers than the four lateral. Pod 4-5 in. long, 1/3 in. broad, flattened, slightly curved, transversely septate, distinctly torulose. Seeds 20–30, ovoid, compressed, smooth, hard, shining, pale brown.

Common in waste ground. Probably introduced from Tropical America. Flowers in the rainy season.

3. **C. obtusifolia** *Linn.*; *Fl. Brit., Ind., II, p.* 263 (under *C. Tora*). A glabrous annual weed growing up into an undershrub. Leaves 3-4 in. long; petiole about 3/4 in.; stipules linear-subulate, caducous; leaflets very shortly stalked, obovate-oblong, entire, glaucous, 1/2–2 in. long; rachis channelled above, with one conical gland between the lowest pair of leaflets. Flowers usually in axillary pairs on very short peduncles; pedicels about 1/5 in., up to 2/5 in. in fruit; sepals nearly free to the base, green, oblong; petals bright yellow, oblong; stamens upper 3 rudimentary, the remaining 7 sub-equal. Pod 6–9 in. long, slender, nearly cylindrical; sutures broad. Seeds 25–35, brown, shining, flattened in the same direction as the pod.

Very common in waste places and on road-sides during the rainy season.

4. Tamarindus *Linn.*

A spineless tree with abruptly pinnate leaves. Flowers racemed; calyx-tube turbinate; teeth lanceolate, imbricate, the 2 lowest connate; petals, only the 3 upper developed, the 2 lateral ovate, the posterior hooded, the lower 2 abortive; stamens monadelphous, only 3 developed, the others reduced to mere bristles at the top of the staminal-tube; anthers oblong, versatile; ovary many-ovuled, with a stalk adnate to the calyx-tube; style filiform; stigma capitate. Pod linear-oblong, many seeded, with a thin crustaceous epicarp and thick pulpy mesocarp.

T. **indica** *Linn.*; *Fl. Brit. Ind., II, p.* 273. A large ever-green tree. Leaflets 10–20 pairs, opposite, oblong, 1/2 to 3/4 in. by 1/6 to 1/5 in., close. Flowers in 10–15-flowered lax racemes at the ends of short branches; pedicels articulated; bracts boat-shaped, caducous; petals yellow, striped with red. Pod 3–8 in. long and about 1 in. broad, slightly compressed, indehiscent. Seeds 3–10, hard, dark-brown or black, compressed.—Vern., *Imli*; *Tamarind.*

Occasionally cultivated.

5. Bauhinia *Linn.*

Unarmed erect trees or climbers with watch-spring tendrils. Leaves simple, usually deeply 2-lobed, rarely entire or fully divided into 2 leaflets.

Flowers showy, in copious, simple or panicled, often corymbose racemes; calyx-tube long and cylindrical or short and turbinate; limb entire and spathaceous, or 2- or 5-cleft; petals 5, sub-equal, usually distinctly clawed; stamens 10, or less by abortion, abortive ones represented by sterile filaments or altogether absent; filaments free; anthers versatile; ovary stalked, many-ovuled; style short or long; stigma small or large and peltate, sub-terminal or oblique. Pod generally linear, flat, dehiscent or indehiscent.

Key to the species.

Leaves cleft half-way down; calyx-tube shorter than the limb .. .. .. 1. *B. purpurea.*
Leaves cleft one-third of the way down; calyx-tube as long or longer than the limb .. .. 2. *B. variegata.*

1. **B. purpurea** *Linn.*; *Fl. Brit. Ind., II, p.* 284. A middle-sized tree; young parts brown-pubescent. Leaves 3–6 in. long, rather longer than broad, cleft about half-way down into two acute or rounded lobes, base usually cordate, 9–11-nerved; petiole 1 to 1-1/2 in. long. Flowers large, rose-purple, in few-flowered terminal brown-tomentose panicles; pedicels 1/5 to 1/2 in., stout, tomentose; bracts and bracteoles small, tomentose, deltoid; calyx tomentose; tube 1/3 to 2/5 in. long; limb twice as long as the tube, usually splitting into two reflexed segments, one emarginate, the other 3-toothed; petals white to deep rose-coloured, 1-2 in. long, oblanceolate, long-clawed, spreading; stamens only 3-4 fertile, the others reduced to anther-less filaments; ovary downy, long-stalked. Pod 6–10 in. by 1/2 to 3/4 in., stalked, linear, flat, pointed, greenish tinged with purple till ripe, late in dehiscing. Seeds 12–15, sub-orbicular, flattened, dark-brown, smooth.

Occasionally cultivated. Flowers: September–November.

2. **B. variegata** *Linn.*; *Fl. Brit. Ind., II, p.* 284. A medium-sized deciduous tree; young shoots brown-pubescent. Leaves 4–6 in. long, as broad as or rather broader than long, cleft 1/4 to 1/3 of the way down into 2, obtuse, subcoriaceous lobes; base usually deeply cordate, 11–15-nerved; petiole 1 to 1-1/2 in. long. Flowers large, fragrant, white or purple, appearing when the tree is leafless, in short axillary or terminal, few-flowered, grey-pubescent racemes; pedicels short or 0; bracts and bracteoles minute, tomentose, deltoid; calyx grey-tomentose; tube slender, 1/2 to 1 in. long; limb spathaceous, nearly as long as the tube, 5-toothed at the apex; petals obovate, rather long-clawed, all white or 4 pale-purple and the 5th darker with dark purple veins; fertile stamens

5; staminodes 0; ovary pubescent along the sutures, long-stalked. Pod 6–12 in. by 3/4 to 1 in., hard, flat, dehiscent, on a glabrous stalk about 1 in. long. Seeds 10–15.—Vern., *Kachnár*.

Occasionally cultivated. Flower-buds used as a vegetable. Flowers: February–April.

XXV. MIMOSACEÆ.

Trees or shrubs, very rarely herbs. Leaves generally bipinnate, rarely simply pinnate. Flowers small, bisexual, rarely polygamous, regular, actinomorphic, in racemes, spikes or heads, 3–6-, usually 5-merous; sepals generally connate into a tubular calyx, lobes valvate; petals also usually valvate and connate below; stamens as many as petals or twice as many or numerous, free or monadelphous, usually exserted, forming the most conspicuous part of the flower; anthers often with a deciduous gland at the apex; gynæcium, fruit and seeds as in *Papilionaceæ* and *Cæsalpiniaceæ*.—*In tropical and subtropical countries, many in dry places.*

Key to the genera.

Stamens 10.	
Prickly; flowers in spikes; anthers gland-tipped	1. *Prosopis.*
Unarmed; flowers in globose heads; anthers not gland-tipped.	
Stigma clavate; pod 2-3 in. long	2. *Desmanthus.*
Stigma capitate; pod 5-6 in. long	3. *Leucæna.*
Stamens indefinite.	
Filaments free	4. *Acacia.*
Filaments connate	5. *Albizzia.*

1. Prosopis *Linn.*

Trees or shrubs, armed with scattered prickles. Leaves bipinnate, pinnæ few, with small narrow leaflets. Flowers small, in narrow spikes, 5-merous, polygamous; calyx campanulate, faintly 5-toothed; petals 5, sub-coherent at the base; stamens 10, free, slightly exserted; filaments filiform; anthers gland-tipped; ovary stalked, many-ovuled; style filiform; stigma minute, terminal. Pod turgid, cylindrical or oblong, with a thick spongy mesocarp, septate between the seeds.

1. **P. spicigera** *Linn.*; *Fl. Brit. Ind., II, p.* 288. A small or medium-sized ever-green tree; branches armed with short nearly straight somewhat compressed prickles, rarely unarmed. Rachis rather slender, 1/2 to 2 in. long; pinnæ 1-2 pairs, 1-3 in. long; leaflets 7–15 pairs,

opposite, oblong, coriaceous, oblique, mucronate, base rounded, 3-nerved, sub-sessile, 1/3 to 1/2 in. by 1/10 to 1/6 in. Flowers creamy-white, in slender pedunculate spikes 2–5 in. long, axillary or arranged in terminal panicles; petals oblong, tips recurved. Pod 5–10 in. by 1/5 to 1/3 in., slender, pendulous, cylindrical, turgid, torulose, narrowed into a short stalk; epicarp thinly coriaceous; mesocarp pulpy; endocarp papery. Seeds 10–15, oblong-compressed.—Vern., *Jand.* (Fig. 76.)

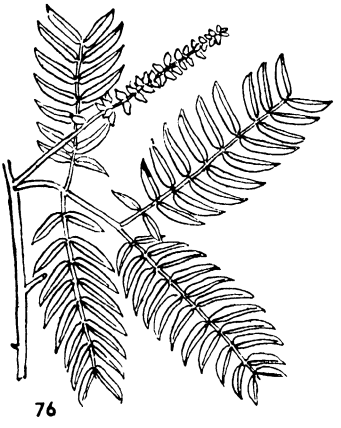

Fig. 76, *Prosopis spicigera*, × ⅔.

Flowers: April–May. Foliage and pods are used for fodder. The sweetish pulp around the seeds is sometimes eaten, raw or cooked.

P. glandulosa *Torr.*, the Mesquite, a native of America, is commonly cultivated. It has longer leaflets and compressed pods.

2. Desmanthus *Willd.*

Shrubs. Leaves bipinnate, with persistent stipules and numerous small strap-shaped sensitive membranous leaflets. Flowers polygamous, in globose heads; calyx minute, campanulate, 5-toothed; petals 5, valvate, finally nearly free; stamens 10; filaments free, filiform; anthers not gland-crested; ovary sessile, linear, many-ovuled; style filiform; stigma clavate. Pod linear, straight, coriaceous, dehiscent.

D. virgatus *Willd.*; *Fl. Brit. Ind.*, *II*, *p.* 290. A nearly glabrous erect shrubby perennial with long slender branches. Rachis 1/2 to 1-3/4 in., with a gland at the base, produced beyond the last pinnæ as a short bristle; pinnæ 2–5 pairs, 1/2 to 2 in. long; leaflets 12–20 pairs, linear-oblong, oblique, mucronate, 1/4 in. long, sessile. Flowers pale yellowish-white, in globose axillary pedunculate heads; peduncles solitary, up to 2 in. in fruit; calyx 1/10 in. long; corolla less than twice as long as the calyx. Pod 2-3 in. by 1/8 in., compressed, 20–30-seeded.

Introduced from Tropical America. Flowers: May–September.

3. Leucæna *Benth.*

Unarmed erect trees. Leaves bipinnate. Flowers sessile, in dense globose heads, 5-merous; calyx cylindrical-campanulate, shortly toothed; petals free; stamens 10, free, much exserted; anthers not

gland-crested ; ovary stalked, many-ovuled ; style filiform ; stigma minute, terminal. Pod flat, coriaceous, strap-shaped, dehiscent.

L. glauca *Benth.* ; *Fl. Brit. Ind., II, p.* 290. A large shrub or a small erect tree ; young shoots densely grey-pubescent. Rachis 3–6 in. long, pubescent, ending in a soft bristle ; pinnæ 4–8 pairs, 2 to 3–1/2 in. long, their rachis pubescent, ending in a soft bristle ; leaflets 10–15 pairs, rather distant, about 1/2 in. long, oblique, linear-oblong, acute, nearly or quite glabrous, sessile. Flowers whitish, in dense globose pedunculate heads ; peduncles 1 to 1–1/2 in. long ; calyx 1/10 in. long ; petals oblong-spathulate. Pod 5-6 in. by 1/2 in., thin, flat, shortly beaked. Seeds 15–20.

Introduced from Tropical America. Flowers : June–August.

4. Acacia *Willd.*

Erect or climbing shrubs or trees, usually armed with spines or prickles. Leaves bipinnate, with minute leaflets. Flowers in globose heads or cylindrical spikes, bisexual or polygamous, usually 5-merous ; calyx campanulate, shortly toothed ; petals exserted, united in the lower half ; stamens indefinite, free, much exserted ; anthers minute, not gland-crested ; ovary many-ovuled ; style filiform ; stigma minute, capitate. Pod usually flattened and dry, dehiscent or indehiscent.

Key to the species.

Spines subulate, straight ; flowers in globose heads.
- Heads axillary, pedunculate.
  - Pod moniliform, tomentose .. .. 1. *A. arabica.*
  - Pod cylindric, turgid .. .. 2. *A. Farnesiana.*
- Heads in terminal panicles .. .. 3. *A. leucophlæa.*

Spines compressed, recurved ; flowers in spikes.
- Pinnæ 10 or more pairs .. .. 4. *A. Catechu.*
- Pinnæ 2-3 pairs .. .. .. 5. *A. modesta.*

1. **A. arabica** *Willd.* ; *Fl. Brit. Ind., II, p.* 293. A moderate-sized ever-green tree with blackish bark ; young twigs pubescent ; spines in pairs below the petiole, straight, white, large in young and small or wanting in old plants. Leaf-rachis 1–3 in. long, downy, often glandular, produced as a minute bristle beyond the last pinnæ ; pinnæ 3–10 pairs, 1/2 to 1-1/2 in. long ; leaflets 10–20 pairs, 1/8 to 1/4 in. long, oblique, linear, sessile, glabrous. Flowers in yellow globose heads forming small axillary fascicles ; peduncles 1/2 to 1 in. long ; heads 1/2 in. in diam. ;

bracts 2–4, above the middle of the peduncle, minute; calyx 1/20 in. long; corolla twice as long as the calyx. Pod 3–6 in. by 1/2 in., stalked, compressed, moniliform, densely grey-tomentose, sub-indehiscent, 8–12-seeded.—Vern., *Kikar, Babul.* (Fig. 77.)

Common. Flowers: July–November.

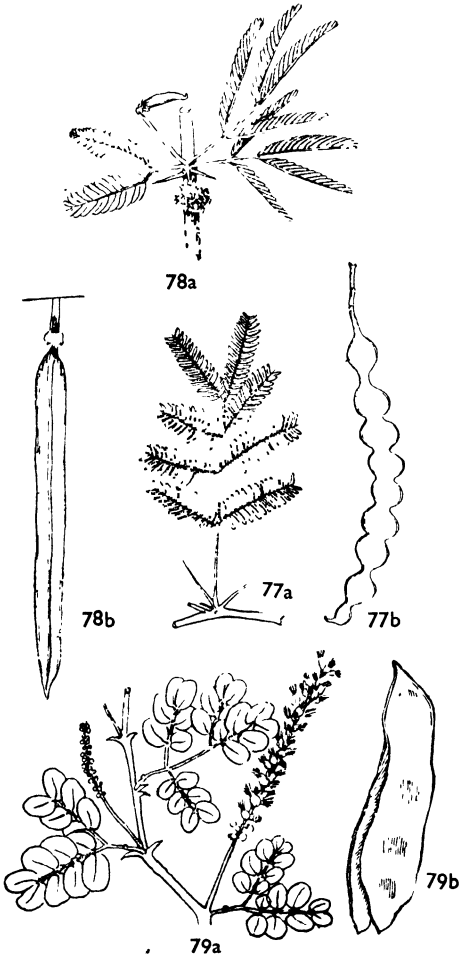

Fig. 77, *Acacia arabica*, (*a*) portion of a twig showing one leaf and spines, ×½, (*b*) pod, ×½; Fig. 78, *Acacia Farnesiana*, (*a*) portion of a twig, ×⅔, (*b*) pod, ×⅔; Fig. 79, *Acacia modesta*, (*a*) flowering twig, ×¾, (*b*) pod, ×½.

2. **A. Farnesiana** *Willd.*; *Fl. Brit. Ind., II, p.* 292. An evergreen shrub or low tree; branches marked with grey or brown raised dots; young twigs glabrescent; spines in pairs below the petiole, straight, whitish, 1/3 to 3/4 in. long. Leaf-rachis 1/2 to 2 in. long, pubescent, with a gland above the middle of the petiole and produced beyond the last pinnæ as a bristle 1/15 to 1/10 in. long; pinnæ mostly 4–8 pairs, 1/2 to 1 in. long; leaflets 10–20 pairs, up to 1/5 in. long, linear-oblong, oblique, acute, nearly or quite glabrous, sessile. Flowers in yellow globose pedunculate heads about 1/2 in. in diam., arranged in axillary fascicles of 2–7; peduncles 1/2 to 1 in. long; bracts whorled, forming a reflexed about 5-toothed tube at or near the apex of the peduncle; corolla about 1/10 in. long. Pod 2-3 in. by 1/2 in., sub-cylindric, turgid, dark brown. Seeds numerous, biseriate.—Vern., *Walaiti kikar.* (Fig. 78.)

Common. Flowers: February–May.

3. **A. leucophlæa** *Willd.*; *Fl. Brit. Ind., II, p.* 294. A moderate-sized deciduous tree, with grey bark; young shoots and inflorescence densely grey-pubescent; spines in pairs below the petiole, straight, dark brown, up to 1 in. long or wanting. Leaf-rachis 1–4 in. long, channelled above, produced beyond the last pair of pinnæ into a stiff pointed densely pubescent bristle 1/12 in. long, usually with glands between the lowest and the 2-3 uppermost pairs of pinnæ; petiole 1/5 to 1/4 in.; pinnæ 6–15 pairs, opposite, 3/4 to 1-1/2 in. long; leaflets 12–30 pairs, 1/8 to 1/6 in. long, 1/20 to 1/15 in. broad, close, overlapping, opposite, sessile, linear-oblong, oblique at the base, very sparsely hairy on the margins and the under-surface. Flowers in light yellow globose pedunculate heads 1/4 in. in diam. arranged in terminal panicles; panicles reaching a foot in length; peduncles 1/3 to 3/4 in.; bracts forming a 5-lobed involucre about the middle of the peduncle; corolla 1/10 in. long. Pod 4–6 in. by 1/3 to 2/5 in., linear, flat, sessile, sub-indehiscent, brown-velvety when young. Seeds 10–20.—Vern., *Reru.*

4. **A. Catechu** *Willd.*; *Fl. Brit. Ind., II, p.* 295. A small or middle-sized deciduous tree; prickles in pairs below the petiole, strongly compressed, recurved, dark-brown or blackish, about 1/5 in. long, often wanting in old plants. Leaf-rachis 2–6 in. long, pubescent, often prickly, channelled above, with a gland on the petiole and often several smaller glands between the pinnæ; pinnæ 10–20 pairs, 1/2 to 1 in. long, very shortly stalked; rachis pubescent; leaflets 16–30 (-50) pairs, about 1/8 in. long, base oblique, sessile. Flowers pale creamy white, in cylindric axillary pedunculate usually solitary spikes 2–4 in. long; peduncles 1/2 to 3/4 in. long; calyx campanulate, pubescent outside; corolla 2-3 times as long as the calyx, slightly pubescent. Pod 1-2 (-3) in. long, nearly 1/2 in. broad, stalked, thin, flat, straight, beaked, dehiscent along both sutures. Seeds 1-2 (-6).—Vern., *Khair.*

Occasionally met with. Flowers: May–July.

5. **A. modesta** *Wall.*; *Fl. Brit. Ind., II, p.* 296. A small or medium-sized deciduous tree; branches dark-coloured, with slightly raised dots; young shoots glabrous; prickles in pairs below the petiole, compressed, recurved, dark-brown, about 1/5 in. long. Leaf-rachis 1/2 to 2 in. long, thin and slender, glabrous, with a gland on the petiole, and sometimes one between the uppermost pair of pinnæ; pinnæ 2-3 pairs, 1/2 to 1 in.; rachis glabrous; leaflets 3–5 pairs, 1/4 to 1/5 in. long, broadly oblong or obovate, oblique, glaucous, shortly stalked. Flowers pale creamy white, in axillary solitary or geminate pedunculate spikes 1/2 to 3 in. long; peduncles up to 1/2 in. long; calyx glabrous; corolla about twice as long as the calyx. Pod mostly 2 to 3-1/2 in. by about 1/2 in., thin,

flat, straight, apex triangular, gradually narrowed at the base into a stalk, dehiscent along both sutures. Seeds 1–5.—Vern., *Phulai*. (Fig. 79.)

Common. Flowers : March–May.

5. Albizzia *Durazz.*

Trees or shrubs without spines. Leaves bipinnate. Flowers in globose heads, bisexual, usually 5-merous ; calyx tubular or campanulate, toothed or shortly lobed ; corolla funnel-shaped, petals connate below the middle ; stamens indefinite, monadelphous at the base ; filaments several times the length of the corolla ; anthers minute, not gland-crested ; ovary sessile or shortly stalked ; style filiform ; stigma capitate, minute. Pod large, thin, flat, strap-shaped, straight, dehiscent or not, continuous within, the suture not thickened.

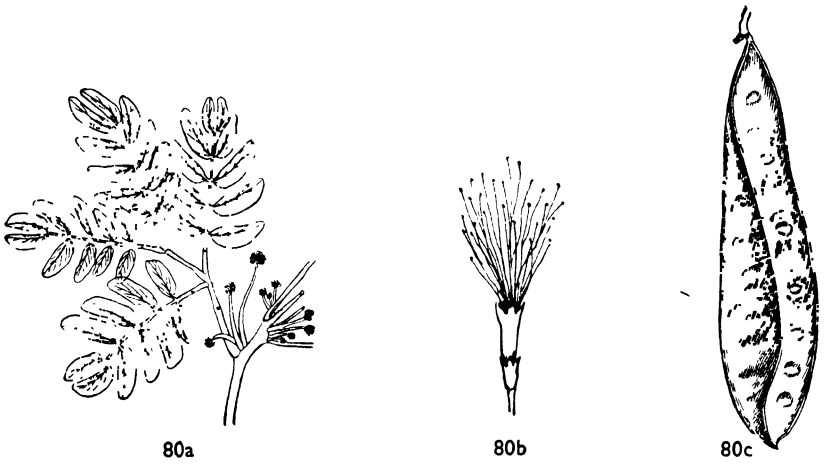

Fig. 80, *Albizzia Lebbek*, (*a*) portion of a flowering twig, ×¼, (*b*) one flower, ×1, (*c*) pod, ×¼.

A. Lebbek *Benth.* ; *Fl. Brit. Ind., II, p.* 298. A large deciduous tree ; young shoots and inflorescence pubescent ; bark fissured. Rachis 3–9 in. long, usually with a large gland on the lower part of the petiole and often one or more between the upper pairs of the pinnæ ; stipules minute, linear, caducous ; petiole up to 5 in. ; pinnæ 2-3 or 1 or 4 pairs, up to 6 in. long, often with glands between pairs of leaflets ; leaflets 3–9 pairs, oblique, oblong, 1-2 in. by 2/5–1 in, sub-coriaceous, sub-sessile ; upper surface green or mottled with white, glabrous ; under surface lighter, downy. Flowers very fragrant, in pedunculate heads which are solitary or in fascicles of 2–4 in the axils of the upper leaves ; peduncles 1½–4 in., downy ; bracts linear, tomentose, caducous ; pedicels very short ;

central flower of the head largest and with thicker perianth ; calyx 1/6 in., campanulate, pubescent ; teeth short, deltoid ; corolla greenish-yellow, 1/3 in. ; lobes lanceolate, pubescent on the back ; stamens 1 to 1-1/2 in. long. Pod 3–12 in. by 1-2 in., straight, tip rounded, acute or with a beak up to an in. long (all forms often met with on the same tree), pale straw-coloured or brown, reticulately veined, dehiscent along one suture, 2–12-seeded. Seeds suborbicular-oblong, brown, very often found damaged by some insect even in the closed pod.—Vern., *Siris*, *Sarinh*. (Fig. 80.)

Very commonly cultivated. The pods remain hanging on the tree for a long time even after ripening. Flowers : April-May. Ripe pods can be seen on the tree even when it is quite bare of leaves and during the ensuing summer.

A. procera *Benth.* is another pretty-commonly cultivated tree in gardens. It is known as the *white siris*.

Mimosa pudica *Linn.* ; *Fl. Brit. Ind., II, p.* 291. A diffuse prickly under-shrub with bipinnate, very sensitive leaves and pink globose heads of tetramerous flowers is commonly cultivated in gardens.—*The sensitive plant* ; Vern., *Lajwanti*, *Chuimui*.

XXVI. ROSACEÆ.

Trees, shrubs or herbs. Leaves alternate, rarely opposite, simple or compound, stipulate. Flowers generally bisexual and regular ; calyx free or adnate to the ovary ; lobes 5, imbricate, often bracteolate ; disk lining the tube of the calyx ; petals 5, rarely 0, deciduous, imbricate ; stamens numerous, rarely 1, 2, 5 or 10, perigynous ; filaments free, rarely connate ; anthers small, 2-celled, dehiscing longitudinally ; carpels 1 or more, free or connate, often adnate to the calyx-tube ; styles free, rarely connate ; ovules in each carpel 1 or more, superposed when more than 1. Fruit superior or inferior, drupaceous, pomaceous, follicular or achenial, sometimes on an enlarged fleshy torus, rarely capsular. Seeds exalbuminous, cotyledons large, plano-convex ; radicle short.—*A large cosmopolitan family, but mainly north temperate, containing about* 90 *genera and* 2,000 *species.*

Potentilla *Linn.*

Herbs. Leaves compound ; stipules adnate to the petiole. Flowers white or yellow, rarely red, solitary or in corymbose cymes ; calyx persistent, 5-, rarely 4-, bracteolate ; lobes as many, valvate in bud ; petals as many, sometimes narrow ; stamens many, rarely few and definite ; disk annular or coating the calyx-tube ; carpels many, rarely 1 or few, on a small dry receptacle ; style persistent or deciduous, ventral or terminal ; ovule 1, pendulous. Achenes many, on a dry receptacle.

P. supina *Linn.*; *Fl. Brit. Ind., II, p.* 359. An annual prostrate herb with numerous slender spreading hairy stems. Leaves pinnate, 1/2 in. long; leaflets 3–9, opposite or alternate, obovate, oblong or cuneate, obtuse, lobulate or serrate. Flowers on slender axillary pedicels, 1/4–3/8 in. across; petals oblong, smaller than the calyx, yellow. Achenes minute, smooth or ridged, not concealed by the hairs of the villous globose receptacle; styles sub-terminal. (Fig. 81.)

Canal banks. Flowers during March–June.

Fig. 81, *Potentilla supina*, (*a*) branch, $\times \frac{2}{3}$, (*b*) fruit, $\times \frac{1}{3}$.

A large number of Rosaceæ are cultivated for their fruits and flowers.

Prunus persica *Stokes*; peach; Vern., *A'ru*. Several varieties are cultivated for the sake of fruits. These are propagated by budding. A double-flowered variety is an ornamental garden plant. Flowers: January–March. Fruits: May onwards.

P. communis *Huds.*, var. **institita** *Bullace*; Vern., *Alucha*. Flowers and fruits about the same time as *P. persica*.

Fragaria vesca *Linn.*, *the straw-berry*, is occasionally grown in some gardens.

Eriobotrya japonica *Lindl.*; Vern., *Lokat*. A small ever-green tree, a native of Japan, is cultivated for the sake of fruit. The best varieties are propagated by inarching. Fruits: April—June.

Pyrus sinensis *Lindl.*; Vern., *Nashpati*. This is the common Indian pear of the plains with hard fruits. The good varieties of European pear (**P. communis** *Linn.*) are also here and there grown at Lahore, but more abundantly near Amritsar. These are propagated by grafting on young plants of *Pyrus sinensis*, which forms a quite good stock for the purpose. **P. Malus** *Linn.*, the apple, is not much grown near Lahore.

Rosa *Linn.* The cultivated double-flowered roses are mostly hybrids derived from **R. gallica** *Linn.* with **R. damascena** *Mill.*, **R. centifolia** *Linn.*, **R. turbinata** *Ait.*, and **R. alba** *Linn.* In India the double-flowered roses (excluding modern introductions) are traced to **R. indica** *Linn.* Apart from these hybrids **R. damascena** *Mill.*, Vern., *gulab*, is commonly cultivated in the gardens for its fragrant flowers which are usually pink and imperfectly double. It is also largely grown for rose-water and *attar*.

XXVII. CACTACEÆ.

Mostly succulent, leafless, perennial shrubs or herbs, often very spiny. Flowers showy, solitary, bisexual, regular; sepals and petals not generally sharply distinguished, superior, in several series, the

innermost largest, sometimes coherent at the base ; stamens numerous, inserted at and free or adnate to the base of the petals ; ovary inferior, 1-celled ; placentas 3 or more, parietal ; ovules numerous, long-stalked ; style simple ; stigma 3- or more-lobed. Fruit a succulent berry, often spiny or bristly, many-seeded. Seeds numerous, immersed in the pulp, exalbuminous ; testa often black ; embryo straight to semi-circular. —*Genera nearly* 25, *species approximately* 1,000, *chiefly American, but naturalized in other warm countries.*

Opuntia *Mill.*

Erect prickly shrubs with jointed flattened stems. Leaves very small, subulate, caducous. Prickles in small tufts. Flowers regular, yellow or red, solitary, sessile ; perianth-segments very numerous, free, erect or spreading. Fruit a red or purple berry bearing tufts of prickles on the outside. Seeds pale ; testa bony.

Key to the species.

Joints bright grass-green, prickles in tufts of 1-few on young joints, increasing up to 10 on older stems	1. *O. monocantha.*
Joints dull bluish- or greyish-green.	
Joints about 2½ in. wide, usually without prickles ; sometimes prickles present in tufts of 1–3	2. *O. stricta.*
Joints 6–8 in. wide ; prickles in tufts of about 4–6	3. *O. Dillenii.*

1. **O. monocantha** *Haw.* ; *Forest Flora Punjab, p.* 263. Shrub, 6–8 ft. high ; joints variable in size and shape, usually 12 by 3-4 in., narrow-oblong to broad-obovate, rather thin, bright grass green. Leaves 1/4 in. long, dark brown. Prickles in tufts of 1-few on young joints, but increasing up to 10 on older ones, straight, up to 2 in. long. Flowers 2-2½ in. long, 3 in. across, yellow ; outer segments of the perianth short, ovate, acute, green ; the inner spathulate, acute, denticulate ; stigmas 5. Berry pyriform, truncate, depressed at the apex, reddish when ripe. (Fig. 82.)

Flowers : April–May.

2. **O. stricta** *Haw.* ; *Forest Flora Punjab, p.* 264. Shrub, 4 ft. high ; joints about 6 by 2½ in., elliptic-oblong, narrowed at both ends, thick, dull greyish-green. Leaves 1/10—1/8 in. long, green or reddish.

Prickles 0, solitary or rarely in tufts of 2 or 3, reddish-brown, straight, 1 in. long. Flowers 3 in. across, yellow ; outer perianth segments short, acute, green ; the inner spathulate, acute ; stigmas 6. Berry turbinate, depressed at the apex, slightly warty, dull carmine when ripe.

Brick-kiln mounds at Lahore. Flowers during April and May.

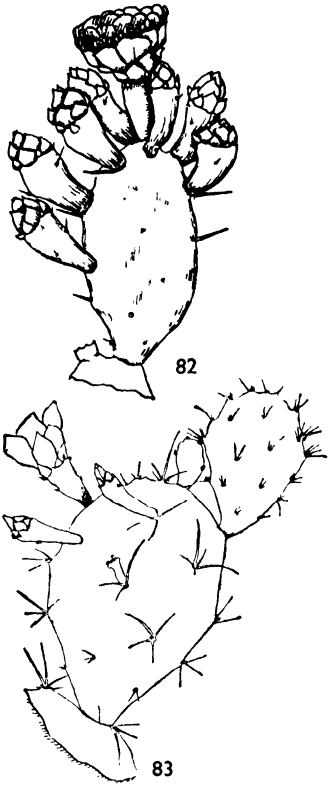

Fig. 82, *O. monacantha*, ×¼ ; Fig. 83, *Opuntia Dillenii*, ×⅛.

3. **O. Dillenii** *Haw.* ; *Forest Flora Punjab, p.* 264. Shrubs about 5 ft. high ; joints 12–16 by 6–8 in., broadly obovate, undulate, not very thick, dull bluish-green. Leaves 1/7 in. long, pale-green. Prickles in tufts of 4–6, the largest very stout, subulate, firm and sharp, 1 to 1½ in. long, usually somewhat curved, yellowish. Flowers 3 in. across, yellow tinged with orange ; outer perianth-segments ovate, acute, rounded, with membranous margins ; the inner obovate, rounded, mucronate ; stamens of unequal lengths ; stigmas 5–8, erect. Berry pyriform, truncate, depressed at the apex, often angular or warty when not fully ripened, deep reddish-purple when ripe. (Fig. 83.)

Common. Flowers from March–May.

A few more species of *Opuntia* are grown in the gardens, but these are not very common at Lahore. For further information reference may be made to Parker's ' Forest Flora for the Punjab with Delhi and Hazara '.

XXVIII. COMBRETACEÆ.

Trees or shrubs with simple, entire, exstipulate leaves. Flowers usually bisexual, regular, 4- or 5-merous ; calyx-tube adnate to the ovary and produced beyond it ; petals episepalous, often wanting ; stamens 8 or 10, biseriate ; ovary inferior, 1-celled ; ovules usually 2–5, on large funicles, pendulous from the apex of the cell. Fruit generally angled or winged. Seed 1, exalbuminous.—*Genera* **17**, *species about* 500, *mostly tropical ; only found in cultivation within the area.*

Terminalia arjuna *Wight & Arn.* (Vern., *Arjun*) is often grown as a road-side tree at Lahore. Flowers : April-May (Parker).

T. Chebula *Retz.* (Vern., *Harar*), Myrobalan and **T. belerica** *Roxb.* (Vern., *Bahera*) are very common in the sub-Himalayan tract. Stray trees are found at Lahore. The fruits are of medicinal value.

Quisqualis indica *Linn.*; *the Rangoon creeper.* A large sub-scandent shrub, a native of Malaya, is commonly planted in gardens. Flowers appear in dense clusters during greater part of the year. These are sweet-scented and appearing first at night are white but turn pink at day-break.

XXIX. MYRTACEÆ.

Trees or shrubs. Leaves opposite, rarely alternate, simple, usually entire, with translucent glands, exstipulate. Flowers regular, generally bisexual; calyx-tube more or less adnate to the ovary, lobes 3 or more, imbricate, valvate or irregularly split; petals usually 4-5, imbricate or connivent in a mass; stamens numerous, inserted with the petals on the margin of the disk lining the calyx-tube; ovary inferior, 2- or more-celled; placentation usually axile; ovules numerous, rarely few or 1. Fruit usually fleshy, in some genera a capsule.—*Genera* 73, *species about* 2,750, *in tropical and sub-tropical countries.*

Several species are cultivated in the gardens.

Eugenia jambolana *Lamk.*; Vern., *Jáman.* A large ever-green tree, very commonly grown for the fruit and as a wind-break for fruit gardens. Often self-sown. Flowers: May-June.

Myrtus communis *Linn., the myrtle.* An ever-green shrub, indigenous to southern Europe.

Psidium Guyava *Linn.*; *Guava.*; Vern., *Amrúd.* A small tree, cultivated for its fruits. Flowers: May (Parker).

Callistemon lanceolatus *DC., the bottle-brush tree.* A small ever-green tree, indigenous to Queensland and New South Wales, but often grown in the gardens. Flowers crimson, in terminal spikes about 6 in. long, the branches soon growing through the spikes. Flowers: March–August.

Eucalyptus *L'Heritier.* Ever-green trees or shrubs, often reaching a gigantic size, usually secreting aromatic resinous gum. Sepals and petals united into a cap which closes the orifice of the calyx-tube in bud and falls off on the opening of the flowers. Indigenous to Australia but numerous species have been introduced into India. A good description of those found in Punjab is found in Parker's 'Forest Flora for the Punjab with Delhi and Hazara'.

XXX. LYTHRACEÆ.

Herbs, shrubs or trees. Leaves opposite, rarely whorled or alternate; stipules 0 or very small. Flowers usually in cymes or panicles, rarely solitary, bisexual, usually regular; sepals united into a tube; lobes 3–6, valvate, often with accessory teeth; petals 3–6 or 0, episepalous, crumpled in bud; stamens 4, 8 or many, episepalous; ovary usually superior or half-inferior, inferior in *Punica*, 2–6-celled; style long; stigma capitate; placentation axile; ovules numerous. Fruit usually capsular, opening by a transverse slit, by valves or irregularly. Seeds numerous, exalbuminous; embryo straight.—*Genera* 23, *species about* 450, *widely spread within the tropics, absent from cold countries.*

Ammannia *Linn.*

Annual glabrous herbs; branches often quadrangular. Leaves opposite or alternate, sometimes whorled, entire, exstipulate. Flowers small, often dimorphic, axillary, solitary and sub-sessile, or in terminal spikes, or in small trichotomous cymes; bracteoles usually 2; calyx campanulate or tubular-campanulate, 3–5-toothed, often with intermediate teeth; petals 3–5 or 0, small, inserted between the calyx-teeth; stamens 2–8, inserted on the calyx-tube; ovary enclosed in the calyx-tube, 1–5-celled; the septa very thin, often absent; style filiform or short; stigma capitate; ovules very many; placentas axile or free central. Capsule membraneous, globose or long-ellipsoid, enclosed in the calyx, opening by 2 or 3 valves, or irregularly, or by a transverse slit. Seeds many, small, smooth, round on the back; raphe on the somewhat flattened inner face.

Key to the species.

Flowers clustered in the leaf axils	1. *A. baccifera.*
Flowers in compound peduncled cymes ..	2. *A. senegalensis.*

1. **A. baccifera** *Linn.*; *Fl. Brit. Ind., II, p.* 569. Erect profusely branched herb, 6–24 in. high. Leaves usually opposite, rarely alternate, 1–3 in. long, lanceolate, tapering to the base, more or less distinctly petioled. Flowers in dense axillary clusters or in very short axillary cymes, shortly pedicellate; bracts filiform, shorter than the pedicels, calyx-tube hemispherical; teeth 4, broad, triangular; accessory teeth small; petals 0 or inconspicuous; stamens 4 (or 2). Capsule depressed, globose, breaking up irregularly above the middle. Seeds plano-convex.

Ravi bank; an early winter annual.

2. **A. senegalensis** *Lamk.*; *Fl. Brit. Ind., II, p.* 570. Stems erect, 6–24 in.; branches sharply quadrangular; leaves opposite, sessile, 1-2 in. long, lanceolate, base sub-auriculate. Flowers in shortly peduncled compound cymes; bracteoles minute, linear; calyx bell-shaped, with 4–8 green lines becoming indistinct in fruit, obscurely 4-toothed; petals 4, pink, falling off very soon; stamens 8. Capsule globose, opening irregularly. Seeds half-ellipsoid.

Among the cultivated plants belonging to this family are:—

Lawsonia inermis *Linn.*; *the henna*; Vern., *Mendhi.* The leaves are used for dyeing the hands, feet and beard by many people. Also makes a good hedge.

Lagerstroemia indica *Linn.* A small tree, 15–20 ft. high. It is frequently planted in the gardens for its showy flowers which are of white, rose or purple colour.

Flowers: May–August.

L. Flos-Reginae *Retz.* Indigenous to Assam and S. India; it is sometimes grown in the gardens.

Punica Granatum *Linn.*; *Pomegranate*; Vern., *Anár.* Ovary inferior Flowers mostly in April and May.

XXXI. ONAGRACEÆ.

Mostly annual or perennial herbs, often aquatic. Leaves opposite or alternate, simple, exstipulate. Flowers in racemes or solitary axillary, bisexual, regular; calyx-tube adnate to the ovary; lobes 4-5, rarely 2, valvate; petals 4-5, rarely 2 or 0, contorted or imbricate; stamens equal or double the number of petals, epigynous; ovary inferior or rarely half-inferior, 2–6-celled, rarely incompletely partitioned; style simple; stigma capitate, 2-lobed or 4-fid; ovules 1 or many in each cell on axile placentas. Fruit a capsule or an indehiscent nut. Seeds small, numerous or only 1 or 2, naked or tipped with a tuft of long hairs, exalbuminous; embryo straight or nearly so.—*Genera about* 40, *species about* 500, *in temperate and sub-tropical regions, rare in the tropics.*

Trapa *Linn.*

Aquatic, floating herbs. Leaves dimorphic; submerged opposite, root-like, pinnati-partite, with filiform segments; floating alternate, rosulate, rhomoidal; the petiole with a spongy dilatation near its apex; stipules small, caducous. Flowers axillary, solitary, peduncled; sepals 4, connate in a short tube, adnate to the lower part of the ovary, persistent, 2 or all becoming spinescent in the fruit; petals 4, white, small, inserted at the margin of an epigynous disk; stamens 4; ovary half-inferior, 2-celled; style subulate; stigma capitate; ovule solitary in each cell, pendulous from the upper inner angle. Fruit a large obovoid bony quadrangular nut with 2 or 4 spines at the angles, 1-celled, with a short cylindric beak at the top through which the radicle is protruded. Seed 1, inverted; cotyledons very unequal.

T. bispinosa *Roxb.*; *Fl. Brit. Ind., II, p.* 590. Floating leaves 2 by 1½–3 in., densely villous beneath, posterior margin entire, faintly crenate in front; petiole 4–6 in. long, woolly. Fruit 3/4 in. long and broad, glabrous or hairy, with two angles spinescent and the other two sometimes more or less obsolete.—*Water Chestnut*; Vern., *Singarha.*

Grown in large ponds for the edible fruit. Flowers: September-October.

XXXII. CUCURBITACEÆ.

Herbaceous climbers, often of large size, with watery juice, climbing by means of solitary, lateral, spiral, simple or divided tendrils. Leaves

alternate, petioled, often cordate, simple, lobed or pedately divided. Flowers regular, unisexual, monoecious or dioecious, panicled, racemed, sub-umbellate or solitary, usually yellow or white. Male flower : Sepals 5, united ; tube usually short, campanulate ; lobes small, usually imbricate ; corolla polypetalous or gamopetalous, petals or lobes 5, inserted on the calyx-tube, imbricate or valvate ; stamens free or variously united, mostly 3, rarely 1–5, inserted on the calyx-tube ; one anther always 1-celled, the others 2-celled ; cells straight or often curved, flexuous or conduplicate ; connective often produced ; dehiscence longitudinal or in curves, following folds of anther-cells, extrorse ; pistillode often present. Female flower : Calyx-tube adnate to the ovary and often produced beyond it, segments as in male ; petals as in male ; staminodes usually 0, or 3 or 5 ; ovary inferior, 1-celled, with 3 large fleshy parietal placentas, often meeting in the centre (hence ovary apparently 3-celled), bearing usually numerous horizontal, rarely few and pendulous ovules ; style simple or rarely 3 free styles ; stigmas 3, large. Fruit fleshy, generally indehiscent. Seeds usually numerous, surrounded with pulp, often flattened, exalbuminous.—*Genera about* 100, *species about* 800, *mainly in warmer parts of the world.*

Key to the genera.

Anther-cells conduplicate or sigmoid ; flowers white, 1 in. or more in diameter	1.	*Cephalandra.*
Anther-cells straight or slightly curved ; flowers pale-yellow, less than ¼ in. in diameter ..	2.	*Mukia.*

1. Cephalandra *Schrader.*

Herbaceous climbers ; tendrils simple. Leaves petioled, 5-angular or 5-lobed, toothed. Flowers dioecious, moderately large, all solitary axillary, white, ebracteate. Male flower : Calyx-tube campanulate, short ; limb 5-lobed, lobes linear ; corolla campanulate, 5-lobed up to about the middle ; stamens 3 ; anthers exserted, connate, one 1-celled, two 2-celled ; cells conduplicate. Female flower : Calyx and corolla as in the male ; ovary oblong ; style long with 3 bifid stigmas ; ovules many, horizontal ; placentas 3, vertical. Fruit fleshy, cylindric, smooth. Seeds many, ovoid, compressed, margined.

C. indica *Naud.* ; *Fl. Brit. Ind., II, p.* 621. A rather extensive climber. Stem cylindrical. Leaves 2–4 in. in diameter, usually broadly cordate-ovate, obtuse, apiculate, 5-angular. Male flower : Peduncle 1 in. long, jointed below the flower ; calyx-lobes linear-

oblong; corolla 1-1½ in. in diameter; lobes long, triangular. Female flower: Peduncle about 1/4 in.; ovary smooth. Fruit bright scarlet, 1-2 by 1/2-1 in., fusiform-ovoid, slightly beaked. Seeds oblong-ovoid, much compressed, smooth, yellowish-grey. (Fig. 84.)

In dry bushy places.

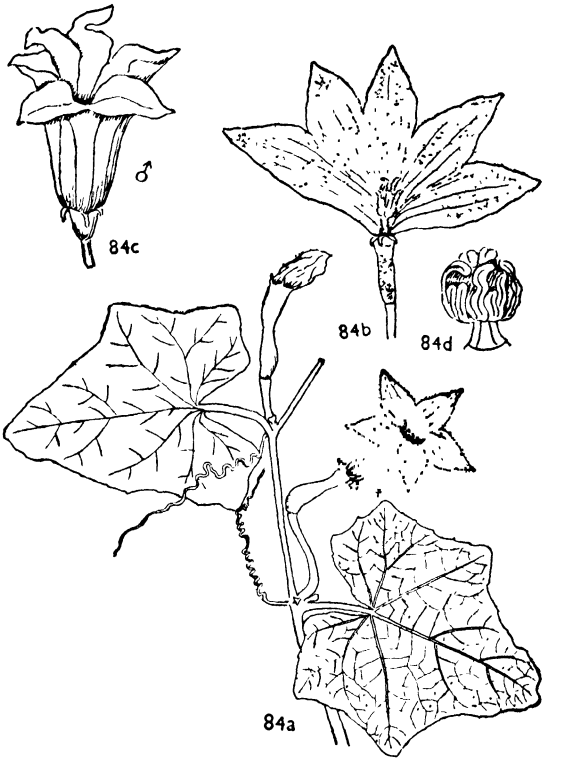

Fig. 84, *Cephalandra indica*, (*a*) a branch bearing female flowers, ×½, (*b*) a female flower with corolla cut open, ×⅔, (*c*) male flower, ×⅔, (*d*) staminal column from a male flower, ×½.

2. **Mukia** *Arn.*

Scabrous climbing herbs; tendrils simple. Leaves 3–7-angular, not deeply lobed, cordate, petioled and subsessile on the same plant. Flowers small, yellow, males and females clustered in the same axil, males very short-peduncled, females sub-sessile. Male flower: Calyx campanulate, teeth 5, subulate; corolla 5-partite; stamens 3; anthers free, cells straight, connective not produced. Female flower: Calyx and corolla as in the male; disk annular; ovary ovoid, hispid; style thick, apex 3-2-lobed; ovules not very many, horizontal; placentas 3-2. Berry globose, small. Seeds not many, ovoid, compressed, strongly margined, faces rough or smooth.

M. scabrella *Arn.*; *Fl. Brit. Ind., II, p.* 623. A slender scabrid climber; stem much branched, angular, very hispid with spreading bristly hairs, young parts covered densely with white hairs. Leaves 1–3 in., deltoid-ovate, shallowly 5-lobed, very deeply cordate at the base, acute or obtuse at the apex, dentate-serrate, rough, hispid beneath; petiole about half as long as the entire leaf, cylindrical, very hispid. Flowers

1/6–1/8 in. in diameter; calyx hairy, segments linear; petals pale-yellow, ovate, ciliate, a little longer than the calyx segments; ovary very hispid. Fruit about ½ in. in diameter, ovoid, bright red. Seeds rough on their faces.

Flowers during summer.

Many Cucurbitaceæ are cultivated for their fruits, which are eaten either raw or after being cooked. Below is given a list of the more important ones:—

Trichosanthes anguina *Linn.*; *Snake gourd*; Vern., *Chichinda.*
T. dioica *Roxb.*; Vern., *Palwal.*
Lagenaria vulgaris *Ser.*; *Bottle gourd*; Vern., *Ghiya.*
Luffa aegyptiaca *Mill.*; Vern., *Ghiya tori.*
L. acutangula *Roxb.*; Vern., *Kali tori.*
Benincasa hispida *Cogn.*; Vern., *Petha.*
Momordica Charantia *Linn.*; Vern., *Karela.*
Cucumis Melo *Linn.*; *The melon*; Vern., *Kharbuza.*
C. Melo *Linn.*, **var. utilissima** *Field and Gard.*; Vern., *Kakri.*
C. Melo *Linn.*, **var. momordica** *Field and Gard.*; Vern., *Phut.*
C. sativus *Linn.*; *Cucumber*; Vern., *Khira.*
Citrullus Colocynthis *Schrad.*; *Colocynth.*; Vern., *Indrayan.*
C. vulgaris *Schrad.*; *Water melon*; Vern., *Tarbuz.*
Cucurbita maxima *Duchesne*; *Great pumpkin* or *spanish gourd.*
C. Pepo *Linn.*; True pumpkin; Vern., *Kashiphal* or *Kaddu.*
C. moschata *Duchesne*; *The musk* or *melon pumpkin.*

XXXIII. FICOIDEÆ.

Annual or perennial, erect or prostrate, often fleshy herbs rarely low shrubs. Leaves alternate, opposite or whorled, simple; stipules 0 or scarious. Flowers bisexual, regular; sepals 5, free or more or less connate, often adnate to the ovary, but free in the local genera, imbricate or rarely valvate, herbaceous; petals 0, rarely 5 or more; stamens perigynous or hypogynous, definite or indefinite; staminodes sometimes present; ovary usually superior, 1–5-celled, of separate carpels in *Gisekia*, styles as many as the carpels; ovules in each carpel many and axile or 1 and basal. Fruit a transversely or longitudinally dehiscent capsule; in *Gisekia* of separate achenes. Seeds more or less reniform, albuminous; embryo curved or annular.—*Genera about* 18, *species about* 600, *chiefly African.*

Key to the genera.

Stamens inserted on the calyx-tube	1. *Trianthema.*
Stamens hypogynous.	
Ovary 3–5-celled	2. *Mollugo.*
Gynæcium of 5 separate carpels	3. *Gisekia.*

1. Trianthema *Linn.*

Prostrate, branching, glabrous or papillose herbs. Leaves opposite, unequal, entire, exstipulate, petioled; petioles connected at the base by their dilated membraneous margins. Flowers small, axillary, sessile or peduncled, solitary or in cymes or clusters; sepals 5, connate into a short or long tube; lobes often cuspidate, coloured within; petals 0; stamens 5–10 or more, inserted near the top of the calyx-tube; ovary free, 1-2-celled; styles 1 or 2, subulate; ovules 1 or many, basal. Fruit a membranous or coriaceous, clavate, transversely dehiscing capsule. Seeds few, reniform; embryo annular.

Key to species.

Style 1.	
Stamens about 15	1. *T. monogyna.*
Stamens about 5	2. *T. crystallina.*
Styles 2, stamens 5	3. *T. pentandra.*

1. **T. monogyna** *Linn.*; *Fl. Brit. Ind., II, p.* 660. Annual. Leaves 1/2–2½ in. long, obovate; petiole up to 1 in. long. Flowers solitary; calyx-tube scarious, thin, closely sheathed by the base of the petiole; lobes obtuse, cuspidate; stamens 10–20; ovary truncate; style 1. Capsule 1/5 in., scarious below, 6–8 seeded, cap exserted, carrying away with it 3 seeds. Seeds reniform, black, dull, marked with raised lines. (Fig. 85.)

Very common, a weed of road-sides and waste places; abundant during the rainy season, especially in soils rich in organic matter.

Flowers: May–October.

2. **T. crystallina** *Vahl.*; *Fl. Brit. Ind., II, p.* 660. Annual. Leaves ½-¾ in. long, narrowly oblanceolate or elliptic, sessile or almost so. Flowers 1 or more in leaf axils; calyx-tube herbaceous, with many ribs, not sheathed by the base of the petiole; lobes triangular, cuspidate; stamens 5; style 1. Capsule 1/12 in., 2-seeded, cap depressed in the centre. Seeds discoid, dull black, marked with raised lines. (Fig. 86.)

Found after the rains, September–October.

3. **T. pentandra** *Linn.*; *Fl. Brit. Ind., II, p.* 660. Perennial. Leaves 1-2 in. long, oblong or elliptic; petiole 1/4–3/4 in. long. Flowers in sessile clusters; bracts scarious; calyx-lobes ovate, often scarious on the margins; stamens 5; styles 2. Capsule 1/6 in., cap separating into two one-seeded parts, lower portion of the fruit 2-seeded. Seeds dull black. (Fig. 87.)

Abundant after rains, September–November.

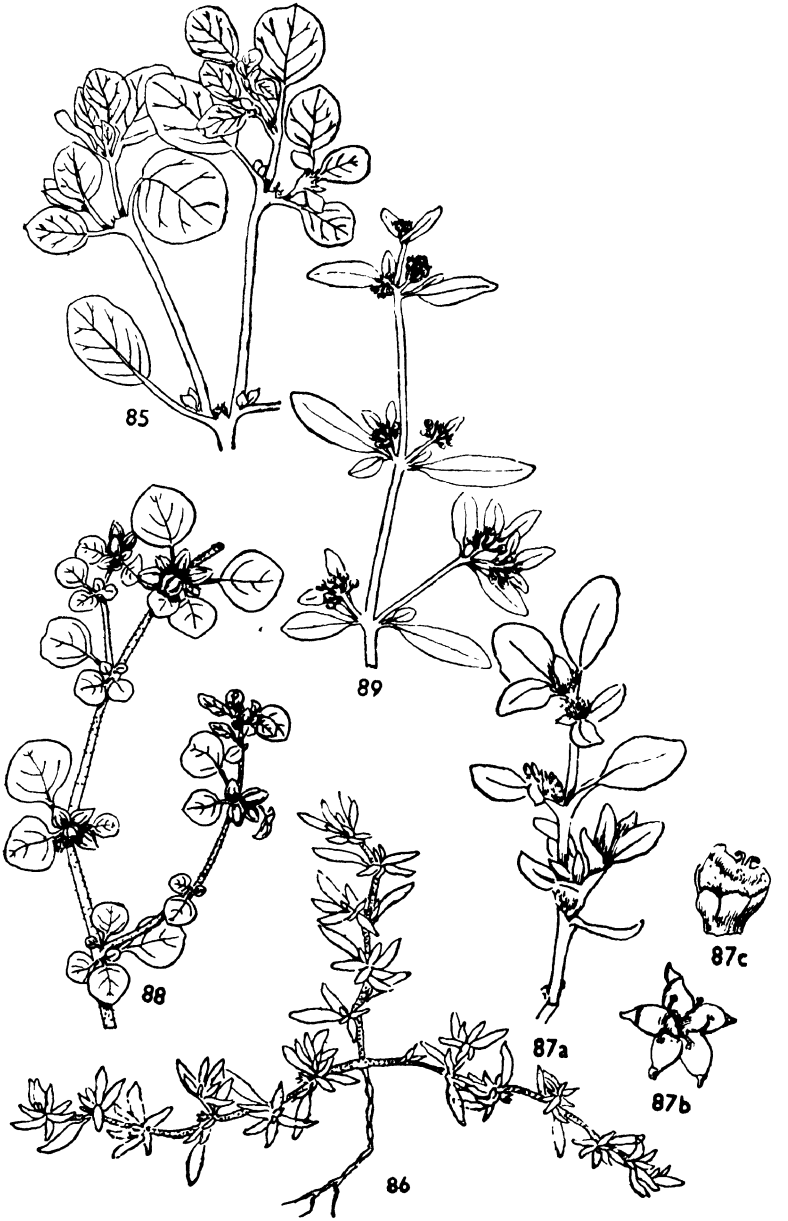

Fig. 85, *Trianthema monogyna*, × ½; Fig. 86, *Trianthema crystallina*, × ⅔; Fig. 87, *Trianthema pentandra*, (*a*) a branch, × ¾, (*b*) a flower, × 3, (*c*) fruit, × 3; Fig. 88, *Mollugo hirta*, × ⅓; Fig. 89, *Gisekia pharmaceoides*, × ¾.

2. Mollugo *Linn.*

Herbs, often dichotomously branched. Leaves apparently whorled, alternate or radical, entire ; stipules caducous. Flowers small, greenish, axillary, sessile or pedicelled, clustered or in cymes or racemes ; bracts inconspicuous ; sepals 5, persistent ; petals 0 ; stamens 3–5, rarely many, often with staminodes intermixed ; ovary superior, 3–5-celled ; styles 3–5, linear or very small ; ovules many, axile. Capsule membranous, sheathed by the sepals, 3–5-celled ; dehiscence loculicidal. Seeds several in each cell, rarely 1, reniform ; embryo annular.

M. hirta *Thunb.* ; *Fl. Brit. Ind., II, p.* 662. A more or less densely hairy prostrate annual. Leaves 1/2–1¼ in. long, opposite or falsely whorled, unequal, orbicular or obovate, obtuse, usually downy on both surfaces ; petiole 0-1/2 in. long. Flowers axillary, 1–6 at a node ; pedicels unequal ; sepals 1/4 in., lanceolate, elliptic or oblong, acute, stellate-hairy on the outside ; staminodes 0 or linear and bifid ; stamens 5–10, rarely more ; ovary ovoid, glabrous ; styles short. Capsule oblong, shorter than the sepals. Seeds numerous, ovoid, with a small white scale at the hilum extended into a long filiform process which curves over the top of the seed. (Fig. 88.)

Near moist places, Chhota Ravi, etc.

3. Gisekia *Linn.*

Diffuse branched herbs. Leaves opposite, exstipulate. Flowers sessile and pedicelled, hermaphrodite, small, greenish or purplish, in axillary cymes ; sepals 5, nearly free, ovate, herbaceous with membranous margins ; petals 0 ; stamens 5, hypogynous ; carpels 5, distinct, each ending in a short simple style and containing one basal ovule. Fruit of 5, free, membranous, papillose, indehiscent achenes. Seeds vertical, sub-reniform ; embryo curved.

G. pharnaceoides *Linn.* ; *Fl. Brit. Ind., II, p.* 664. A glabrous herb ; branches prostrate or ascending. Leaves 3/4–2 in. long, spathulate or oblong-spathulate, tapering into a short petiole. Flowers numerous, small, in sessile or peduncled, cymose umbels, on slender pedicels ; sepals 1/10 in., oblong-oval, with membranous borders ; filaments dilated below. Fruit as long as the sepals. Seeds rounded on the back, blackish, covered with short white glands. (Fig. 89.)

In dry sandy places. Flowers : April–September.

XXXIV. UMBELLIFERÆ.

Herbs, annual or perennial, rarely woody. Stems furrowed, often hollow. Leaves alternate, rarely simple, usually much divided, sheathing

at the base. Flowers regular or irregular, bisexual or polygamous, in compound, rarely simple umbels, the peripheral flowers sometimes with unequal petals, ray-like ; bracts and bracteoles involucrate ; calyx superior, tube adnate to the ovary ; lobes 5 or 0 ; petals 5, epigynous, distinct, often bifid with an inflexed apex, imbricate, valvate in *Hydrocotyle* ; stamens 5, alternate with the petals ; filaments inflexed in bud ; anthers 2-celled, opening length-wise ; ovary inferior, 2-celled, crowned by the disk ; styles 2 ; ovules solitary in each cell, pendulous. Fruit dry, dividing into two mericarps (ripe carpels), these often remaining suspended at the top by the divided thread-like central axis (carpophore) ; mericarps mostly prominently ribbed and often with parallel resinous canals (vittæ). Seed solitary in each mericarp, pendulous ; albumen cartilaginous ; embryo minute, near the hilum.—*Genera* 200, *species about* 2,500, *mainly in the temperate regions ; in the tropics mostly on the mountains.*

Key to the genera.

Leaves simple ; umbels simple	1. *Hydrocotyle.*
Leaves divided ; umbels compound.	
Carpophore absent	2. *Oenanthe.*
Carpophore present, bipartite	3. *Ammi.*

1. Hydrocotyle *Linn.*

Prostrate herbs, rooting at the nodes. Leaves round or reniform, long-petioled ; stipules small, scarious. Umbels simple, small, opposite the leaves ; bracts small or 0. Flowers white, sometimes unisexual ; calyx-teeth 0 or minute ; petals entire, valvate or imbricate. Fruit laterally compressed, commissure narrow ; lateral primary ridges concealed within the commissure or remote from it and prominent ; vittæ 0 or obscure ; carpophore 0. Seeds laterally compressed.

Key to the species.

Leaves orbicular, 1/2 in. or so in diameter ; stipules cauline	1. *H. rotundifolia.*
Leaves reniform, 1 in. or more broad ; stipules adnate to the petiole	2. *H. asiatica.*

1. **H. rotundifolia** *Roxb.* ; *Fl. Brit. Ind., II, p.* 668. Stems filiform, glabrous. Leaves about 1/2 in. in diameter, orbicular, cordate, palmately 5–7-lobed, crenate, glabrous, shining above, coarsely hairy beneath ; petiole 1/2–1½ in. ; stipules cauline. Flowers minute, almost sessile, 4–8 in a head ; peduncle very short, solitary ; bracts oblong ;

petals lanceolate, acute, valvate. Fruit 1/12 in., rather broader than long, compressed, glabrous ; mericarps with 5, not sharp ribs. (Fig. 90.)

Very common during winter in grassy plots.
Flowers : February—April.

2. **H. asiatica** *Linn.* ; *Fl. Brit. Ind., II, p.* 669. Stems long, prostrate, given off from leaf-axils of a short vertical root-stock, cord-like, glabrous, with long internodes. Leaves 1 in. or more broad, reniform, rather broader than long, crenate, glabrous and shining on both sides ; petiole up to 4 in. long ; stipules adnate to the petiole. Flowers nearly sessile, usually 3–6 together ; peduncles erect, pubescent, 1–3 from the nodes, shorter than the petioles, opposite the leaves ; bracts ovate ; petals minute, ovate, acute, slightly imbricate. Fruit 1/6 in. ovoid, longer than broad ; pericarp hard, thickened ; mericarps with 9 vein-like ribs.—Vern., *Brahmi booti.* (Fig. 91.)

On canal banks. Flowers : February–June.
Used as a tonic in Ayurvedic medicine.

2. Oenanthe *Linn.*

Marshy herbs. Leaves 1–3-pinnate, ultimate segments large or small, rarely reduced almost to sheaths. Umbels compound ; bracts 0 or solitary ; bracteoles several, linear. Flowers white, often polygamous, males sometimes radiate ; calyx-teeth small, acute ; petals emarginate. Fruit glabrous, ellipsoid, longer than broad or globose, nearly terete ; commissure broad ; mericarps semiterete, dorsally compressed ; inner face plane ; lateral primary ridges large, triangular, corky ; dorsal and intermediate primary ridges much smaller, sometimes obsolete, or all sub-equal ; furrows 1-vittate ; carpophore 0 ; disk usually not prominent. Seeds terete or dorsally compressed, inner face plane.

Oe. stolonifera *Wall.* ; *Fl. Brit. Ind., II, p.* 696. A stoloniferous nearly glabrous herb ; stems 2–4 feet, decumbent, often floating, rooting freely from many of the lower nodes. Leaves 1-2-pinnate ; leaflets 1-2 by 1/2-1 in., lanceolate or rhomboid-lanceolate, serrate or sometimes lobed. Peduncles 2-3 in. long, leaf-opposed ; rays 6–30, nearly equal. Fruit glabrous, obovoid, 1/8 in. long ; ridges distinct but not elevated. (Fig. 92.)

On canal banks. Flowers : April–June.

3. Ammi *Linn.*

Annual or biennial herbs. Flowers white, outer rayed ; calyx-teeth minute or obsolete ; petals obovate, entire or unequally bilobed ; ovary depressed at the apex. Fruit ovate or oblong, laterally com-

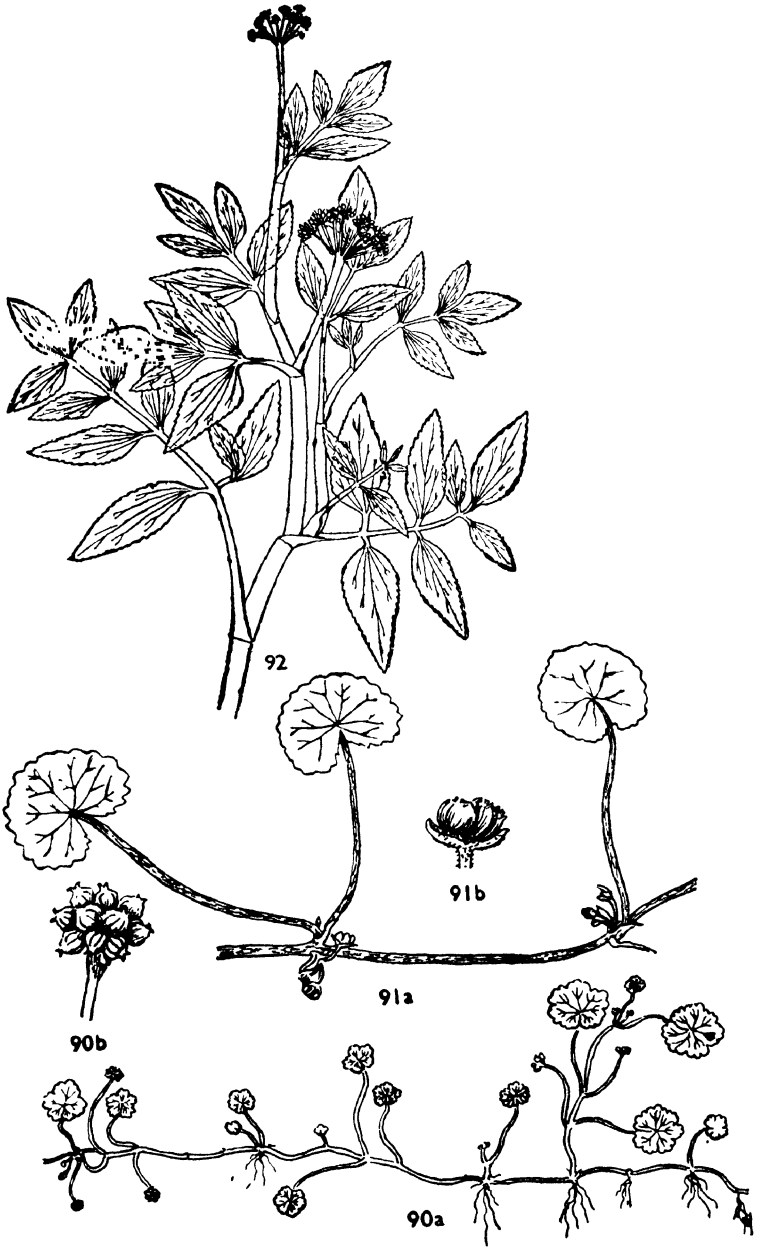

Fig. 90, *Hydrocotyle rotundifolia*, (*a*) a plant, $\times \frac{3}{4}$, (*b*) a cluster of fruits, $\times 3$; Fig. 91, *Hydrocotyle asiatica* (*a*) portion of a plant, $\times \frac{2}{3}$, (*b*) a cluster of fruits, $\times \frac{3}{4}$; Fig. 92, *Oenanthe stolonifera*, $\times \frac{1}{3}$.

pressed ; mericarps not separating, with 5 filiform equal ribs ; ribs 1-vittate ; carpophore bipartite.

A. Huntii *Wats.* ; *Lond. Jour. Bot., VI, p.* 384, 1847. An erect, glabrous herb. Stem 3-4 ft., swollen at the nodes. Leaves 2-3-pinnate, more than 1 ft. long ; leaflets lanceolate, serrate, 1-3 in. long. Peduncles stout, leaf-opposed, 8 in. or more in length ; rays 30–40, slender, 1-2 in. Fruit obovoid, mealy, ridges distinct.

This plant is a native of Azores. Flowers : March.

Following members of this family are commonly cultivated :—

Carum copticum *Benth.* ; Vern., *Ajwain.*
Foeniculum vulgare *Mill.* ; *Fennel* ; Vern., *Saunf.*
Peucedanum graveolens *Benth.* ; *Indian dill* ; Vern., *Sowa.*
Coriandrum sativum *Linn.* ; *Coriander* ; Vern., *Dhania.*
Cuminum Cyminum *Linn.* ; *Cumin* ; Vern., *Safed Zira.*
Daucus Carota *Linn.* ; *Carrot* ; Vern., *Gajar.*

XXXV. RUBIACEÆ.

Mostly trees or shrubs, sometimes herbs. Leaves opposite or whorled, simple, mostly entire, with interpetiolar or intrapetiolar stipules, sometimes with stipules replaced by leaves. Flowers bisexual, mostly regular, arranged variously ; calyx adnate to the ovary, limb various ; corolla epigynous, more or less tubular ; lobes 4-5, valvate, imbricate or contorted ; stamens 4-5, alternate with the corolla-lobes, inserted in the tube or at its mouth ; anthers mostly free, 2-celled, opening lengthwise ; disk epigynous, usually annular or cushion-like ; ovary inferior, 2- or more-celled, with axile, apical or basal placentation, rarely 1-celled with parietal placentas ; ovules 1 or more in each cell ; style simple, or variously lobed, stigmas various. Fruit a capsule, berry or drupe. Seeds mostly albuminous ; embryo curved or straight.—*Genera* 450, *species about* 5,000, *mostly tropical, but a number are found in the temperate and a few species of Galium even in the arctic countries.*

Galium *Linn.*

Glabrous, hispid, scabrid or prickly, erect or scandent, weak herbs. Leaves 3 or more in a whorl. Flowers minute, in axillary and terminal cymes, white, yellow or greenish ; pedicel jointed with the ovary ; calyx-limb 0 ; corolla rotate or shortly funnel-shaped ; lobes 4, rarely 3 or 5, valvate ; stamens 4, rarely 3 or 5, inserted in the corolla-tube ; ovary 2-celled ; styles 2, short, with capitate stigmas ; ovule 1 in each cell,

attached to the middle of the septum, erect. Fruit small, 2-lobed, dry, smooth or bristly. Seeds 2, adhering to the pericarp.

G. aparine *Linn.*; *Fl. Brit. Ind., III, p.* 205. Stems 1–5 ft. long, scrambling, very rough. Leaves mostly in whorls of 6 or 8, 1/2–2 in. long, narrowly lanceolate, usually hispid all over. Flowers in 3–9-flowered axillary cymes, white, tinged with green. Fruit purplish, covered with hooked bristles. (Fig. 93.)

Common as forest undergrowth during winter. Flowers: February–April.

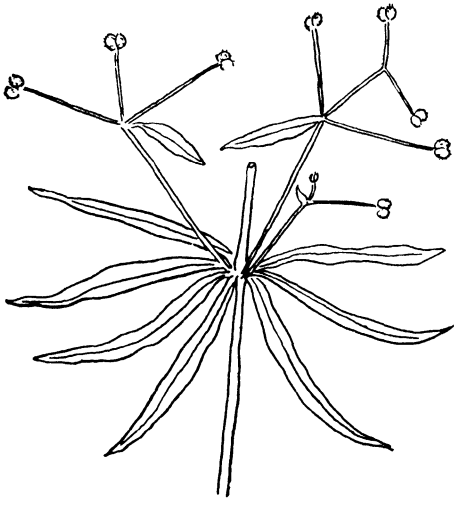

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Fig. 93, *Galium aparine*, a twig with fruits, × 1.

XXXVI. COMPOSITÆ.

Herbs or undershrubs, rarely tall shrubs or small trees or climbers. Leaves alternate or opposite, simple or variously dissected, exstipulate. Flowers crowded into heads (capitula), surrounded at the base by one or more whorls of free or united bracts (involucre); sometimes the heads compound and the partial heads few- or 1-flowered; floral bracts entirely absent or reduced to scales or bristles on the flat, conical or rarely elongated or concave receptacle. Flowers all tubular (heads discoid), or the inner tubular and the outer ligulate (heads radiate), or all ligulate (heads ligulate), all bisexual, bisexual or male, rarely heads dioecious; calyx (pappus) superior; limb 0 or of hairs or chaffy; corolla epigynous, gamopetalous, either tubular, 4-5-lobed and actinomorphic, or ligulate, rarely bilabiate, and zygomorphic; stamens 5, rarely 4, epipetalous, mostly included in the corolla; filaments free; anthers generally connate into a tube sheathing the style, rarely free, 2-celled, opening lengthwise, base of cells often tailed or prolonged downwards; ovary inferior, 1-celled; ovule solitary, erect from the base, anatropous; style usually divided at the top into two stigmatic arms. Fruit achenial (cypsela), usually crowned with pappus, sometimes beaked. Seed exalbuminous; cotyledons straight, plano-convex.—*The largest family of flowering plants, genera more than* 1,000, *species about* 10,000, *distributed over all parts of the world.*

Key to the genera.

A. Heads simple, discoid ; pappus of hairs.
Flowers neither blue nor yellow, of some shade of red or whitish.
Involucral bracts not spinescent.
Receptacle naked.
All flowers similar .. .. 1. *Vernonia.*
Outer flowers different from the central.
Involucral bracts not scarious.
Involucral bracts narrow. Herbs.
Anther-cells tailed .. .. 6. *Blumea.*
Anther-cells not tailed .. 7. *Laggera.*
Involucral bracts broad. Under-shrub .. .. .. 8. *Pluchea.*
Involucral bracts scarious .. 10. *Gnaphalium.*
Receptacle with an outer ring of scales, naked at the top. A small herb densely covered with leaves and reddish heads in their axils .. .. .. 9. *Ifloga.*
Receptacle bristly .. .. 26. *Saussurea.*
Involucral bracts spiny.
Leaves spinous.
Pappus hairs feathery .. .. 24. *Cnicus.*
Pappus hairs somewhat scaly, unequal, united at the base in a deciduous ring 25. *Silybum.*
Leaves not spinous .. .. 27. *Volutarella.*
Flowers blue ; outer much larger than the central ones, neuter .. .. .. 28. *Centaurea.*
Flowers yellow or yellowish.
Plants not spiny.
Involucral bracts not scarious.
Anther-cells not tailed .. .. 5. *Conyza.**
Anther-cells tailed.
Pappus 1-seriate .. .. 6. *Blumea.*
Pappus double, outer of short scales, inner of filiform or flattened hairs.
Leaves densely cottony beneath .. 13. *Pulicaria.*
Involucral bracts scarious. Hoary or woolly herbs .. .. .. 10. *Gnaphalium.*

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* Sometimes the heads are minutely radiate in *Conyza stricta.*

Plants spinescent.
Flowers pale yellow .. .. 24. *Cnicus.*
Flowers bright yellow .. .. 23. *Cousinia.*

B. Heads simple, discoid; pappus of scales or barbed bristles.
Heads bluish or white .. .. .. 2. *Ageratum.*
Heads yellow.
Plants not spinescent.
Leaves opposite.
Heads 1/2 in. in diam., entirely yellow; pappus 0 or of 1–3 bristles .. .. 16. *Spilanthes*
Heads 1/4-1/2 in. in diam., ray florets when present white; pappus of 2–4 awns armed with retrorse bristles .. 17. *Bidens.*
Leaves alternate. Small, often creeping herbs. Pappus ear-shaped .. .. 20. *Cotula.*
Plants spiny .. .. .. 29. *Carthamus*
Heads orange-red .. .. .. 29. *Carthamus.*

C. Heads simple, discoid; pappus 0.
Flowers reddish, rose-purple or white.
Leaves mostly pinnatisect .. .. 4. *Cyathocline.*
Leaves simple, linear .. .. 9. *Ifloga.*
Flowers orange-red. Leaves spinulose-serrate 29. *Carthamus.*
Flowers yellow or greenish.
Plants spiny .. .. .. 29. *Carthamus.*
Plants not spinescent.
Heads 1-sexual; involucre of female heads covered with hooked bristles .. 14. *Xanthium.*
Heads bisexual.
Heads 1/2 in. in diameter. Leaves opposite .. .. .. 16. *Spilanthes.*
Heads less than 1/4 in. in diameter.
Leaves not opposite.
Plants 2–6 ft. tall. Heads very small, numerous, in large terminal panicles .. .. .. 21. *Artemesia.*
Small, often prostrate herbs. Stems 9 in. or less long.
Heads subsessile .. .. 3. *Centipeda.*
Heads on peduncles about 1/2 in. long 20. *Cotula.*

D. Heads simple, radiate ; pappus of hairs.
  Heads 3/4-1 in. in diameter .. .. 12. *Vicoa.*
  Heads 1/4-1/3 in. in diameter .. .. 13. *Pulicaria.*

E. Heads simple, radiate ; pappus of bristles or scales.
  Ray florets white.
    Pappus of 2–5 minute teeth .. .. 15. *Eclipta.*
    Pappus of 2–4 awns provided with retrorse bristles .. .. .. 17. *Bidens.*
  Ray florets yellow.
    Disk florets also yellow .. .. 16. *Spilanthes.*
    Disk florets white or pale-yellow .. 18. *Tridax.*

F. Heads simple, radiate ; pappus 0.
  Rays yellow .. .. .. 16. *Spilanthes.*
  Rays white.
    Leaves entire or slightly toothed .. 15. *Eclipta.*
    Leaves 1-2-pinnatisect .. .. 19. *Matricaria.**

G. Heads simple, ligulate.
  Achenes beaked .. .. .. 31. *Lactuca.*
  Achenes not beaked.
    Juice yellow .. .. .. 34. *Launea.*
    Juice white.
      Cauline leaves 0 or few, stalked ; achenes fusiform .. .. .. 30. *Crepis.*
      Cauline leaves 1/2-amplexicaul ; achenes oblong, with 4-5 rugose ribs ; outermost bracts with scarious margins .. 32. *Picridium.*
      Cauline leaves many, amplexicaul ; achenes compressed, ovoid or obovoid, with 3–5 ribs on each face .. .. 33. *Sonchus.*

H. Heads compound.
  Heads terminal. Leaves prickly .. .. 22. *Echinops.*
  Heads axillary. Leaves not prickly .. 11. *Cœsulia.*

1. Vernonia *Schreb.*

Herbs or shrubs, bearing alternate leaves. Heads discoid, pink or purple, in corymbose cymes or panicled, homogamous ; involucre globose, equalling or shorter than the flowers ; bracts many-seriate, inner longest ; receptacle naked or pitted, sometimes shortly hairy. Corollas all equal,

* Heads are rarely discoid and without ray-florets in *Matricaria.*

Fig. 94, *Vernonia cinerascens*, $\times \frac{1}{2}$; Fig. 95, *Ageratum conzoides*, $\times \frac{1}{2}$; Fig. 96, *Cyathocline lyrata*, $\times \frac{1}{2}$; Fig. 97, *Conyza ambigua*, $\times \frac{1}{3}$.

tubular, slender; lobes 5, narrow; anther-bases obtuse; style-arms subulate. Achenes ribbed or terete; pappus of many hairs, girt on the outside with a row of short hairs or flattened bristles.

Key to the species.

Herb: leaves ovate or lanceolate; achenes not ribbed .. .. 1. *V. cinerea.*
Small shrub; leaves spathulate; achenes 5-ribbed .. 2. *V. cinerascens.*

1. **V. cinerea** *Less.*; *Fl. Brit. Ind., III, p.* 233. An erect or rarely suberect, more or less hairy, generally slightly branched, annual herb, 1/2–1½ ft. tall. Leaves short- or long-petioled, 1–3 in. long, up to 1½ in. broad, ovate or lanceolate, obtuse or acute, little or deeply, obtusely or acutely toothed, membranous or sub-cariaceous, hairy on both sides. Heads 1/4 in. in diam., on slender bracteate peduncles, corymbose; involucral bracts linear-lanceolate, sharply pointed. Corolla pink or lilac, lobes pubescent. Achenes 1/15–1/20 in., terete, not ribbed, clothed with appressed white hairs; pappus white or dirty white, outer hairs very short.

A very common weed and very variable especially in size and leaves. This probably depends on the amount of water and shelter available. Plants growing in fields are generally larger, while those growing on road-sides are stunted.

Flowers during the cold season.

2. **V. cinerascens** *Schultz-Bip.*; *Fl. Brit. Ind., III, p.* 237. A much-branched undershrub, up to 3 ft. tall, ashy-pubescent. Leaves 1-2 in. long, spathulate, tapering to a narrow base, rounded or apiculate, entire or serrate, pubescent on both sides, gland-dotted. Heads 1/4 in. in diam., in terminal corymbose cymes; peduncles ebracteate or with minute bracts; involucral bracts linear, subacute. Corolla purple, glabrous. Achenes 1/5–1/10 in. long, 5-ribbed, silky; pappus white; outer hairs much shorter than the inner, rigid. (Fig. 94.)

Flowers during winter.

2. Ageratum *Linn.*

Erect herbs. Leaves opposite or the upper alternate. Heads discoid, corymbose, homogamous; involucre campanulate; bracts 2-3-seriate, linear, subequal; receptacle flat or nearly so, naked or with caducous scales. Corollas all tubular, equal, regular; limb 5-cleft; anthers appendaged, base obtuse; style-arms elongate, obtuse. Achenes 5-angled; pappus of 5 short connate scales.

A. conyzoides *Linn.*; *Fl. Brit. Ind., III, p.* 243. A softly hairy, generally branched, annual herb, 1-2 ft. tall. Leaves 2–5 in. long

including the long petiole, ovate, crenate ; base wedge-shaped to sub-cordate. Heads in dense terminal corymbs, pale-blue or white ; involucral bracts linear, acute, striate. Achenes black ; pappus scales awned, often serrate below. (Fig. 95.)

A very common winter weed.

3. Centipeda *Lour.*

Herbs with alternate, entire or coarsely toothed leaves. Heads small, sessile on the branches or racemose, discoid, yellow ; involucre hemispheric ; bracts 2-seriate, subequal, with scarious margins, spreading in fruit ; receptacle flat or somewhat convex, naked. Florets all regular, tubular, but heterogamous ; outer female, many-seriate, fertile ; corolla narrow, obscurely 2-3-lobed ; central florets bisexual, few, fertile, with broader, campanulate, 4-fid corolla ; anther-bases obtuse, entire ; style-arms of bisexual florets short, truncate. Achenes obtusely 4-angled, hairy or bristly at the angles, lacking pappus.

C. orbicularis *Lour.* ; *Fl. Brit. Ind., III, p.* 317. A prostrate annual ; stems many from the root, 4–9 in. long, glabrous or sparsely woolly. Leaves subsessile 1/4-1/2 in. long, oblong-spathulate, with few teeth. Heads 1/10-1/6 in. in diam., axillary solitary, nearly sessile, globose, yellow ; involucral bracts small, oblong, obtuse, with membranous margins. Achenes minute.

In wet places. Flowers during winter.

4. Cyathocline *Cass.*

Erect, annual, odorous herbs. Leaves alternate, pinnatisect. Heads small, discoid, corymbose, heterogamous ; involucre hemispheric ; bracts sub-2-seriate, lanceolate, acute, margins scarious ; receptacle with a contracted base, elevated, top concave, naked. Outer florets many-seriate, female, fertile, filiform, 2-toothed ; central florets hermaphrodite, usually sterile, regular, 5-cleft ; anther-bases truncate ; style exserted. Achenes minute, oblong, smooth ; without pappus.

C. lyrata *Cass.* ; *Fl. Brit. Ind., III, p.* 246. Sparsely hairy, sweet-scented, branched annual, 1-2 ft. tall. Leaves 1–5 in. long, mostly pinnatisect, segments toothed, generally decreasing in size towards the leaf-base. Heads in small rounded panicled corymbs, rose-purple or sometimes white, 1/6 in. in diam. Achenes minute. (Fig. 96.)

A winter plant, generally found in moist situations.

5. Conyza *Less.*

Herbs. Leaves alternate. Heads discoid, corymbose or panicled, heterogamous; involucre campanulate; bracts 2-many-seriate, narrow, outer smaller; receptacle flat or convex, naked or pitted and fimbriate. Outer florets female, 2-many-seriate, filiform, rarely ligulate, 2-3-toothed, fertile; inner hermaphrodite, all or mostly fertile, yellow, tubular, limb 5-toothed; anther-bases obtuse, entire; style-arms of female florets flattened, tips long or short. Achenes minute, compressed; pappus slender, 1-seriate.

Key to the species.

Heads 1/10 in. in diam. ..	..	..	1. *C. stricta.*
Heads 1/5 in. in diam. ..	..	..	2. *C. ambigua.*

1. **C. stricta** *Willd.*; *Fl. Brit. Ind., III, p.* 258. An erect, pubescent or hoary, annual herb, 1-2 ft. tall, generally much corymbosely branched in the upper part. Stems leafy. Leaves 1/2–3 in. long, subsessile, linear, spathulate or obovate-spathulate, entire or toothed, rarely pinnatifid, hairy on both sides. Heads numerous, yellow, 1/10 in. across or less, ovoid, peduncled, corymbose; involucral bracts linear-lanceolate. Achenes pale yellow, about 1/40 in. long, narrowly elliptic, puberulous; pappus reddish.

Ravi bank. It is probably a recent introduction from the hills.

C. ambigua *DC.*; Syn. *Erigeron linifolius Willd.*; *Fl. Brit. Ind., III, p.* 254. A greyish-green herb, 1–2½ ft. tall. Stems solitary or more commonly several from the base, erect, very leafy, appressed hairy or villous. Leaves sessile, 1½–3½ in. long, linear, entire or distantly serrate, densely hairy, rarely glabrescent above, sub-tomentose or villous beneath. Heads about 1/5 in. in length and diam.; involucral bracts many, linear, very acute, centre hairy, margins scarious. Outer florets numerous, 1/6 in. long, with filiform minutely 2-3-toothed pale corolla; inner florets pale yellow; anthers linear, somewhat appendiculate. Achenes pale-brown, 1/20 in. long, margins sparsely silky; pappus dirty-white, 1/6 in. long. (Fig. 97.)

Quite common in irrigated lands. Flowers: March–June.

This plant is frequently called *Erigeron linifolius* or sometimes *E. canadense*. Hooker says that the plant is found as an escape or a garden weed in Punjab and elsewhere. It is however so abundant now at Lahore that it can hardly be called an escape.

6. Blumea *DC.*

Glandular pubescent or woolly herbs. Leaves alternate, usually toothed or lobed. Heads discoid, corymbose, panicled or fascicled, rarely racemed, heterogamous, purple, rosy or yellow; involucre ovoid

or campanulate ; bracts many-seriate, narrow, acute, soft or herbaceous, outer smaller ; receptacle flat, naked. Outer florets many-seriate, female, fertile, with filiform, 2-3-toothed corolla ; central florets bisexual, few, fertile ; corolla tubular, slender, limb 5-toothed ; anthers sagittate, tails small, slender ; style-arms of bisexual florets flattened or almost filiform, rarely connate with the adjoining anthers. Achenes small, sub-terete or angled, ribbed or not ; pappus 1-seriate, slender, often caducous.

Key to the species.

Corolla purple .. .. .. 1. *B. Wightiana.*
Corolla yellow.
Achenes not-ribbed, glabrate ; whole plant strongly smelling of turpentine or camphor .. 2. *B. lacera.*
Achenes ribbed, silky ; plants not strongly odorous .. .. 3. *B. membranacea.*

1. **B. Wightiana** *DC.* ; *Fl. Brit. Ind., III, p.* 261. A pleasantly aromatic, villous, rarely thinly hairy and glandular, erect herb, 1-2 ft. tall. Stems solitary to a few from the root, very leafy. Leaves petioled, at the base of the stem 2–4 in. long, cauline 1-2 in. long including the petiole. Heads 1/4 in. long, collected into terminal spiciform dense (rarely open) cymes or panicles ; receptacle glabrous ; involucral bracts linear, acuminate, with softly hairy tips, not spinous-tipped. Corolla purple or pale-purple ; lobes in hermaphrodite florets glandular. Achenes pale-brown, terete or 4-5-angled, not ribbed, sparsely hairy.

A weed. Flowers : February–May.

2. **B. lacera** *DC.* ; *Fl. Brit. Ind., III, p.* 263. A generally glandular, densely or sparsely hairy, simple or branched, erect annual herb, 1–3 ft. tall, strongly smelling of camphor or turpentine. Leaves petioled or upper sessile, 1–5 in. long, gradually decreasing in size from below upwards, obovate or elliptic, sharply toothed or serrate, lower often lobulate or lyrate, always more or less hairy, often densely beneath. Heads 1/3 in. long, in short axillary cymes or collected into terminal spiciform or corymbose, pubescent or sub-tomentose panicles ; involucral bracts linear, acuminate, hairy, often glandular, margins scarious ; receptacle glabrous. Corolla yellow, in hermaphrodite florets nearly glabrous. Achenes grey-brown, slightly 4-angled, not ribbed, glabrate. (Fig. 98.)

A very common weed. Flowers : February–June.

3. **B. membranacea** *DC.* ; *Fl. Brit. Ind., III, p.* 265. A pubescent or sparsely hairy glandular herb, 1–4 ft. tall, often much branched. Stem stout, often woody below. Leaves lower up to 6 in. long, gradually

decreasing in size upwards, obovate, deeply lobed, pinnatifid or lyrate, sharply, sometimes spinosely, toothed, membranous, glabrescent or pubescent, tapering downwards into winged petioles. Heads numerous, ¼ in. in diam., on slender divaricating peduncles up to 1 in. long, forming large much branched open panicles terminating all the upper branches ; involucral bracts many, 4-5-seriate, green or purplish, narrow, outer spreading in fruit, all or the outer sharply tipped. Corolla yellow, in hermaphrodite florets glandular. Achenes 8–10-ribbed, silky. (Fig. 99.)

A common and a very variable plant. Flowers : February–May.

Var. **gracilis** *J. D. Hooker.* Stem not much branched. Leaves lyrate or sub-lyrate, sharply toothed, bright green. Heads sub-solitary, racemose or clustered at the ends of the branches.

Var. **muralis** *J. D. Hooker.* Stem usually simple, slender. Leaves elliptic-ovate or lanceolate, toothed or serrulate, very membranous, glandular hairy. Involucral bracts rigid, purplish.

7. Laggera *Sch. Bip.*

Annual or perennial, often glandular hairy herbs. Leaves alternate. Heads discoid, in terminal or axillary corymbose racemes, heterogamous ; involucre campanulate ; bracts many-seriate, narrow, often rigid, outer shorter ; receptacle flat, naked. Outer florets female, many-seriate, fertile ; corolla filiform, mouth minutely toothed ; disk-florets bisexual, fertile ; corolla tubular, limb 5-fid ; anther-bases 2-lobed or sagittate ; auricles obtuse or acute, often unequal, not prominently tailed ; gynaecium and fruit as in *Blumea*.

L. aurita *Schultz-Bip.* ; *Fl. Brit. Ind., III, p.* 271. A coarse grey-green, annual or perennial, hairy herb, 1½–3 ft. tall, strongly smelling somewhat like turpentine, generally branched from the base. Stems leafy, not winged. Leaves sessile or petioled, 1–2½ in. long, lanceolate or ob-lanceolate, toothed, lobed or pinnatifid ; basal lobes not prominently decurrent on the stem. Heads 1/3-1/2 in. in diam., in small lateral or terminal corymbs, on peduncles mostly 1-2 in. long ; outer involucral bracts slender, soft, villous, spreading and recurved ; inner straight, often with purplish pointed tips. Flowers pink ; anthers shortly tailed ; style pubescent ; arms very short, obtuse. Achenes small, hairy ; pappus long, white. (Fig. 100.)

In waste places. Flowers : February–May.

8. Pluchea *Cass.*

Perennial, pubescent or tomentose, herbs or undershrubs, woody below. Leaves alternate, simple. Heads small, discoid, in terminal

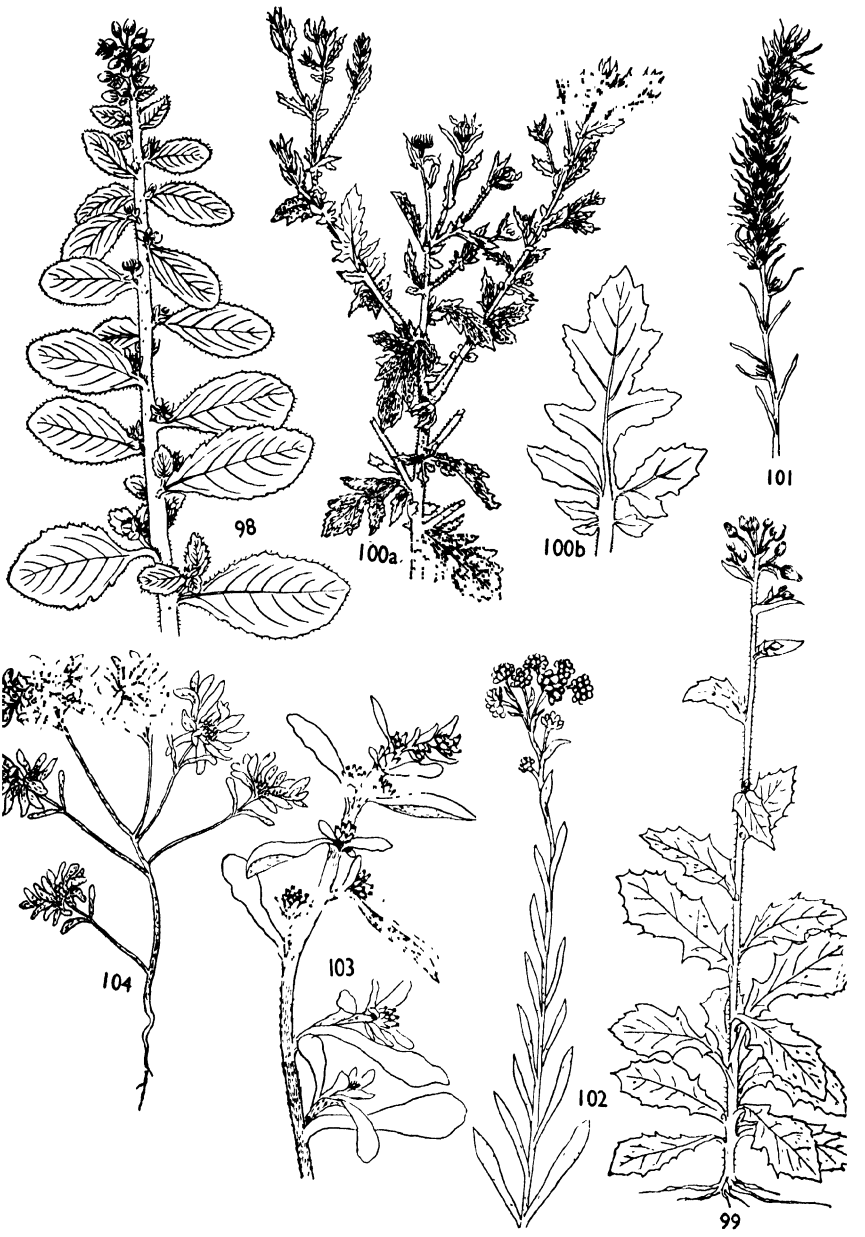


Fig. 98, *Blumea lacera*, $\times\frac{1}{2}$; Fig. 99, *Blumea membranacea*, $\times\frac{1}{2}$; Fig. 100, *Laggera aurita*, (*a*) a branch, (*b*) a lower leaf, $\times\frac{1}{2}$; Fig. 101, *Ifloga Fontanesii*, $\times\frac{2}{3}$; Fig. 102, *Gnaphalium luteo-album*, $\times\frac{1}{2}$; Fig. 103, *G. indicum*, $\times\frac{1}{2}$; Fig. 104, *G. pulvinatum*, $\times\frac{1}{2}$.

compound leafless corymbs, white or lilac ; heterogamous ; involucre ovoid or campanulate ; bracts ovate, mostly broad, dry, rigid ; receptacle flat, naked. Outer florets female, fertile, many-seriate ; corolla filiform ; inner florets hermaphrodite, sterile, few ; corolla tubular, 5-fid ; anthers sagittate, cells tailed ; style-arms of hermaphrodite florets filiform, entire or 2-fid. Achenes small, 4-5-angled ; pappus hairs rigid, slender, 1-seriate, of the outer florets free, of the inner many and connate.

P. lanceolata *Oliv.* ; *Fl. Brit. Ind., III, p.* 272. Hoary undershrub. Stems many from the base, erect, slender, silky-pubescent. Leaves sessile, 1–2½ in. long, lanceolate or oblanceolate, entire or toothed, prominently nerved. Heads longer than broad ; involucre contracted at the mouth ; bracts short, rounded, outer hoary, usually tinged with purple.

Changa Manga. Flowers : February–April.

9. Ifloga *Cass.*

Herbs. Leaves alternate, small, slender, often clustered. Heads discoid, small, solitary or clustered, sessile, forming leafy spikes, heterogamous ; involucral bracts few ; receptacle cylindric below, top flat, or slightly elevated, naked, with an outer ring of scales as long as the involucral bracts. Outer florets female, 1-many-seriate, fertile ; corolla very slender, obscurely toothed ; disk-florets hermaphrodite, sterile ; corolla-limb 5-toothed ; anther-bases sagittate, tails very slender. Achenes glabrous ; of outer florets small, oblong, without pappus ; of inner florets with pappus of a few feathery hairs.

I. Fontanesii *Cass* ; *Fl. Brit. Ind., III, p.* 277. Hairy or glabrate annual. Stems generally many from the root, 4–6 in. long, ascending, densely covered with leaves and heads. Leaves 1/2-1 in. long, linear, acute. Heads reddish, 1/6 in. long, glistening, glabrous, 2-3 in the axil of each leaf throughout the length of the branches and thus giving rise to dense leafy spikes ; involucral bracts red, scarious, aristate. Pappus red. (Fig. 101.)

Flowers : February–May.

10. Gnaphalium *Linn.*

Hoary or woolly herbs. Leaves alternate, quite entire. Heads small, in terminal or axillary corymbs or fascicles, discoid, heterogamous ; involucre ovoid or campanulate ; bracts many-seriate, all scarious, or with a white, yellow or brown more or less scarious blade ; receptacle flat, naked. Florets all fertile ; outer female, 2- or more-seriate, filiform, 3-4-toothed ; disk-florets hermaphrodite, fewer, slender, limb dilated, 5-toothed ; anther-bases sagittate, tails slender ; style-arms of hermaphro-

dite florets truncate or capitate. Achenes oblong or obovoid, not ribbed ; pappus caducous ; hairs 1-seriate, slender or thickened at the tip, connate at the base or not.

Key to the species.

Leaves more than 1 in. long.		
Heads in corymbose leafless clusters ..	1.	*G. luteo-album.*
Heads in leafy spikes	2.	*G. indicum.*
Leaves less than 1 in. long ; heads in rounded, leafy, axillary or terminal clusters	3.	*G. pulvinatum.*

1. **G. luteo-album** *Linn.* ; *Fl. Brit. Ind., III, p.* 288. 4–16 in. high, white-tomentose. Leaves sessile, 1–3 in. by 1/4-1/2 in., oblong-spathulate to lanceolate, lower obtuse, upper acute. Heads about 1/4 in. in diam., whitish, yellow or brownish, glistening, in dense leafless corymbose clusters ; involucral bracts oblong, obtuse, hyaline except near the base. Achenes muricate or minutely bristly. (Fig. 102.)

In damp places. Flowers : March–May.
Two varieties are distinguished.

Var. **multiceps.** Heads golden-yellow ; stems often more than one from the root.

Var. **pallida.** Heads pale-brown.

The second form is more common, but the first is also frequently met with.

Young heads often form terminal globose clusters, but this species can always be distinguished from *G. pulvinatum* from the larger size of its leaves and heads.

2. **G. indicum** *Linn.* ; *Fl. Brit. Ind., III, p.* 289. Stems generally several from the root, 4–16 in. high, more or less white-woolly. Leaves mostly 1-2 in., obovate or spathulate, apiculate, usually woolly on both the surfaces. Heads 1/8 in. in diam., in simple or branched, short or long, leafy spikes, pale yellow or pale brownish ; involucral bracts linear-oblong, acute. Achenes minutely papillose. (Fig. 103.)

Common. Flowers : February–April.

3. **G. pulvinatum** *Delile.* ; *Fl. Brit. Ind., III, p.* 289. A small woolly annual. Stems many, 2–6 in. long, spreading from the root, nearly prostrate. Leaves 1/2 in. or less in length, 1/5 in. broad, spathulate, narrowed at the base into a short petiole. Heads 1/12 in. in diam., hidden amongst the bases of the crowded spreading terminal leaves and immersed in wool ; involucral bracts linear, recurved, green, with acute hyaline tips. Achenes slender, minutely papillose. (Fig. 104.)

In drying up ponds and in other damp localities.
Flowers during winter.

11. Caesulia *Roxb.*

A glabrous herb. Leaves alternate, serrulate. Heads in sessile, axillary, involucrate balls, each sessile on a broad convex common receptacle, 1-flowered ; involucral bracts 2, opposite, keeled or winged, and at length adnate to and enclosing the achene. Flowers tubular ; limb narrowly campanulate, deeply 5-fid ; anthers sagittate, tails branched ; style-arms short, linear-cuneate, sub-truncate. Achenes included in the laterally compressed bracts, without pappus.

C. axillaris *Roxb.* ; *Fl. Brit. Ind., III, p.* 291. A sub-erect or prostrate herb. Stems several, 6–16 in. long. Leaves 2–5 in. long, sessile, linear or linear-lanceolate, narrowed towards both ends, serrulate ; base sheathing, enclosing the compound heads. Heads pearly-white ; 1/3-3/4 in. in diam. ; anthers exserted.

In marshy places ; canal-side. Flowers from October onwards during the cold season.

12. Vicoa *Cass.*

Rough or hairy herbs. Leaves alternate, entire or toothed ; upper amplexicaul. Heads radiate, terminal, solitary or on leaf-opposed peduncles, woolly, heterogamous ; involucre campanulate ; bracts many-seriate, narrow ; inner scarious ; outer shorter, margins scarious ; receptacle flat or subconvex, naked. Ray-florets female, 1-2-seriate, fertile ; ligule narrow, 2-3-toothed ; disk-florets bisexual, fertile, slender ; limb hardly dilated, 5-toothed ; anthers sagittate ; tails slender ; style-arms of bisexual florets flattened, broader upwards, obtuse or truncate. Achenes small, cylindric, hardly ribbed, rounded at the apex ; pappus 1-seriate ; hairs 5-many, smooth, scabrid or bearded.

V. vestita *Benth.* ; *Fl. Brit. Ind., III, p.* 297. Densely and softly hairy, sometimes glabrate, rigid, leafy herb, 10–18 in. tall, much branched. Leaves 1–3 in. long, lower petioled, upper sessile, oblong, oblong-lanceolate or broadly spathulate, serrate or subentire, obtuse or sub-acute. Heads bright yellow, 3/4-1 in. in diam. ; involucral bracts 1/5 in. long, squarrose, with filiform recurved tips. Achenes sub-silky. (Fig. 105.)

Flowers : March–June.

13. Pulicaria *Gaertn.*

Usually woolly or villous herbs. Leaves alternate, sessile, 1/2-amplexicaul. Heads solitary, radiate and heterogamous or disciform and homogamous, yellow ; involucre hemispheric or obconic ; bracts few-seriate, narrow, acuminate or awned ; receptacle flat or somewhat convex, pitted. Ray-florets, if present, 1-2-seriate, pistillate ; ligules narrow, minute or 0 ; disk-florets hermaphrodite, fertile, slender ; limb elongate, shortly 5-fid ;

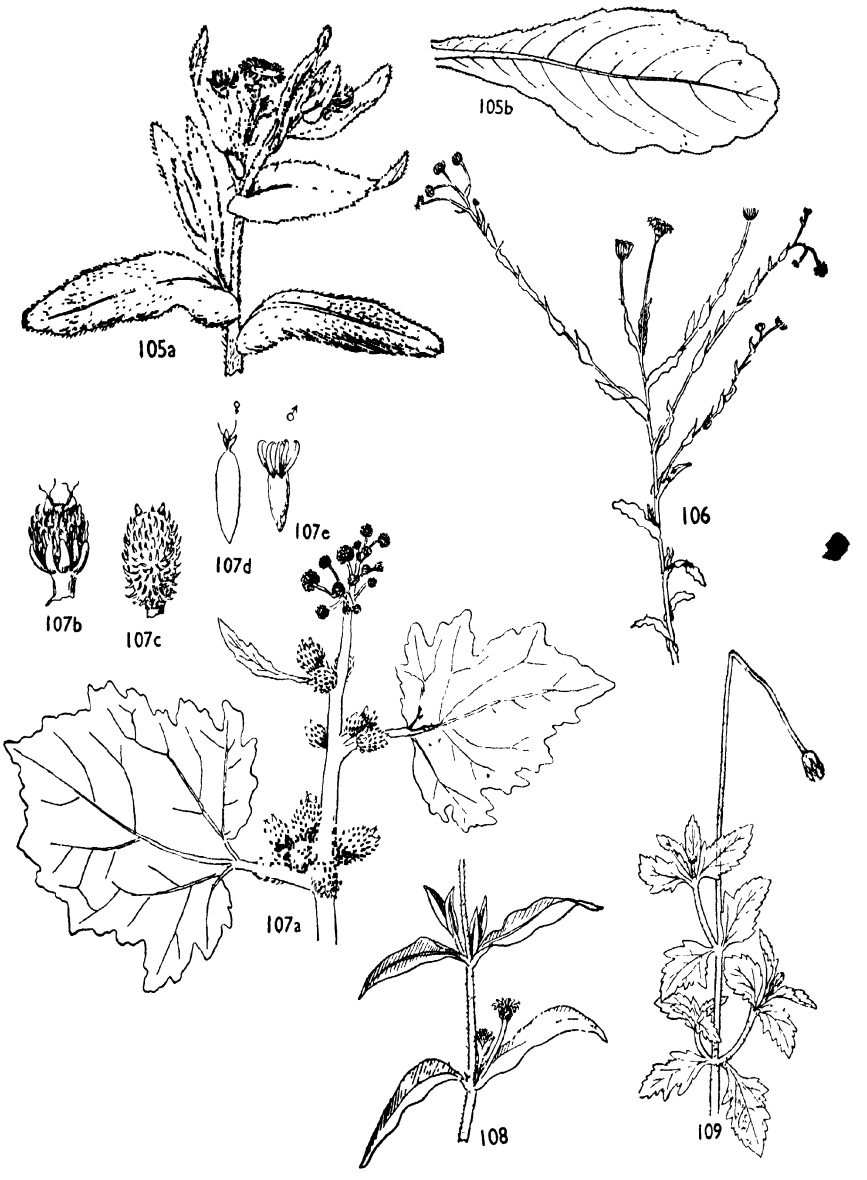


Fig. 105, *Vicoa vestita*, (*a*) a flowering branch, $\times\frac{1}{2}$, (*b*) a lower leaf, $\times\frac{1}{3}$; Fig. 106, *Pulicaria crispa*, $\times\frac{1}{2}$; Fig. 107, *Xanthium strumarium*, (*a*) a flowering twig, $\times\frac{1}{3}$, (*b*) a female flowering head, $\times 1\frac{1}{2}$, (c) a fruiting head, $\times\frac{2}{3}$, (*d*) a female flower, $\times 1\frac{1}{2}$, (*e*) a male flower, $\times 3$; Fig. 108, *Eclipta alba*, $\times\frac{1}{2}$; Fig. 109, *Tridax procumbens*, $\times\frac{1}{3}$.

anther-bases sagittate ; tails capillary, simple or branched ; style-arms linear, obtuse. Achenes terete or ribbed ; pappus double, outer of short jagged teeth, inner of filiform or flattened hairs.

P. crispa *Benth.* ; *Fl. Brit. Ind., III, p.* 299. A stout perennial, 1-2 ft. tall, branches cottony. Leaves 1/2–2 in. long, linear or linear-oblong ; in young plants sometimes up to 4 in. long, obovate-spathulate ; margins recurved, toothed or crisped ; undersurface densely cottony. Heads yellow, 1/4-1/3 in. in diam. ; involucral bracts linear, setaceous, pubescent outside. Ligules shorter than the bracts, sometimes absent. Achenes glabrous ; pappus hairs 3 times as long as the achenes, connate at the base with the outer involucral teeth. (Fig. 106.)

Race-course ground, at Chaburji, and in waste places and fields. Common. Flowers : February–May.

14. **Xanthium** *Linn.*

Annual, rough herbs. Leaves alternate, toothed or lobed. Heads monœcious, female and hermaphrodite (male), axillary ; hermaphrodite in the upper axils, globose, many-flowered, sterile, with tubular 5-toothed corolla ; female 2-flowered, fertile, apetalous ; involucre of hermaphrodite (male) heads short ; bracts few, 1-2-seriate, narrow ; receptacle cylindric, with hyaline scales enclosing the flowers ; invol. of female heads of bracts united into an ovoid 2-beaked green utricle with two 1-flowered cells, clothed with hooked bristles and sometimes with a few small free outer bracts. Filaments monadelphous ; anthers free, bases obtuse, tips mucronate, inflexed ; style of hermaphrodite florets slender, undivided ; of female florets with free arms, exserted from the involucre. Achenes enclosed in the hardened involucral cells, obovoid, without pappus.

This is a peculiar genus, and when in fruit, it is not at once recognizable as a *Compositæ*.

X. strumarium *Linn.* ; *Fl. Brit. Ind., III, p.* 300. An erect rough annual, 1½–3 ft. high. Leaves long-stalked, with blades 2–5 in. long, ovate-triangular, lobed and toothed, cordate or cuneate at the base, scabrid. Heads in terminal and axillary racemes ; female involucres 1/2-1 in. long, ovoid or oblong, closely covered with hooked spines, with erect or diverging beaks ; hermaphrodite heads 1/4 in. in diam., with prominent exserted anthers. (Fig. 107.)

A winter annual, especially abundant in moist localities, e.g. the banks of Chhota Ravi.

15. **Eclipta** *Linn.*

Strigose or hirsute herbs bearing opposite leaves. Heads small, axillary or terminal, peduncled, heterogamous, rayed ; involucre broadly campanulate ; bracts sub-2-seriate, green, outer large and broad ; recep-

tacle flat, covered with broad scales enclosing several flowers; ray-florets sub-2-seriate, female, fertile or sterile; ligule small, entire or 2-toothed, white; disk-florets bisexual, fertile, tubular, limb 4-5-fid; anther-bases obtuse, subentire; style-arms flattened, with short or triangular obtuse appendages. Achenes from ray-florets narrow, triquetrous, often empty; from the disk-florets stouter, laterally sub-compressed; pappus absent or of two short awns or teeth.

E. alba *Hassk.*; *Fl. Brit. Ind., III, p.* 304. An erect or prostrate, strigose or hirsute, annual weed, much branched, frequently rooting from the lower nodes; branches 1/2–2 ft. long. Leaves opposite, sessile, 1–3 in. long, variable in width and form, linear to oblong-lanceolate, narrowed at both ends, toothed or nearly entire. Peduncles solitary or paired, short or long. Heads 1/4-1/3 in. in diameter; involucral bracts ovate, obtuse or acute, as long as or longer than the flowers; outer larger than the inner and leaf-like. (Fig. 108.)

Common in waste places and on road-sides.
Flowers practically throughout the year.

16. Spilanthes *Linn.*

Annual herbs bearing opposite leaves. Heads usually long-peduncled, axillary or terminal, broadly ovoid or conical, homogamous and discoid or heterogamous and shortly radiate; involucre ovoid or campanulate; bracts sub-2-seriate; receptacle conical, elongate, covered with concave scales enclosing the flowers and often connate with the ovary into a stalk. Ray-florets pistillate, 1-seriate, fertile; ligule white or yellow; disk-florets hermaphrodite, fertile; corolla tubular, 4-5-fid; anther-bases truncate, entire or 2-toothed; style-arms of disk-florets truncate. Achenes dorsally compressed, margins and angles usually ciliate; pappus 0, or 1–3 bristles.

S. Acmella *Linn.*; *Fl. Brit. Ind., III, p.* 307. Prostrate or sub-erect; branches 1–3 ft. long, pubescent or hairy. Leaves 1-2 in. long, stalked, ovate or lanceolate, coarsely toothed or serrate. Heads yellow, pretty-looking, 1/2 in. in diam., often longer than broad, on long peduncles; ligules very short.

Near moist places. Flowers: October–March.

S. Acmella *Linn.*, var. **oleracea** *Clarke*, which is more robust and succulent and bears larger leaves and flowers, is cultivated in gardens.

17. Bidens *Linn.*

Herbs bearing opposite, entire, toothed or pinnate leaves. Heads corymbose or sub-solitary, heterogamous and rayed or homogamous and

discoid ; involucre campanulate or hemispheric ; bracts sub-2-seriate, connate at the base, outer green, inner membranous ; receptacle flat or convex, covered with narrow flat scales nearly as long as the disk-florets. Ray-florets 1-seriate, pistillate or neuter ; ligule spreading, 2-3-toothed, yellow or white ; disk-florets hermaphrodite, fertile ; limb tubular, 5-fid ; anther-cells entire or sub-sagittate ; style-arms of hermaphrodite flowers hairy above, tips short, acute. Achenes 4-gonous or dorsally compressed, linear or wedge-shaped, often narrowed, but not beaked above ; pappus of 2–4, erect, stiff, retrosely hispid bristles.

B. pilosa *Linn.* ; *Fl. Brit. Ind.*, *III*, *p.* 309. An erect, glabrous or pubescent annual, 1–3 ft. tall. Leaves opposite, long-stalked, 2–5 in. long, very variable, simple, 3-fid, trifoliolate or 1-2-pinnatifid ; leaflets ovate or lanceolate, serrate. Heads on long peduncles, 1/4-1/2 in. in diam. ; ray-florets 5–7 or sometimes absent, white ; disk-florets yellow. Achenes 1/2-2/3 in. long, black, linear, 4-gonous, with 2–4 pale awns armed with retrorse bristles.

Lahore, near Lawrence gardens and at other places. The achenes with bristly awns easily stick to clothes.

Flowers : December–February.

18. Tridax *Linn.*

Perennial herbs. Leaves opposite, toothed, lobed or pinnatisect. Heads very long-peduncled, rayed, heterogamous ; invol. bracts few-seriate ; outer short, broad, green ; receptacle slightly convex, covered with membranous scales. Ray-florets female, fertile, ligulate or 2-lipped, with the outer lip large 3-fid or 3-partite, the inner small 2-lobed or -parted or 0 ; disk-florets hermaphrodite, fertile, tubular ; limb elongate, 5-lobed ; anthers with short acute basal lobes ; style-arms of hermaphrodite florets hairy above, tips subulate. Achenes turbinate or oblong, silky ; pappus of aristate feathery bristles.

T. procumbens *Linn.* ; *Fl. Brit. Ind.*, *III*, *p.* 311. A weak straggling hirsute-hairy herb ; branches 1–3 ft. long. Leaves in distant pairs, 1–3 in. long, petioled, ovate or lanceolate, deeply irregularly serrate, hairy on both sides. Heads 1/2-3/4 in. in diam., on peduncles up to 1 ft. long ; scales on the receptacle in fruit up to 1/3 in. long. Disk-florets pale-white ; ligules of ray-florets yellow. Achenes dark- or grey-brown ; pappus 1/5 in. long. (Fig. 109.)

On road-sides and in cultivated lands. Flowers almost throughout the year.

19. Matricaria *Linn.*

Erect herbs. Leaves alternate, 1-2-pinnatisect. Heads terminal, peduncled, solitary or corymbose, heterogamous, rayed, rarely discoid ;

involucre hemispheric; bracts few-seriate, appressed, outer shorter, with usually scarious margins; receptacle naked. Ray-florets pistillate, fertile or sterile; ligule white, elongate, rarely short; disk-florets hermaphrodite, fertile; tube terete or 2-edged; limb 4-5-fid; anther-bases obtuse, entire; style-arms of hermaphrodite florets with truncate and penicillate tips. Achenes oblong, often incurved, truncate; dorsally convex and ribbed or not, ventrally 3–5-ribbed; faces glandular or wrinkled; pappus very short or 0.

M. Chamomilla *Linn.*; *Fl. Brit. Ind.*, *III*, *p.* 315. A glabrous aromatic herb, about 1 ft. tall, much branched. Leaves 1/2–1½ in. long, 1-2-pinnatisect; segments nearly filiform. Heads corymbose, 1/2-3/4 in. in diam.; involucral bracts with white margins; receptacle conical, elongating during fruiting. Ligules white, much longer than the bracts, deflexed after flowering, or rarely absent. Achenes small, grey, white-ribbed on the ventral face only; pappus absent.

The flower-heads and the oil obtained from this plant are often used as a substitute for the true Chamomile (*Anthemis nobilis*), a native of Europe.

20. Cotula *Linn.*

Small, often creeping, herbs. Leaves alternate, pinnatifid or pinnatisect. Heads small, peduncled, discoid, yellow, heterogamous (rarely homogamous); involucre hemispheric or campanulate; bracts sub-2-seriate, green, margins often scarious; receptacle naked. Outer florets female, 1-2-seriate, fertile; corolla conic, 2-toothed, or 0; disk-florets hermaphrodite, fertile; tube slender; limb 4-fid; anther-bases obtuse, entire; style-arms of hermaphrodite florets truncate or obtuse; styles of female florets sometimes entire. Achenes from the ray-florets or all stipitate, compressed, sheathed at the top by the base of the corolla or possessing a short ear-shaped pappus.

Key to the species.

Leaf-segments not mucronate; outer achenes with winged margins .. .. .. 1. *C. anthemoides.*
Leaf-segments mucronate; outer achenes not winged 2. *C. hemispherica.*

1. **C. anthemoides** *Linn.*; *Fl. Brit. Ind.*, *III*, *p.* 316. A small diffuse glabrate or hairy annual herb. Stems 3–6 in. long. Leaves 1/3-3/4 in., 1-2-pinnati-fid or -sect; segments with lanceolate lobes, not mucronate. Peduncles generally more than 1/2 in. long, slender, naked. Outer achenes broad, flat, with winged margins. (Fig. 111.)

Common in moist places. Flowers: March–May.

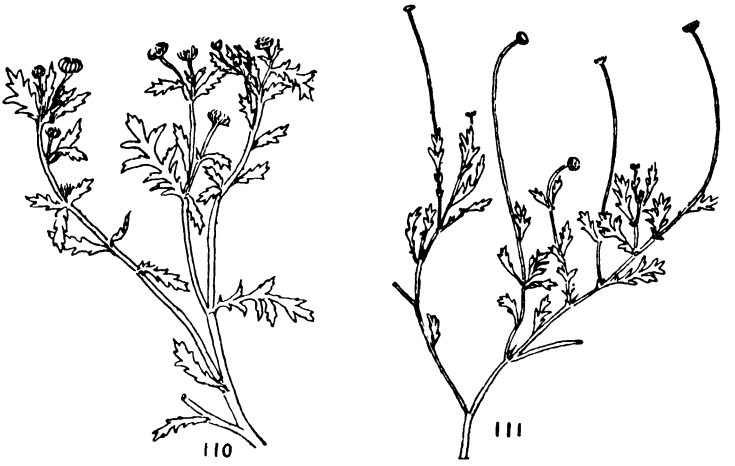


Fig. 110, *Cotula hemispherica*, × ⅔; Fig. 111, *C. anthemoides*, × ⅔.

2. **C. hemispherica** *Wall.*; *Fl. Brit. Ind., III, p.* 316. A sub-erect or prostrate, glabrous or villous, annual herb. Stems many, often thickened below, 3–8 in. long, branched in the upper part. Leaves stalked or sessile, 1/2–2 in. long, pinnatisect; segments many, linear, mucronate. Heads solitary, yellow, 1/6 in. in diam.; peduncles 1/2 in. or generally less in length, erect in flower, inclined or drooping in fruit. Achenes angled, not winged. (Fig. 110.)

Ravi bank. Flowers: February–May.

21. Artemisia *Linn.*

Aromatic herbs or undershrubs. Leaves radical and alternate, 1–3-pinnatisect. Heads numerous, small, globose, discoid, in simple or compound, never corymbose, racemes, forming long terminal panicles, heterogamous or homogamous; involucral bracts few-seriate, hairy, outer shorter, margins scarious; receptacle flat or raised, naked or hisrute. Outer florets, if present, female, 1-seriate, fertile; corolla very slender, 2-3-toothed; disk-florets hermaphrodite, fertile or sterile, limb 5-toothed; anther-bases obtuse, entire; style-arms of hermaphrodite florets with truncate usually penicillate tips, often connate in the sterile florets. Achenes very minute, faintly striate; pappus 0.

A. scoparia *Waldst.*; *Fl. Brit. Ind., III, p.* 323. Glabrate, hoary or villous, annual or sometimes perennial herb, 2–6 ft. tall, much branched. Leaves 1–3 in. long, sessile or petioled, 1-3-pinnatisect, segments very narrow; floral leaves short, simple, linear. Heads 1/10 in. or less in diam., sessile or on short capillary stalks, yellow; involucral bracts

glistening, oblong, obtuse, margins scarious. Outer female florets mostly fertile; inner hermaphrodite florets sterile and with larger corollas. Achenes very minute.

River-side; not common. Flowers after the rainy season.

22. Echinops *Linn.*

Rigid, armed, white-tementose herbs. Leaves alternate, pinnatifid, spinous. Heads compound, terminal, solitary, globose involucrate balls; individual heads numerous, crowded, white, sessile or shortly stalked on a common receptacle, 1-flowered; involucral bracts many-seriate, rigid, pungent or spinescent; outer short, of short hairs or narrow; inner spathulate; innermost linear-lanceolate; sometimes all connate into a tube with one long rigid spine on the outer side; receptacle minute. Florets bisexual, all fertile, tube slender, limb with 5 slender segments; filaments glabrous; anthers sagittate, auricles connate, tails fimbriate; style-arms thick, at length spreading. Achenes long, villous; pappus a ring of many short bristles.

E. echinatus *DC.*; *Fl. Brit. Ind., III, p.* 358. 1–3 ft. high, much branched annual. Stem white-cottony. Leaves sessile, 3–5 in. long, pinnatifid; lobes oblong or triangular, ending in long rigid spines up to 1½ in. long, glabrous or rough above, white-tomentose beneath. Compound head 1-1½ in. in diam. with many stout spines. Florets white. Achenes 1/6 in. long, obconic, densely silky, surrounded by the connate hardened inner involucral bracts. (Fig. 112.)

Common in the district. Flowers during summer.

23. Cousinia *Cass.*

Herbs with alternate, toothed, lobed or pinnatisect, more or less spinescent leaves. Heads solitary or clustered, homogamous; involucre globose; bracts many-seriate; outer appressed, with long erect spreading or recurved spinous tips; inner erect, slender, scarious; receptacle flat, densely bristly. Flowers all similar, bisexual (outer rarely neuter), tubular, yellowish; limb cylindric, slender, usually unequal, 5-fid; filaments glabrous; anthers sagittate, auricles connate, tails branched, villous; style-arms narrow. Achenes glabrous, obovoid, 5-many-ribbed, compressed; pappus hairs 1-seriate, slender or flattened, simple, free, caducous.

C. minuta *Boiss.*; *Fl. Brit. Ind., III, p.* 359. A dwarf, rigid, sub-dichotomously branched, annual herb, 6–12 in. tall; branches leafy, spreading. Stem yellowish or whitish. Leaves sessile, 1–3 in. long, oblong or lanceolate, sinuate-pinnatifid, often hoary or cobwebby,

sparingly spinescent. Heads terminal and in the forks, 1/3-1/2 in. in diam.; bristles on the receptacle smooth; outer involucral bracts 15–20, triangular-lanceolate, up to 1 in. long, greenish, stout and sharply pointed. Flowers yellow. Achenes obovoid, compressed, 5–7-ribbed, truncate with a crenulate ring; ribs sub-crenate; pappus caducous; hairs scabrid. (Fig. 113.)

Lahore, river-side; Sheikhupura. Flowers: March–May.

24. Cnicus *Linn.*

Erect, stiff, armed herbs. Leaves alternate, often decurrent, serrate-toothed or pinnatifid, spinescent. Heads solitary, long or short peduncled, scattered or crowded, bisexual or dioecious; involucre ovoid, hemispheric or globose; bracts many-seriate, appressed, erect, spreading or recurved, spine-tipped; outer foliaceous; receptacle flat, densely bristly. Flowers white, pale-yellow or red; tube slender; limb equal or oblique, 5-fid; anthers sagittate, auricles connate, tails slender; style-arms short, rarely filiform, obtuse. Achenes glabrous, obovoid, obtusely 4-angled, smooth or 5–10-ribbed; pappus copious, but soon falling off; hairs many-seriate, feathery, unequal.

Key to the species.

Flowers dioecious, dingy purple ..	.. 1. *C. arvensis.*
Flowers bisexual, pale-yellow or white ..	.. 2. *C. argyracanthus.*

1. C. **arvensis** *Hoffm.*; *Fl. Brit. Ind., III, p.* 362. Annual or perennial erect herbs with creeping root-stock. Stems solitary or tufted, simple or branched, 1½–3 ft. tall, not winged, cobwebby-tomentose above. Leaves sessile, 3–6 in. by 1-2 in., sinuate-pinnatifid, pale-green above, white, more or less woolly-tomentose beneath, spinous. Heads unisexual, male and female on different plants, solitary, clustered or corymbose, dingy purple; male 1/2-1 in. in diam., globose; female longer, more campanulate; involucral bracts glabrate or cobwebby; outer ovate or triangular, ending in a short spine; inner longer, with undulate, often recurved, tips; innermost linear-lanceolate, scarious. Corolla-limb 5-partite. Achenes 1/8 in. long, linear-oblong, compressed, smooth, shining; pappus brownish. (Fig. 114.)

A common weed; especially abundant in somewhat moist places. Flowers: February–May.

2. C. **argyracanthus** *DC.*; *Fl. Brit. Ind., III, p.* 362. 3–6 ft. tall. Stems robust, branched, grooved, often cottony. Leaves green, glabrous above, cottony or glabrate beneath, irregularly pinnatifid, margins densely beset with long, sharp spines; radical petioled, 10–24 in. by 1-2 in.; cauline shorter, sessile. Heads densely clustered, sessile or

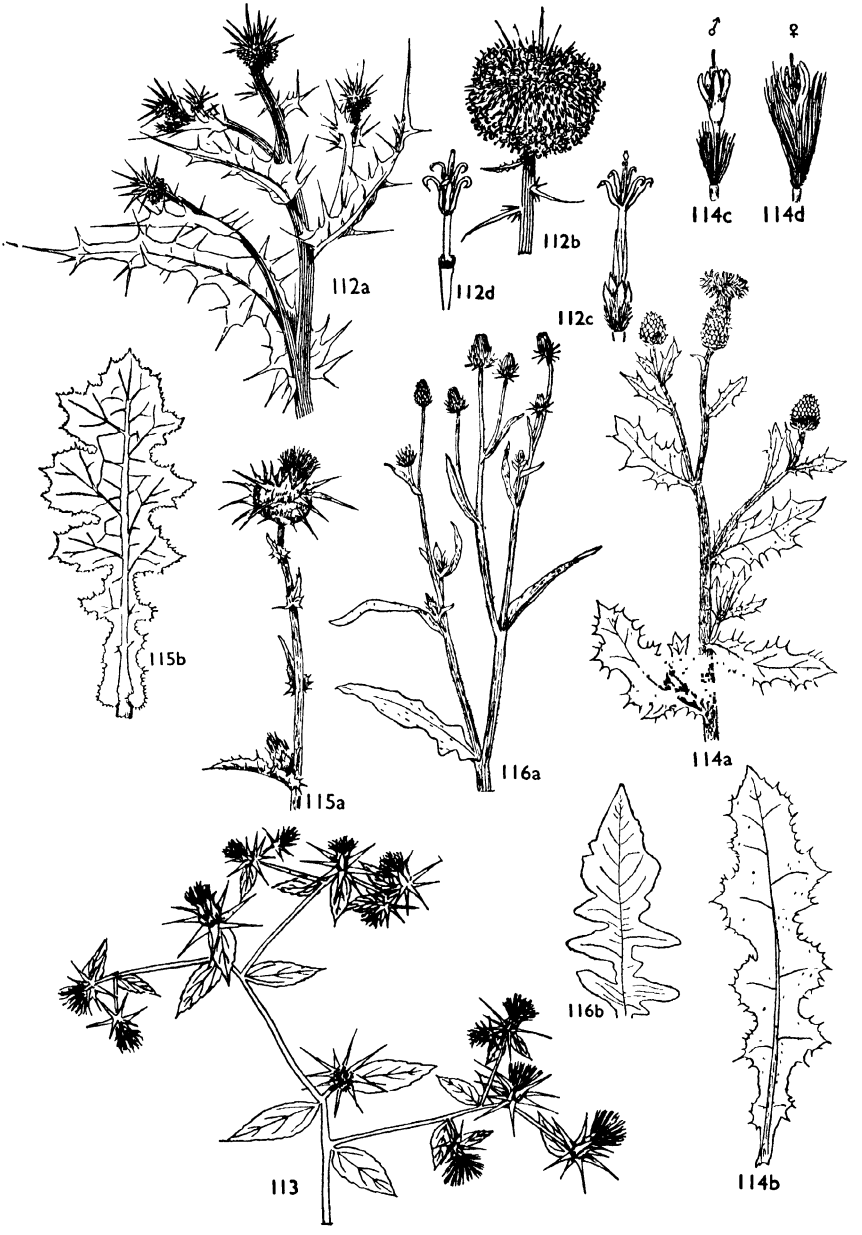


Fig. 112, *Echinops echinatus*, (*a*) a twig bearing young heads, $\times\frac{1}{2}$, (*b*) a flowering compound head, $\times\frac{1}{3}$, (*c*) an individual head, $\times 1\frac{1}{2}$, (*d*) one flower, $\times 1\frac{1}{2}$; Fig. 113, *Cousinia minuta*, $\times\frac{1}{3}$; Fig. 114, *Cnicus arvensis*, (*a*) a flowering branch, $\times\frac{1}{3}$, (*b*) a lower leaf, $\times\frac{1}{3}$, (*c*) a male flower $\times 1$, (*d*) a female flower, $\times 1$; Fig. 115, *Silybum Marianum*, (*a*) a flowering twig, $\times\frac{1}{4}$, (*b*) a leaf, $\times\frac{1}{6}$; Fig. 116, *Saussurea*

subsessile, 3/4-1 in. in diam., globose, pale-yellow or white; involucral bracts with woolly margins; outer ending in long, rigid, erect or spreading spines; innermost linear, acuminate. Flowers bisexual; corolla 1/2 in. long; limb 5-lobed. Achenes 1/8 in. long, oblong, compressed; pappus nearly white.

Race-course ground and canal-side. Rare. Recently introduced by canals from the Himalayas, where it grows generally from 6,000–9,000 ft.

25. Silybum *Gaertn.*

Stout glabrous herb with alternate, sinuate-lobed, spinescent leaves. Heads large, solitary, terminal, nodding; involucre sub-globose; bracts many-seriate; outer broad and fimbriated with spines below, above terminating in a spreading rigid spine; inner lanceolate, erect, pungent; receptacle flat, densely bristly. Flowers all bisexual, similar and fertile, purple; tube slender; limb dilated below, 5-fid; filaments glabrous, united in a sheath below; anthers sagittate, auricles connate, mucronate or shortly tailed; style subentire. Achenes glabrous, obovoid-oblong, compressed; pappus many-seriate; hairs unequal, somewhat scaly, united at the base in a deciduous ring.

S. Marianum *Gaertn.*; *Fl. Brit. Ind., III, p.* 364. Annual or biennial, 1–4 ft. tall. Stem often stout, smooth, grooved, leafy throughout. Leaves 3–12 in. by 1–4 in., broadest about the middle; margin spinous. Heads 1-2 in. in diam.; spines of involucral bracts 1/2-1 in. long. Flowers rose-purple. Achenes $\frac{1}{4}$ in. long, black or grey, transversely wrinkled; pappus white. (Fig. 115.)

Flowers during March–May.

26. Saussurea *DC.*

Unarmed. Leaves radical and alternate, entire, toothed, pinnatifid or pinnatisect. Heads solitary, corymbose or panicled; involucre ovoid, oblong, globose or hemispheric; bracts many-seriate, appressed, not spinescent; inner longer than outer and narrower; receptacle flat or convex, densely bristly. Flowers purple or bluish, all bisexual and similar; tube slender; limb narrow 5-fid; filaments free, glabrous; anthers sagittate, auricles connate, tails usually long, lacerate; style-arms linear. Achenes glabrous, oblong, angled; top truncate and cupular; pappus white, hairs feathery, base thickened and connate into a deciduous ring.

S. candicans *Clarke*; *Fl. Brit. Ind., III, p.* 373. Erect herb, 2–5 ft. high. Stem simple below, corymbosely branched above, cottony. Leaves 4–10 in. long, sometimes longer, oblong or obovate-oblong, entire,

sinuate-toothed, or lobed at the base, or lyrate-pinnatifid, upper more dissected than the lower, narrowed at the base into a long or short petiole, glabrous or pubescent above, cottony, white-tomentose or rarely glabrate below. Heads numerous, corymbose, erect or sub-erect, long-peduncled, 1-1½ in. in diam., pale-red; involucral bracts lanceolate, rigid, sharp, cottony or pubescent; bristles on the receptacle long. Corolla 1/2 in. or more long. Achenes 1/10 in. long, dark-brown, 5-angled, muricate, top cupular; pappus white; hairs slender, 1/2 in. long. (Fig. 116.)

Lahore, river-side; Changa Manga. Flowers: December–April.

27. Volutarella *Cass.*

Leaves alternate. Heads heterogamous, purple or violet; involucre ovoid or globose; bracts many-seriate; innermost narrow, acute; outer shorter, acute, awned or spinescent; receptacle flat, densely bristly. Outer florets 1-seriate, neuter; disk florets hermaphrodite, fertile; tube slender, short; limb cylindric, 5-fid; filaments glabrous or hairy; anther-bases sagittate, auricles connate, shortly tailed; style filiform, arms free or connate. Achenes obovoid or oblong, 5–15-ribbed, striate and pitted between the ribs; pappus many-seriate, bristly; outermost gradually shorter.

V. divaricata *Benth.*; *Fl. Brit. Ind., III, p.* 383. An erect or [illegible] stiff branched annual weed, 1–3 ft. tall. Stems angled, smooth or scabrid. Leaves sessile, 1–3 in. long, sometimes up to 5 in. long, often undulate or crisped. Heads 1/2 in. in diam.; involucral bracts reddish, ovate, glabrate, with a 1/4-1/3 in. long, spreading or recurved, smooth, spinescent awn; bristles on the receptacle short. Corolla 1/2 in. long, straight, pale-purple. Achenes 1/5 in. long, acutely 4-5-angled; top broad, truncate; base narrowed; pappus 1/2 in. long, silver-brown. (Fig. 117.)

A troublesome weed from its hard spiny head.
Flowers during the cold months.

28. Centaurea *Linn.*

Herbs. Leaves radical and alternate, entire, toothed or pinnatifid. Heads solitary, corymbose or panicled; flowers all tubular but heterogamous; involucre globose; bracts many-seriate, overlapping, appressed, margins often scarious; receptacle flat, densely bristly. Outer florets 1-seriate, larger, neuter, with a spreading 5-lobed limb; inner florets hermaphrodite, fertile, tube slender, limb 5-lobed to the middle or lower; anthers sagittate, basal lobes connate; tails long or short, entire or lacerate; style-arms with a thickened hairy basal ring, erect and

connate or shortly spreading. Achenes oblong, compressed or obtusely 4-angled; pappus variable; hairs rigid or not, many-seriate, entire, serrulate, bearded or feathery.

C. Cyanus *Linn.*; *Fl. Brit. Ind., III, p.* 384. Erect, annual or biennial, slender herb. Leaves 1½–4 in. long, narrow, entire, toothed or lyrate-pinnatifid, generally cottony below. Heads blue, showy; involucral bracts oblong, obtuse, cottony, with brown scarious toothed margins. Achenes grey, silky, longer than the middle row of pappus-hairs.—*Corn cockle or corn blue bottle.*

Grown in gardens largely as a winter annual, but now and then found growing as an escape in gardens and cultivated fields.

C. moschata *Linn.* is *the Sweet Sultan* and is also commonly grown for ornamental purposes.

29. Carthamus *Linn.*

Herbs with alternate, stiff, spinescent leaves. Heads discoid, terminal, homogamous; involucre ovoid or sub-globose; bracts many-seriate; inner dry, entire or with a short fimbriate appendage; outer without or with a foliaceous, toothed or spinescent appendage; receptacle flat, densely bristly. Flowers all tubular, hermaphrodite, fertile (rarely a few marginal pistillate or neuter), yellow or orange-red; corolla-tube slender; limb oblong, dilated at the base, 5-cleft (or 0 in pistillate flowers); filaments usually hairy in the middle; anther-bases sagittate, connate; tails short, fimbriate; style-arms short or long. Achenes glabrous, obovoid, 4-angled or compressed; pappus absent or chaffy.

Key to the species.

Upper leaves very spinous; flowers yellow ..	1. *C. Oxyacantha.*
Upper leaves unarmed or spinulose-toothed; flowers orange-red	2. *C. tinctorius.*

1. **C. Oxyacantha** *Bieb.*; *Fl. Brit. Ind., III, p.* 386. A stout, strongly armed, generally much branched, puberulous herb, 1-1½ ft. tall, stem and branches white. Leaves sessile, 1–5 in. long, oblong or oblong-lanceolate; lower often pinnatifid, shortly spinulose-toothed; upper 1/2-amplexicaul, very spinous. Heads 3/4-1½ in. in diameter; outer involucral bracts exceeding the head, white below the contracted portion, green above it, with yellow spines. Flowers yellow. (Fig. 118.)

Very abundant in fields after the winter crops have been harvested. Flowers: March–June.

2. **C. tinctorius** *Linn.*; *Fl. Brit. Ind., III, p.* 386. An erect nearly glabrous herb up to 2 ft. tall, corymbosely branched in the upper part.

Fig. 117, *Volaturella divaricata*, (*a*) a branch from a small plant $\times \frac{2}{3}$, (*b*) a leaf, $\times 1\frac{1}{2}$; Fig. 118, *Carthamus Oxycantha*, $\times \frac{1}{2}$; Fig. 119, *C. tinctorius*, $\times \frac{1}{2}$.

Leaves sessile, 1–3 in. long, lanceolate, spinulose-serrate, sometimes entire and unarmed. Heads 1/2-1 in. in diameter; involucral bracts ovate-oblong; outer constricted above the base, green, spinous or not; inner narrower than the outer, acute. Flowers orange-red.—*The Safflower*; Vern., *Kusumbh*. (Fig. 119.)

Sometimes cultivated as a winter season crop. The seeds yield oil, flowers a red dye. Flowers during March and April.

30. Crepis *Linn.*

Glabrous or hairy herbs; hairs never stellate. Leaves largely radical and pinnatifid; cauline few, alternate, generally stem-clasping, entire or toothed. Heads peduncled, bearing only ligulate flowers; involucre cylindric or campanulate; involucral bracts either many-seriate and regularly imbricate, or the outer small or very much shorter than the linear 1-seriate inner; base or midrib thickened when fruiting or not; receptacle flat, naked. Ligules yellow, spreading, 5-toothed. Achenes more or less fusiform or oblong, finely 10–20-ribbed, tip narrowed; pappus short or long, usually copious; hairs usually silvery, simple and soft.

C. japonica *Benth.*; *Fl. Brit. Ind.*, *III*, *p.* 395. Glabrous or sparsely hairy annual. Stems solitary or tufted, erect, 1/2–2 ft. tall, simple or branched, naked or bearing a few leaves. Leaves largely radical, rosulate, 2–6 in. long, soft, membranous, mostly pinnatifid or sinuate-toothed, sometimes obovate; lobes toothed, terminal large. Heads in terminal corymbs, on slender bracteolate peduncles, 1/6-1/4 inch in diameter; involucral bracts 6–8, narrowly oblong, green with hyaline margins, glabrous, fruiting with a strong basal midrib. Achenes 1/12 in. long, reddish, flattened, narrowly fusiform, pointed, but not beaked; pappus soft, white, equalling or longer than the achenes. (Fig. 120.)

An elegant plant; common on road-sides and in gardens, especially in damp and shady places. Flowers probably throughout the year.

Fig. 120, *Crepis japonica*, (*a*) a plant, $\times \frac{1}{6}$, (*b*) a leaf, $\times \frac{1}{2}$.

31. Lactuca *Linn.*

Glabrous or hispid herbs, with milky juice. Leaves radical and alternate, entire, toothed, pinnatifid or pinnate; cauline often stem-clasping and auricled. Heads sessile or peduncled, panicled, corymbose, racemose or subspicate, yellow, purple or blue, ligulate; involucre usually narrow; bracts few-seriate, thin, green, margin often membranous; inner long, narrow, subequal; outer shorter; receptacle flat, naked. Ligules long, spreading, 3–5-toothed; style-arms long. Achenes compressed or flattened, ovoid, oblong or narrow, beaked, faces 3-ribbed; ribs slender or strong, smooth or transversely wrinkled, the middle one often strongest; beak slender or short and cylindric, dilated into an entire or toothed pappus-bearing disk; pappus copious, soft and white; hairs very slender, simple.

Key to the species.

Flowers blue	2.	*L. dissecta.*
Flowers yellow.		
Leaves more than 1 in. broad, spinulose-toothed	1.	*L. Scariola.*
Leaves or leaf-semgnets narrow, linear, mostly less than $\frac{1}{2}$ in. broad, not spinous ..	3.	*L. polycephala.*

1. **L. Scariola** *Linn.*; *Fl. Brit. Ind.*, *III*, *p.* 404. Erect herb, 2–5 ft. tall, annual or biennial, glabrous or nearly so, very leafy, corymbosely or paniculately branched above. Stem usually prickly in the lower part. Leaves 5–7 in. long, mostly more than 1 in. broad, sessile, runcinate or pinnatifid, teeth spinulose, cauline 1/2-amplexicaul, midrib prickly on the lower surface. Heads 1/2 in. long, erect, cylindric, arranged in irregularly corymbose or lax panicles; branches and peduncles white and bearing green appressed cordate bracts; outer involucral bracts shorter, triangular or ovate; inner longer and linear. Flowers yellow. Achenes brown, 1/4-1/3 in. long (including the beak); body oblanceolate,

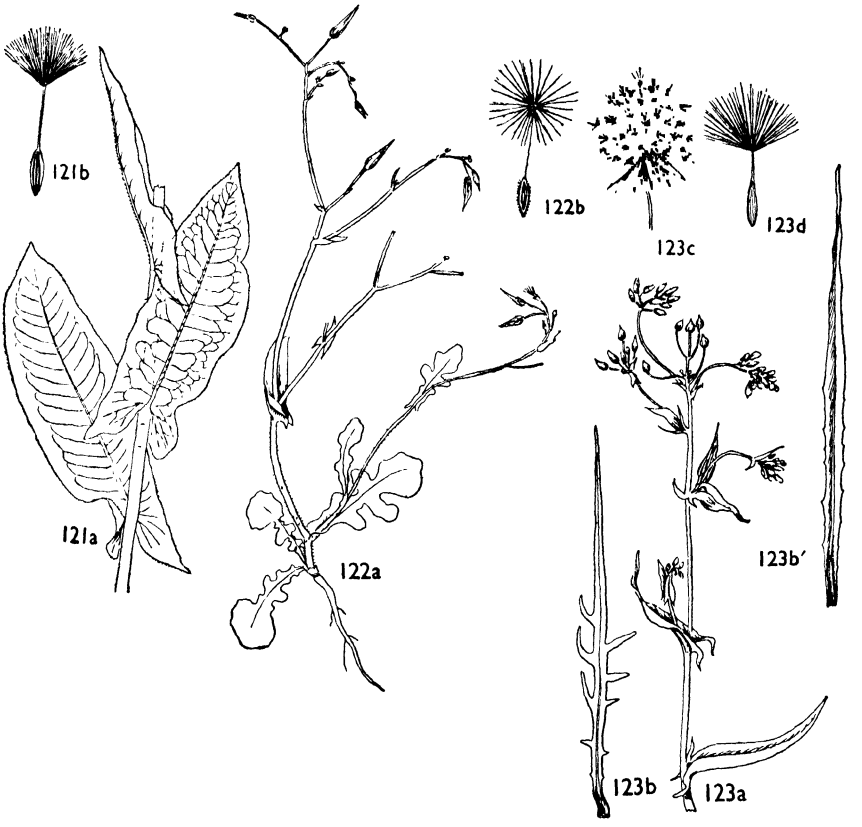


Fig. 121, *Lactuca Scariola*, (*a*) portion of a branch bearing 3 leaves, $\times \frac{1}{3}$, (*a*) achene, $\times 1\frac{1}{2}$; Fig. 122, *L. dissecta*, (*a*) plant, $\times \frac{1}{2}$, (*b*) achene, $\times 2$; Fig. 123, *L. polycephala*, (*a*) a flowering branch, $\times \frac{1}{4}$, (*b*) (*b′*) leaves, $\times \frac{1}{4}$, (*c*) a head of achenes, $\times 1\frac{1}{2}$, (*d*) an achene, $\times 2$.

many-ribbed ; beak capillary, as long as or slightly longer than the body ; pappus shorter than the achene. (Fig. 121.)

This species is a recent introduction from the Himalayas, the seeds having been probably brought down by the canal water to the plains of the Central Punjab. Flowers in the early part of summer.

2. **L. dissecta** *Don.* ; *Fl. Brit. Ind., III, p.* 405. Annual herb, erect or spreading, glabrous or sparsely pubescent. Stems often tufted, 6–18 in. long, dichotomously branched from the base and leafy, rarely little branched and nearly naked. Leaves 1–4 in. long, very variable, entire, lyrate, runcinate-pinnatifid or almost bipinnatifid ; radical leaves usually many, sessile or petioled ; cauline leaves 1/2-amplexicaul, lobed at the base, uppermost linear. Heads corymbose, 1/4-1/2 in. long, erect, narrowly cylindric ; peduncles slender ; outer involucral bracts minute, ovate ; inner narrowly linear. Flowers blue or pale-blue. Achenes including the beak 1/4 in. long; body much compressed, transversely rugose, 3-ribbed on each face, margins thickened ; beak capillary, twice as long as the body ; pappus 1/6 in. long. (Fig. 122.)

In waste places. Flowers during the early part of summer.

3. **L. polycephala** *Benth.* ; *Fl. Brit. Ind., III, p.* 410. A slender flaccid glabrous annual, erect or partly spreading. Stems 6–18 in. long, striate, simple or sub-dichotomously branched. Leaves 2–10 in. long, 1/4-3/4 in. broad, membranous ; radical leaves stalked, narrowly linear or lanceolate, entire, sinuate-toothed or pinnatifid ; cauline leaves sessile, shorter but broader than the radical leaves, narrowly or broadly lanceolate, mostly entire, finely acuminate, sagittate at the base and with acute lobes. Heads 1/3 in. long, erect, 10–20-flowered, arranged in dichotomous or sub-umbellate corymbs or panicles ; outer involucral bracts minute, inner 6–10 linear-oblong, green with scarious margins. Flowers yellow. Achenes 1/8-1/6 in. long, reddish brown, little compressed, elliptic-lanceolate, strongly about 10-ribbed, smooth, narrowed into a short slender brown beak ; pappus as long as the achenes. (Fig. 123.)

Ravi bank near Lahore. Flowers : March-April.

L. sativa *Linn.* (=**L. Scariola** *Linn.* var. **sativa** *Linn.*) is the garden lettuce and is commonly grown in gardens. The parts are more succulent than those of *L. Scariola* and quite smooth.

32. Picridium *Desf.*

Glabrous herbs with milky juice. Leaves radical or alternate, toothed or pinnatifid, lobes often crisped and toothed or spinulose. Heads campanulate, yellow ; flowers all ligulate ; involucral bracts many-seriate, thin, green ; innermost subequal, lanceolate, unchanged in

fruit; outer shorter, broader, with scarious margins; receptacle flat, naked. Achenes oblong, truncate at both ends, constricted at the tip; ribs 4-5, thick, transversely rugose; pappus very soft, white; hairs many-seriate, slender, simple, connate at the base into a deciduous ring.

P. tingitanum *Desf.*; *Fl. Brit. Ind., III, p.* 413. Annual, 6–18 in. tall. Stem stout. Leaves 3–8 in. long, variable in breadth, membranous; radical elongate-obovate or spathulate, sinuate-toothed or pinnatifid, sometimes with a large terminal sagittate lobe, denticulate; cauline 1/2-amplexicaul, auricled. Heads 1-1½ in. in diam., on thickened peduncles; outer involucral bracts cordate, with broad membranous margins and thickened tips. Achenes 1/10 in. long, pale, corky, 4-angled or showing four moniliform ribs; pappus 1/2 in. long.

Occasionally found near Lahore.

33. Sonchus *Linn.*

Erect herbs with milky juice. Stem fistular, grooved or angled. Leaves radical or alternate, the former stalked, the latter generally stem-clasping, coarsely toothed or pinnatifid, teeth often spinulose. Heads terminal, in irregularly subcorymbose or umbellate panicles, yellow; flowers many, all ligulate; involucre ovoid, campanulate or cylindric, often dilated, thickened and conic at the base; bracts many-seriate, overlapping, green, outer smaller; receptacle flat, naked. Ligules long, spreading, 5-toothed. Achenes ovoid, obovoid or ellipsoid, sub-terete or markedly flattened, not beaked, 3–5-ribbed on each face; ribs smooth or minutely transversely wrinkled; pappus copious, white; hairs many-seriate, very slender, simple, usually united at the base into a deciduous ring.

Key to the species.

Basal lobes of the cauline leaves acute ..	2. *S. oleraceous.*
Basal lobes of the cauline leaves obtuse.	
Leaves hard; teeth long, spinous; involucral bracts glabrous; achenes much compressed, not transversely wrinkled	1. *S. asper.*
Leaves thin; teeth small, not spinous; involucral bracts glandular-hairy; achenes hardly compressed, transversely wrinkled ..	3. *S. arvensis.*

1. **S. asper** *Vill.*; *Fl. Brit. Ind., III, p.* 414. Annual herb, 2-3 ft. tall, glabrous or sparsely glandular in the upper parts. Stem sub-umbellately branched. Leaves 6–10 in. long and 2-3 in. broad, hard, lanceolate, 1/2-amplexicaul, with rounded basal lobes; teeth numerous long and spinous. Heads crowded, 3/4-1 in. in diameter, the ultimate

peduncles mostly less than 2 in. long ; involucral bracts glabrous. Achenes flattened ; faces with 3 prominent ribs, obscurely muricate between the ribs. (Fig. 125.)

In gardens and cultivated fields. Flowers : January–April.

2. **S. oleraceous** *Linn.* ; *Fl. Brit. Ind., III, p.* 414. Habit similar to that of the last. Leaves 3–9 in. long, thin, lanceolate or pinnatifid, with a large terminal lobe ; marginal teeth small, prickly ; basal lobes of the cauline leaves acute or acuminate, entire or pinnatifid. Heads mostly short peduncled, 3/4-1 in. in diameter. Achenes as in *S. asper*, but distinctly muricate between the ribs. (Fig. 124.)

A common weed of gardens. Flowers : April-May.

3. **S. arvensis** *Linn.* ; *Fl. Brit. Ind., III, p.* 414. Plant 2–4 ft. tall, glabrous below, glandular hairy above. Leaves 4–10 in. long, 1-2 in. broad, thin, largely radical, nearly entire, lanceolate or pinnatifid, uppermost nearly linear ; teeth small, not spiny ; basal lobes rounded ; under-surface glaucous. Heads 1 in. in diameter ; peduncles ultimately 2–4 in. long ; involucral bracts glandular-hairy. Achenes narrow, each face minutely transversely wrinkled. (Fig. 126.)

On road-sides and in fields and gardens. Flowers : November–March.

34. Launea *Cass.*

Glabrous perennial herbs with yellow juice. Leaves chiefly radical, sinuate-lobed or pinnatifid, margins often spinulose-toothed. Heads peduncled or sessile, solitary or fascicled, forming interrupted racemes, yellow ; flowers all ligulate ; involucre campanulate or cylindric ; bracts many-seriate, green, with scarious margins ; inner long, linear, subequal ; outer shorter, with keel often thickened in fruit ; receptacle flat, naked. Ligules long, spreading, 5-toothed ; anther-bases sagittate, auricles setaceous ; style-arms slender. Achenes narrow, sub-terete, angled or slightly flattened, truncate at both ends ; ribs 4-5, very stout, close-set, smooth ; pappus copious ; hairs white, many-seriate, simple, all connate at the base into a deciduous ring.

L. nudicaulis *Less.* ; *Fl. Brit. Ind., III, p.* 416. Stems few to many, 6–24 in. long, tufted, decumbent, naked or with a few small leaves. Radical leaves 2–8 in. long, sessile ; lobes entire or coarsely toothed, obtuse or acute, margin at least in the older leaves beset with sharp, white, cartilaginous teeth. Heads 1/2-2/3 in. long. Achenes 1/12 in. long, pale, columnar or outer slightly curved and compressed, very thickly ribbed, much shorter than the soft white pappus. (Fig. 127.)

Abundant. Flowers throughout the year.

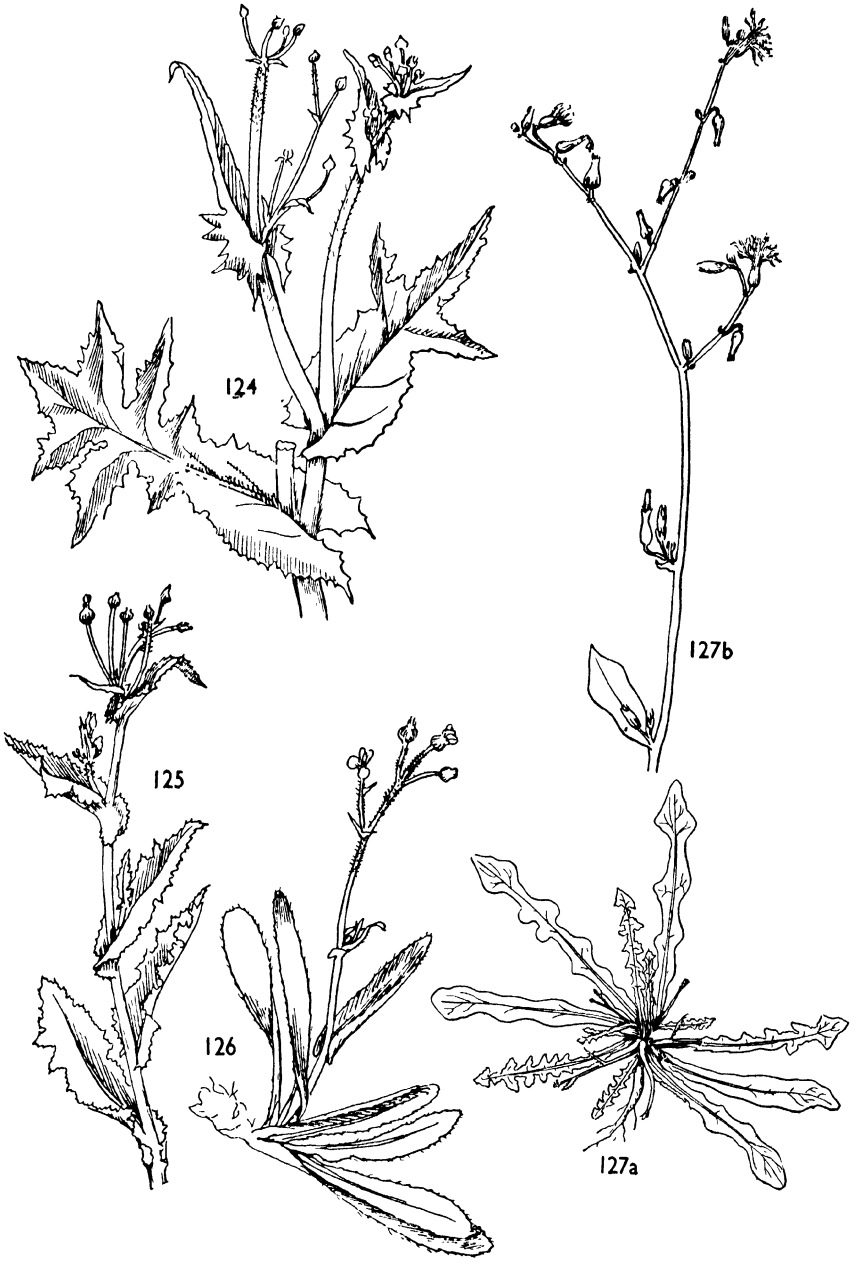


Fig. 124, *Sonchus oleraceus*, $\times \frac{1}{6}$; Fig. 125, *S. asper*, $\times \frac{1}{4}$; Fig. 126, *S. arvensis*, $\times \frac{1}{4}$; Fig. 127, *Launea nudicaulis*, (*a*) vegetative parts, $\times \frac{1}{4}$, (*b*) a flowering branch, $\times \frac{1}{3}$.

XXXVII. CAMPANULACEÆ.

Mostly herbs, nearly always with milky juice. Leaves alternate, rarely opposite, simple, exstipulate. Flowers bisexual, regular, axillary or terminal, solitary, or in panicles or racemes; sepals 5, connate; tube adnate to the ovary, persistent; corolla gamopetalous, tubular or campanulate; lobes 5, valvate; stamens 5, alternate with the corolla-lobes, inserted along with the corolla or on the disk on the top of the ovary; filaments usually free from each other; ovary inferior, or rarely superior, 2–5-celled; placentation axile, rarely basal or apical; ovules usually numerous; style linear; stigmatic lobes as many as the constituent carpels. Fruit a capsule or a berry, often crowned by the persistent calyx-lobes. Seeds small, albuminous; embryo straight, axial.—*Genera about* 50, *species nearly* 800, *widely distributed, but more abundant in cold countries.*

Key to the genera.

Flowers in panicled clusters .. 1. *Campanula.*
Flowers in a dense spike .. 2. *Sphenoclea.*

1. Campanula *Linn.*

Perennial or annual, erect or decumbent herbs. Leaves alternate or the radical forming a rosette. Flowers peduncled or subsessile, axillary or terminal, panicled, spicate or subcapitate, purple or white; sepals 5, connate, tube adnate to the ovary, top-shaped, persistent; corolla campanulate, 5-fid; stamens 5, free, filaments dilated at the base; anthers free; ovary inferior, 3-(rarely 4-5-) celled; ovules very many in each cell; style cylindric; stigma shortly 3–5-lobed. Capsule obovoid or elongate, truncate, dehiscing by pores or valves at the base or on the sides below the calyx-limb. Seeds usually flattened.

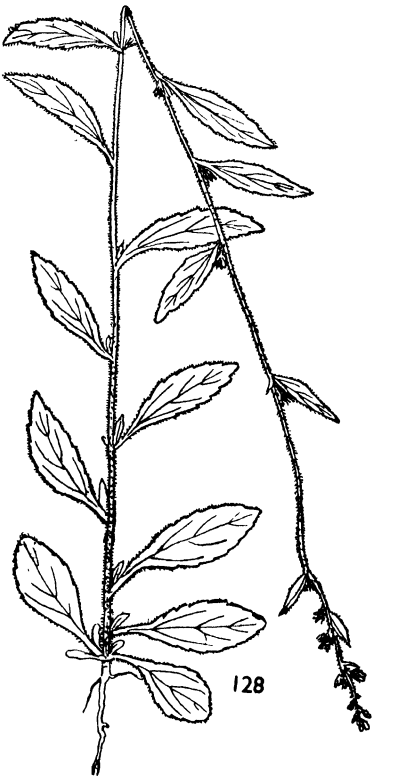


Fig. 128, *Campanula canescens*; × ½.

C. canescens *Wall.*; *Fl. Brit. Ind., III, p.* 439. An erect herb, clothed with rather stiff hairs. Stems 6–24 in. high. Leaves 1–2½ in.

long, oblong or lanceolate, crenate. Flowers in panicled clusters, dimorphic, normal and cleistogamic, the latter without petals or stamens ; calyx teeth linear-lanceolate, 1/4 in., smaller in cleistogamic flowers ; corolla 1/3 in. long, purplish ; ovary 3- or occasionally 4- or 5-celled. Capsule 1/5-1/4 in. in diameter, smaller in the cleistogamic flowers. (Fig. 128.)

Lahore, river-side. Flowers : March-April.

2. Sphenoclea *Gaertn.*

Herbs, annual, erect. Leaves alternate, lanceolate, entire. Flowers small, sessile, in lateral and terminal, peduncled, dense, cylindric spikes, with a conical apex, bracteate ; bracteoles 2 ; calyx 1/2-superior, limb 5-fid, lobes ovate ; corolla epigynous, 5-lobed ; stamens 5, epipetalous ; filaments short, linear ; anthers ovate ; ovary at first inferior, 2-celled ; ovules numerous on stalked placentas ; style short ; stigma obscurely 2-lobed. Capsule 1/2-inferior, membranous below, truncate, opening transversely at the level of the calyx teeth. Seeds narrowly oblong.

S. zeylanica *Gaertn.* ; *Fl. Brit. Ind., III, p.* 438. Stem 9–30 in., branched or not, glabrous. Leaves 1-2 in., sessile or almost so, glabrous. Spikes and peduncles each 3/4–2 in. long. Flowers greenish-yellow. Capsule 1/6 in. in diameter, crowned above with the persistent calyx-lobes. Seeds minute, slightly rough.

River-side, in moist places. Flowers : September-October.

XXXVIII. PRIMULACEÆ.

Perennial or annual herbs. Leaves all radical or, when cauline, alternate, opposite or whorled, exstipulate. Flowers bisexual, regular, from solitary to paniculate or umbellate, often heterostyled ; sepals mostly 5, connate, inferior, persistent ; petals 5, connate, imbricate ; stamens 5, inserted opposite the corolla-lobes, rarely with alternating staminodes ; ovary 1-celled, superior ; ovules numerous ; placentation free central ; style long or short ; stigma entire. Fruit a many-seeded capsule, dehiscing by valves or transversely. Seeds albuminous ; embryo transverse.—*Genera about* 25, *species nearly* 550 ; *distributed mostly in mountainous regions of the north temperate, rare in the tropics and the southern hemisphere.*

Anagallis *Tournef.*

Slender annual or perennial herbs. Leaves opposite, quite entire. Flowers axillary, solitary, peduncled, red or blue, rarely white ; calyx

5-partite ; corolla rotate, 5-partite ; stamens 5, filaments villous ; ovary globose ; style filiform ; ovules many, amphitropous. Capsule globose, opening by a transverse cut about the middle. Seeds many, peltate, plano-convex.

A. arvensis *Linn.* ; *Fl. Brit. Ind., III, p.* 506. An annual procumbent herb, glabrous. Stems 6–18 in., branching from the base. Leaves 1/2–1½ in., sessile, ovate or lanceolate, acute, gland-dotted. Peduncles 1-2 in. long, slender, erect in flower, decurved in fruit. Flowers blue ; sepals narrowly lanceolate, acuminate, almost equalling the corolla ; corolla 1/3-1/2 in. in diameter, lobes ciliate at the margin. Capsule 1/5-1/4 in. in diameter ; style persistent ; seeds trigonous. (Fig. 129.)

Fig. 129, *Anagallis arvensis*, ×1.

Abundant during the cold season as a weed of cultivation.

XXXIX. SALVADORACEÆ.

Unarmed or spiny trees or shrubs. Leaves opposite, simple, entire ; stipules rudimentary. Flowers in dense axillary clusters or panicles, bisexual or dicœcious, regular ; calyx 3-4-toothed ; petals 4, free or partially connate, imbricate ; stamens 4, inserted on or near the base of the petals, alternate with them ; filaments free or connate at the base ; anthers 2-celled, dorsifixed, opening lengthwise ; disk 0 or of separate glands between the filaments ; ovary superior, 1-2-celled ; ovules 1-2 in each cell, basal, erect ; style short ; stigma 2-fid or sub-entire. Fruit a berry or drupe. Seed usually 1, erect, exalbuminous ; embryo with thick cordate cotyledons.—*Genera* 3, *species* 8, *in Asia and Africa.*

Salvadora *Linn.*

Shrubs or trees. Leaves opposite, entire. Flowers small, hermaphrodite or functionally unisexual, in panicled racemes or spikes ; bracts minute ; calyx campanulate, lobes 4, imbricate ; corolla campanulate ; tube with 4 small teeth (sometimes sub-obsolete) between the bases of the filaments ; stamens 4, on the corolla, alternate with its lobes ; ovary 1-celled, with one erect basal ovule ; style 0 ; stigma truncate. Drupe globose, supported by the slightly enlarged calyx, and sub-persistent corolla ; endocarp crustaceous. Seed erect, globose, exalbuminous.

S. oleoides *Dcne.*; *Fl. Brit. Ind., III, p.* 620. A small evergreen tree; branches many, spreading, whitish. Leaves 1½–3 by 1/3-1/2 in., linear- or ovate-lanceolate, pale-green, coriaceous, glabrous; petiole 1/5-1/3 in. Flowers sessile, greenish-white, in erect axillary panicled spikes; bracts ovate, acute, deciduous; calyx 1/12 in. long; corolla slightly longer, lobes obovate-oblong, reflexed; stamens exserted. Drupe 1/5 in. in diameter, yellow when ripe. (Fig. 130.)

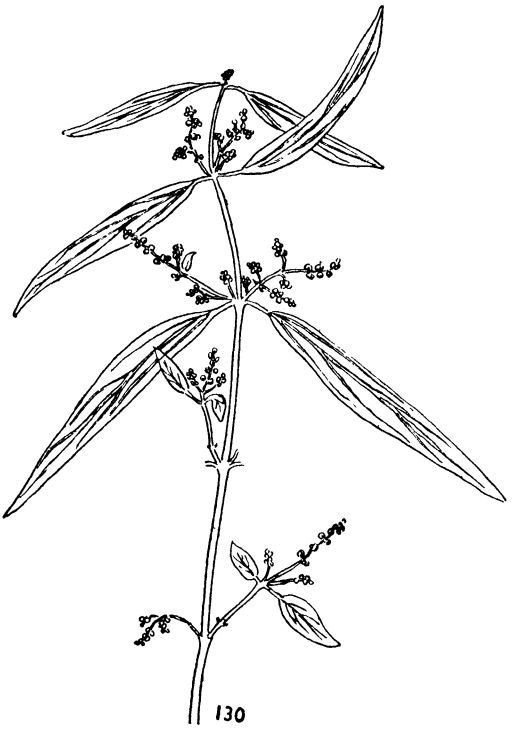


Fig. 130, *Salvadora oleoides*, × ⅔.

Throughout the plains of the Punjab, except in the moister tract towards the foot of the hills. Abundant and together with *Prosopis spicigera* and *Capparis aphylla* forms the bulk of the vegetation in the Punjab *rakhs*. Flowers during March to May.

XL. ASCLEPIADACEÆ.

Shrubs or herbs, erect or climbing, generally with milky and acrid juice. Leaves mostly opposite, simple, entire, exstipulate. Flowers mostly cymose, bisexual, regular; calyx-lobes 5, imbricate or open, inferior; corolla 5-lobed; lobes contorted or valvate; corona simple or of 5 or more scales, either adnate to the corolla-tube or the stamens or to both; stamens 5, mostly inserted at the base of the corolla and alternate with its lobes; filaments flat, usually connate in a fleshy tube round the ovary (staminal-tube), the apex of the tube often united to the much dilated stigmas (the stigmatic disk); anthers 2-celled, coherent round the stigma, the pollen of each cell usually agglutinated in a small ovoid waxy pollen-mass (pollinium), rarely granular, the pollinia of the adjoining cells of two contiguous anthers united in pairs or fours either

directly or by appendages (caudicles) to glands (corpuscula) which lie at the angles of the stigmatic disk ; ovary of 2 distinct superior carpels enclosed by the staminal-tube ; ovules numerous, in several series on the projecting ventral placentas ; styles 2, distinct, but united at the apex in a common thick, often disk-like, 5-angular stigmatic disk. Fruit of 2, often widely divergent, follicles ; one occasionally abortive. Seeds numerous, small, usually flattened, crowned with a tuft of long hairs.—*Genera about* 325, *species nearly* 1,800, *mainly found in tropical and sub-tropical countries, very numerous in S. Africa, rare in cool countries.*

Key to the genera.

Stems erect	1.	*Calotropis.*
Stems twining.		
Leaves not markedly cordate ; follicles smooth.		
Corolla 1 inch or more in diameter, white or pink with purple veins, divided 1/3 way down	2.	*Oxystelma.*
Corolla 1/2 inch in diameter, greenish, cleft nearly to the base	3.	*Pentatropis.*
Leaves deeply cordate ; follicles spiny ..	4.	*Daemia.*

1. Calotropis *Br.*

Erect, glabrous or hoary, shrubs or small trees. Leaves opposite, broad, sub-sessile. Flowers medium-sized, in umbelliform or sub-racemose cymes ; sepals glandular within ; corolla broadly campanulate ; lobes broad, naked, valvate ; corona scales 5, fleshy, laterally compressed, radiating from the large staminal-tube, dorsally spurred ; anther-tips membranous, inflexed ; pollen-masses one in each cell, pendulous, flattened, waxy ; stigma depressed, 5-angled or -lobed. Follicles turgid, smooth. Seeds comose.

C. procera *Br.* ; *Fl. Brit. Ind., IV, p.* 18. Shrub, 3–6 ft. high ; young parts and under-surface of leaves covered with appressed white floccose tomentum. Leaves 2–5 in. long, sessile, thick, glaucous-green, elliptic or obovate-oblong, acute or shortly acuminate, with a slightly cordate or often amplexicaul base. Flowers about 1 in. across, scented ; corolla pink or whitish with purple spots ; lobes erect ; corona scales 1/4 in. long, glabrous, equalling or exceeding the staminal column, apex bifid and without auricles. Follicles 3-4 in. long, recurved. Seeds 1/4 in. long, broadly ovate, flat, minutely tomentose, with a tuft of silky hairs. (Fig. 131.)

Common ; a weed of fallow land and in waste places.
Flowers : March–May.

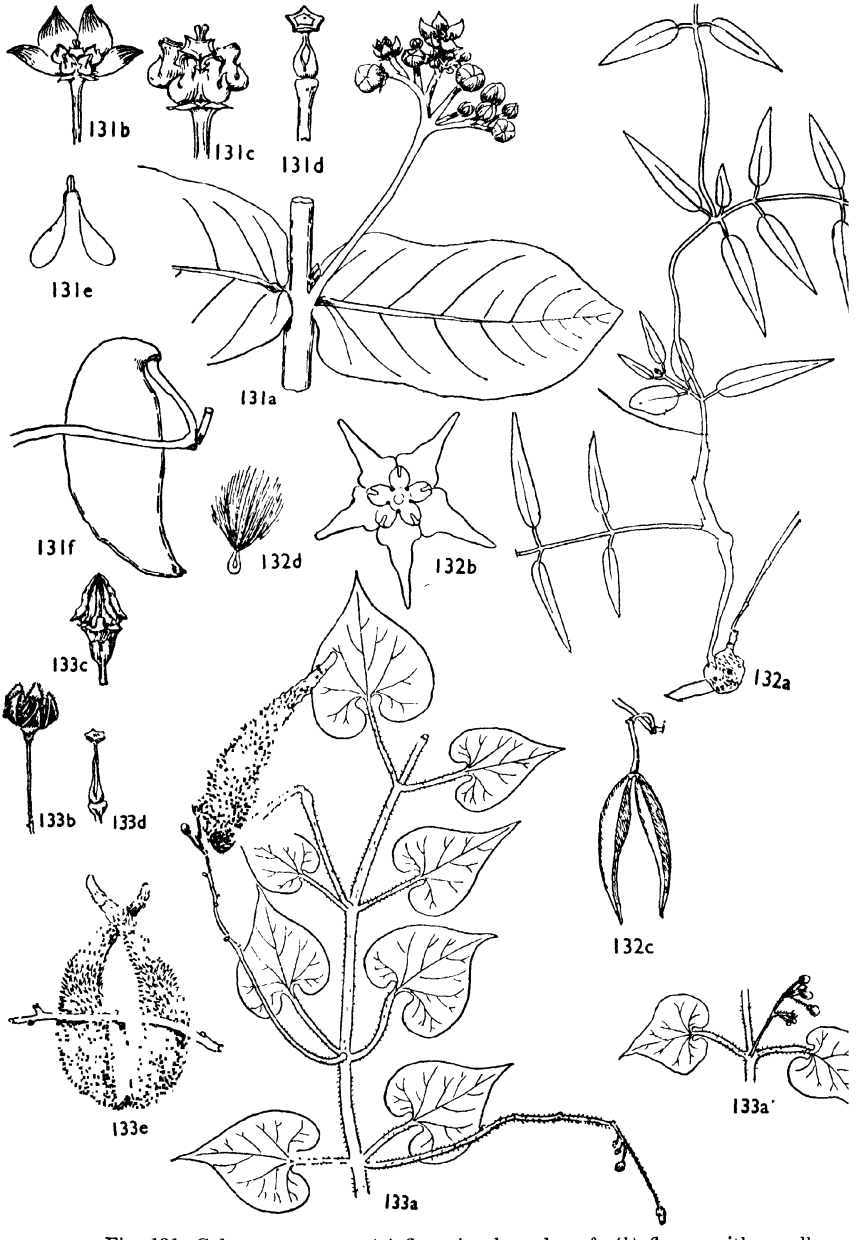


Fig. 131, *Calotropis procera*, (*a*) flowering branch, $\times \frac{3}{4}$, (*b*) flower with corolla opened out, $\times \frac{3}{4}$, (*c*) flower with corolla removed, $\times 1\frac{1}{2}$, (*d*) gynaecium, $\times 1\frac{1}{2}$, (*e*) pollinia, $\times 1\frac{1}{2}$, (*f*) follicle, $\times \frac{1}{3}$; Fig. 132, *Pentatropis cynanchoides*, (*a*) part of a plant with two branches arising from the perennial root-stock, $\times \frac{1}{2}$, (*b*) a flower as seen from above, $\times \frac{3}{4}$, (*c*) a pair of follicles, $\times \frac{3}{4}$, (*d*) seed, $\times \frac{3}{4}$; Fig. 133, *Daemia extensa*, (*a*) (*a'*) branches with flowering and fruiting inflorescences, $\times \frac{2}{3}$, (*b*) flower, $\times \frac{3}{2}$, (*c*) flower with corolla removed, $\times 1\frac{1}{2}$, (*d*) gynaecium, $\times 1\frac{1}{2}$, (*e*) a pair of follicles, $\times \frac{2}{3}$

C. gigantea *Br.*; *Fl. Brit. Ind., IV, p. 17.* A large shrub 8–10 ft. high. Flowers 1½-2 in. across, purplish or white, not scented; corolla-lobes spreading; corona scales shorter than the staminal column, with rounded apex and 2 obtuse auricles just below it.

Cultivated plants are found in some gardens. The species possesses a number of medicinal properties.

2. Oxystelma *Br.*

Twining glabrous herbs. Flowers large, in few-flowered cymes; pedicels filiform; calyx small, 5-partite, glandular within; corolla broadly saucer-shaped, campanulate or rotate; lobes ciliate and sub-valvate below, tips overlapping to the right; corona double, one annular, at the base of the corolla, other staminal, of 5 scales adnate to the bases of the stamens, with cordate or dilated bases, 2-keeled within; filaments short, connate; anther-tips membranous, inflexed; pollen-masses one in each cell, oblong, compressed, pendulous, waxy; stigma slightly convex. Follicles thick, oblique or curved, smooth or narrowly 2-winged. Seeds comose.

O. esculentum *Br.*; *Fl. Brit. Ind., IV, p.* 17. A much-branched, slender, deciduous, perennial climber. Leaves 2–4 in. long, about 1/8 in. broad, linear-lanceolate, acute or acuminate; petiole 1/4-1/2 in. long, very slender. Flowers 1 in. or more in diameter, white and rose-coloured with purple veins; peduncles and pedicels very slender, the former often exceeding the leaves; calyx-lobes oblong-lanceolate, acute; corolla rotate, margin ciliate; staminal corona-scales acuminate, with incurved subulate tips. Follicles 2-2½ in. long, ovoid-lanceolate, tapering to a point, glabrous. Seeds 1/3 in. long, broadly ovate, flat, hairs 3/4 in. long.

On hedges and trees on the river-side.

Flowers: June–November.

3. Pentatropis *Br.*

Twining slender herbs or undershrubs. Flowers small, in sub-umbellate cymes; calyx deeply divided, lobes 5; corolla rotate, 5-fid; lobes elongate, overlapping to the right; corona scales laterally compressed, vertically adnate to the backs of the anthers, with free tips and spurred bases; staminal-tube short; anther-tips inflexed; pollen-masses one in each cell, not compressed, pendulous, waxy; stigma flat on the top, slightly 5-angled. Follicles smooth. Seeds with long hairs.

P. cynanchoides *Br.* (**P. spiralis** *Dcne.*); *Fl. Brit. Ind., IV, p.* 19. A glabrous twiner. Roots tuberous. Leaves 1–3½ by 1/4-1 in., ovate, lanceolate or linear-lanceolate, acute or obtuse, usually mucronate, base rounded or cordate, more or less fleshy; petiole 1/10-3/4 in. long, slender. Flowers greenish, in 5-6-flowered cymes, 1/2 in. in diameter;

peduncles 0 or short; pedicel 1/4-1/2 in. long, slender; calyx-lobes ovate, acuminate, puberulous; corolla-lobes 1/3-1/2 in. long, narrowly acuminate, glabrous outside, puberulous within; corona scales deltoid-ovate, acute or acuminate. Follicles 2-3 in. long, lanceolate, with narrow back. Seeds 1/6 in. long, ovate, flat, minutely crenate at the lower end. (Fig. 132.)

In the *rakh* forests, climbing on *Salvadora*, *Capparis*, etc.
Flowers: February–March. Fruits ripen in May.

4. Daemia *Br.*

Perennial twiners. Flowers long-stalked, in axillary, racemose or corymbose cymes; calyx 5-lobed, cleft to the base, glandular within; corolla-tube short, funnel-shaped; lobes 5, large, broadly ovate, spreading, overlapping to the right; corona of an outer annular 5–10-crenate or -lobed membrane and 5 laterally compressed scales vertically adnate to the anthers, spurred behind and with free long subulate tips; staminal-tube large; anther-tips inflexed; pollen-masses one in each cell, slightly compressed, pendulous, waxy; stigma flat on top. Follicles tapering to a narrow point, covered with soft spines. Seeds comose.

D. extensa *Br.*; *Fl. Brit. Ind., IV, p.* 20. A more or less hispid, fœtid, twining herb. Leaves long-petioled, 1½–4 in. long, broadly ovate, acuminate, base deeply cordate, more or less hairy on both sides, margin ciliate. Peduncles 2–6 in. long, longer than the leaves; bracts linear, acute; pedicels 1/2–2 in. long, pubescent; flowers yellowish-green, tinged with pink at the base; corolla nearly 3/4 in. in diameter. Follicles 2-2½ in. long, lanceolate, often slightly curved, long-pointed, covered with long soft spines. Seeds 1/4 in. long, ovate, crenate at the rounded base, densely pubescent. (Fig. 133.)

Lahore, Changa Manga.
Flowers and fruits: November–April.

Cryptostegia grandiflora *Br.* A large evergreen climbing shrub with thick glossy foliage and large handsome pink-purple flowers about 2 in. across; corolla funnel-shaped; filaments free. Follicles 4-5 by 1 in., woody.

Native of Madagascar, cultivated in gardens and sometimes found as an escape.
Flowers: April–September.

Asclepias curassavica *Linn.* A native of W. Indies; an erect perennial herb with linear-lanceolate leaves and handsome orange-coloured flowers is also commonly cultivated in the gardens.

XLI. GENTIANACEÆ.

Herbs, rarely aquatic, sometimes shrubs. Leaves opposite, rarely alternate, entire, exstipulate. Flowers bisexual, usually regular, in

dichasial cymes, mostly bright coloured and showy ; sepals usually 4 or 5, free or connate, imbricate, persistent ; petals usually 4 or 5, connate, usually contorted ; stamens as many as the petals and alternate with them, epipetalous ; anthers 2-celled, opening lengthwise ; disk 0, or annular or of glands below the ovary ; ovary superior, 1-celled, with two parietal placentas bearing numerous ovules ; style simple. Fruit a capsule. Seeds numerous, with copious endosperm.—*Genera about* 80, *species nearly* 800, *in every part of the globe, but mainly in temperate and subtropical regions, abundant on the mountains.*

Erythraea *L. C. Rich.*

Herbs, erect, branched. Leaves opposite, sessile. Flowers in dichotomous cymes, rose-coloured or white ; calyx 4-5-partite ; corolla-tube long or short ; lobes 4 or 5, spreading ; stamens 4 or 5, near the summit of the corolla-tube ; filaments short, linear ; anthers narrowly oblong ; ovary 1-celled, placentas far intruded ; style linear ; stigmas semi-circular or oblong. Capsule oblong, about as long as the calyx, 2-valved. Seeds numerous, very small.

E. ramosissima *Pers.* ; *Fl. Brit. Ind., IV, p.* 101. Annual, 2–15 in. high. Leaves 1/2–1½ in. long, ovate, elliptic or lanceolate, obtuse or acute. Bracts conspicuous ; flowers sessile, pink or white ; calyx teeth linear, nearly equalling the corolla-tube. (Fig. 134.)

Common in grassy plots. Flowers : March–May.

Fig. 134, *Erythraea ramosissima*, × ½.

XLII. BORAGINACEÆ.

Herbs, shrubs or trees, usually scabrid or hispid. Leaves alternate, rarely opposite, simple, exstipulate. Flowers in simple, forked, spiked or racemed cymes, rarely solitary axillary, mostly bisexual, sometimes polygamous, usually regular, bracteate or not ; calyx 5-, rarely 6–8-toothed or -lobed ; imbricate or rarely valvate, usually persistent ; corolla tubular, funnel-shaped or rotate ; lobes usually 5, rarely 6–8, contorted or imbricate ; stamens as many as the corolla-lobes and alternate with them,

epipetalous; anthers 2-celled, opening lengthwise; disk present or obsolete; ovary superior, 2-celled, with 2 ovules in each cell or 4-celled with 1 ovule in each cell, entire or deeply 4-lobed; styles 2 or 1, when 1 terminal or from the middle of the lobes (gynobasic). Fruit a drupe or of 4 nutlets. Seeds albuminous or not.—*Genera about* 100, *species nearly* 1,800, *widely distributed, numerous in the Mediterranean region.*

Key to the genera.

Ovary entire or only slightly 4-lobed, style terminal.
- Trees.
  - Style twice forked .. .. 1. *Cordia.*
  - Style once forked .. .. .. 2. *Ehretia.*
- Herbs .. .. .. 3. *Heliotropium.*

Ovary deeply lobed, style gynobasic.
- Flowers not yellow.
  - Throat of the corolla-tube closed by scales.
    - Flowers in elongate, ebracteate racemes 4. *Cynoglossum.*
    - Flowers mostly axillary, solitary.
      - Flowers pedicelled, bluish white .. 5. *Bothriospermum.*
      - Flowers subsessile, pink-blue .. 6. *Gastrocotyle.*
  - Throat of the corolla-tube without scales, naked or simply hairy; flowers white .. 7. *Nonnea.*
- Flowers yellow .. .. .. 8. *Arnebia.*

1. Cordia *Linn.*

Trees or shrubs. Leaves alternate, rarely sub-opposite, petioled. Flowers in dichotomous corymbs or clusters, ebracteate, polygamous (bisexual and male); calyx tubular or campanulate; teeth very short, often irregular, in fruit accrescent; corolla funnel-shaped; lobes 4–8, as long as the tube, recurved; stamens 4–8, filaments often hairy at the base; anthers shortly exserted; ovary entire, 4-celled, glabrous; style terminal, long, bipartite; branches again bipartite, linear or subspathulate; cells 1-ovuled. Fruit an ovoid or ellipsoid drupe with sticky pulp; cells 1–4, usually fertile. Seeds exalbuminous.

Key to the species.

Leaves alternate, 3–5-nerved .. .. 1. *C. obliqua.*
Leaves subopposite, 1-nerved .. .. 2. *C. Rothii.*

1. **C. obliqua** *Willd.*; *Fl. Brit. Ind., IV, p.* 137. A deciduous medium-sized tree. Leaves alternate, 3–5 by 2½–4½ in., rounded, entire or sinuate-dentate, glabrous or nearly so above, more or less pubescent

beneath, basal nerves 3, rarely 5 ; petiole 3/4-1½ in. long. Peduncles 1-2 in. long. Flowers white, 1/5-2/5 in. across, shortly pedicellate ; calyx glabrous without, pubescent within, splitting irregularly on the opening of the flowers ; corolla-lobes 5 ; filaments hairy at the base. Drupe ovoid, 1/2-1 in. long, yellow-pink or nearly black when ripe ; pulp viscid, sweetish, edible.—Vern., *Lasura*. (Fig. 135.)

2. **C. Rothii** *Roem. & Sch.* ; *Fl. Brit. Ind., IV, p.* 138. A large shrub or small tree. Leaves nearly or quite opposite, 2–4 by 3/4-1 in., broadly oblanceolate, entire, obtuse, base tapering, rough and glabrous above, more or less pubescent beneath, 1-nerved ; petiole 1/4-1/2 in. long. Peduncles 1/2-1 in. long. Flowers white, 1/5 in. across, usually tetramerous ; calyx minutely pubescent on the outside, silky within ; filaments glabrous. Drupe ovoid, 1/2 in. long, usually 1-seeded, yellow or reddish brown when ripe, with gelatinous edible pulp.—Vern., *Gondi*. (Fig. 136.)

2. Ehretia *Linn.*

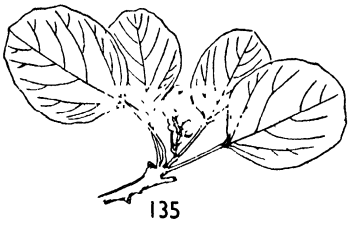
Shrubs or trees. Leaves alternate. Flowers in axillary or terminal corymbs or panicles, small, white ; calyx 5-partite ; corolla-tube short or cylindric ; lobes 5, imbricate, spreading or reflexed ; stamens 5, inserted on the corolla-tube ; anthers usually exserted ; ovary 2-celled ; cells 2-ovuled ; style terminal, shortly or deeply cleft into two parts ; stigmas capitate. Drupe small, subglobose, containing 4 or by suppression 3–1 seeds. Seeds straight ; testa thin ; albumen scanty.

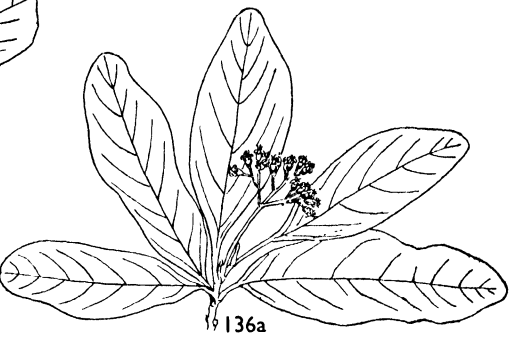
E. laevis *Roxb.* ; *Fl. Brit. Ind., IV, p.* 143. A small deciduous tree or a large shrub. Leaves 3–5 by 2–3½ in., very variable, broadly elliptic or elliptic-obovate, glabrous or nearly so, bright green above, paler beneath, entire ; petiole 1/3–3/4 in. long ; apex variable. Flowers numerous, 1/3 in. across, shortly pedicellate, mostly in terminal corymbs ; corolla-tube exceeding the calyx, lobes exceeding the tube ; style shortly 2-fid. Drupe 1/8 in. across.

Flowers : February-March.

3. Heliotropium *Linn.*

Herbs, rarely shrubby. Leaves alternate. Flowers small, white or nearly so, in terminal dichotomising cymes, usually with long scorpioid branches ; bracts small, 0, or leafy ; calyx 5-partite or -lobed ; segments lanceolate or linear ; corolla tubular ; lobes 5, imbricate, spreading ; stamens 5, on the corolla-tube, included ; anthers subsessile ; ovary completely or imperfectly 4-celled, 4-ovuled ; style terminal, short or long ; stigma conical. Fruit dry, of 4, more or less free, nutlets.





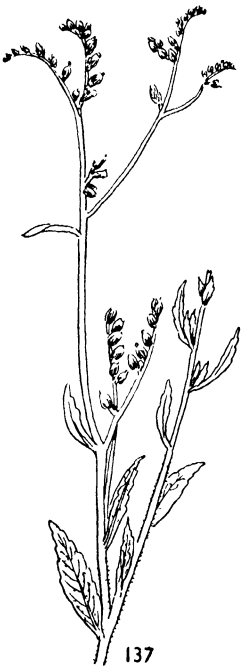


Fig. 135, *Cordia obliqua*, $\times\frac{1}{4}$; Fig. 136, *C. Rothii*, (*a*) flowering twig, $\times\frac{1}{2}$, (b) flower, $\times 3$; Fig. 137, *Heliotropium undulatum*, $\times\frac{2}{3}$; Fig. 138, *H. strigosum*, $\times\frac{2}{3}$.

Key to the species.

Leaves obovate, more than 1/2 in. broad; an erect herb	1.	*H. Eichwaldi.*
Leaves lanceolate, less than 1/2 in. broad but never very narrow; plants erect or suberect ..	2.	*H. undulatum.*
Leaves very narrowly lanceolate, about 1/10 in. broad; usually prostrate herb	3.	*H. strigosum.*

1. **H. Eichwaldi** *Steud.* ; *Fl. Brit. Ind., IV, p.* 149. An erect annual herb, up to 2 ft. high, much branched from a woody base. Stems softly closely hairy. Leaves 1–3 by 3/4–1½ in., obovate, obtuse, usually tapering to the base, entire, with bulbous-based hairs on both sides, nerves more prominent on the underside ; lower long-petioled. Flowers sessile, ebracteate, in dense, 1½–3 in. long, 2-ranked spikes, grouped in twos or threes, 1/8 in. long, white ; calyx 5-partite, densely hairy on both sides ; corolla hairy on the outside. Nutlets 4, 1/12 in., ellipsoid, glabrous or minutely warty.

Abundant in the fields after the winter crops have been cut down and in gardens as a weed.

Flowers : March–June.

2. **H. undulatum** *Vahl* ; *Fl. Brit. Ind., IV, p.* 150. Shoots erect or suberect, much branched, 6–24 in. high, scabrous. Leaves 1/2–1½ by 1/4-1/3 in., sessile or almost so, lanceolate, acute, very rough, margin crisped-crenulate. Flowers sessile, in short, 3/4–2 in. long, lax spikes, ebracteate ; sepals 1/16 in., scabrous ; corolla-tube 1/8 in., scabrous on the outside. Nutlets 1/12 in., hispid. (Fig. 137.)

Minto Park, Race Course grounds, etc.

Flowers : March–May.

3. **H. strigosum** *Willd.* ; *Fl. Brit. Ind., IV, p.* 151. A small prostrate perennial herb, covered with straight, stiff, appressed, white hairs ; stems tufted, much branched, up to 8 in. long. Leaves small, 1/4–1 by 1/10 in., nearly sessile, linear-lanceolate, entire, acute. Spikes 1–3 in. long ; flowers small, white or pale-blue, 1/10 in. long, bracteate, lower often pedicellate and with leafy bracts ; sepals 1/12 in., ovate-lanceolate ; stigma narrowly conical. Nutlets 1/16-1/12 in. long, more or less united, glabrous or slightly hairy. (Fig. 138.)

Flowers : April–October, perhaps throughout the year.

4. Cynoglossum *Linn.*

Erect hairy herbs. Leaves radical and alternate, radical petioled. Flowers in long, simple or forked, one-sided racemes, sessile or lower shortly pedicellate, ebracteate ; calyx deeply 5-lobed, in fruit spreading, not (or slightly) enlarged ; corolla-tube as long as the calyx, with 5 obtuse scales in the throat ; lobes 5, obtuse, imbricate ; stamens 5, included beneath the scales ; ovary 4-lobed ; style short, gynobasic. Nutlets 4, ovoid, flattened on one side, without a margin, more or less covered with minute hooked bristles ; receptacle convex ; carpophore (after the nuts have fallen) linear, shortly conical at the base.

Fig. 139, *Cynoglossum lanceolatum*, $\times \frac{1}{2}$; Fig. 140, *C. micranthum*, (*a*) flowering branch, $\times \frac{1}{2}$, (*b*) lower leaf, $\times \frac{1}{2}$, (*c*) fruit, $\times 1\frac{1}{2}$; Fig. 141, *Bothriospermum tenellum*, (*a*) a flowering and fruiting branch, $\times \frac{2}{3}$, (*b*) fruit, $\times \frac{1}{2}$, (*c*) a nutlet, $\times 5$; Fig. 142, *Gastrocotyle hispida*, (*a*) branch, $\times \frac{1}{2}$, (*b*) flower, $\times 3$, (*c*) fruit, $\times 3$.

Key to the species.

Racemes divaricately forked	..	1. *C. micranthum.*
Racemes not divaricately forked	..	2. *C. lanceolatum.*

1. **C. micranthum** *Desf.*; *Fl. Brit. Ind., IV, p.* 156. An erect herb, 1–4 ft. high, covered with rough long white bulbous-based hairs, often mingled with short pubescence. Radical leaves usually absent at the time of flowering, larger than the cauline leaves; cauline 1½–3½ by 1/3–3/4 in., lanceolate, narrowed at both ends, minutely round-toothed, acute, conspicuously veined on the under-surface; lower petioled, upper subsessile. Racemes characteristically divaricate, branches bearing fruits up to 5 in. long. Flowers 1/10 in. in diameter, shortly pedicellate, white, with blue black scales in the throat of the corolla; calyx-lobes in the fruit 1/20 in. Nutlets 1/16 in. long, uniformly bristly. (Fig. 140.)

Flowers about August.

2. **C. lanceolatum** *Forsk.*; *Fl. Brit. Ind., IV, p.* 156. Very much like the first, but the leaves somewhat broader. Racemes not conspicuously divaricate, forking usually unequal; branches in fruit often 6–10 in. long. Calyx-lobes in fruit 1/8-1/6 in.; nutlets 1/8 in. (Fig. 139.)

Flowers: September–April.

5. Bothriospermum *Bunge*

Weak herbs covered with stiff appressed hairs. Flowers axillary, pedicellate, the upper often going off into a bracteate raceme; calyx 5-partite; lobes narrow, not (or scarcely) enlarged in fruit; corolla-tube short, throat with 5 scales; lobes 5, imbricate in bud, obtuse, spreading; stamens 5, included; ovary deeply 4-lobed; style short, gynobasic; stigma capitate. Nutlets 4, ellipsoid, with a large hollow scar near the middle on the inner face; carpophore oblong.

B. tenellum *Fisch. and Mey.*; *Fl. Brit. Ind., IV, p.* 167. A prostrate or diffuse, adpressedly hairy herb; stems 6–18 in. long. Leaf-blades mostly 1/2-1 in. long, spathulate or ovate-lanceolate, entire, crenulate, irregularly obtuse or acute; petiole in the lower leaves up to 1½ in., 0 in the upper. Flowers bluish white, distant or the upper in close bracteate racemes; pedicel 1/10-1/6 in., as long as the calyx, slender; corolla 1/6 in. across, tube with pouch-like enlargements at the base. Nutlets 1/20-1/15 in.; scar elliptic, longitudinal. (Fig. 141.)

Lahore, Ravi side. Flowers: March–May.

6. Gastrocotyle *Bunge*

A diffuse hispid herb. Flowers small, axillary, solitary and subsessile, or in dense small axillary racemes ; calyx 5-partite ; corolla-tube short, closed with scales ; lobes 5, imbricate in bud, obtuse, spreading ; stamens 5, included ; ovary 4-lobed ; style short, gynobasic ; stigma sub-capitate. Nutlets 4, or fewer, ovoid, erect, incurved, with an oblong, elevated, margined scar near the middle of the inner face ; carpophore half as long as the nutlets, with a 4-ridged apex.

G. hispida *Bunge* ; *Fl. Brit. Ind., IV, p.* 168. A diffuse herb, densely covered with large stiff white bristly hairs, branching from the base ; branches up to 18 in. long. Leaves 1–3½ in. long ; lower larger, petioled, spathulate ; upper sessile, lanceolate, obscurely crenate, acute. Flowers pink-blue, 1/5 in. in diameter ; pedicels 0 or much shorter than the calyx. Nutlets 1/8-1/6 in. long, wrinkled, minutely papillose. (Fig. 142.)

Chaburji side. Flowers : February–April.

7. Nonnea *Moench.*

Hispid or villous, annual or perennial herbs. Flowers in dense bracteate cymes, elongating in fruit ; calyx 5-fid, much enlarged in fruit, tube enclosing the nutlets; corolla-tube straight, about as long as the calyx ; throat naked or hairy, not provided with scales, small scales sometimes present lower down ; lobes 5, imbricate in bud, obtuse, spreading ; stamens 5, included ; ovary deeply 4-lobed ; style filiform, gynobasic ; stigma shortly or obscurely 2-lobed. Nutlets 4, ovoid, reticulately wrinkled, on a conic receptacle and with large, basal, oblique, hollow scar appendaged at the centre and hard margined.

N. pulla *Lamk.* ; *Fl. Brit. Ind., IV, p.* 169. A much branched herb up to 1½ ft. high, densely covered with stiff pointed hairs. Leaves 1-2 by 1/4-1/2 in., elongate-ovate or lanceolate, gradually tapering to the apex, upper more or less stem-clasping, lower often petioled, entire, acute or acominate. Flowers white, in dense racemes 1–3 in. long, elongating in the fruit up to 6 in. ; pedicel 1/8-1/4 in. ; bracts up to 1½ in. long, leaf-like ; calyx 1/4 in. long, 1/2 in. in fruit, subglobose, lobes acuminate ; corolla-tube 1/4 in. long. Nutlets 1/10 in., slightly wrinkled. (Fig. 143.)

Common near railway lines, also in other waste places and fields. Flowers : February–April.

8. Arnebia *Forsk.*

Annual or perennial, densely hispid herbs ; root often staining red. Flowers in terminal elongate bracteate racemes, subsessile, heterostylic ;

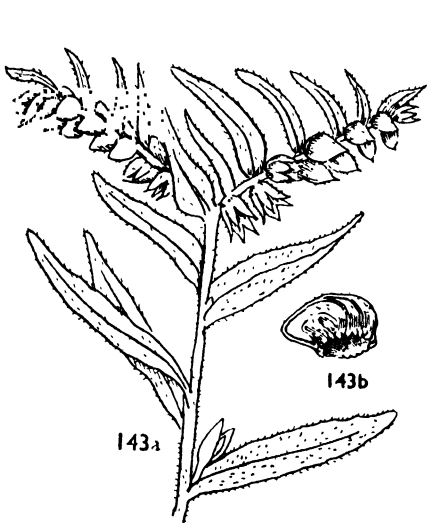


Fig. 143, *Nonnea pulla*, (*a*) flowering branch, $\times\frac{3}{4}$, (*b*) one nutlet, $\times 3$; Fig. 144, *Arnebia hispidissima*, $\times\frac{1}{2}$.

calyx deeply cleft into 5 linear lobes; corolla-tube slender, longer than the calyx-lobes; throat naked, without scales; lobes 5, imbricate in bud, obtuse, spreading; stamens 5, inserted much below the mouth of the tube in the long-styled flowers, in the throat and semi-exserted in the short-styled flowers; ovary deeply 4-lobed; style gynobasic, shortly bipartite; stigmas small, capitate. Nutlets 4, ovoid, acute, erect, with a large triangular flat basal scar shortly produced up the inner face.

A. hispidissima *DC.*; *Fl. Brit. Ind., IV, p.* 176. A more or less prostrate herb, branching from a woody base and densely clothed all over with long, white, stiff hairs, spreading from tubercular bases; branches 3–10 in. long. Leaves 3/4–3 in. long, sessile, lanceolate or narrowly so, entire, acute or somewhat obtuse. Racemes compact, one-sided. Flowers yellow; bracts 1/4-1/3 in. long, linear; sepals 1/5 in. long; corolla-tube 1/3 in. long; hairy outside. Nutlets very small, tubercled on all sides. (Fig. 144.)

In sandy places mostly. Flowers: November–April.

XLIII. CONVOLVULACEÆ.

Herbs or shrubs, often twining ; juice often milky. Leaves alternate, simple, exstipulate (absent in *Cuscuta*). Flowers bisexual, regular, bracteate, often large and showy, mostly in pedunculate axillary cymes, rarely solitary ; sepals 5, rarely 4, connate for a short distance, sometimes distinct to the base, usually persistent ; petals as many as the sepals, connate ; tube bell- or funnel-shaped ; limb entire or shortly lobed, plaited and contorted in bud ; stamens as many as, alternating with and inserted upon the petals ; anthers linear or oblong, dorsifixed, 2-celled, opening lengthwise ; disk below the ovary, annular or lobed ; carpels 2, connate, superior ; ovary 2-celled, with 2 ovules in each cell or 4-celled with one ovule in each cell ; style linear, simple or forked ; stigma one, capitate or 2-lobed, or stigmas 2 ; ovules sessile, erect, anatropous. Fruit dry or fleshy, indehiscent or a capsule opening by 2 or 4 valves or irregularly. Seeds 1–4, exalbuminous and with plaited cotyledons (albuminous and without cotyledons in *Cuscuta*).—*Genera about* 50, *species nearly* 1,100, *mostly in tropical and subtropical countries.*

Key to the genera.

Leaf-bearing shrubs or herbs.
- Fruit indehiscent, or breaking up irregularly —a large climbing shrub .. .. 1. *Rivea.*
- Fruit dehiscent, capsular, opening by 2 or 4 valves.
  - Style unbranched, stigma capitate .. 2. *Ipomea.*
  - Style branched, stigmas two .. .. 3. *Convolvulus.*

Leafless parasitic herb .. .. .. 4. *Cuscuta.*

1. Rivea *Chois.*

Large twining shrubs. Flowers on 1–3-flowered axillary peduncles ; bracts 2, narrow ; sepals subequal ; corolla large, white ; tube long, cylindric ; limb widely funnel-shaped, plicate ; stamens included, attached near the middle of the corolla-tube ; anthers never twisted ; ovary 4-celled, 4-ovuled, with an annular disk below ; style filiform ; stigmas 2. Fruit nearly dry, globose, polished, indehiscent or irregularly breaking up. Seeds 1–4, glabrous, in mealy pulp.

R. hypocrateriformis *Chois.* ; *Fl. Brit. Ind., IV, p.* 184. Stems grey silky pubescent. Leaves 1–4 by 1–4 in., orbicular-cordate, obtuse, emarginate or mucronate, entire, nearly glabrous above, adpressedly silky beneath, with a gland on either side of the midrib at the base of

the lower surface; petiole up to 2 in. long. Flowers usually solitary, 2½-3 in. long, 2 in. across, pedicellate, on 1/5–2 in. long peduncles; sepals 1/3 in., ovate-elliptic, obtuse, silky-hairy; corolla glabrous or with a few scattered hairs on the outside. Fruit 1/2 in. in diameter, brown.

In hedges or growing over bushes. Lahore and Changa Manga.

Flowers during the rains. The flowers open at sunset and close and wither by next morning (Parker).

2. Ipomea *Linn.*

Twining or prostrate herbs, rarely shrubs or sub-erect. Leaves alternate, entire, lobed or divided. Flowers generally showy, of various colours, in 1-many-flowered axillary cymes; sepals equal or unequal, ovate or linear; corolla bell- or funnel-shaped; tube long or short; limb 5-plaited, shortly lobed; stamens unequal, shorter or longer than the corolla-tube; filaments filiform or dilated below; anthers oblong, twisted or straight; ovary generally 2-celled and 4-ovuled; disk annular; style filiform; stigma entire or 2-lobed. Capsule rounded or ovoid, mostly opening by 4 valves, sometimes indehiscent.

I. aquatica *Forsk.*; *Syn.* **I. reptans** *Poir.*; *Fl. Brit. Ind., IV, p.* 210. Shoots elongate, trailing on mud and rooting from the nodes or floating, glabrous or nearly so. Stem hollow. Leaves 3–6 in. long, elliptic-oblong, cordate or hastate, or much narrowed, entire or somewhat lobed, acute; petiole 1–6 in. long. Cymes 1–5-flowered, on peduncles up to 7 in. long; bracts inconspicuous; pedicel often 1-2 in. long; sepals subequal, 1/3 in. long, ovate, obtuse; corolla about 2 in. long, funnel-shaped; limb pale rose-coloured; throat and tube dull purple; stamens unequal; filaments woolly at the base. Capsule ovoid, 1/3 in. long, glabrous. Seeds minutely closely covered with silky hairs.

In ponds and ditches. Flowers during winter. Dried juice is useful as a purgative.

I. palmata *Forsk.*; *the railway creeper.* A graceful climber, with deeply 5–7-lobed leaves. Flowers pale-purple, in small cymes; corolla campanulate, 3-4 in. long. Commonly cultivated in gardens and very frequently at the railway stations.

I. Batatas *Lamk.*; *the sweet potato*; Vern., *Shakar-kandi.* It is cultivated for the sake of the tuberous roots which are eaten after boiling or roasting. It is believed to be a native of tropical America. Flowers and fruits are very rarely seen.

3. Convolvulus *Linn.*

Erect, prostrate or twining herbs. Flowers on 1-many-flowered axillary peduncles; bracts narrow; sepals subequal or the outer wider; corolla campanulate; limb 5-plaited, nearly entire; stamens included; ovary 2-celled, 4-ovuled; style filiform; stigmas 2, distinct, oblong or

linear. Fruit a globose 2-celled capsule, opening by 4 valves or irregularly. Seeds normally 4, usually smooth or minutely tuberculate.

Key to the species.

Branches not twining, prostrate; flowers nearly sessile	1. *C. pluricaulis.*
Stems trailing or twining; flower stalks 1-2 in. long	2. *C. arvensis.*

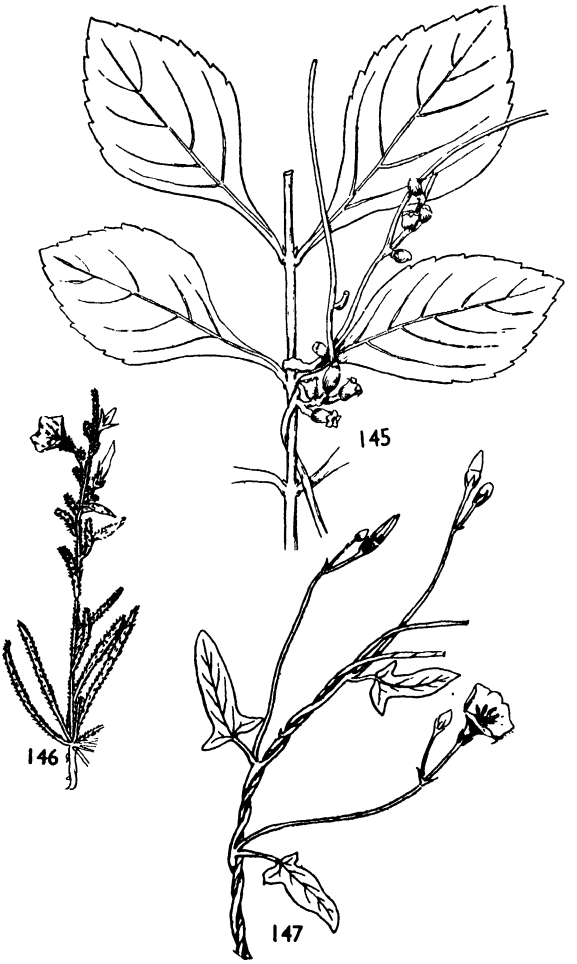


Fig. 145, *Cuscuta reflexa* on *Duranta plumieri*, ×½; **Fig. 146,** *Convolvulus pluricaulis*, ×½; **Fig. 147,** *C. arvensis*, ×½.

1. **C. pluricaulis** *Chois.* ; *Fl. Brit. Ind., IV, p.* 218. A perennial herb with a woody root-stock. Branches up to 2 ft. long, prostrate or suberect, slender, hairy. Leaves nearly sessile, linear, linear-oblanceolate or spathulate, mostly up to 1 in. long, but often up to 2½ in., the distal ones smaller, hairy on both sides. Flowers mostly solitary or in pairs, subsessile ; calyx thin, hairy, segments subequal, acuminate ; corolla white or various shades of pink, 1/3-3/4 in. in diameter ; throat yellowish ; stamens white. Capsule 1/8-1/6 in. in diameter. Seeds dark brown, microscopically tuberculate. (Fig. 146.)

Very variable in habit, size and hairiness of the leaves. Mostly in dry places. Flowers : March–June.

2. **C. arvensis** *Linn.* ; *Fl. Brit. Ind., IV, p.* 219. A glabrous or somewhat pubescent annual herb, with many trailing or twining stems 1/2–3 ft. long. Leaves stalked, 1–3 by 1/4-1 in., ovate or lanceolate, entire or the lower ones lobed ; base auriculate or hastate ; apex obtuse or apiculate ; petiole 1/4-1 in. long. Peduncle 1–3 in. long, solitary, slender, bearing 2–4 flowers ; pedicel up to 1 in. long ; sepals unequal, obtuse or sometimes mucronate, nearly glabrous ; corolla widely funnel-shaped, 3/4-1 in. long, 1 in. in diameter, white or various shades of pink with a yellowish centre, glabrous. Capsule 1/4-1/3 in. in diameter. (Fig. 147.)

Common in the gardens, fields and on road-sides.
Flowers : March–June.

4. Cuscuta *Linn.*

Leafless twining parasites, with thread-like yellowish stems, attached to the host plants by minute haustoria. Flowers small, in clusters or racemes ; bracts 0 or small ; sepals 5, distinct or shortly connate ; corolla tubular ; throat with 5 fimbriate scales near the base ; lobes short, imbricate ; stamens 5, inserted near the throat of the corolla-tube ; filaments short ; ovary completely or incompletely 2-celled, 4-ovuled ; styles 1 or 2 ; stigmas 2. Capsule globose, opening by a horizontal split near the base, 2–4-seeded. Seeds glabrous, albuminous ; embryo slender, twisted ; cotyledons 0 or obscure.

C. reflexa *Roxb.* ; *Fl. Brit. Ind., IV, p.* 225. Stems long, branched, succulent, glabrous, forming dense yellow interlaced masses over other trees, shrubs and herbs. Flowers fragrant, waxy white, shortly pedicellate, in many small clusters or racemes ; bracts small, fleshy ; corolla-tube 1/4-1/3 in. long ; lobes short, triangular, reflexed ; style very short ; stigmas 2, large, nearly sessile, diverging. Capsule 1/4-1/3 in. in diameter. (Fig. 145.)

Very common on almost every kind of plant.
Flowers : October–February.

XLIV. SOLANACEÆ.

Herbs, shrubs or rarely small trees. Leaves alternate, but often two at a node, rarely clustered, simple, exstipulate. Flowers regular, bisexual, in terminal or lateral cymes or solitary ; sepals inferior, usually 5, connate, persistent and often much enlarged in fruit ; petals 5, united into a funnel- or bell-shaped or rotate corolla, often plicate, contorted or valvate ; stamens usually 5, inserted on the corolla-tube and alternate with its lobes ; anthers 2-celled, cells parallel, opening lengthwise or by apical pores ; carpels 2, superior, oblique, connate into a 2-celled ovary, the cells sometimes again divided by a false septum ; ovules very numerous, axile on large swollen placentas ; style terminal, linear ; stigma capitate or shortly lobed. Fruit a capsule or a berry. Seeds albuminous ; embryo curved or annular.—*Genera about* 85, *species nearly* 1,800 ; *tropical to temperate regions.*

Key to the genera.

Fruit a berry.		
Herbs, unarmed (prickly only in *Solanum xanthocarpum*).		
Anthers opening by apical pores ; calyx not enlarged in fruit	1.	*Solanum.*
Anthers opening longitudinally ; calyx much enlarged in fruit.		
Flowers solitary	2.	*Physalis.*
Flowers in umbellate cymes ..	3.	*Withania.*
A spinous shrub	4.	*Lycium.*
Fruit a capsule.		
Capsule spiny	5.	*Datura.*
Capsule not spiny	6.	*Nicotiana.*

1. Solanum *Linn.*

Shrubs or herbs, unarmed or prickly. Leaves alternate or sub-opposite, entire or pinnatifid, petiolate. Flowers in lateral or terminal, often umbellate, cymes or solitary ; calyx 5-lobed, not enlarged in fruit ; corolla-tube very short ; limb 5-lobed, spreading, plicate ; stamens 5 in the corolla-throat ; filaments short ; anthers large, oblong, narrowed upwards and coherent in a projecting cone, opening by apical pores ; ovary 2-celled ; style long ; stigma small. Fruit a globose berry containing numerous discoid seeds.

Key to the species.

Leaves smooth ; flowers white	1.	*S. nigrum.*
Leaves prickly ; flowers bluish-purple ..	2.	*S. xanthocarpum.*

1. **S. nigrum** *Linn.* ; *Fl. Brit. Ind., IV, p.* 229. An erect, nearly glabrous, much branched annual herb, 1-2 ft. high. Leaves 1–4 in. long, ovate, with coarse angular teeth, tapering into the petiole below, acute at the apex, thin. Flowers white, 1/4-1/2 in. in diameter, in umbellate extra-axillary pedunculate cymes ; pedicel slender, drooping ; calyx 1/8 in. long ; teeth small, oblong, obtuse, smooth ; corolla glabrous outside ; filaments hairy at the base. Berry 1/4 in. in diameter, yellow, red or black when ripe. (Fig. 148.)

A very common weed. Flowers during the greater part of the year.

2. **S. xanthocarpum** *Schrad. & Wendl.* ; *Fl. Brit. Ind., IV, p.* 236. A prostrate perennial herb, beset with yellow prickles all over, young parts covered with stellate hairs. Leaves 2–5 in. long, pinnatifid, nerves on both surfaces armed with numerous long straight prickles. Flowers bluish-purple, 1 in. in diameter, solitary or in small cymes; calyx 1/5-1/2 in. long, stellate-hairy and prickly ; corolla hairy outside ; filaments glabrous. Berry 1/2-3/4 in. in diameter, yellow or white, streaked with green. (Fig. 149.)

Common in waste places. Flowers : March-May.

Two species of *Solanum* are very common plants of cultivation.

S. tuberosum *Linn.*; the potato; Vern., *Alú.*

S. Melongena *Linn.*; the egg plant or brinjal; Vern., *Baingan.*

2. Physalis *Linn.*

Annuals. Leaves alternate. Flowers axillary, solitary ; calyx bell-shaped, becoming much enlarged and inflated in the fruit ; segments 5, small, convergent ; corolla also bell-shaped ; stamens 5, attached near the base of the corolla ; anthers oblong, shorter than the filaments, dehiscing longitudinally ; ovary 2-celled ; style linear ; stigma obscurely 2-lobed. Berry globose, many- or few-seeded.

Key to the species.

Corolla ¼ in. in diam., fruiting calyx about 1 in. long	1.	*P. minima.*
Corolla ½ in. in diam., fruiting calyx often much larger	2.	*P. peruviana.*

P. minima *Linn.* ; *Fl. Brit. Ind., IV, p.* 238. Erect or somewhat prostrate pubescent herb, 6–18 in. high, much branched. Leaves 1-1½ in.

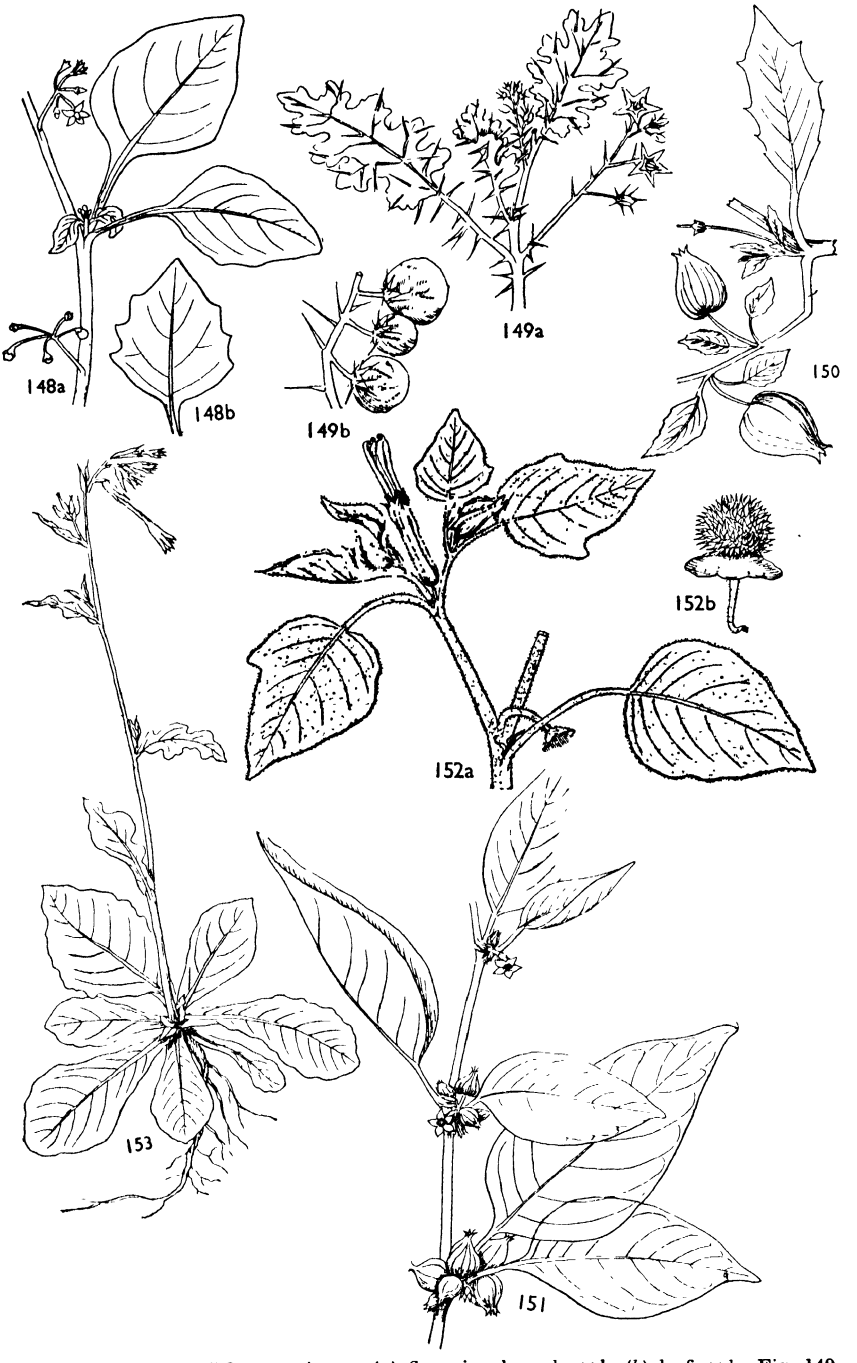


Fig. 148, *Solanum nigrum*, (*a*) flowering branch, $\times\frac{1}{2}$, (*b*) leaf, $\times\frac{1}{2}$; Fig. 149, *S. xanthocarpum*, (*a*) flowering branch, $\times\frac{1}{2}$, (*b*) fruits, $\times\frac{3}{4}$; Fig. 150, *Physalis minima*. $\times\frac{3}{4}$; Fig. 151, *Withamia somnifera*, $\times\frac{1}{4}$; Fig. 152, *Datura alba*, (*a*) flower-

long, ovate, acute, tapering to the base, sinuate-toothed, thin; petiole slightly less than or as long as the blade. Pedicel slender, nodding; corolla 1/4 in., lurid yellow, very shortly 5-lobed. Berry 1/3-1/2 in. in diameter, loosely enclosed within the much enlarged, membranous, 5–10-ribbed, reticulately veined calyx up to 1¼ in. long. (Fig. 150.)

A weed in cultivated fields. Flowers: March onwards.

P. peruviana *Linn.*; *Fl. Brit. Ind., IV, p.* 238. Plants stouter. Corolla 1/2 in. in diameter, with 5 large purple spots near the base within. Ripe berry yellow or amber-coloured; fruiting calyx 1-1¾ in. long, usually villous or pubescent.—*Cape goose-berry*; Vern., *Ras Bhari.*

A native of Central America, but cultivated throughout India for its fruits. Flowers during winter.

3. Withania *Pauq.*

Perennial herbs or shrubs, unarmed. Leaves alternate or in unequal pairs. Flowers in subsessile axillary umbellate cymes; calyx bell-shaped, 5-toothed; in fruit much enlarged, subglobose; corolla also bell-shaped; lobes 5, short, valvate; stamens attached near the base of the corolla; anthers oblong, dehiscing longitudinally. Ovary 2-celled; style linear; stigma shortly 2-fid. Berry globose. Seeds numerous, discoid.

W. somnifera *Dunal*; *Fl. Brit. Ind., IV, p.* 239. A perennial much branched herb, semi-shrubby at the base, densely covered with fine stellate hairs. Leaves 2–5 by 1-2 in., ovate ovate-oblong or ovate-lanceolate, entire, acute or obtuse, tapering to the base, thick; petiole up to 1 in. long. Flowers greenish or lurid yellow, in about 5-flowered cymes; pedicel 1/4 in. or less long; calyx (in flower) 1/5 in. long, tomentose; corolla 1/3 in. long, pubescent outside; lobes recurved at the apex; ovary glabrous; style as long as the stamens. Berry 1/4-1/3 in. in diameter; yellow or red when ripe; fruiting calyx 1/2 in. or more, enclosing the berry.—Vern., *Asgandh.* (Fig. 151.)

Abundant, especially in waste places. Flowers throughout the year. Various parts of the plant are used in medicine.

4. Lycium *Linn.*

Spinous shrubs. Leaves alternate or clustered at the nodes. Flowers solitary; calyx bell-shaped, 5- or less-lobed, not much enlarged in the fruit; corolla funnel-shaped; lobes 5-4, imbricate; stamens 5-4, on the corolla-tube; anthers almost included, dehiscing longitudinally; ovary 2-celled; style filiform; stigma sub-capitate. Berry small, sub-globose. Seeds many, compressed.

L. europæum *Linn.*; *Fl. Brit. Ind., IV, p.* 240. A nearly glabrous thorny shrub. Leaves usually small, 1/2-1 in. long, rarely large, up to

2½ by 1 in., subsessile or petioled, linear-oblong, oblanceolate or spathulate, entire, acute or rounded at the apex, tapering to the base. Flowers nearly white to pale-purple, on slender pedicels longer than the flowers ; calyx 1/8 in., often sub-bilabiate ; corolla 1/2 in. long ; tube somewhat curved ; lobes 1/4 to 1/3 the length of the tube, rounded. Berry 1/6 in. in diameter, yellow.

In dry places.
Flowers : June–November.

5. **Datura** *Linn.*

Annual strong smelling herbs. Leaves alternate, large. Flowers very large, solitary ; calyx tubular, 5-toothed at the apex, breaking transversely above the base in fruit ; corolla long, tubular-funnel-shaped ; limb recurved, shortly 5-lobed, plicate ; stamens 5, adnate to the base of the corolla-tube ; filaments filiform ; anthers included, longitudinally dehiscent ; ovary 2- or 4-celled by false septa ; style long, filiform ; stigma 2-lobed. Capsule rounded, covered with rigid spines all over, 4-valved or irregularly breaking up near the apex. Seeds numerous.

D. alba *Nees* (**D. fastuosa** *L., var.* **alba**) ; *Fl. Brit. Ind., IV, p.* 243. Stems up to 6 ft. high, herbaceous or woody below, finely pubescent. Leaves 3–10 in. long, ovate, acute or acuminate, entire or sinuate, unequal at the base, pubescent ; petiole long or short. Pedicel 1/2 in. long ; calyx 1¼-1½ in. long, deeply 5-toothed ; corolla 4-5 in. long, white. Capsule globose, equally spiny on all sides, suberect or nodding, 1¼ in. in diameter. (Fig. 152.)

In gardens and waste grounds near habitation.
Flowers : March–June.

6. **Nicotiana** *Linn.*

Erect viscid herbs. Leaves radical and alternate. Flowers in terminal or subterminal racemoid cymes ; calyx ovoid-tubular, segments 5 ; corolla tubular or funnel-shaped, 5-lobed ; stamens attached in the lower part of the corolla-tube ; filaments filiform ; anthers opening lengthwise ; ovary 2-celled ; style filiform ; stigma shortly 2-fid. Capsule 2-valved to the middle. Seeds numerous, small, hardly compressed.

N. plumbaginifolia *Viv.* ; *Fl. Brit. Ind., IV, p.* 246. An erect branched herb, up to 3 ft. high, viscidly pubescent all over. Leaves 3–7 by 1½–4½ in., radical larger than the cauline, sessile, elliptic-oblong, entire, usually wavy, acute, base narrowed, sub-amplexicaul. Cymes elongated ; flowers greenish or pinkish white ; pedicel 1/4–3/4 in. ; calyx about 1/2 in. long, cleft to the middle ; corolla 1½-1¾ in. long ; tube long and

narrow ; lobes small, only 1/3 inch. Capsule 3/8 by 1/4 in., ovoid-conical ; valves again splitting. (Fig. 153.)

A common introduced weed ; native of Mexico and the W. Indies. It first came to Bengal but has now spread all over Northern India from Assam to Punjab.

Flowers : February–June.

N. Tabacum *Linn.* and **N. rustica** *Linn.* ; *Fl. Brit. Ind., IV, p. 245.* These species yield tobacco and are commonly cultivated in fields.

Besides those mentioned above, following more Solanaceæ are commonly cultivated :—

1. **Lycopersicum esculentum** *Mill.*, the tomato plant.
2. **Capsicum annum** *Linn.*
3. **C. frutescens** *Linn.*

   These two species of *Capsicum* and their varieties include the various forms of chillies commonly cultivated in India. A key to the various forms is given in Duthie's ' Flora of the Upper Gangetic Plain '.

4. **Petunia nyctaginifera** *Juss.*
5. **P. violacea** *Lindl.*

   Both are natives of Argentina and are largely grown during winter in gardens throughout India for their showy flowers.

XLV. SCROPHULARIACEÆ.

Herbs and undershrubs. Leaves opposite, alternate or whorled, often lower opposite, upper alternate ; stipules 0. Inflorescence racemose or cymose, often spikate. Flowers bisexual, zygomorphic, hypogynous ; sepals 5, rarely 4, distinct or more or less connate, usually persistent ; corolla 4-5-lobed, more or less two lipped or spreading, variously imbricate ; stamens usually 4, sometimes 5 or 2, inserted on the corolla-tube and alternate with its lobes ; anthers often coherent, 2- rarely 1-celled ; disk annular or one-sided ; carpels 2, median, connate ; ovary superior, 2-celled, rarely unilocular ; ovules usually numerous, anatropous, on thick axile placentas ; style simple ; stigma capitate, 2-lobed. Fruit mostly a capsule, opening by 2, rarely 4, valves or pores. Seeds numerous and small or few and large, albuminous ; embryo straight or slightly curved.—*Genera about* 200, *species nearly* 2,500, *in all parts of the world.*

Key to the genera.

Leaves all alternate.

Stamens 5	..	..	..	1.	*Verbascum.*
Stamens 4	..	..	..	2.	*Celsia.*

Leaves all or at least the lower opposite.
  Stamens 4.
    Corolla distinctly 2-lipped.
      Corolla saccate, mouth closed .. 3. *Antirrhinum.*
      Corolla not saccate, mouth open .. 4. *Mazus.*
    Corolla not 2-lipped, 4-lobed .. .. 5. *Herpestis.*
Perfect stamens only 2.
    Calyx 5-lobed .. .. .. 6. *Bonnaya.*
    Calyx 4-lobed .. .. .. 7. *Veronica.*

1. **Verbascum** *Linn.*

Tall, erect, woolly herbs. Leaves alternate. Flowers nearly sessile, in simple spikes ; calyx 5-lobed ; corolla rotate ; tube very short ; lobes 5, broad, spreading ; stamens 5 ; style-top dilated ; stigma capitate. Capsule ovoid, septicidal, valves separating from the axis. Seeds numerous, wrinkled, not winged.

V. Thapsus *Linn.* ; *Fl. Brit. Ind., IV, p.* 250. A densely woolly stout herb, up to 5 ft. high. Stem usually unbranched, winged with prolonged leaf-bases. Leaves 4–18 in. long, ovate, oblanceolate or oblong-lanceolate, entire or crenate, obtuse, acute or acuminate, very decurrent, lower petioled, upper sessile. Spikes usually 6–12 in. long, sometimes up to 3 ft., densely woolly. Corolla yellow, 3/4-1 in. across, woolly outside ; filaments 3 short and bearded, 2 longer and glabrous. Capsule tomentose. (Fig. 154.)

Flowers : April–August.

2. **Celsia** *Linn.*

Annual herbs. Leaves radical and alternate. Flowers pedicellate, in simple or branched terminal racemes, often forming a large terminal panicle ; calyx deeply 5-cleft ; corolla rotate ; tube very short ; lobes 5, nearly equal, spreading ; stamens 4, nearly equal. Capsule globose, septicidally 2-valved, valves usually 2-fid. Seeds numerous, minute, transversely wrinkled, not winged.

C. coromandeliana *Vahl* ; *Fl. Brit. Ind., IV, p.* 251. An erect pubescent herb, 1½–3 ft. high. Radical leaves 2–6 in. long, crowded, petioled, often pinnately lobed ; cauline alternate, 1–3½ in. long, sessile or nearly so, oblong-ovate, passing into bracts ; all leaves dentate and hairy on both sides. Pedicel glandular-pubescent ; bracts leafy ; corolla yellow, 1/2 in. in diameter, lobes rounded ; filaments hairy. Capsule 1/3 inch. (Fig. 155.)

In comparatively moist waste places. Flowers : March–May.

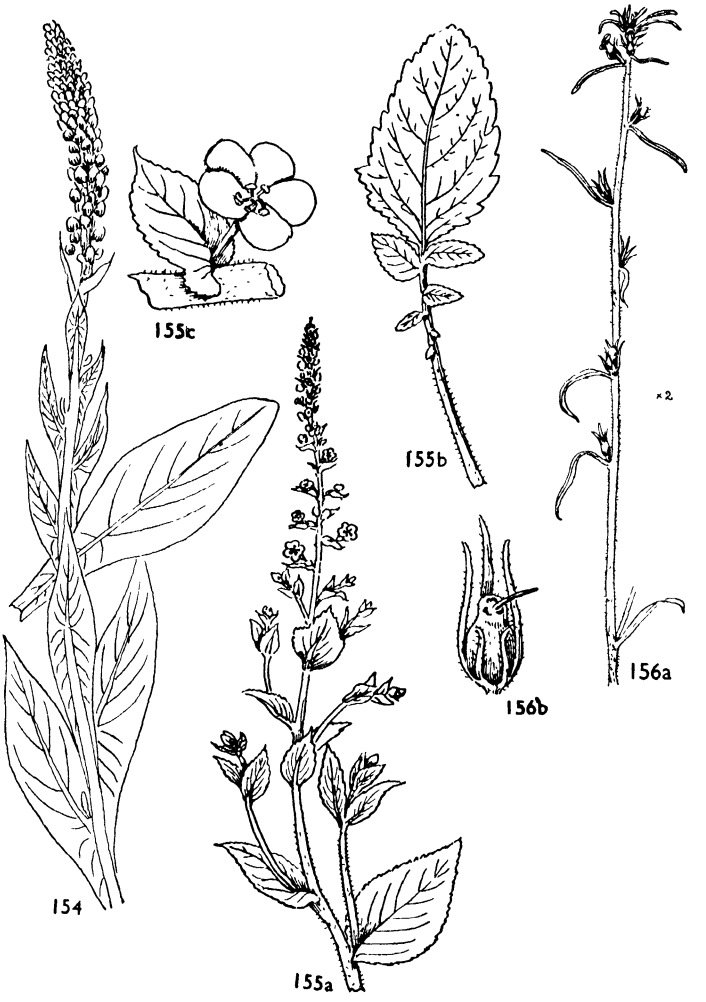


Fig. 154, *Verbascum Thapsus*, $\times \frac{1}{4}$; Fig 155, *Celsia coromandelina*, (*a*) flowering branch, $\times \frac{1}{4}$, (*c*) flower, $\times 1\frac{1}{2}$; Fig. 156, *Antirrhinum Orontium*, (*a*) (*b*) $\times \frac{1}{2}$, 1.

3. Antirrhinum *Linn.*

Annual or biennial herbs. Lower leaves opposite, upper alternate. Flowers solitary in the axil of the upper leaves or racemed; calyx 5-parted; corolla 2-lipped, compressed; upper lip erect, 2-lobed; lower spreading, 3-lobed; base saccate, closing the throat; stamens 4, in unequal pairs; anther-cells distinct, parallel; style simple; stigma 2-

lobed. Capsule ovoid, many-seeded, opening by pores at the top. Seeds oblong.

A. Orontium *Linn.*; *Fl. Brit. Ind., IV, p.* 253. A slender erect more or less hairy herb, 6–18 in. high, branched from the base. Leaves 1-2 in. long, linear or narrowly spathulate, entire, narrowed at the base. Flowers pale-pink, streaked with purple, nearly 1/2 in. long, nearly sessile; calyx-segments linear, spreading, longer than the corolla. Capsule 1/2 in. or slightly less, pubescent. (Fig. 156.)

In fields and along railway lines. Flowers in spring.

4. Mazus *Lour.*

Small herbs. Lower leaves opposite or forming a rosette, upper opposite or alternate. Flowers in terminal racemes; bracts very short; calyx bell-shaped, 5-lobed; corolla-bilabiate; tube short; upper lip erect, 2-lobed; lower much larger, spreading, 3-lobed; palate 2-ridged, mouth open; stamens 4, in unequal pairs, forming two arches; stigma 2-lobed. Capsule globose, included within the calyx, loculicidal; valves entire. Seeds numerous, very minute.

M. rugosus *Lour.*; *Fl. Brit. Ind., IV, p.* 259. A glabrous or sparsely hairy annual. Stems tufted. Radical leaves 1–3½ in. long, broadly spathulate, with petiole-like base; cauline leaves 1/2–1½ in., spathulate; all leaves irregularly toothed. Racemes many from the base, 3–10 in. long, simple or branched; calyx 1/4 in. long, lobes nearly as long as the tube; corolla 1/3-1/2 in. long, pale-blue or white, streaked with purple-blue. Capsule 1/5 in. in diameter. (Fig. 157.)

A very common weed of gardens and lawns.
Flowers: November–May.

5. Herpestis *Gaertn.*

Herbs. Leaves opposite. Flowers axillary, solitary; calyx 5-parted, segments unequal, posterior larger; corolla not markedly bilabiate; tube cylindric; limb spreading, lobes 4, nearly equal, upper outermost in bud, notched; stamens in unequal pairs, included; style dilated at the top; stigma 2-lobed. Capsule 2-grooved, 2- or 4-valved. Seeds numerous, very minute.

H. Monnieria *H.B. & K.*; *Fl. Brit. Ind., IV, p.* 212. A glabrous, creeping, much branched, somewhat succulent herb; branches 3–12 in. long, rooting at the nodes. Leaves 1/4–1 in. long, sessile, oblong-obovate or spathulate, entire, obtuse, veins obscure, lower surface gland-dotted. Flowers nearly 1/2 in. long and as much in diameter; pedicel usually

longer than the leaves ; corolla pale-blue with purple veins ; tube longer than calyx. Capsule ovoid, pointed, included within the calyx. (Fig. 158.)

In marshy places.

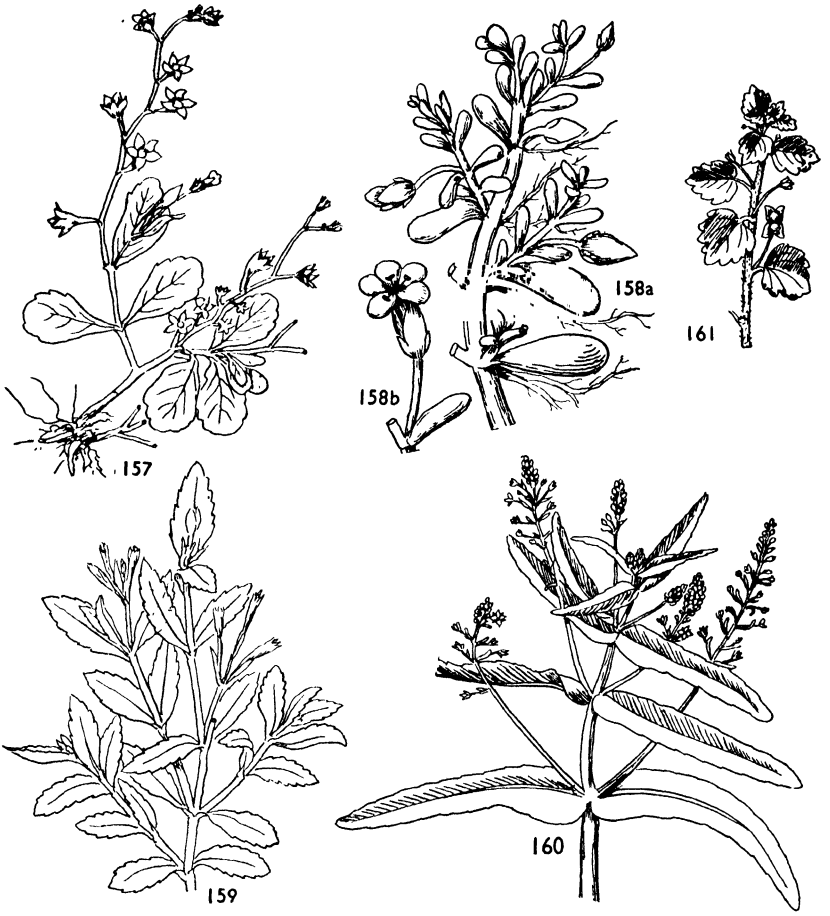


Fig. 157, *Mazus rugosus*, $\times \frac{2}{3}$; Fig. 158, *Herpestis Monnieria*, (*a*) branch, $\times 1\frac{1}{4}$, (*b*) flower, $\times 1\frac{1}{2}$; Fig. 159, *Bonnaya veronicaefolia*, $\times \frac{2}{3}$; Fig. 160, *Veronica Anagallis*, $\times \frac{1}{2}$; Fig. 161, *V. agrestis*, $\times \frac{2}{3}$.

6. Bonnaya *Link et Otto*

Annual, quite glabrous herbs. Leaves opposite. Flowers in terminal or leaf-opposed racemes ; bracteoles 0 ; calyx deeply cleft into 5 linear segments ; corolla bilabiate ; tube cylindric ; upper lip erect, broad, concave, 2-fid ; lower larger, spreading, 3-lobed ; stamens 2, lower only

perfect; upper pair reduced to staminodes; stigma 2-lobed. Capsule narrowly cylindrical, much longer than the calyx, septicidally 2-valved. Seeds numerous, wrinkled.

B. veronicæfolia *Spreng.*; *Fl. Brit. Ind., IV, p.* 285. A more or less prostrate branched herb, often rooting at the nodes; branches quadrangular. Leaves 1/2–1¼ in. long, oblong-lanceolate or obovate, distinctly toothed or the lower sub-entire, obscurely nerved. Corolla 1/4-1/3 in. long, violet, streaked with purple. Capsule about twice as long as the calyx. (Fig. 159.)

Flowers during the rains and winter.

7. Veronica *Linn.*

Herbs. Lower leaves opposite, upper often alternate, passing into bracts. Flowers axillary solitary or in terminal or axillary racemes, bracteate; bracteoles 0; calyx 4-partite; segments unequal; corolla-tube very short; lobes 4, spreading, unequal, upper and lower usually narrowest; stamens 2, exserted; ovules few in each cell; style simple, linear; stigma subcapitate. Capsule notched, opening by 2 valves. Seeds ovate or globose.

Key to the species.

Racemes axillary; leaves sessile, entire or nearly so	1. *V. Anagallis.*
Flowers solitary, axillary, forming terminal leafy racemes; leaves shortly stalked, toothed ..	2. *V. agrestis.*

1. **V. Anagallis** *Linn.*; *Fl. Brit. Ind., IV, p.* 293. An erect, nearly glabrous herb, 6–24 in. high. Stems succulent, hollow, often stoloniferous. Leaves mostly opposite, 2–6 in. long, sessile, narrowly or broadly lanceolate, entire or minutely serrate; base more or less stem-clasping. Flowers light pink, 1/6-1/3 in. in diameter, in lax axillary racemes; pedicel slender, filiform, up to 1/2 in. long, longer than the bracts. Capsule 1/8-1/6 in. long, compressed. (Fig. 160.)

Common in wet places. Flowers during winter, largely from January to April.

2. **V. agrestis** *Linn.*; *Fl. Brit. Ind., IV, p.* 294. A prostrate, pubescent, much branched annual herb; branches 6–12 in. long. Leaves lower opposite, upper alternate, passing into floral leaves, 1/3–1 in. long, shortly petioled, ovate or broadly so, toothed. Flowers in terminal racemes; bracts leafy; pedicel slender, drooping, nearly as long as the bracts; sepals 1/4 in. long, ovate, obtuse, ciliate; corolla 1/6–1/3 in. in

diameter, white, bluish or pinkish. Capsule 1/4 in. in diameter, halves globose. (Fig. 161.)

A common weed, appearing during winter in gardens and grassy plots.
Flowers : January–April.

XLVI. OROBANCHACEÆ.

Brownish root-parasites, never green, often with tuberous root-stock. Stem usually stout, simple or branched. Leaves alternate, scaly, often crowded near the base. Flowers bisexual, zygomorphic, bracteate, in racemes or spikes, hypogynous ; calyx 4-5-parted ; corolla-tube curved ; limb bilabiate or with 5 subequal lobes, upper lip often arched, lower 3-fid, throat with 2 villous folds ; stamens 4, in unequal pairs, inserted on the corolla-tube and alternate with the lobes ; anthers 1- or 2-celled, cells opening by slits or apical pores ; disk usually obscure ; ovary superior, 1-celled, with numerous ovules borne on 4 parietal placentas, which sometimes ultimately reach the centre of the ovary. Fruit a capsule, often enveloped by the calyx, usually opening by 2 valves. Seeds very numerous, small, albuminous, with a minute embryo.—*Genera* 11, *species about* 150, *in tropical, subtropical and temperate countries, chiefly S. Europe and E. Asia.*

Key to the genera.

Corolla-lobes broad, subequal, yellow ..	1. *Cistanche.*
Corolla bilabiate, blue, upper lip 2-lobed, lower 3-lobed	2. *Orobanche.*

1. Cistanche *Hoffm. & Link*

Flowers in dense spikes, subsessile ; bracteoles 2 ; calyx broadly tubular-campanulate ; lobes 5, subequal, obtuse ; corolla-tube long, incurved, dilated above ; limb spreading, oblique, lobes 5, broad, nearly equal ; stamens 4, sub-exserted ; ovary 1-celled, with 4 nearly equidistant placentas ; stigma broad. Capsule ovoid, laterally compressed, 2-valved to the base.

C. tubulosa *Wight* ; *Fl. Brit. Ind., IV, p.* 324. A glabrous or hairy, very stout, unbranched herb, 1–5 ft. high, and up to 3 in. thick ; scales 1/2–1½ in. long, lanceolate. Spikes 3–10 in. long ; bracts longer than the calyx, lanceolate ; bracteoles shorter and linear ; calyx 1/2-3/4 in. long ; lobes about ⅓ as long as the tube ; corolla yellow, 2-3 times as long as the calyx ; tube inflated ; mouth 3/4–1¼ in. in diameter ; lobes short, rounded, reflexed ; filaments hirsute below ; anthers woolly. Capsule 1 in. long, beaked.

Parasitic on many plants, *Calotropis, Sueda,* etc.
Flowers during winter.

2. Orobanche *Linn.*

Flowers in somewhat lax bracteate spikes; bracteoles 2; calyx bell-shaped, 4- or rarely 5-toothed; corolla-tube curved, dilated above, breaking off transversely at the base; limb 2-lipped; upper lip erect, 2-lobed; lower spreading, 3-lobed; stamens 4, included; ovary 1-celled; placentas 4, in pairs; stigma funnel-shaped, more or less 2-lobed. Capsule 2-valved, valves often cohering with the style.

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Fig. 162, *Orobanche indica*, $\times \frac{1}{3}$.

O. **indica** *Ham.*; *Fl. Brit. Ind., IV, p.* 326. A more or less hairy scapigerous herb, 4–18 in. high. Stem simple or branched from the base. Scales few, lanceolate. Flowers sessile or nearly so; bracts half as long as the corolla-tube; bracteoles filiform; calyx nearly 1/2 in. long, pubescent, teeth about 1/3 of the tube; corolla 3/4–1¼ in. long, pubescent, upper portion blue or lilac, lower whitish; tube almost funnel-shaped, constricted above the insertion of the stamens; anthers hairy. Capsule 1/3 in. long, oblong, narrow-pointed, glabrous. (Fig. 162.)

Parasitic on various cultivated plants, especially members of the *Cruciferæ* and *Solanaceæ*.

Flowers during winter.

XLVII. ACANTHACEÆ.

Herbs or shrubs, sometimes climbing. Leaves opposite, exstipulate. Flowers bisexual, zygomorphic, in cymes, racemes, spikes or panicles, rarely solitary, often with conspicuous bracts; bracteoles 2 or more; calyx 4-5-lobed or -parted; corolla 2-lipped or subequally 5-lobed; lobes imbricate or contorted; stamens 4, in unequal pairs, or 2, inserted on the corolla-tube and alternate with its lobes; filaments free or partially connate in pairs; anthers 2-celled or sometimes 1-celled by abortion; cells close together or separated, sometimes one much smaller than the other, opening lengthwise; disk present, often conspicuous; ovary superior, 2-celled; placentation axile; ovules 2 or more in each cell, often on hook-like processes (retinaculæ); style simple, linear; stigmas 2, often of unequal size, one minute or wanting. Fruit a capsule opening by 2 valves from the apex downwards. Seeds usually exalbuminous; embryo large.—*Genera about* 240, *species nearly* 2,000, *mostly tropical.*

Key to the genera.

Corolla subequally 5-lobed, stamens 4	..	1. *Ruellia.*
Corolla deeply 2-lipped, stamens 2 ..	..	2. *Peristrophe.*

1. Ruellia *Linn.*

Herbs or undershrubs. Flowers sessile or subsessile; bracteoles large; calyx 5-partite; teeth subequal, narrow, acute; corolla not bilabiate, limb subequally 5-lobed; stamens 4, in unequal pairs; anthers 2-celled; ovary elongated; ovules in each cell 3–10; style long, linear; stigma one missing, other simple, linear. Capsule clavate, base solid, seed-bearing upward. Seeds large, thinly discoid, margined, on large hooked retinaculæ.

R. **tuberosa** *Linn.*; *Sp. Pl.*, 635. An annual, erect or ascending herb, branching from the base; branches 1-2 ft. long. Leaves

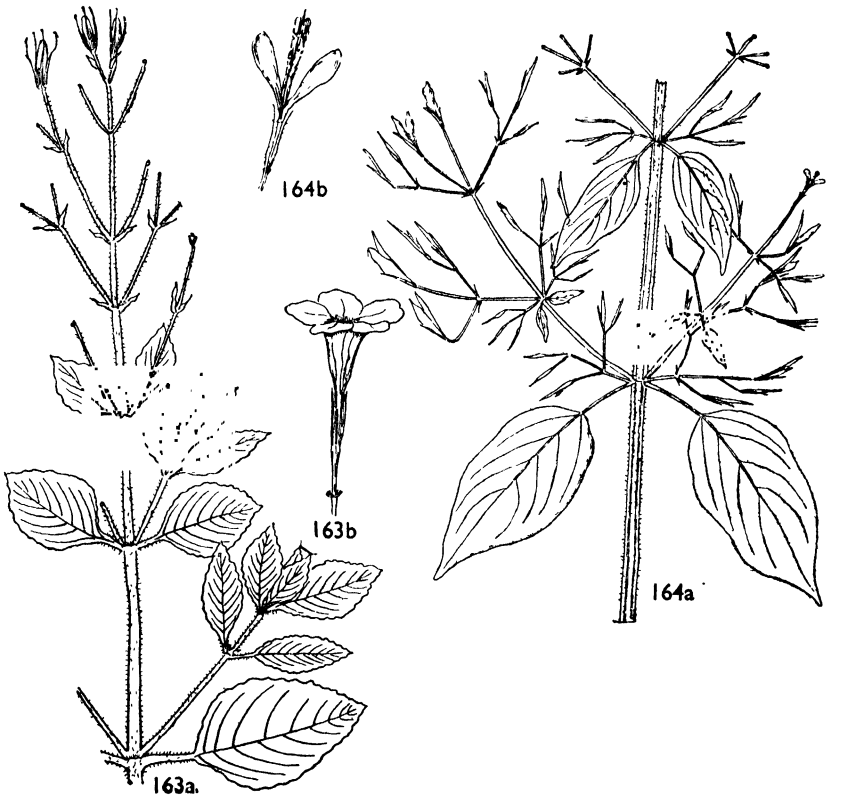

Fig. 163, *Ruellia tuberosa*, (*a*) branch, ×½, (*b*) flower, ×½; Fig. 164, *Pristrophe bicalyculata*, (*a*) flowering branch, ×½, (*b*) flower, ×½.

1½–3½ in. long, petioled, ovate or ovate-lanceolate, margin wavy and irregularly toothed, apex acute or acuminate, base acute ; petiole 1/3–1 in. long. Inflorescence a panicle of axillary dichasial cymes passing into monochasia ; floral leaves linear, 1/4-1/3 in. long ; pedicel short, up to 1/3 in. long ; calyx 2/3-3/4 in. long, pubescent ; corolla 1½ in. long, bluish pink ; tube funnel-shaped, curved ; anterior lobe 2-ridged. Capsule 2/3 in. long. (Fig. 163.)

A foreign plant, native of America.

Common in gardens, near moist places. Flowers : March–June.

2. Peristrophe *Nees*

Erect, spreading herbs. Flowers in axillary and terminal trichotomous cymes, forming large lax panicles ; bracts 1–4 together ; bracteoles 4 ; calyx deeply 5-lobed, segments equal, linear-lanceolate ; corolla-tube slender ; limb deeply 2-lipped, upper lip subentire, lower very shortly 3-lobed ; stamens 2 ; anthers 2-celled, one cell higher than the other ; ovary 4-ovuled ; style filiform, minutely bifid. Capsule ellipsoid, stalked. Seeds ovoid, compressed.

P. bicalyculata *Nees* ; *Fl. Brit. Ind., IV, p.* 554. A 2–4 ft. high, hairy, rough annual, much branched ; branches angular. Leaves 1–3 in. long, ovate, acuminate, entire, more hairy on the lower surface ; petiole 1/4-1/2 in. long. Bracts 2, unequal, opposite, longer than the calyx ; bracteoles 4, smaller ; calyx 1/8-1/6 in. long, margin ciliate ; corolla pink, 1/3-1/2 in. long, hairy outside ; anther-cells ovoid ; filaments pubescent below. Capsule 1/3 in. long, narrowed below into a stalk, pointed at the apex. (Fig. 164.)

Abundant on canal banks, river-side and in shady places in the gardens. The plants come out during the rains.

Flowers : September–April.

XLVIII. VERBENACEÆ.

Herbs, shrubs or trees ; young branches often quadrangular. Leaves opposite or whorled, simple or palmately or pinnately compound, exstipulate. Flowers bisexual, zygomorphic, in cymes, racemes or spikes, these often compound or paniculate ; calyx 4-5-lobed or -toothed, persistent ; corolla bilabiate or subequally 4- or 5-lobed ; stamens 4, rarely 2 or 5, epipetalous ; anthers 2-celled, opening lengthwise ; disk usually inconspicuous ; ovary superior, 2–8-celled, usually 4-celled, entire or 4-lobed ; ovules 1 or 2 in each cell. erect or rarely pendulous ; style terminal ; stigma usually entire. Fruit usually drupaceous, containing 4 or less one-seeded nutlets (pyrenes). Seeds exalbuminous or nearly

so ; embryo straight.—*Genera about* 70, *species nearly* 750, *tropical and sub-tropical.*

Key to the genera.

Flowers in long slender mostly terminal spikes ; erect herbs	1. *Verbena.*
Flowers in ovoid or cylindric pedunculate axillary heads ; a creeping herb	2. *Lippia.*
Flowers in axillary cymes ; an erect shrub ..	3. *Callicarpa.*

1. Verbena *Linn.*

Erect, pubescent herbs. Leaves opposite, toothed or pinnatifid. Flowers small, sessile, in simple or corymbose terminal spikes ; calyx tubular, shortly 5-toothed ; corolla tubular, obscurely 2-lipped, 5-lobed ; stamens 4, in unequal pairs, included ; ovary 4-lobed, 1- or 4-celled, 4-ovuled ; style short, obscurely 2-lobed. Fruit shorter than the calyx, dry ; pyrenes 4 or fewer.

Fig. 165, *Verbena officinalis*, $\times \frac{1}{2}$; Fig. 166, *V. bonariensis*, $\times \frac{1}{3}$.

Key to the species.

Flowers in lax elongated spikes, mostly more than 3 in. long .. .. .. 1. *V. officinalis.*
Flowers in dense spikes, not more than 1½ in. long 2. *V. bonariensis.*

1. **V. officinalis** *Linn.*; *Fl. Brit. Ind., IV, p.* 565. A perennial herb, more or less pubescent, 1–3 ft. high; stem quadrangular. Leaves 2–4 in. long; lower petioled, pinnatifid or coarsely toothed; upper sessile, 3-partite, or entire. Flowers pinkish, in long slender spikes, 3–10 in. long; calyx glandular-hairy; corolla hairy, tube nearly cylindric, twice as long as the calyx. (Fig. 165.)

In waste places and as a garden weed; common.
Flowers: March–June.

2. **V. bonariensis** *Linn.*; *Fl. Brit. Ind., IV, p.* 565. An erect, more or less woody, rough, hairy herb, about 3 ft. high; stem sharply quadrangular. Leaves 1½–4 by 1/2–1½ in., sessile, lanceolate or obovate, stem-clasping, sharply serrate, veins prominent on the under-side. Spikes short, dense, cylindric, 1/2–1¼ in. long, in closely packed terminal corymbs; the internode below the corymbs greatly elongated; flowers bluish purple; calyx ciliate on the outside, 1/8-1/6 in. long. Pyrenes half as long as the calyx. (Fig. 166.)

A native of Brazil, but now naturalized in various parts of India.

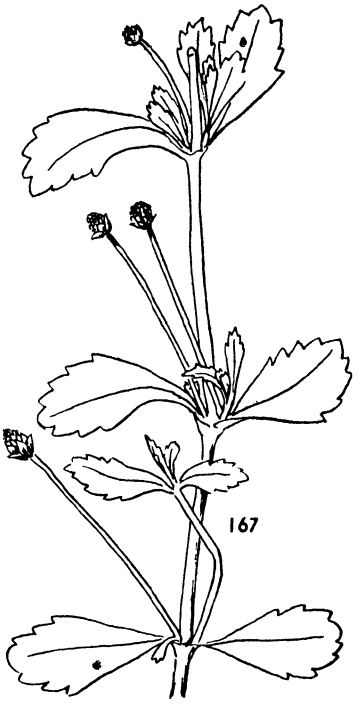

Fig. 167, *Lippia nodiflora*, ×⅔.

2. Lippia *Linn.*

Herbs. Flowers very small, sessile, in ovoid or cylindric peduncled axillary spikes; bracts exceeding the calyx, conspicuous; bracteoles 0; calyx small, membranous, 2-parted; corolla-tube cylindric; limb obscurely 2-lipped, upper lip bifid, lower 3-lobed; stamens 4, in unequal pairs; ovary 2-celled, 2-ovuled; style short; stigma subcapitate. Fruit dry, separating into 2 one-seeded pyrenes.

L. nodiflora *Rich.*; *Fl. Brit. Ind., IV, p.* 565. A prostrate widely creeping, much branched, perennial herb, rooting at the nodes, pubescent

or sometimes nearly glabrous. Leaves 3/4–1½ in. long, sessile or nearly so, obovate or spathulate, narrowed to the base, sharply toothed at the rounded apex. Peduncles 1–3 in. long, usually from the axil of one only of each pair of leaves; bracts 1/10 in. long; calyx 1/12 in. long, hairy outside, closely covering the fruit; corolla white or pink, 1/10-1/8 in. long. Fruit smaller than the calyx. (Fig. 167.)

Abundant, especially near moist places. Flowers throughout the year.

3. Callicarpa *Linn.*

Shrubs with opposite leaves. Flowers in axillary peduncled cymes, shorter than the leaves; bracts linear, inconspicuous; calyx bell-shaped, limb minutely 4-lobed; corolla tubular, tube short, limb 4-lobed, lobes nearly equal, spreading; stamens 4; ovary imperfectly 2-celled, cells 2-ovuled; style linear; stigma dilated, obscurely bifid. Fruit a small, succulent, globose drupe, containing 4 one-seeded pyrenes.

C. macrophylla *Vahl*; *Fl. Brit. Ind., IV, p.* 568. An erect shrub 4–8 ft. high; branches, petioles, under-surface of the leaves and inflorescence densely woolly-tomentose. Leaves 4–10 by 1–4 in., shortly petioled, lanceolate, acuminate, crenate, upper surface stellately pubescent or glabrescent. Flowers hardly 1/5 in. long, pink. Drupe 1/6 in. in diameter, white. (Fig. 168.)

Shalamar side. Flowers during winter.

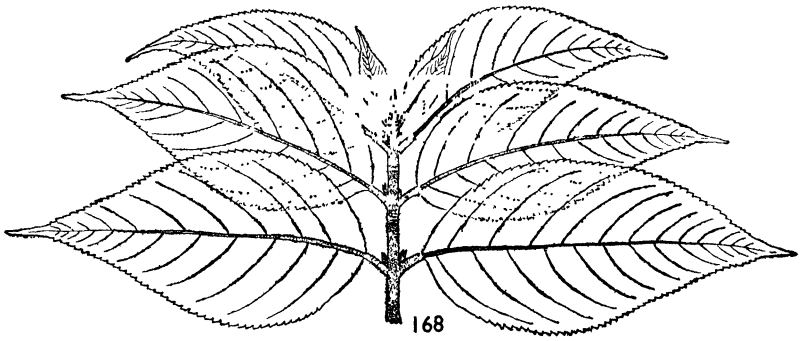

Fig. 168, *Callicarpa macrophylla*, ×½.

Several *Verbenaceæ* are commonly cultivated in the gardens.

1. **Duranta Plumieri** *Jacq.* A very common hedge plant, native of tropical America. Flowers through the greater part of the year. Flowers pinkish blue; stamens included.

2. **Clerodendron inerme** *Gaertn.* A seashore plant, but very commonly used for hedges and covering banks, walls, etc. Grows very quickly. Flowers white; stamens far exserted.

Flowers during summer.

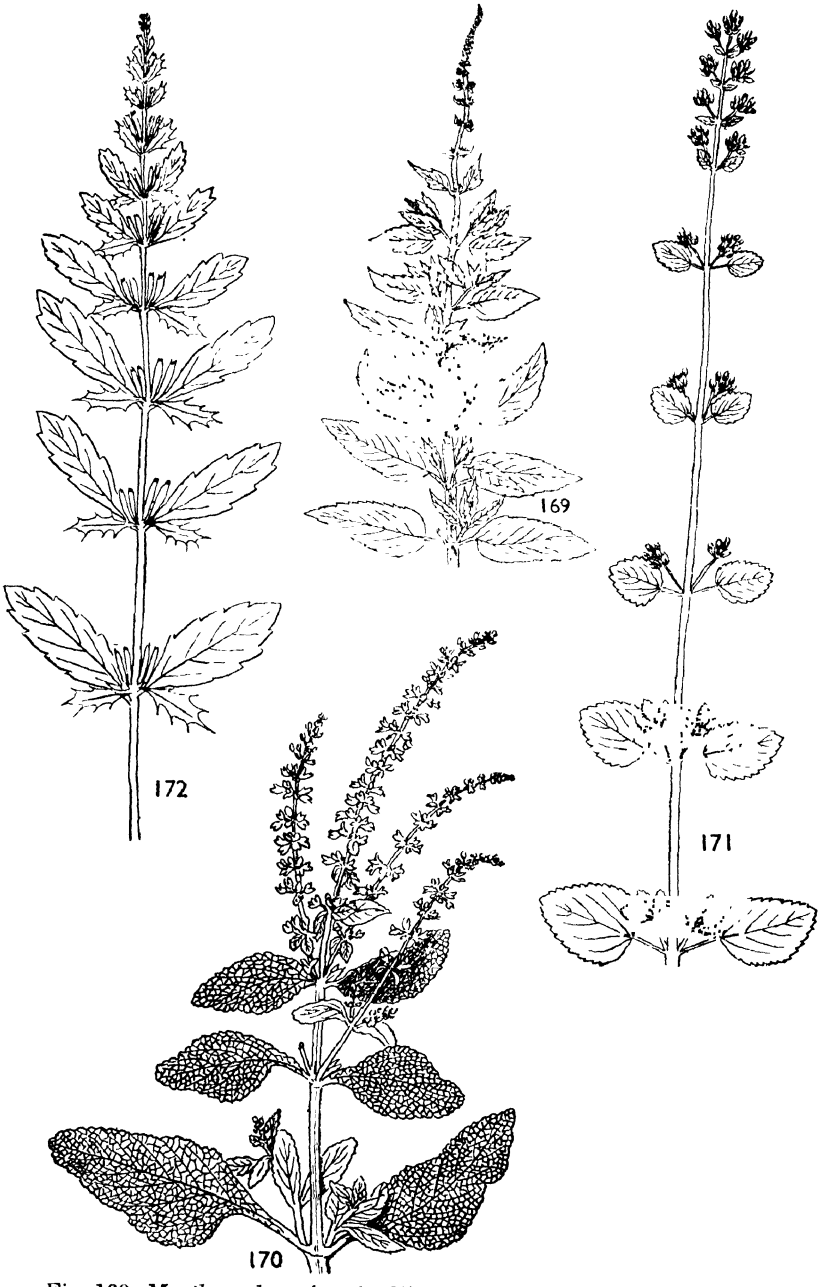

Fig. 169, *Mentha sylvestris* $\times \frac{1}{3}$; Fig. 170, *Salvia plebeia*, $\times \frac{1}{2}$; Fig. 171, *Nepeta ruderalis*, $\times \frac{1}{2}$; Fig. 172, *Lallemantia Royleana*, $\times \frac{1}{2}$.

XLIX. LABIATÆ.

Herbs, rarely shrubs, usually aromatic. Stem usually quadrangular. Leaves opposite, rarely whorled (not in the local species), simple, exstipulate. Flowers bisexual, zygomorphic, rarely almost regular, in opposite, few- or many-flowered, axillary cymes, hypogynous; calyx 4-5-lobed, often distinctly 2-lipped, persistent; corolla usually distinctly 2-lipped, upper lip erect and 2-lobed or notched, lower spreading and 3-lobed or rarely entire, rarely lip only one or the limb cleft into 4 or 5 subequal lobes; stamens 4, all equal or in unequal pairs, or 2, epipetalous; anthers 2-celled, opening lengthwise; cells in *Salvia* widely separated; disk present; ovary superior, of 2 deeply lobed carpels, 4-celled; ovules solitary in each cell, erect; style gynobasic (rising from between the 4 lobes); stigma usually 2-fid. Fruit of 4 one-seeded dry nutlets, included within the persistent calyx. Seeds exalbuminous, usually with straight embryo.—*A large order; genera about* 200, *species nearly* 3,000, *spread all over the world.*

Key to the genera.

Corolla not 2-lipped, subequally 4-lobed	1.	*Mentha.*
Corolla 2-lipped.		
Stamens 2	2.	*Salvia.*
Stamens 4.		
Bracts without awns; calyx 1/6 inch long	3.	*Nepeta.*
Bract-teeth with long-pointed awns; calyx 1/3 inch long	4.	*Lallemantia.*

1. Mentha *Linn.*

Strong-scented perennial herbs with a creeping root-stock. Flowers in large whorls, forming axillary and terminal spikes; calyx bell-shaped, 5-toothed; corolla subequally 4-lobed; stamens 4, equal, erect, protruding; anther-cells parallel; style-arms short.

M. sylvestris *Linn.*; *Fl. Brit. Ind., IV, p.* 647. An erect or diffuse hoary herb, 1–3 ft. high. Leaves 1–3 by 2/3–2 in., nearly sessile, lanceolate, ovate or oblong, serrate, acute, base rounded or cordate, upper surface hoary-pubescent, lower white-tomentose. Spikes cylindric, 1–3 by 1/3-1/2 in.; lower bracts leaf-like, upper smaller, lanceolate; pedicel hairy; calyx hairy, teeth triangular or lanceolate, acute; corolla lilac, about 1/8 in. in diameter, tube included in the calyx, hairy outside, glabrous within. Nutlets usually pale and smooth, sometimes brown and delicately reticulate. (Fig. 169.)

On canal banks.

M. piperata *Linn.* (peppermint) is commonly grown in vegetable gardens. Vern., *Pudina.*

2. Salvia *Linn.*

Herbs. Flowers in small whorls forming erect panicled racemes ; calyx bell-shaped, 2-lipped, upper lip entire, lower 2-fid, throat naked ; corolla 2-lipped, upper lip erect, entire, lower 3-lobed, lateral lobes spreading ; stamens 2 perfect ; filaments short ; anther-cells widely separated by the much elongated, slender, curved connective ; upper cell perfect, enclosed within the upper lip of the corolla ; lower imperfect ; disk usually enlarged in front ; style bifid. Nutlets triquetrous, smooth.

S. plebeia *R. Br.* ; *Fl. Brit. Ind., IV, p.* 655. A roughly pubescent erect herb, 6–24 in. high, fastigiately branched. Leaves 1–6 in. long, petioled, broadly lanceolate or ovate, obtuse or sub-acute, crenate, base rounded or acute, often decurrent ; petiole 1/2–3 in. long ; size of the leaves and their petioles decreasing from below upwards. Racemes spikate, slender ; bracts lower leaf-like, upper small and lanceolate ; flowers hardly 1/4 in., bluish ; corolla-tube with a ring of hairs inside. Nutlets brown when ripe. (Fig. 170.)

Common, especially near moist places.
Flowers : March–June.

3. Nepeta *Linn.*

Erect or prostrate herbs. Flowers in axillary or terminal whorls ; calyx tubular, 15-ribbed, equally 5-toothed, or 2 lower teeth narrower ; corolla bilabiate, tube not annulate within, throat inflated ; upper lip straight, notched ; lower 3-fid, midlobe largest ; stamens 4, ascending under the upper lip, posterior pair longer than the anterior ; style-lobes subulate.

N. ruderalis *Buch.-Ham.* ; *Fl. Brit. Ind., IV, p.* 661. A pubescent, erect or more or less prostrate annual herb, branching from the base, 6–28 in. high. Leaves 1/2–2½ in. long, long-petioled, rounded, cordate or truncate at the base, crenate, obtuse, green or hoary. Flower whorls distant, unilateral, in interrupted spikes, villous and at least the lower ones distinctly pedunculate. Flowers pedicellate, 1/4 in. long ; calyx hairy, teeth subequal, 3 posterior triangular, 2 anterior filiform ; corolla purplish, pubescent, slightly longer than the calyx. (Fig. 171.)

Flowers during the cold season.

4. Lallemantia *Fisch. & Mey.*

Erect or prostrate herbs. Flowers in numerous whorls, forming long narrow interrupted spikes ; calyx tubular, 15-nerved, 2-lipped, upper lip with 3 obtuse lobes of which the lateral are placed under the central, lower of 2 acute lobes ; corolla bilabiate, tube not annulate within ;

upper lip erect, notched ; lower spreading, 3-lobed, midlobe largest ; stamens 4, ascending under the upper lip ; style-lobes subulate.

L. Royleana *Benth.* ; *Fl. Brit. Ind., IV, p.* 667. An annual, hoary-pubescent or glabrescent herb ; stems 6–18 in. long. Leaves 1/2–2½ in. long, petioled up to 1 in., elliptic or ovate, large-toothed, base cordate or narrowed into the petiole. Flowers shortly pedicellate ; bracts about 1/2 in. long, oblong or lanceolate, toothed, teeth awned ; calyx 1/3 in. long, teeth erect with incurved margins ; corolla pale-lilac, slightly longer than the calyx, limb small. Nutlets 1/10 inch. (Fig. 172.)

L. PLANTAGINACEÆ.

For description see the description of the genus *Plantago*. The two other genera of the family are monotypic, not very important and unrepresented in India.

Plantago *Linn.*

Herbs. Leaves radical, alternate or opposite. Flowers on axillary scapes, small, greenish, spicate, often dimorphic, bisexual, hypogynous ; sepals 4, persistent ; corolla salver-shaped, 4-lobed, scarious ; stamens 4, epipetalous ; filaments very fine, persistent ; anthers large, pendulous, versatile ; ovary superior, 2–4-celled, ovules 1 or more in each cell ; style filiform, with 2 lines of stigmatic hairs. Capsule 1–4-celled, dehiscing transversely, membranous, 1- or more-seeded. Seeds usually peltate, albuminous ; testa thin, mucilaginous ; embryo cylindric.

Key to the species.

Leaves all radical or alternate.		
Corolla lobes hirsute	1.	*P. ciliata.*
Corolla glabrous.		
Lobes ovate, acute	2.	*P. amplexicaulis.*
Lobes rounded, obtuse or apiculate ..	3.	*P. ovata.*
Stem with opposite leaves	4.	*P. pumila.*

1. **P. ciliata** *Desf.* ; *Fl. Brit. Ind., IV, p.* 707. A densely woolly or silky, annual or perennial herb. Stem 0 or very short. Leaves 1–6 in. long, long- or short-petioled, oblanceolate, acuminate. Scapes numerous, longer or shorter than the leaves ; spikes 1-2 in. long, oblong or cylindric ; bracts ovate, obtuse, membranous, green on the back, villous ; sepals membranous, villous ; corolla-lobes acuminate, hirsute. Capsule 2-celled, cells 1-seeded. Seeds boat-shaped. (Fig. 173.)

2. **P. amplexicaulis** *Cav.* ; *Fl. Brit. Ind., IV, p.* 706. A sparsely hairy or glabrate, annual or perennial herb. Stem 0 or branched from

the base, branches 2–5 in. long. Leaves 2½–6 in. long, narrowly lanceolate, sheathing at the base, finely acuminate, entire or sparingly toothed, 5-nerved. Scapes numerous, as long as or longer than the leaves, glabrous; spikes 1/2–1½ in. long, ovoid; bracts cupular, glabrous, membranous except for the green midrib. Flowers 1/4-1/3 in. long; sepals rounded, outer with a green keel, inner all membranous; corolla-lobes ovate, acute. Capsule 2-celled, cells 1-2-seeded. Seeds 1/6 in., boat-shaped. (Fig. 174.)

Flowers during spring.

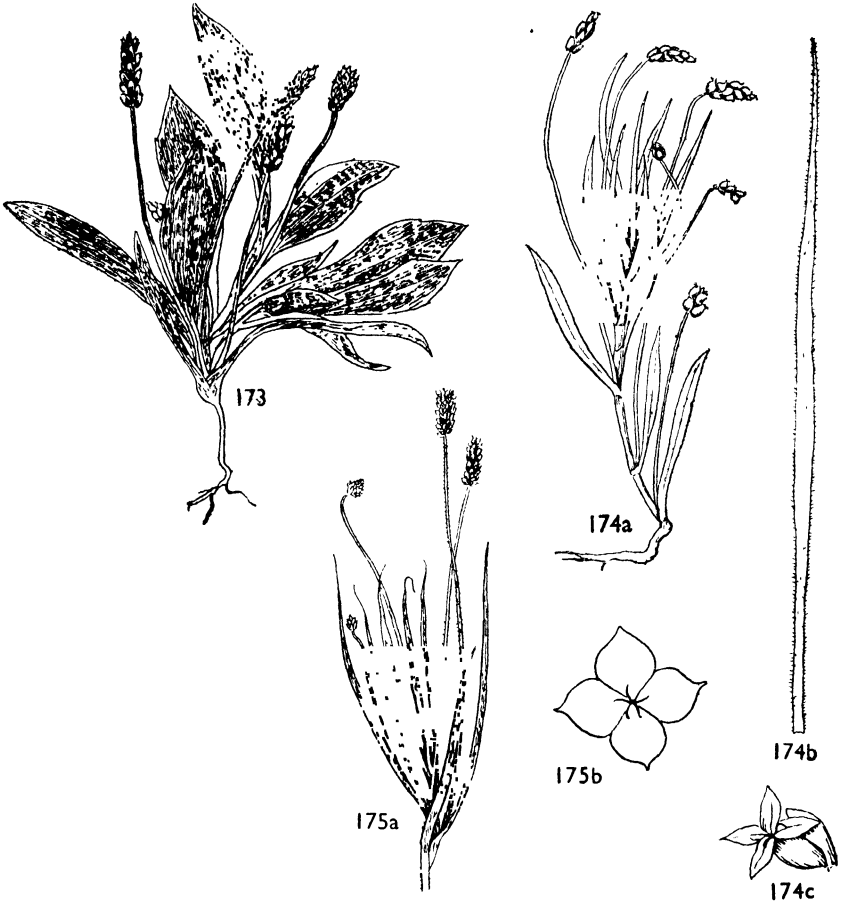

Fig. 173, *Plantago ciliata*, ×½; Fig. 174, *P. amplexicaulis*, (*a*) a fruiting plant, ×½, (*b*) lower leaf, ×½, (*c*) flower, ×3; Fig. 175, *P. ovata*, (*a*) plant, ×4, (*b*) flower, front view showing the corolla lobes, ×3.

3. **P. ovata** *Forsk.*; *Fl. Brit. Ind., IV, p.* 707. A sparsely or thickly villous annual, 3–12 in. high. Stem mostly 0, branched when rarely

present. Leaves 3–9 in. long, filiform, linear or narrowly lanceolate, finely acuminate, entire or distantly toothed, usually 3-nerved. Scapes numerous, longer or shorter than the leaves, glabrous or pubescent; spikes 1/2–2 in. long, ovoid or cylindric; bracts ovate-oblong, obtuse, glabrous, with broad scarious margins. Flowers 1/4 in. long; sepals all nearly alike, glabrous or pubescent; corolla-lobes rounded, concave, obtuse or apiculate. Capsule 2-celled, cells 1-seeded. Seeds boat-shaped.—Vern., *Isabgol.* (Fig. 175.)

The seeds yield, when boiled, a large amount of tasteless mucilage which is used medicinally.

Flowers: March–May.

4. **P. pumila** *Willd.*; *Fl. Brit. Ind., IV, p.* 707. A glabrous or puberulous, erect or ascending herb. Leaves 1½–2½ in. long, opposite, filiform, revolute. Peduncles in the axil of the upper leaves, 2–4 in. long, flexuous; spikes 1/3-1/2 in. long, ovoid or subglobose; bracts all longer than the calyx, as long as the spikes, filiform. Flowers very small; corolla-lobes finely acuminate.

Cultivated. Flowers during spring.

LI. NYCTAGINACEÆ.

Herbs or shrubs. Leaves opposite or alternate, simple, exstipulate. Flowers arranged in various ways, usually cymose, often surrounded by brightly coloured bracts, mostly bisexual, sometimes unisexual, hypogynous; perianth tubular, contracted above the ovary, petaloid; limb usually 3–5-lobed, plicate, falling off after flowering; tube persistent, enveloping the fruit; stamens 1 to many, free or united at the base, inflexed in bud; anthers 2-celled, opening lengthwise; filaments often unequal; ovary superior, 1-celled; ovule 1, erect; style slender. Fruit indehiscent, enclosed in the hardened perianth-tube. Seed albuminous; embryo curved or coiled; cotyledons folded.—*Genera about* 25, *species* 250, *tropical and sub-tropical, chiefly American.*

Boerhaavia *Linn.*

Herbs. Leaves opposite. Flowers small, in paniculate umbels or heads, jointed on the pedicel; perianth-tube slender; limb funnel-shaped, 5-lobed; stamens 1–5, exserted; ovary stalked; stigma peltate. Fruit small, enclosed in the glandular perianth-tube. Cotyledons broad, thin.

B. diffusa *Linn.*; *Fl. Brit. Ind., IV, p.* 709. A prostrate or ascending, diffusely branched herb, pubescent or nearly glabrous; root fusiform,

stout; root-stock woody; branches 6–24 in. long. Leaves 1/2–2½ by 1/2–1¼ in., petioled up to 1 in., in unequal pairs, ovate or broadly so; base cordate or rounded; margin entire, usually undulate; apex mostly obtuse; upper surface green, lower often silvery white. Flowers minute, bracteate, in small umbels at the end of long slender axillary peduncles, usually forming loose terminal panicles; perianth pink, glandular-viscid outside, lobes bifid; stamens 1–3, slightly exserted. Fruit 1/8 in. long, shortly clavate, 5-ribbed. (Fig. 176.)

Fig. 176, *Boerhaavia diffusa*, ×½.

Common, especially in dry places. Flowers practically throughout the year.

Among the *Nyctaginaceæ* commonly cultivated at Lahore are:

Mirabilis Jalapa *Linn.*, the 'Marvel of Peru' or the 'Four-o'clock' plant. It bears red, white, yellow or variegated flowers in large numbers.—Vern., *Gul abbás*.

Bougainvillea. Several species, *B. glabra* Choisy, *B. spectabilis* Willd., etc. are commonly cultivated.

LII. ILLECEBERACEÆ.

Herbs or undershrubs. Leaves mostly opposite, simple, often connate at the base; stipules usually scarious. Flowers small, green or white, often with scarious bracts, bisexual, regular; calyx 4-5-lobed or -partite, persistent, lobes imbricate; petals 0 or represented by small staminodes; stamens as many as and opposite the calyx-lobes, rarely fewer or more, mostly perigynous; filaments free or connate at the base; anthers 2-celled; ovule mostly erect or pendulous from a basal funicle; style 1, terminal, or 2-3. Fruit an indehiscent nut, 1-seeded, enclosed by the calyx. Seeds albuminous; embryo straight, curved or annular.—*Genera about* 17, *species nearly* 75, *widely spread, inhabitants of dry arid regions.*

Herniaria *Linn.*

Small tufted prostrate herbs. Leaves opposite. Flowers minute, in green axillary clusters; calyx 4-5-parted; petals 0; disk annular; stamens 4-5; staminodes present or 0; ovule erect; style 2-fid. Seed sub-globose or reniform; embryo annular.

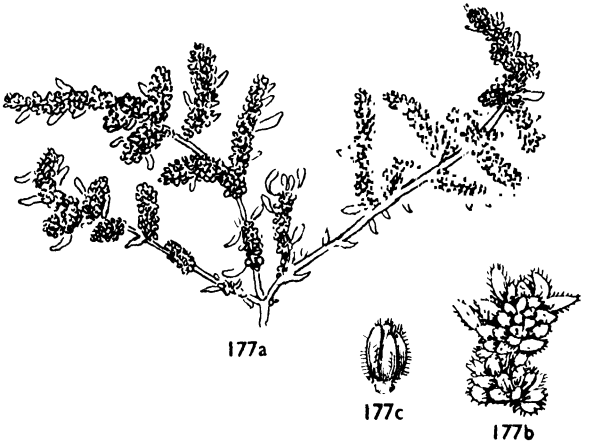

Fig. 177, *Herniaria hirsulta*, (*a*) a large branch, ×1, (*b*) portion of a branch, ×2, (*c*) flower, ×6.

H. hirsuta *Linn.*; *Fl. Brit. Ind.*, *IV*, *p.* 712. A prostrate perennial herb, covered with long rather stiff appressed hairs, profusely branched from the base; branches 2–8 in. long. Leaves very small, 1/10-1/3 in. long, shortly petioled, narrowly ovate or lanceolate, acute or obtuse, entire; stipules scarious. Flowers hardly 1/10 in. long; calyx green, hairy outside, smooth within, 5-parted; stamens 5, shorter than the calyx, alternate with 5 staminodes; style very short; stigmas subsessile. Capsule 1/15 in. (Fig. 177.)

Flowers during spring and early summer.

LIII. AMARANTACEÆ.

Herbs or shrubs, sometimes climbing. Leaves alternate or opposite, simple, exstipulate. Flowers monochlamydeous, usually bisexual and regular, sometimes monoecious or polygamous, small, borne in spikes, heads, racemes or panicles; bracts and bracteoles usually scarious, the latter sometimes hooked; sepals 3–5, almost or nearly free, imbricate, mostly dry and membranous, persistent; stamens mostly as many as the sepals, or rarely fewer, hypogynous, opposite the sepals, very often united at the base into a short tube; staminodes often present in between the stamens; anthers 1- or 2-celled, opening lengthwise; ovary superior, 1-celled, with a single basal or rarely more ovules; style short or long, ending in a capitate or 2-3-fid stigma. Fruit indehiscent, or dehiscing irregularly or by a transverse lid, mostly one- sometimes more-seeded. Seeds usually with a shining crustaceous testa and an annular embryo

surrounding a starchy perisperm.—*Genera about* 75, *species nearly* 700, *mostly inhabiting tropical and sub-tropical regions.*

Key to the genera.

Leaves alternate.
- Densely tomentose, hoary undershrub .. 3. *Aerua.*
- Plants without dense tomentum, green.
  - Flowers bisexual and with conspicuous pink calyx .. .. .. 2. *Digera.*
  - Flowers monoecious or polygamous; calyx inconspicuous .. .. .. 1. *Amarantus.*

Leaves opposite.
- Flowers in elongated spinescent spikes.
  - Flowers all perfect, deflexed, and with fimbriate staminodes .. .. 5. *Achyranthes.*
  - Flowers not all perfect, imperfect ones reduced to hooked awns; without staminodes .. .. .. 4. *Pupalia.*
- Flowers in globose axillary spikes without spines .. .. .. 6. *Alternanthera.*

1. Amarantus *Linn.*

Annuals. Leaves alternate. Flowers monoecious or polygamous, in axillary or in panicled, erect or drooping, densely or laxly spiked clusters; sepals 3–5, ovate-oblong, linear-lanceolate or aristate; stamens 3–5, free; anthers 2-celled; staminodes 0; ovary compressed; style short or 0; stigmas 2-3, filiform or subulate; ovule 1, erect. Utricle compressed, indehiscent or opening by a transverse lid; tip entire or 2-3-toothed. Seeds orbicular.

Key to the species.

Stamens 5; sepals 5.
- Leaf axils armed with spines .. .. 1. *A. spinosus.*
- Leaf axils without spines .. .. 2. *A. paniculatus.*

Stamens 3; sepals 3.
- Fruit with an acute apex, wrinkled; an erect herb; flowers both in axillary clusters and in terminal spikes .. .. .. 3. *A. viridis.*
- Fruit orbicular, membranous; a prostrate herb with 2-lobed leaves and flowers only in axillary clusters .. .. .. 4. *A. blitum.*
- Fruit ovoid, wrinkled; leaves mostly obtuse; flowers all in axillary clusters .. .. 5. *A. polygamus.*

1. **A. spinosus** *Linn.*; *Fl. Brit. Ind., IV, p.* 718. An erect glabrous herb, 1–3 ft. high, armed with sharp axillary spines up to 1 in. long. Stem terete, glabrous, hard, green or tinged with red. Leaves 1–4 in. long, lanceolate, ovate or rhomboid, long-petioled, obtuse or retuse, base cuneate, margin crisped or wavy. Flowers in axillary clusters, or on axillary or terminal lax- or dense-flowered spikes, green, sessile; bracts exceeding the sepals, setaceous; sepals 5, with a green midrib and scarious margins, of male flowers 1/10 in. long, acuminate, of female smaller, obtuse, apiculate; stamens 5. Utricle about 1/15 in. long, ovoid, wrinkled, with a thickened top; styles 2 or rarely 3, spreading. Seeds black, shining, without a thickened border.—Vern., *Chulai.* (Fig. 179.)

Very common in waste grounds and cultivated fields; almost throughout the year, but mostly after the rains. The leaves are eaten. Ash of the plant is used in dyeing.

2. **A. paniculatus** *Linn.*; *Fl. Brit. Ind., IV, p.* 718. A tall robust annual, 2–6 ft. or more high, much branched. Stem often 1 in. or more in diameter at the base, grooved, often with red striations, glabrous or puberulous. Leaves 2–6 in. long and 1–3 in. broad, elliptic- or ovate-lanceolate, acute or acuminate, minutely dotted beneath, base cuneate, main secondary nerves prominent beneath, fine on the upper surface; petiole 1–4 in. long. Flowers in dense, many-flowered, sub-squarrose, red, green or golden-coloured, sub-erect spikes, the whole forming a thyrsoid panicle of which the central spike is the largest, reaching 4 in. or more; bracts much longer than the sepals, acicular, recurved; sepals 5, 1/10-1/8 in. long, oblong-lanceolate, sharply acuminate; stamens 5. Fruit 1/8 in. long, ovoid, narrowed towards the apex; styles usually 3, short. Seeds yellowish-white with a thickened rounded border or pitchy black with a narrow thin border.

Cultivated sometimes as a cold season crop within the area or occurs as an escape. It is more regularly cultivated in the Himalayas, where it forms a very handsome crop during autumn.

3. **A. viridis** *Linn.*; *Fl. Brit. Ind., IV, p.* 720. A slender annual glabrous herb, 1-2 ft. high, erect or sometimes prostrate below, usually much branched. Stem grooved, striate, usually pinkish. Leaves 1–3½ in. long, ovate, obtuse or retuse, base broadly cuneate, margin often crisped; petiole nearly as long as the blade. Flower-clusters pale-green, small, in axillary and terminal panicled lax slender spikes up to 5 in. long; bracts shorter than the sepals, ovate-oblong or oblanceolate, acute, hyaline and with a green keel; sepals 3, about 1/15-1/20 in. long, quite awnless, otherwise similar to the bracts; stamens 3. Fruit indehiscent,

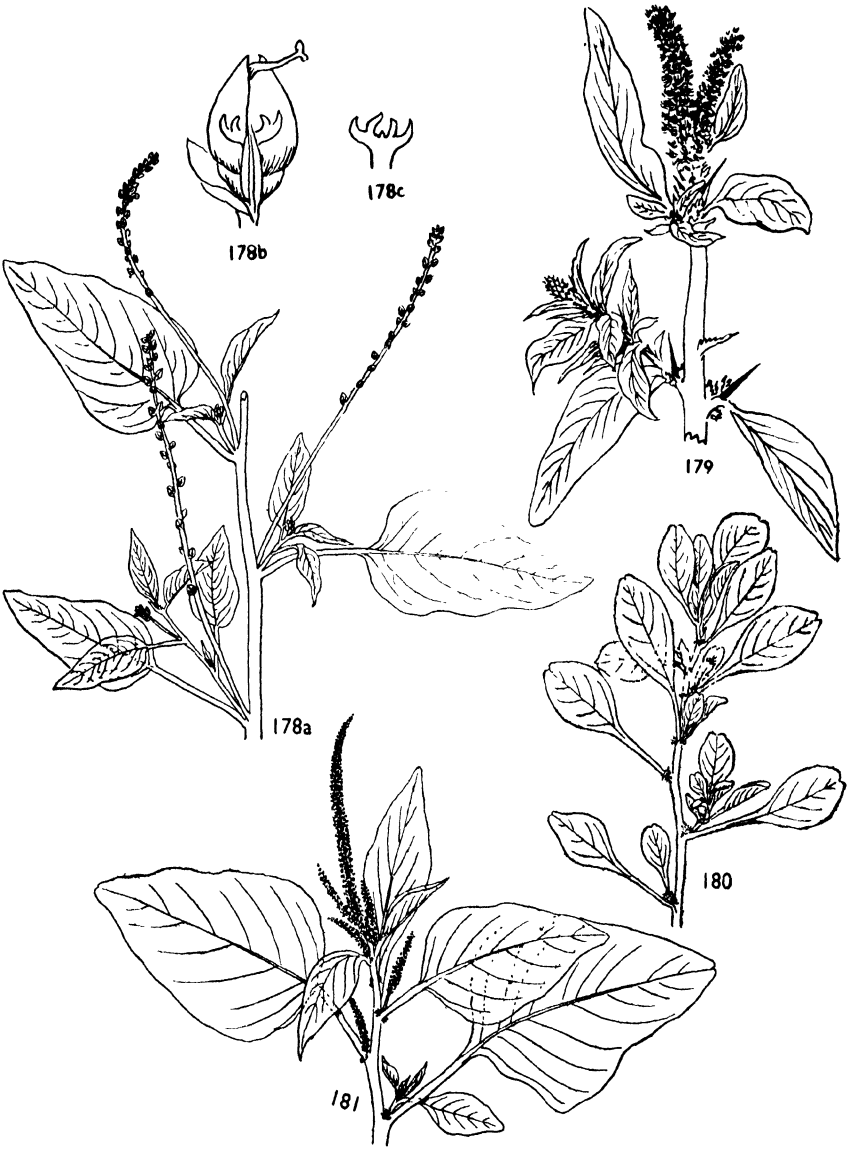

Fig. 178, *Digera arvensis*, (*a*) flowering twig, $\times \frac{1}{2}$, (*b*) flower, $\times 5$, (*c*) scale bud in the axil of the bracteole, $\times 5$; Fig. 179, *Amarantus spinosus*, $\times 1$; Fig. 180, *A. blitum*, $\times \frac{1}{2}$; Fig. 181, *A. viridis*, $\times \frac{1}{2}$.

acute, markedly wrinkled; styles 2 or 3. Seeds pitchy black, border obtuse. (Fig. 181.)

A common weed of fields and gardens. Abundant almost throughout the year.

4. **A. blitum** *Linn.*; *Fl. Brit. Ind., IV, p.* 721. A decumbent or procumbent annual herb; part of the stem often leafless. Leaves small, mostly 1/2–1½ in. long, ovate to elliptic-lanceolate, dotted, obtuse, retuse or emarginate, base acute; petiole usually half as long as the blade. Flowers in axillary clusters; bracts nearly as long as the sepals; sepals 3, about 1/15 in. long, linear-lanceolate or oblong, acute or obtuse and apiculate, hyaline; stamens 3. Fruit dehiscent, globose, with short obtusely conical tip, membranous. Seeds rounded, deep red or shining black, border acute. (Fig. 180.)

A weed; sometimes used as a pot-herb.

Var. **oleracea**; *Fl. Brit. Ind., IV, p.* 721. Tall, erect, succulent. Leaf-blades 1–2½ in. long, ovate-oblong or rounded; petiole nearly as long. Flower-clusters axillary and in terminal, simple or branched spikes. Fruit indehiscent.—Vern., *Sil.*

Cultivated for the sake of its grain, which is eaten either with milk or made into ladús (sweetmeat balls). The leaves are also sometimes used as a pot-herb.

5. **A. polygamus** *Linn.*; *Fl. Brit. Ind., IV, p.* 721. A small annual glabrous herb; branches many, 4–8 in. long, prostrate or ascending. Stem striate. Leaves small, 1/3–1 in. long, obovate or oblanceolate, obtuse, rarely retuse or emarginate, often rigid and apiculate, base cuneate, dotted beneath or not, secondary nerves 5-6; petiole 1/8-1/2 in. long. Flowers in axillary clusters only; bracteoles shorter than the sepals, lanceolate-oblong, acuminate, membranous, midrib prominent; sepals 3, 1/20-1/15 in. long, shortly acuminate; stamens 3. Fruit nearly as long as the sepals, ovoid, tapering upwards, much wrinkled, circumscissile or indehiscent; styles 3, distinct. Seeds lenticular, black and shining.

Abundant throughout India and Ceylon and in all tropical and sub-tropical countries.

2. Digera *Forsk.*

Leaves alternate. Flowers bisexual, spicate; bracteoles with crested scales in their axils; sepals 5, oblong; outer larger, 5–9-nerved; inner 1–4-nerved; stamens 5, free; anthers 2-celled; staminodes 0; ovary oblong, truncate; style filiform; stigmas 2, recurved; ovule 1, erect. Nut subglobose. Seeds globose, erect.

D. arvensis *Forsk.*; *Fl. Brit. Ind., IV, p.* 717. Glabrous or very sparsely hairy annual herb, 6–24 in. high. Leaves very variable in shape, membranous; blade 1/2–2½ in. long, mostly ovate, acute or acuminate, entire or irregularly toothed; base rounded or acute; petiole up to 2 in. or rarely more long. Spikes 1–4 in. long, axillary; bracts persistent

Fig. 182, *Aerua javanica*, (*a*), (*b*) branches, $\times \frac{1}{2}$; Fig. 183, *Achyranthes aspera*, $\times \frac{1}{2}$; Fig. 184, *Pupalia lappacea*, (*a*) flowering branch, $\times \frac{1}{2}$, (*b*) cluster of fruits, $\times 2$;

after the falling of the fruits; flowers 1/8 in. long, pinkish. Seeds pale. (Fig. 178.)

A weed of the rainy season. Flowers: August-September.

3. Aerua *Forsk.*

Woolly herbs or undershrubs. Leaves alternate or opposite. Flowers small, bisexual or polygamous, in solitary or panicled spikes; sepals 4-5, membranous; stamens 4-5, connate below with interposed linear staminodes into a cup; anthers 2-celled; ovary ovoid or subglobose; style long or short; stigma capitellate or 2-fid; ovule 1, pendulous from a long basal funicle. Utricle indehiscent or opening by a transverse lid.

A. javanica *Juss.*; *Fl. Brit. Ind.*, *IV*, *p.* 727. A hoary-tomentose undershrub, 2-3 ft. high. Leaves alternate, 1–4 in. long, sessile or shortly petioled, linear to oblanceolate, sometimes almost oblong, acute, obtuse or retuse, flat or margins recurved. Spikes 1/2–3 in. long, sessile, globose or cylindric, densely woolly, panicled. Flowers dioecious, 1/10 in. long, enveloped in long wool; perianth purple on the inside; style elongate; stigma 2-fid, lobes long. (Fig. 182.)

In dry or waste places. Flowers: March–November.

4. Pupalia *Juss.*

Herbs or undershrubs bearing opposite leaves. Flowers in spikes of small clusters, all not perfect; the imperfect reduced to awns bearing spreading hooked bristles; sepals 5, green, acuminate, 3–5-nerved; stamens 5, nearly free below; anthers 2-celled; staminodes 0; ovary ovoid; style slender; stigma capitellate; ovule 1, pendulous from a long basal funicle. Utricle ovoid, compressed, indehiscent, top areolate.

P. lappacea *Juss.*; *Fl. Brit. Ind.*, *IV*, *p.* 724. A pubescent or tomentose straggling undershrub. Leaves 2–4 in. long, shortly petioled, broadly ovate or elliptic, acute, sub-acute or acuminate, membranous, young densely tomentose, mature thinly hairy above but always subtomentose beneath. Spikes terminal, 4–10 in. long, tomentose; flower-clusters close or distant, flowering 1/4 in. long, fruiting 1/2 in. long; bracts 1/8-1/6 in. long, ovate, aristate, villous, persistent after the fall of the flower-clusters, the outermost very broad, membranous; bracteoles 1/5 in. long, lanceolate, aristate, 3-nerved, densely white-woolly; sterile flowers of 4–7 stellately spreading bristly awns, yellowish during fruiting. Utricle membranous. Seeds 1/10 in. long, ellipsoid, compressed, black and shining. (Fig. 184.)

Flowers practically throughout the year. The sterile awned flowers help in the distribution of the fruits by animals.

5. Achyranthes *Linn.*

Herbs or undershrubs bearing opposite leaves. Flowers in slender spikes, soon deflexed ; bracts and bracteoles spinescent ; sepals 5, subulate-lanceolate, aristate, shining, at length hardened and strongly ribbed ; stamens 5, filaments connate at the base with as many squarish, toothed or fimbriate staminodes ; anthers 2-celled ; ovary oblong, sub-compressed ; style filiform ; stigma capitellate ; ovule 1, pendulous from a long basal funicle. Utricle oblong or ovoid. Seed oblong.

A. aspera *Linn.* ; *Fl. Brit. Ind., IV, p.* 730. Annual or perennial herb, 1–3 ft. high, often woody below. Stems erect or sub-scandent, little or much branched. Leaves 1–5 in. long, elliptic, obovate or sub-orbicular, rounded at the apex or shortly suddenly acuminate, young tomentose on both the surfaces, mature usually glabrate on the upper surface and with close appressed hairs on the under-surface ; petiole 1/4–3/4 in. long. Spikes rigid, rapidly lengthening during fruiting to as much as 2 ft. ; flowers 1/6–1/4 in. long, greenish-white, numerous, sharply deflexed against the stout pubescent inflorescence axis ; bracts and bracteoles shorter than the flowers, ovate, acuminate, spinescent, persistent ; sepals ovate-oblong, acuminate, glaucous, margin scarious ; stamens 5 ; staminodes fimbriate. Utricle oblong, enclosed in the hardened perianth. Seeds brown. (Fig. 183.)

A very common weed of waste places and road-sides. Flowers almost throughout the year, but more abundantly after the rains and during the first winter months.

6. Alternanthera *Forsk.*

Usually prostrate herbs with opposite leaves. Flowers small, white, axillary, often in clustered heads ; sepals unequal ; anterior and 2 posterior flattened ; 2 lateral innermost, concave ; stamens 2–5 ; filaments short, connate into a short cup with or without interposed staminodes ; anthers 1-celled ; ovary globose or ovoid ; stigma subsessile, capitellate ; ovule 1, pendulous from a long basal funicle. Utricle compressed, ovoid, orbicular or obcordate. Seed lenticular.

A. sessilis *R. Br.* ; *Fl. Brit. Ind., IV, p.* 731. A prostrate herb with many 6–18 in. long branches. Stem rooting at the nodes, young with 2 opposite grooves containing hairs, mature glabrous. Leaves mostly 1–3 in. long, shortly stalked, linear-oblong, lanceolate or elliptic, obtuse or sub-acute, rather fleshy, glabrous. Flowers in small axillary sessile 1/4-1/2 in. long heads, white, sessile ; bracts and bracteoles ovate, scarious ; sepals about 1/10 in. long, ovate, acute, 1-nerved, glabrous

rigid, scarious ; perfect stamens mostly 2 or 3 ; ovary broader than long, compressed. Utricle broadly obcordate. (Fig. 185.)

Common in damp places. Flowers almost throughout the year.

LIV. CHENOPODIACEÆ.

Annual or perennial herbs or shrubs. Leaves alternate, simple, exstipulate. Flowers monochlamydeous, minute, often green, bisexual or unisexual, mostly regular, bracteate or not ; bracteoles 2 or 0 ; sepals green, 3–5, free or connate, imbricate, sometimes wanting in female flowers, often accrescent in fruit ; stamens usually as many as the sepals and opposite to them, hypogynous or inserted on the disk or on the calyx ; filaments free, rarely with intervening staminodes ; anthers 2-celled, incurved in bud, opening lengthwise ; disk present or 0 ; ovary superior or immersed in the base of the calyx, with one solitary, basal or lateral, campylotropous ovule ; style 1, with capitate or 2-3-lobed stigma, or stigmas 2–5, or styles 2-3. Fruit an indehiscent nut, rarely opening by a transverse lid, often enclosed in the enlarged fleshy perianth. Seed solitary, mostly erect, with or without albumen ; embryo curved, annular or spirally coiled.—*Genera about* 75, *species nearly* 500, *widely dispersed throughout the world, chiefly in saline soils.*

Key to the genera.

Embryo annular, albumen copious ; leaves flat.
- Flowers bisexual.
  - Fruiting perianth without wings. Many leaves more than 1/2 inch long .. .. 1. *Chenopodium.*
  - Fruiting perianth with transverse wings. Leaves mostly not more than 1/2 inch long 2. *Kochia.*
- Flowers monoecious .. .. .. 3. *Atriplex.*

Embryo spirally coiled; albumen scanty or absent.
- Perianth without wings. Leaves nearly cylindrical .. .. 4. *Sueda.*
- Fruiting perianth transversely winged. Leaves subglobose .. .. 5. *Salsola.*

1. Chenopodium *Linn.*

Erect or prostrate herbs. Leaves alternate, entire, lobed or toothed. Flowers minute, 2-sexual, in cymose clusters ; perianth usually 5-lobed ; stamens 5 or fewer ; disk 0 ; ovary free, depressed or compressed ; styles

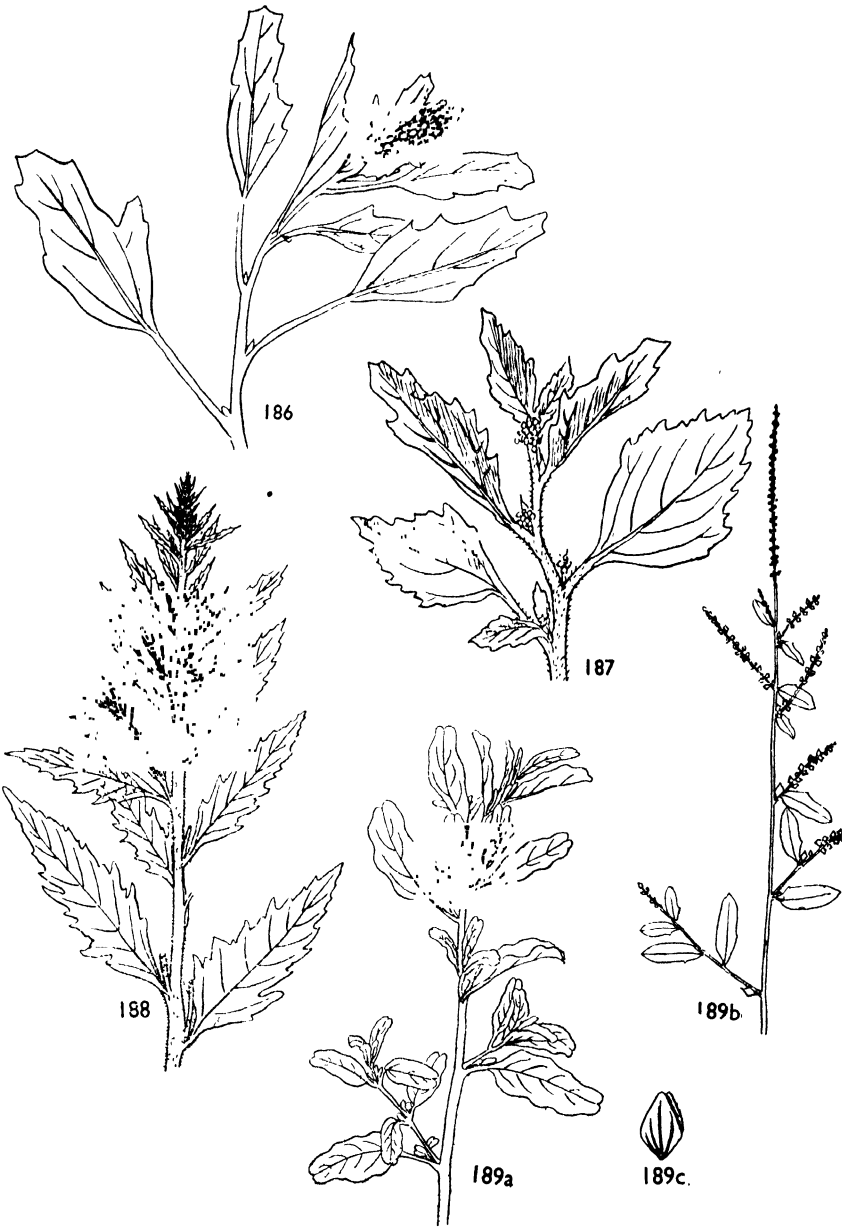

Fig. 186. *Chenopodium album*, $\times \frac{2}{3}$; Fig. 187, *C. murale*, $\times \frac{2}{3}$; Fig. 188, *C. ambrosoides*, $\times \frac{1}{4}$; Fig. 189, *Atriplex crassifolia*, (*a*) vegetative shoot, $\times \frac{1}{2}$, (*b*) flowering shoot, $\times \frac{1}{2}$, (*c*) female flower, $\times \frac{1}{4}$.

2-3. Utricle membranous, included in the perianth. Seed horizontal or vertical ; testa crustaceous ; albumen floury ; embryo annular.

Key to the species.

A rather tall scentless herb ; seeds smooth and shining	1.	*C. album.*
A rather fœtid and low herb ; seeds wrinkled, dull black	2.	*C. murale.*
Strongly aromatic glandular herb	3.	*C. ambrosioides.*

1. **C. album** *Linn.* ; *Fl. Brit. Ind.*, *V*, *p.* 3. An erect annual scentless herb, 1–10 ft. high, greenish or mealy-white. Stem angled, often striped green, red or purple. Leaves very variable in shape, 1–5 in. long ; lower ovate or oblong, toothed or entire, angled or lobed, margin more or less sinuate ; upper mostly narrow, entire ; petiole slender, often equalling or longer than the lamina. Flowers in cymose clusters, forming axillary spikes or long terminal panicles ; sepals 1/16–1/12 in. long, oblong-lanceolate, keeled at the back, completely enclosing the thin membranous utricle ; stigmas 2. Seeds rounded, compressed, with an acute margin, smooth, black, shining.—Vern., *Báthú*. (Fig. 186.)

A very common weed, both in cultivated fields and waste places. Also sometimes cultivated. The leaves are often eaten raw as salad or cooked as a pot-herb. Flowers practically at all times in the year.

2. **C. murale** *Linn.* ; *Fl. Brit. Ind.*, *V*, *p.* 4. An annual herb, somewhat fœtid, sub-glabrous, 1/2–1½ ft. high ; branches erect or somewhat diffuse. Leaves 1–3 in. long, bright green, rhombic or deltoid ovate, acute, base cuneate, sides irregularly lobed and more or less sharply toothed ; petiole long or short. Flower-clusters in lax or dense axillary divaricate cymes ; sepals 1/16 in. long, oblong, obtusely keeled, incurved and closing over the fruit ; stigmas 2. Seeds rounded, compressed, sharply keeled, dull-black, wrinkled. (Fig. 187.)

A winter weed of cultivated fields.

3. **C. ambrosioides** *Linn.* ; *Fl. Brit. Ind.*, *V*, *p.* 4. An erect, strongly aromatic, [illegible]-hairy herb, 2–4 ft. high ; aroma characteristic. Leaves up to 3 in. long below, decreasing in size higher up, lanceolate or oblong, obtuse or acute, lower coarsely toothed. Flower-clusters scattered on the numerous branchlets, or in slender, often paniculate spikes ; flowers green, minute, sessile ; sepals about 1/16 in. long, connate at the base, elliptic, acute, valvate, incurved ; two outer sepals glandular and closing over the fruit ; stigmas 3–5, very minute. Seeds brown, depressed globose. (Fig. 188.)

Common near Shalamar garden. Flowers : February–May.

2. Kochia *Roth.*

Usually villous undershrubs or herbs. Leaves alternate, sessile, narrow, entire. Flowers minute, usually bisexual, axillary, ebracteate; perianth subglobose, 5-lobed, incurved, closing over the fruit; lobes transversely winged on the back; stamens 5, exserted; anthers large. Fruit a depressed membranous utricle; style slender; stigmas 2, filiform. Seed orbicular, horizontal; testa membranous; albumen scanty; embryo annular.

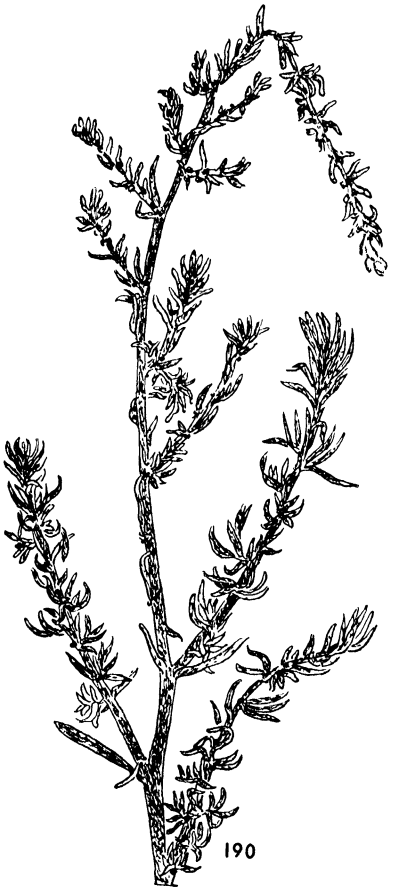

Fig. 190, *Kochia indica*, $\times \frac{2}{3}$.

K. indica *Wight*; *Fl. Brit. Ind.*, *V*, *p.* 11. A tall erect whitish annual, up to 6 ft. high, branching from the base, covered with woolly hairs. Leaves 1/4–1¼ in. long, elliptic or linear-lanceolate, acute, base tapering, hairy on both sides. Flowers minute, axillary, solitary or in pairs. Perianth about 1/10 in. across; lobes incurved, mucronate, ultimately closing over the utricle and developing broadly triangular-ovate scarious transverse wings; ovary depressed-globose. Seed 1/10 in. in diam. (Fig. 190.)

Abundant on the canal side and in other waste places.

3. Atriplex *Linn.*

Usually mealy herbs or shrubs. Leaves mostly alternate. Flowers monoecious or dioecious. Male flowers in slender leafless interrupted spikes, ebracteate; sepals 3–5, oblong, obtuse; stamens 3–5. Female flowers 2-bracteate; bracts flat, accrescent, dilated in fruit and forming a 2-valved envelope on the outside of the fruit; perianth 0. Fruit a utricle enclosed by the greatly enlarged and hardened bracts; stigmas 2. Seed erect, or inverse and suspended from the funicle, rarely horizontal; testa various; albumen floury; embryo annular.

A. crassifolia *C. A. Mey.*; *Fl. Brit. Ind.*, *V*, *p.* 6. An erect or diffuse much branched mealy annual herb, 1–5 ft. high; stem and branches white. Leaves petiolate, oblong or ovate, 1-1½ in. long, entire or sinuate-toothed, obtuse or acute, base cuneate, hastate or sagittate; petiole slender. Flowers monoecious; male clusters in long, slender, terminal, leafless, interrupted spikes; female flower-clusters small, axillary, mostly on the lower part of the branches. Fruiting bracts ovate to orbicular, with cuneate to rounded base, each entire or toothed and each bearing a thick white convex smooth disk on its base. (Fig. 189.)

Abundant in the area. Flowers after the rainy season.

4. Sueda *Forsk.*

Undershrubs. Leaves fleshy, terete, rarely somewhat flattened. Flowers minute, axillary, mostly 2-sexual, bracteate and 2-bracteolate; calyx 5-fid or 5-partite, segments equal or unequal; stamens 5, short. Utricle included, membranous or spongy; stigmas 2–5, subulate or

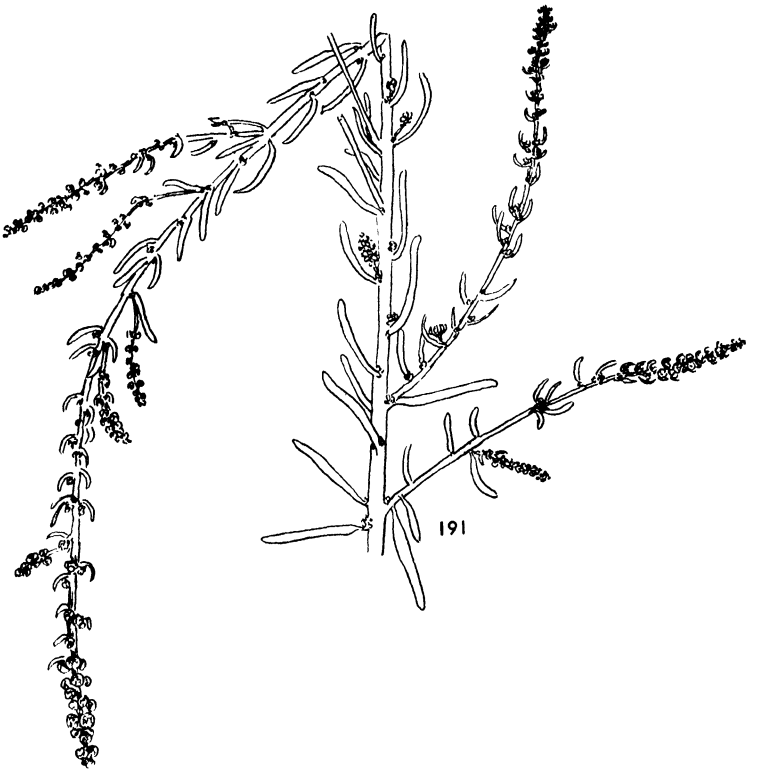

Fig. 191, *Sueda fruticosa*, × ⅔.

recurved. Seed erect, oblique or horizontal ; testa crustaceous ; albumen scanty or absent ; embryo plano-spiral.

S. fruticosa *Forsk.* ; *Fl. Brit. Ind., V, p.* 13. A much branched undershrub, 2–4 ft. high ; branches pale, glabrous, often with quite prominent leaf scars. Leaves alternate, subsessile, 1/4–3/4 in. long, half-terete, fleshy ; floral leaves smaller, sessile. Flowers solitary or 2-3 together, upper ones forming slender leafy spikes ; bracteoles membranous, 1/20 in. long, ovate, acute, entire or denticulate ; calyx about 1/10 in. long, subglobose ; segments equal, thick, obtuse, incurved, concave. Utricle obovoid, membranous ; stigmas 2 or 3, short, subulate, recurved. Seed erect, obliquely ovoid, beaked ; testa black and shining.—Vern., *Lúnak.* (Fig. 190.)

Common in saline soils. The bushes are often gregarious. *Sajji* is prepared from its ash. The plant is also used for feeding camels. Flowers often in the rains and in early winter months.

5. Salsola *Linn.*

Undershrubs. Leaves mostly alternate, sessile, small. Flowers axillary, solitary or clustered, 2-sexual 2-bracteolate ; sepals 4 or 5, transversely winged above the middle in the fruit and completely embracing it ; stamens 5 or fewer, usually hypogynous. Fruit an ovoid or subglobose, fleshy or membranous utricle ; stigmas 2-3, subulate or linear. Seed usually horizontal ; testa membranous ; albumen absent ; embryo spiral.

S. fœtida *Del.* ; *Fl. Brit. Ind., V, p.* 18. A densely branched hoary perennial undershrub up to 3 ft. high ; branches stout ; leaves crowded, minute, subglobose, fleshy ; the floral ones somewhat imbricate and forming short cylindric spikes. Flowers small ; bracteoles fleshy, 1/20 in. long, broadly ovate or orbicular ; calyx 5- (rarely 4-) partite, not exceeding the bracteoles, silvery-white ; segments concave, oblong, obtuse ; wings on the fruiting perianth scarious, symmetrical, rounded, margins often overlapping ; stigmas large, recurved.

Common in saline soils. *Sajji* is prepared from the ash.

The following two plants belonging to this family are commonly grown in the fields as vegetables :—

1. **Beta vulgaris** *Linn.* This is the garden beet and yields the beet root (vern., *Chukandar*). The flowers of this differ from those of *Chenopodium* species in the base of the perianth being thickened and ovary being sunk in the fleshy disk and in the presence of both bract and bracteoles.

2. **Spinacea oleracea** *Linn.* This is the *spinach* (vern., *Palak*). It differs from the genus *Chenopodium* in possessing polygamous flowers.

LV. POLYGONACEÆ.

Herbs or rarely shrubs with usually alternate entire leaves ; stipules usually sheathing the stem (ochreate), membranous or scarious. Flowers mostly small, regular, usually bisexual, clustered ; clusters axillary or spicate or panicled ; pedicel usually jointed ; perianth of 5 sepals arranged quincuntially or of 6 sepals in two whorls, green or coloured, free or connate, persistent ; stamens 5–8, rarely more or less ; disk annular, glandular or 0 ; carpels 2 or 3, united ; ovary superior, 2-3-gonous ; styles 2 or 3, free or connate ; ovule 1, basal, orthotropous. Fruit a small nut, usually enclosed in the persistent perianth, biconvex or trigonous. Seed erect ; testa membranous ; albumen floury, sometimes ruminate ; embryo curved or straight.—*Genera about* 40, *species about* 800, *mostly distributed in the north temperate countries, a few tropical, arctic or in the southern hemisphere.*

Key to the genera.

Perianth-segments 5 ; stamens 5–8 .. .. 1. *Polygonum.*
Perianth-segments 6, in two whorls of three each ; stamens 6 .. .. .. 2. *Rumex.*

1. Polygonum *Linn.*

Herbs with alternate, entire, rarely lobed leaves and tubular (ochreate), membranous stipules. Flowers 2-sexual, small or minute, clustered ; clusters axillary and sessile, or in spiciform, capitate or panicled racemes ; pedicel short, usually jointed under the perianth ; bracts and bracteoles membranous, ochreate ; disk glandular or 0 ; sepals petaloid, mostly 5, 2 outer usually smallest ; stamens 5–8, perigynous ; ovary biconvex or 3-gonous ; styles 2 or 3, free or connate below ; stigmas usually capitellate. Nut biconvex or trigonous, included in the persistent perianth. Seed albuminous ; embryo lateral, radicle long ; cotyledons small, flat.

Key to the species.

Flowers axillary .. .. .. 1. *P. plebejum.*
Flowers in terminal spiciform racemes.
Mouth of the ochrea eciliate ; styles mostly 2 ; fruit biconvex .. .. 2. *P. glabrum.*
Mouth of the ochrea with cilia exceeding the length of the tube ; styles 3 ; fruit trigonous 3. *P. barbatum.*

1. **P. plebejum** *Linn.* ; *Fl. Brit. Ind., V, p.* 27. An annual or perennial, smooth or somewhat rough, diffusely or densely branched, prostrate herb, often with a woody root-stock. Stems many from the

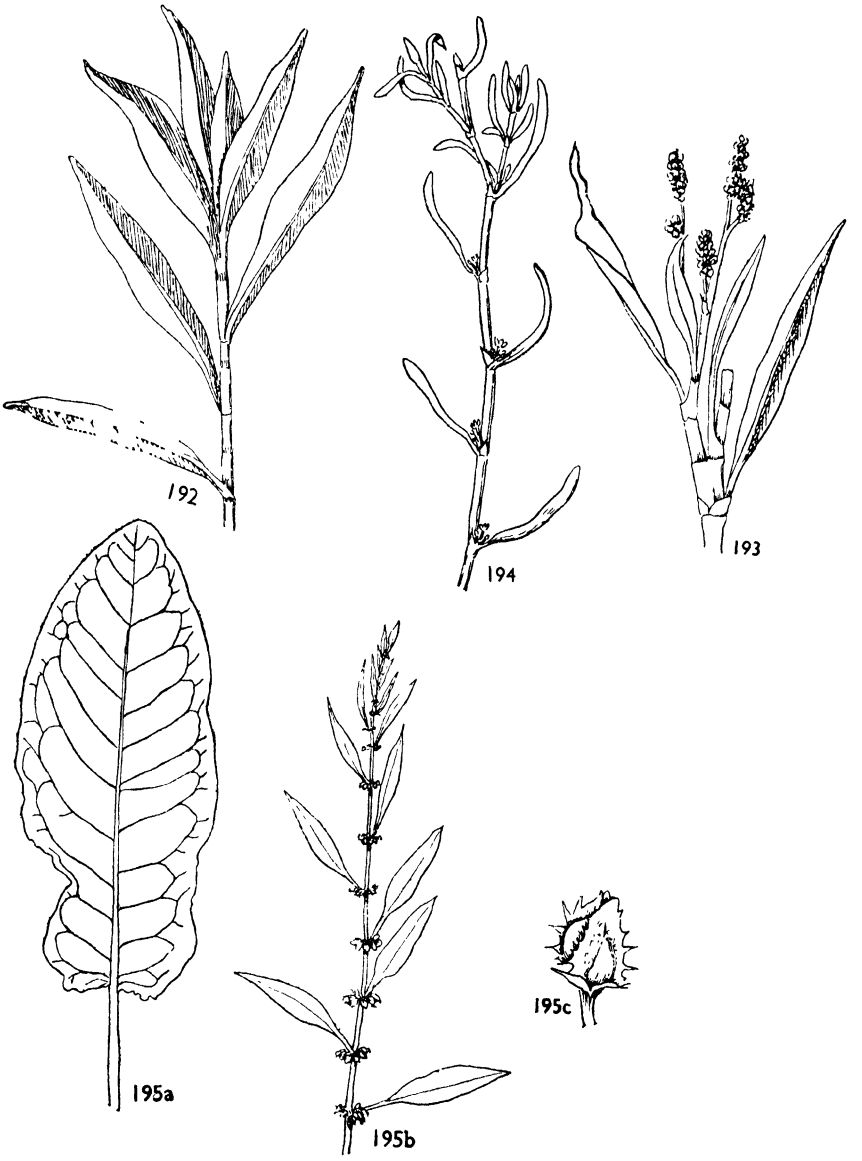

Fig. 192, *Polygonum barbatum*, $\times\frac{1}{2}$; Fig. 193, *P. glabrum*, $\times\frac{1}{3}$; Fig. 194, *P. plebeium*, $\times 1\frac{1}{2}$; Fig. 195, *Rumex dentatus*, (*a*) leaf, $\times\frac{1}{2}$, (*b*) flowering branch, $\times\frac{1}{2}$, (*c*) fruit, $\times 3$.

root, up to $1\frac{1}{2}$ ft. long, terete, grooved; lower internodes often as long as the leaves or longer, upper shorter, often very short. Leaves 1/6-2/3 in. long, sessile or shortly stalked, linear, linear-oblong, or the shorter

ones sometimes obovate, acute or obtuse ; stipules hyaline, lacerate to the middle and fimbriate, nerves rather obscure, excurrent. Flowers axillary, solitary, or in clusters of 2–4, subsessile ; perianth leaves about 1/10 in. long, pink, with green midrib, obtuse or the two outer ones acute ; styles 3. Nut shortly trigonous, brown, smooth and shining. (Fig. 194.)

A common weed of cultivated and waste grounds ; abundant in drying up ponds and other damp localities. Flowers can be seen throughout the year, but these are most about from February to June.

The species is very variable. In the Flora of British India on the basis of the length of the internode, length and shape of the leaves, degree or exsertion of the flower, acuteness of the perianth-leaves, etc., ten varieties are recognized, but all these pass insensibly into one another.

2. **P. glabrum** *Willd.* ; *Fl. Brit. Ind., V, p.* 34. A tall erect glabrous plant, 2–5 ft. high. Stem stout, not much branched, usually tinged with red. Leaves 4–9 in. long, lanceolate, acuminate, gradually narrowing at the base, usually gland-dotted ; ochrea 1-1½ in. long, truncate, eciliate at the mouth. Flowers white or rosy, in terminal panicled racemes 2–4 in. long ; peduncles up to 1 in. long, glabrous ; bracts 1/6 in. long, truncate or rounded, glabrous or rarely shortly ciliate ; perianth-segment 1/8-1/4 in. long, ovate-oblong, obtuse, eglandular ; stamens 6–8 ; styles 2, rarely 3, connate below. Nut about 1/8 in. long, biconvex, rarely trigonous, brown-black. (Fig. 193.)

Occurs on the banks of Chhota Ravi. Flowers : May–October (?).

3. **P. barbatum** *Linn.* ; *Fl. Brit. Ind., V, p.* 37. An annual herb, 1½–3 ft. high, erect or decumbent below. Stem glabrous or nearly so. Leaves 2–7 in. long, sessile or subsessile, linear-lanceolate or lanceolate, acuminate or acute, tapering or sometimes rounded at the base, margin and midrib beneath shortly ciliate ; ochrea with cilia at the mouth exceeding the length of the tube, strigose. Flowers white, in slender spiciform racemes 2–4 in. long ; peduncles glabrous or nearly so ; bracts crowded, glabrous or sparingly and shortly ciliate at the margin ; perianth leaves 1/10 in. long, eglandular ; stamens 5–8 ; styles always 3, connate below. Nuts 1/12 in. long, trigonous. (Fig. 192.)

Common near water.

2. **Rumex** *Linn.*

Annual or perennial herbs. Leaves radical and alternate ; stipules often disappearing with age. Flowers in axillary clusters or in whorls arranged in simple or panicled racemes ; sepals 6, 3 outer unchanged, 3 inner enlarging in fruit, entire or toothed ; stamens 6, in three pairs ; ovary 3-gonous ; styles 3 ; stigmas fimbriate. Nut included in the usually

enlarged inner sepals, angles acute. Embryo lateral, nearly straight; cotyledons linear or oblong.

R. dentatus *Linn.*; *Fl. Brit. Ind.*, *V*, *p.* 59. An erect annual, 1–3 ft. high. Stem grooved, glabrous. Leaves radical and alternate, glabrous; radical up to 6 in. long or longer; upper smaller, mostly 2–4 in. long; all oblong, obtuse, rounded or cordate at the base, or the upper ones oblanceolate or linear; margin often crisped; petiole 1/2–3 in. long. Flowers arranged in leafy or leafless, close or distant whorls on simple or panicled racemes, bisexual; pedicel about 1/5 in. long, with articulation near the base. Fruiting sepals nearly as long as the pedicel, ovate or oblong-ovate, acute or obtuse, with an oblong smooth tubercle on the back and broad densely reticulate and irregularly toothed wings; teeth many, short, stout, straight, without hooks; fruit about 1/10 in. long, sharply trigonous. (Fig. 195.)

A common weed during winter, especially near damp places. In such localities the leaves are much larger than on plants growing in dry situations.

Muehlenbeckia platyclados *Meissn.* (*Cocoloba platyclada* F. Muell.). This is an interesting shrub, with the branches much flattened and converted into phylloclades. The leaves are produced only during the moist season. The greenish white flowers are borne in small clusters at the nodes. It is a native of Solomon Islands, but is frequently cultivated in the gardens.

Antigonon leptopus *Hook. & Arn.*, a native of Mexico, is another member of the Polygonaceæ commonly grown locally. It is a beautiful climber producing clusters of pink or white flowers during the rainy and cold seasons.

LVI. EUPHORBIACEÆ.

Herbs, shrubs or trees, often with milky juice. Leaves alternate, sometimes opposite, or opposite above and alternate below, mostly simple, rarely divided or compound; stipules usually small, sometimes replaced by glands or thorns. Inflorescence various, usually complex; first branching often racemose and subsequent ones cymose, or all cymose; in *Euphorbia* the partial inflorescence (called cyathium) is so condensed as to give the appearance of single flower, consisting of a perianth-like involucre and many male flowers of single naked stamens surrounding a solitary female flower consisting of a naked pistil. Flowers usually small, often minute, always unisexual, monoecious or dioecious, regular, hypogynous; perianth mostly of one whorl, green or rarely petaloid, rarely double, with 4-5 small petals, often wanting in one or both sexes; segments valvate or imbricate; disk entire or of separate glands or 0; stamens 1-many, free or connate; anthers 2-celled, opening lengthwise, transversely or by pores; gynæcium superior, mostly of 3 more or less united carpels; ovary trilocular, ovules 1-2 in each cell,

anatropous, pendulous from the inner angle of the cell, with ventral raphe ; micropyle usually covered by a caruncle ; styles as many as the carpels, free or connate, entire or divided ; stigmatic surface usually on the inner face of the styles or style-arms. Fruit almost invariably a schizocarp-capsule splitting into three 2-valved 1-2-seeded cocci, rarely a drupe or nut. Seeds with or without an aril, mostly albuminous ; embryo straight, with flat cotyledons.—*Genera about* 220, *species nearly* 4,000, *throughout the world, but chiefly tropical and absent from the arctic countries.*

Key to the genera.

Partial inflorescences cyathiums .. .. 1. *Euphorbia.*
Inflorescence not a cyathium.
  Leaves small, simple, entire, distichous .. 2. *Phyllanthus.*
  Leaves not distichous.
    Petals present in both sexes ; flowers in axillary bracteate racemes. Stellately tomentose herbs with sinuate-toothed or lobed leaves .. .. .. 3. *Chrozophora.*
    Petals absent ; flowers in terminal subpanicled racemes. A tree-like glabrous herb with palmately serrate-lobed leaves .. 4. *Ricinus.*

1. Euphorbia *Linn.*

Herbs or shrubs with copious milky juice. Stems slender and leafy or tall, thick and fleshy. Leaves alternate or opposite. Flowers monoecious ; inflorescence a cyathium of many male and one female flowers in a small 4-5 lobed turbinate or campanulate perianth-like involucre ; lobes with thick glands at the sinuses ; glands often with a petal-like spreading white or coloured limb. Male flowers a pedicelled stamen without any perianth ; anther-cells usually globose. Fem. flowers a solitary, pedicelled, 3-celled ovary in the centre of the involucre, also without perianth ; ovule one in each cell ; styles 3, free or connate, simple or 2-fid. Fruit a capsule of three 2-valved cocci, separating elastically from the centre and dehiscing ventrally or both ventrally and dorsally. Seeds albuminous ; embryo with broad and flat cotyledons.

Key to the species.

A cactus-like shrub or small tree with thick fleshy prickly largely leafless branches .. 1. *E. Royleana.*
Herbs with slender throughout leafy stems.
  Leaves all alternate or alternate below and whorled or opposite above. Plants erect.

Involucre with 4 glands.		
Involucral glands reniform; leaves spathulate or obovate	2.	*E. helioscopia.*
Involucral glands semi-lunate; leaves linear or linear-lanceolate ..	3.	*E. dracunculoides*
Involucre mostly with a single large gland ..	4.	*E. geniculata.*
Leaves opposite.		
Leaves more than 1/2 inch long.		
Glands of the involucre with a prominent membranous petaloid limb ..	5.	*E. hypericifolia.*
Glands of the involucre with a narrow or without a limb	6.	*E. pilulifera.*
Leaves less than 1/2 inch long; prostrate herbs. Capsules hairy.		
Cocci keeled, seeds with 4–6 shallow or deep transverse wrinkles.		
Cocci pubescent all over; seeds with faint wrinkles; leaves with obscure nerves	7.	*E. thymifolia.*
Cocci ciliate on the keels only; seeds with deep wrinkles; leaves with three prominent nerves ..	8.	*E. prostrata.*
Cocci rounded at the back, hirsute; seeds faintly pitted; leaves quite entire	9.	*E. granulata.*
Capsules glabrous.		
Leaves as long as broad; seeds smooth	10.	*E. microphylla.*
Leaves much longer than broad; seeds obscurely transversely wrinkled	11.	*E. Clarkeana.*

1. **E. Royleana** *Boiss.*; *Fl. Brit. Ind.*, *V*, *p.* 257. An erec glabrous fleshy cactus-like shrub up to 15 ft. high; stem sometimes u to 1 ft. or more thick; branches straight, ascending, with 5–7 broa flat faces and as many thick obtuse undulate wings. Leaves few, inserte on the wings of the branches, alternate, 3–6 in. long, sessile, spathulate entire, rounded or mucronate, thick and fleshy, soon falling off; stipule spiny, persistent on the wings of the branches. Involucres 1/2 in. i diameter, greenish yellow, arranged in small subsessile axillary cymes o 3 or more flowers; lobes 4, spathulate, fimbriate; glands rounded brownish; styles long, free nearly to the base. Capsule nearly 3/4 in across, trigonous, glabrous, on a stalk up to 1/2 in. long; cocci compressed (Fig. 196.)

Commonly planted in hedges; flowers during summer. New leaves mostl appear during the rainy season.

2. **E. helioscopia** *Linn.* ; *Fl. Brit. Ind., V, p.* 262. A glabrous erect annual herb, 1/2–2 ft. tall. Stem little or unbranched below, copiously 5-, 3- and 2-parously cymosely branched above ; branches umbellate, divaricate. Leaves alternate on the main stem, in whorls of 5, 3 or 2 above, 1/2–2 in. long, shortly stalked, spathulate or obovate, glabrous or sparsely hairy, rounded at the apex, finely toothed. Involucres in umbellate cymes, 1/10 in. across, turbinate, 4-toothed ; glands 4, yellow, reniform, entire ; styles free to the base. Capsule 1/8 in. in diameter, globose, smooth ; cocci rounded at the back. Seeds turgidly oblong or subglobose, deeply reticulately pitted. (Fig. 197.)

A common weed of gardens during winter. Extends in the western Himalayas up to 8,000 feet. Flowers from January onwards.

3. **E. dracunculoides** *Lamk.* ; *Fl. Brit. Ind., V, p.* 262. A glabrous annual, 6–18 in. high. Stems many from the base, erect, cymosely sub-umbellately branched above. Leaves lower alternate, 1–3 in. long, sessile, linear or linear-lanceolate, acute or subacute ; floral leaves opposite or whorled, shorter, broader. Involucres solitary, nearly sessile, 1/10 in. across, campanulate or turbinate, glabrous outside, hairy within ; lobes ovate, ciliate ; glands semi-lunate ; styles short, free, shortly 2-fid. Capsule 1/8-1/6 in. in diameter, smooth ; cocci with a median dorsal nerve, but scarcely keeled. Seeds oblong, with a whitish leprous tuberculate testa. (Fig. 198.)

A weed of cultivated fields. Flowers : December–April.

4. **E. geniculata** *Orteg.* ; *Nov. Pl. Hort. Matr. Dec.* 1797, *p.* 18. An annual herb, 1–3 ft. high ; internodes below the inflorescence usually very long. Leaves alternate below, opposite above, 2–4 in. long, oblong-ovate or oblong-lanceolate, crenulate or sub-entire ; stipules glandular ; floral leaves narrower, often pale near the base. Involucres in dense corymbose cymes, 1/10 in. broad at the flowering time, campanulate ; gland mostly 1, exceptionally 2 or 3, long-stalked, with expanded disciform hollow top ; styles connate below, 2-fid. Capsule 1/6-1/5 in. across, smooth. Seeds dark-grey. (Fig. 200.)

This species is a native of tropical America, but has now established itself as a weed of cultivated fields or gardens throughout India. Flowers practically throughout the year.

5. **E. hypericifolia** *Linn.* ; *Fl. Brit. Ind., V, p.* 249. An erect or spreading annual, herbaceous or somewhat woody below ; branches 1/2–2 ft. long, glabrous or sparsely pubescent ; nodes often swollen. Leaves opposite, 1/3–1½ in. long, 1/4-3/4 in. broad, shortly petioled, elliptic-oblong, obtuse or rounded, unequal-sided at the base, serrulate ; stipules minute, subulate. Involucres minute, cup-shaped, many or a few in axillary pedunculate cymes, 1/4-1/2 in. in diameter ; peduncles mostly 1/4-3/4 in.

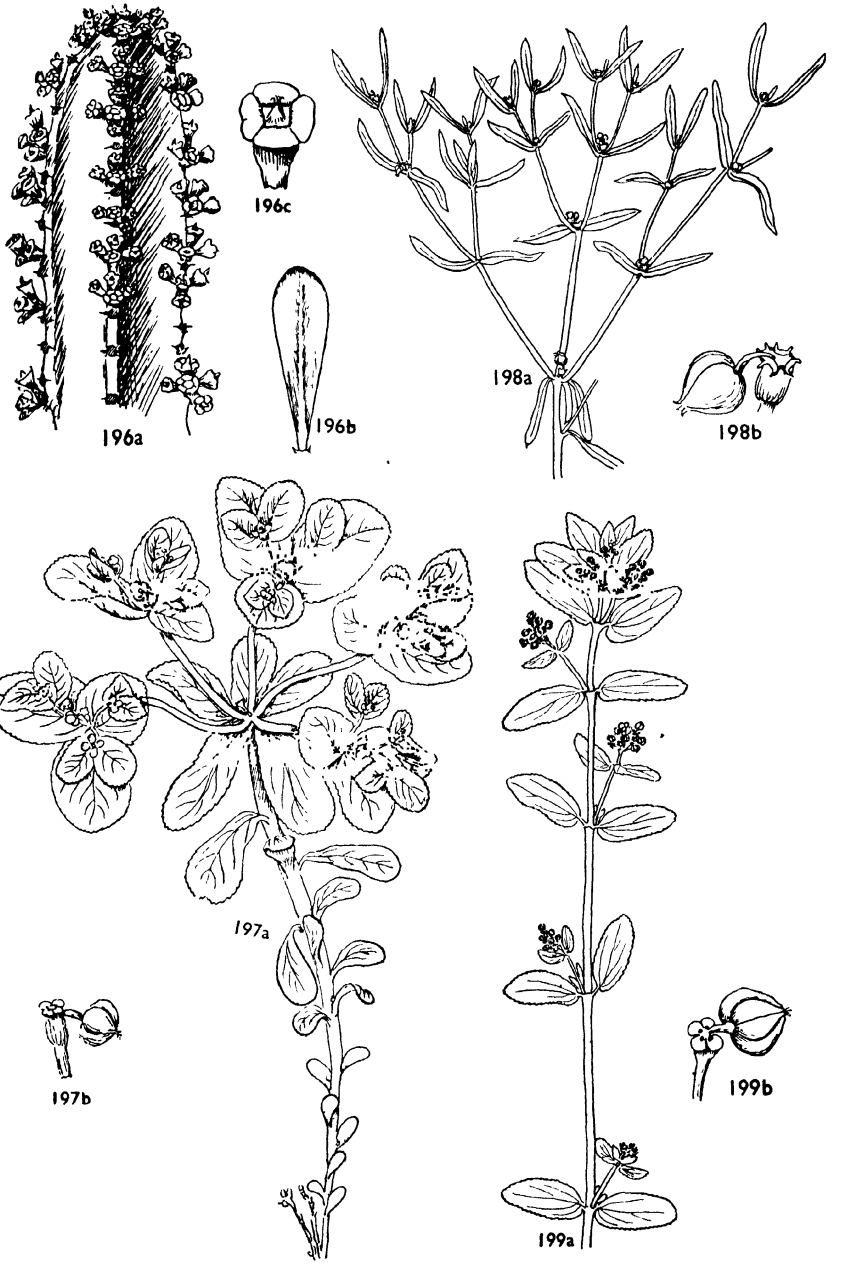

Fig. 196, *Euphorbia Royleana*, (*a*) flowering branch $\times \frac{1}{4}$, (*b*) leaf, $\times \frac{1}{2}$, (*c*) fruit, $\times 3$; Fig. 197, *E. heliscopia*, (*a*) flowering shoot, $\times \frac{2}{3}$, (*b*) cyathium, $\times 2$; Fig. 198, *E. dracunculoides*, (*a*) flowering shoot, $\times \frac{1}{2}$, (*b*) cyathium, $\times 2$; Fig. 199, *E. hypericifolia*, (*a*) flowering branch, $\times \frac{2}{3}$, (*b*) cyathium, $\times 4$.

long, with a pair of leaves just below the involucres ; lobes of the involucre narrowly lanceolate, acuminate, longer than the glands ; glands 4-5, shortly stipitate, rounded or transversely elliptic, green, bordered by a minute white or pink petaloid limb ; styles short, deeply 2-fid. Capsule 1/12 in. across, glabrous or pubescent. Seeds ellipsoid, reddish brown, somewhat shining, smooth or with shallow transverse pits. (Fig. 199.)

In waste places. Flowers throughout the year.

6. **E. pilulifera** *Linn.* ; *Fl. Brit. Ind.*, *V*, *p.* 250. Erect or ascending annual herb, 1/2–2 ft. high (or long), hispid with long crisped hairs. Main stem terete ; branches often 4-angled. Leaves opposite, 3/4–1¾ in. by 1/3–3/4 in., shortly petioled or subsessile, obliquely oblong-lanceolate, acute, toothed or serrulate, dark green above, pale beneath ; stipules minute, linear, caducous ; floral leaves minute. Involucres numerous, 1/25 in. long, campanulate, pubescent, crowded in axillary and terminal dense pedunculate or sessile globose cymes ; lobes subulate ; glands 4, shortly stipitate, red-tipped, without or with a very narrow limb ; styles bifid to the base. Capsule 1/20 in. across, hairy ; cocci compressed, keeled ; seeds pale-brown, ovoid, acutely angled, faintly transversely wrinkled. (Fig. 201.)

A very common weed in all places. Flowers and fruits all the year round.

7. **E. thymifolia** *Burm.* ; *Fl. Brit. Ind.*, *V*, *p.* 252. A more or less hispidly pubescent, prostrate, generally pale green, annual herb ; branches many, divaricate, 4–12 in. long, spreading flat on the ground. Stems pale copper. Leaves opposite, spreading, 1/8-1/4 in. long, ovate or oblong, obtuse, obliquely truncate or subcordate at the base, crenulate in the upper part, rather thick, glabrous or pubescent beneath ; nerves obscure ; petiole minute, often pinkish ; stipules lateral, subulate, fimbriate. Involucres 1–3 in the axil of a leaf, especially on crowded terminal branchlets, green or pinkish, 1/25 in. long, turbinate, pubescent ; lobes short, ciliate ; glands minute, stipitate, deep red, with a minute pinkish or without a limb. Capsule about 1/25 in. across, shortly stalked, erect, pubescent all over ; cocci obtusely keeled. Seeds 4-angled, with 5-6 shallow transverse wrinkles.

There is no specimen of this in the Panjab University Herbarium, but it is likely to occur within the area.

8. **E. prostrata** *Ait.* ; *Fl. Brit. Ind.*, *V*, *p.* 266. Habit similar to that of the preceding species, but plants dark green. Stem glabrous or pubescent, pinkish. Leaves opposite, distichous, 1/8-1/3 in. long, shortly petioled, elliptic or obovate, obtuse, obliquely rounded at the base, entire, slightly wavy or obscurely crenulate, glabrous or somewhat puberulous beneath ; under-surface pinkish ; basal nerves 3, generally

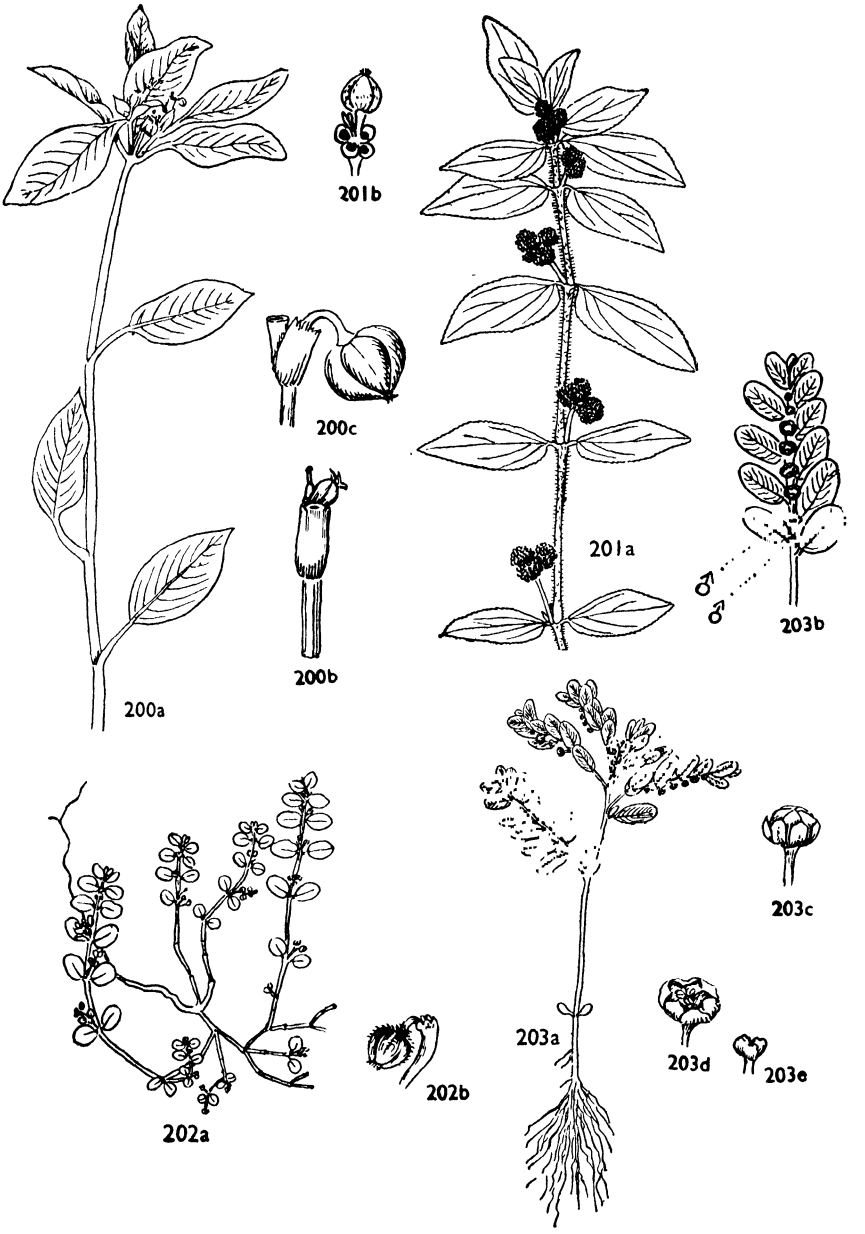

Fig. 200, *Euphorbia geniculata*, (*a*) flowering branch, $\times \frac{2}{3}$, (*b*) young cyathium, $\times 3$, (*c*) fruiting cyathium, $\times 3$; Fig. 201, *E. pilulifera*, (*a*) flowering branch, $\times \frac{1}{2}$, (*b*) cyathium, $\times 6$; Fig. 202, *E. prostrata*, (*a*) plant, $\times \frac{3}{4}$, (*b*) cyathium, $\times 4$; Fig. 203, *Phyllanthus Niruri*, (*a*) small plant, $\times \frac{1}{2}$, (*b*) flowering twig, $\times 1$, (*c*) female flower, $\times 3$, (*d*) male flower, $\times 6$, (*e*) stamens, $\times 9$.

distinct; stipules interpetiolar, triangular. Involucres subsolitary, axillary, about 1/30 in. long, on stalks as long or longer, campanulate, pinkish or red; limb of the glands very small or obsolete. Capsule about 1/20 in. across; cocci prominently keeled and ciliate on the keels. Seeds 4-angled, with 4–6 deep transverse wrinkles. (Fig. 202.)

This is the commonest species out of the small-leaved forms of the genus in the area of this flora. Flowers throughout the year.

9. **E. granulata** *Forsk.*; *Fl. Brit. Ind.*, *V*, *p.* 252. A hispidly-villous herb, with many prostrate, very brittle, 3–8 in. long branches from the root; root in old plants crowned by a short root-stock. Leaves opposite, very small, 1/10-1/8 in. long, minutely petioled, obovate, oblong-obovate or orbicular, rounded or retuse at the apex, unequal-sided at the base, entire, villous on both surfaces; stipules minute, ciliolate. Involucres axillary and on short leafy branchlets, subsolitary, subsessile, turbinate, hairy; lobes short, oblong, obtuse, ciliate; glands usually without a limb; styles very short, 2-fid. Capsule 1/20 in. across; cocci rounded at the back, without a keel, hirsute. Seeds faintly pitted.

It is not clear if this species is annual or perennial. Boissier describes it as annual, but Hooker from the presence of a root-stock in the old plants thinks it to be certainly perennial.

10. **E. microphylla** *Heyne.*; *Fl. Brit. Ind.*, *V*, *p.* 252. Glabrous or sparsely hairy annual. Stems many, 3–12 in. long, slender, prostrate, spreading in a rosette from the root, much distichously branched, whitish, brittle. Leaves opposite, 1/6-1/4 in. long, nearly as broad, obliquely oblong, rounded-oblong or subquadrate, rounded or retuse, entire or more or less toothed towards the apex, coriaceous; stipules minute, triangular, 2-partite or laciniately toothed. Involucres 1/30 in. across, sub-solitary axillary, very numerous, throughout the length of the branches, campanulate, shortly stalked; bracts at the base of the involucral stalks subulate; lobes of the involucre triangular, acute, nearly entire; glands very shortly stipitate; limb very small, sinuately-lobed; styles very short, 2-fid. Capsule about 1/15 in. across, glabrous; cocci obtusely keeled. Seeds smooth, bluish white, mucose when moistened.

Weed of cultivated fields and waste places. Flowers throughout the year.

11. **E. Clarkeana** *Hook. f.*; *Fl. Brit. Ind.*, *V*, *p.* 253. A glabrous, annual herb; branches many, crowded from the root, divaricate, prostrate, spreading, or rarely suberect. Stem pale, filiform, with a few scattered hairs towards the tip. Leaves opposite, mostly 1/6-1/2 in. long, 1/12-1/6 in. broad, nearly sessile, often crowded towards the end of short branchlets, linear-oblong, entire or toothed at the rounded tip, obliquely rounded or somewhat auricled towards one side at the base; stipules setaceous

from a broad toothed base. Involucres axillary, 1/30 in. across, chiefly towards the apex of lateral branches, campanulate, glabrous; lobes lanceolate, toothed, longer than the glands; limb of the glands obsolete or nearly so; styles very short. Capsule 1/18 in. across, quite glabrous; cocci keeled. Seeds pale-brown, acutely 4-angled, obscurely transversely wrinkled.

Common in cultivated fields.

The following species of *Euphorbia* are commonly grown in the local gardens :—

1. **E. pulcherrima** *Willd.* (*Poinsettia pulcherrima* R. Grah.). This is an unarmed shrub. The upper floral leaves are brightly coloured, crimson or yellowish white. It is for the sake of these that it is cultivated in gardens under the popular name of *Poinsettia*. Propagation can be easily carried on by cuttings. It is a native of Mexico. Flowers during winter.

2. **E. splendens** *Boj.* It is a prickly undershrub, a native of Madagascar with numerous long straight sharp thorns, alternate, spathulate, mucronate, leaves and scarlet showy involucres in dichotomous cymes. Flowers during the cold season.

2. Phyllanthus *Linn.*

Herbs, shrubs or trees. Leaves alternate, distichous, quite entire. Flowers small, monoecious, usually in axillary clusters, apetalous. Male flower: Sepals 4–6, imbricate, in 2 series; disk glandular or 0; stamens 3–5 in the centre of the flower; filaments free or connate; anthers 2-celled, oblong or didymous, rarely reniform, cells parallel or diverging, dehiscence extrorse, vertical or transverse by the confluence of the cells; pistillode 0. Female flower: Sepals as in male flowers; disk glandular; ovary mostly 3-celled; styles free or connate, usually 2-fid, with slender arms; ovules 2 in each cell. Fruit of 3 or rarely more, crustaceous or coriaceous, rarely bony, 2-valved cocci, with or without a separable coriaceous, rarely fleshy, epicarp. Seeds 3-gonous, without a strophiole; testa crustaceous; albumen fleshy; cotyledons flat or flexuous.

P. Niruri *Linn.*; *Fl. Brit. Ind., V, p.* 298. An erect herb, 1/2–2 ft. high, glabrous, often branching from the base. Leaves 1/4-1/2 in. long, subsessile, elliptic-oblong, rounded, obtuse or rarely acute, pale-green, glaucous beneath; nerves few, obscure; stipules lanceolate-subulate. Flowers numerous, axillary, minute. Male flowers solitary or 2-3 together, almost sessile; sepals 5-6, 1/40 in. long, orbicular; disk of minute glands; anthers 3, sessile on a short column, didymous, reniform. Female flowers solitary, shortly pedicellate; sepals 5-6, 1/20 in. long, oblong, subacute, with broad white margins, not enlarging in fruit, spreading, not reflexed; styles very short, free, 2-lobed. Capsule 1/16-1/12 in. across, depressed-

globose, smooth hardly lobed, thinly crustaceous. Seeds trigonous, with equal parallel slender ribs and faint transverse striæ. (Fig. 203.)

A very common annual weed, especially in somewhat damp places.

P. Embelica *Linn.*; *Fl. Brit. Ind., V, p.* 289. It is a moderate-sized deciduous tree, which is often grown in the gardens for the sake of its fruit. This is about 1/2-1 in. in diameter, fleshy, and contains 3 bony 2-valved cocci. Styles are connate below and are twice 2-fid. The fruit is at first acid, but afterwards becomes sweet to taste. It is commonly pickled or made into jam. It is much used in Indian medicine, and along with bark and leaves in dyeing and tanning.—Vern., *ámlá* or *aolá*. Flowers: April–June.

3. Chrozophora *Neck.*

Diffuse, densely hispid or stellately tomentose herbs or undershrubs. Leaves alternate, sinuate-toothed or lobed, wavy or plaited, 2-glandular at the base. Flowers in sessile axillary bracteate racemes, monoecious; bracts 1-fid.; males crowded in the upper part of the raceme; females solitary, pedicelled. Male flower: Calyx globose or ovoid, splitting into 5 valvate segments; petals 5, short; disk obscure; stamens 5–15; filaments connate below in one or more whorls; anthers oblong, cells contiguous, parallel; pistillode 0. Female flower: Sepals narrow; petals narrow or 0; disk-glands short, broad; ovary 3-celled; styles erect or spreading, 2-fid; ovule 1 in each cell. Capsule of 3 hispid, tomentose or scaly, almost fleshy, 2-valved cocci. Seeds without a strophiole; testa shining; albumen fleshy; cotyledons broad, flat.

Key to the species.

Ovary and capsule with stellate tomentum and silvery scales.	
A prostrate herb; stamens about 15 in two whorls	1. *C. tinctoria.*
An erect undershrub; stamens 5 ..	2. *C. obliqua.*
Ovary and capsule with stellate tomentum but without silvery scales.	
Erect herb; leaves pale, up to 4 in. long; sepals of female flowers triangular ..	3. *C. plicata.*
A prostrate herb; leaves dark-brown, less than 1½ in. long; sepals of female flowers linear	4. *C. prostrata.*

1. **C. tinctoria** *A. Juss.*; *Fl. Brit. Ind., V, p.* 408. An annual prostrate herb, softly stellately tomentose in all parts; branches up to 1 ft. long. Leaves 1–2½ in. long, from ovate and sinuate-toothed or entire to rounded and obtusely lobed, thick, softly tomentose on both

surfaces ; petiole 1/2–4 in. long. Racemes short, lengthening in fruit. Male flowers numerous ; stamens mostly about 15 in 2 whorls ; pedicel of female flowers at length decurved and up to 3 in. long in fruit. Capsule 1/3 in. across ; ovaries and capsules stellately tomentose and clothed with silvery scales. (Fig. 204.)

Common on the Ravi bank and at other places. Flowers : March–May.

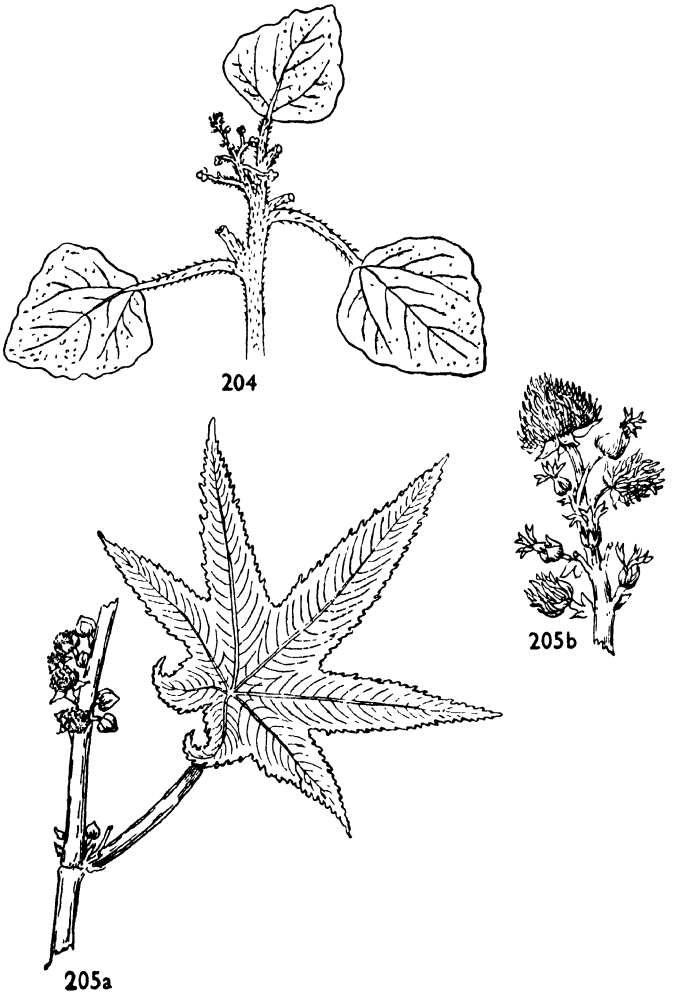

Fig. 204, *Chrozophora tinctoria*, × ½ ; Fig. 205, *Ricinus communis*, (*a*) twig bearing male flowers, × ½, (*b*) female flowers, × ¾.

2. **C. obliqua** *A. Juss.* ; *Fl. Brit. Ind.*, *V*, *p.* 409. An erect or suberect undershrub, much branched, thickly stellately tomentose.

Leaves 1-2 in. long, ovate, sinuate-toothed; petiole nearly as long or longer; stamens 5; ovaries and capsules stellately tomentose and with silvery scales.

This has been collected from Ferozepore by Thomson and may occur near Lahore.

3. **C. plicata** *A. Juss.*; *Fl. Brit. Ind.*, *V*, *p.* 409. An erect hoary annual up to 2 ft. high; lower part usually without branches, sparingly branched above. Leaves 2–5 in. long, ovate to orbicular, entire or sinuate-toothed, often obscurely 3-lobed, thick, pale-green, stellately hairy on both surfaces, scabrid on the upper surface; petiole nearly equalling the blade. Racemes many-flowered; stamens about 15 in two whorls; sepals of female flowers triangular. Capsules 1/3 in. across, densely stellate hairy, but without silvery scales; fruiting pedicels often 2-3 in. long.

Occurs throughout India, but appears to be not abundant near Lahore and there are no specimens in the Panjab University Herbarium.

4. **C. prostrata** *Dalz.*; *Fl. Brit. Ind.*, *V*, *p.* 410. A prostrate stellately woolly herb, diffusely branched from the base. Leaves 1/2–1½ in. long and nearly as broad, broadly ovate or orbicular, deeply bullate, often dark-brown, finely pubescent above, densely stellate-woolly beneath. Racemes few-flowered; stamens about 15 in two whorls; sepals of the female flowers linear. Capsule 1/4 in. across, stellately woolly but without silvery scales; its pedicel never greatly lengthening.

Hooker includes this under *C. plicata*, but more probably it is a distinct species. There are no specimens in the Panjab University Herbarium, but it was collected by Thomson from Lahore.

4. Ricinus *Linn.*

A tall glabrous annual or sometimes a small perennial tree. Leaves alternate, broad, palmately 7-many-lobed, gland-serrate. Flowers large, in terminal sub-panicled erect racemes, monoecious, apetalous, upper male, lower female; disk 0. Male fl.: Calyx membranous, splitting into 3–5 valvate segments; stamens very many; filaments connate, much branching; anther-cells distinct, distant, subglobose, divergent; pistillode 0. Female fl.: Calyx spathaceous, caducous; ovary 3-celled; styles short or long, spreading, often very large, entire, 2-fid or 2-partite, feathery or papillose; ovule 1 in each cell. Capsule of three 2-valved cocci. Seeds oblong, smooth; testa crustaceous; albumen fleshy; cotyledons broad, flat. (Fig. 205.)

R. communis *Linn.*; *Fl. Brit. Ind.*, *V*, *p.* 457. Leaves 6–18 in. in diameter, green or reddish; petioles 4–12 in. long. Male flowers 1/2 in. across; female calyx nearly as long; styles often deeply coloured. Capsule

1/2-1 in. in diameter, globose-oblong, smooth or echinate. Seeds mottled, with whitish caruncle.—Vern., *Arand.* (Fig. 205.)

This is the castor-oil plant.

LVII. URTICACEÆ.

Trees, shrubs or herbs, with usually alternate, rarely opposite, simple or palmately divided, stipulate leaves. Flowers small, inconspicuous, usually unisexual, monoecious or dioecious, rarely bisexual, in cymes or cymose spikes, panicles or clusters, or crowded on the surface of a flat, concave or globose fleshy receptacle or (in *Ficus*) on the inner surface of a closed globose receptacle; bracts and bracteoles variable; perianth equally or unequally toothed, lobed or partite; stamens generally as many as and opposite to the perianth segments, sometimes less; anthers 2-celled; rudimentary pistil in male flowers sometimes present; ovary superior, 1-celled; ovule solitary, erect or pendulous; style often excentric, simple or 2-fid, sometimes very short or absent. Fruit various, a simple drupe, samara or more generally an achene, or compound and consisting of a confluent mass of perianths and pericarps and in which the receptacle also sometimes takes part (as in *Ficus*). Seeds albuminous or exalbuminous; embryo various.—*A large family, genera about* 110, *species nearly* 1,500, *chiefly tropical or sub-tropical.*

Key to the genera.

Leaves palmately divided to the base, segments lanceolate	1.	*Cannabis.*
Leaves not as above.		
Flowers in spikes	2.	*Morus.*
Flowers in axillary clusters	3.	*Pouzolzia.*
Flowers on the inner wall of globose closed fleshy receptacles	4.	*Ficus.*

1. Cannabis *Tournef.*

A tall erect herb. Leaves alternate or the lower opposite, upper 1–3- lower 5–11-partite; segments lanceolate, serrate; stipules free. Flowers small, generally dioecious; male flowers clustered in short axillary paniculate cymes; sepals 5, imbricate; stamens 5, erect in bud; pistillode 0; female flowers in axillary racemes; bracts convolute, leafy; perianth hyaline, embracing the ovary or 0; ovary sessile; style central, arms 2, filiform, caducous; ovule pendulous. Fruit a compressed, crustaceous achene. Seed flattened; albumen on one side, fleshy; embryo curved; cotyledons broad, thick, subequal; radicle upcurved, incumbent.

C. sativa *Linn.*; *Fl. Brit. Ind.*, *V*, *p.* 487. Annual, very rarely perennial, 4–8 ft. high; leaves 4–8 in. long. Flowers green.—*Hemp*; Vern., *bhang*. (Fig. 206.)

Common on the Ravi side. The plants come out during winter and flower mostly from February to May. It is a native of Central Asia and W. India, but is now widely cultivated in many other tropical and temperate countries.

A valuable fibre is obtained from the inner bark of the stem, which is used in making ropes, etc. In America the plant is largely cultivated for this purpose. In India the plant is largely grown for the sake of the narcotic resin which exudes from it and which is used both as a drug and as a stimulant like opium. There are three chief forms of the drug: *Bhang* consists of the mature dried leaves with their resinous deposit, *Ganja* of female flowering tops with resin on them packed together and *Charas* is the resin knocked off from the twigs. The last comes mostly from Central Asia. The first is usually made into a liquor; the second and third are usually smoked. In small doses these produce a pleasant excitement, but large doses produce delirium and catalepsy. The sale of these drugs is kept in check by a licensing system.

2. Morus *Linn.*

Trees or shrubs. Leaves alternate, entire, toothed or lobed; basal nerves 3; stipules small, lateral, lanceolate, caducous or deciduous. Flowers mono- or dioecious; male flowers in catkins; sepals 4, imbricate; stamens 4, inflexed in bud; pistillode turbinate; female flowers in pseudo-spikes; sepals 4, decussate, imbricate, accrescent and succulent in fruit; ovary included, straight, 1-celled; style central, 2-partite or 2-fid; ovule pendulous. Fruit a spike or head of many achenes enclosed in the succulent perianths, the whole forming a composite berry (sorosis). Seed subglobose; albumen fleshy; embryo incurved; cotyledons oblong, equal; radicle ascending, incumbent.

1. **M. alba** *Linn.*; *Fl. Brit. Ind.*, *V*, *p.* 492. A medium-sized deciduous tree; young parts, petioles and under-surface of the leaves more or less pubescent. Leaves mostly 2-3 in. long, ovate, acute or shortly acuminate, serrate or crenate-serrate, often 3-lobed; base truncate or cordate; petiole 3/4-1 in. long. Flowers greenish; male and female usually on different branches, occasionally on different trees; male catkins 1/2–1½ in. long, rather lax, slightly pubescent; female spikes ovoid, on peduncles as long as the spikes; sepals of the female flowers glabrous or slightly hairy, the two inner flat or concave, the outer ones keeled; style-arms free to the base, glabrous or nearly so. Fruit 1/2-1 in. long, ovoid, white or red and ultimately black when ripe.—*The mulberry*; Vern., *tút*. (Fig. 208.)

Probably a native of China, but now naturalized in many other countries.

Common in the *Shisham* (*Dalbergia sissoo*) plantations at Shahdara and Changa Manga.

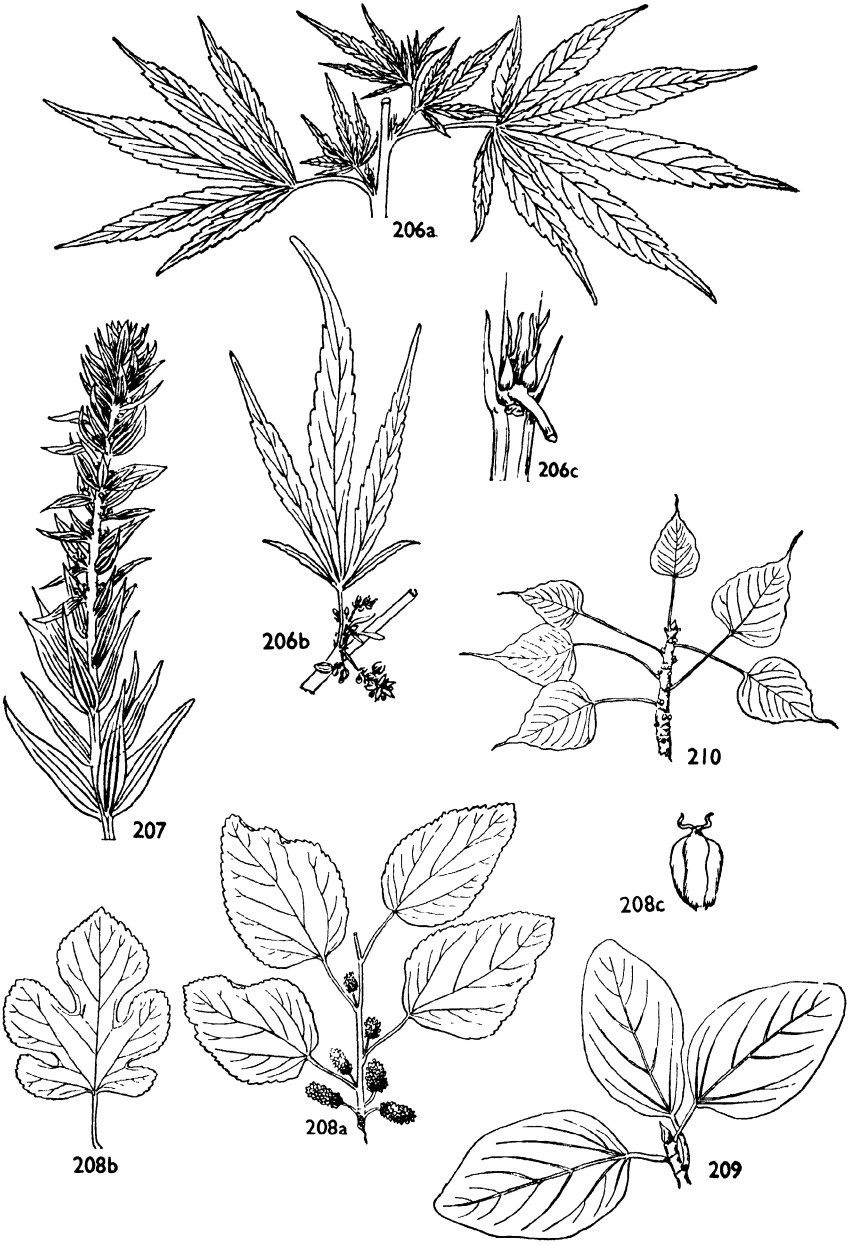

Fig. 206, *Cannabis sativa*, (*a*) vegetative branch, $\times\frac{1}{2}$, (*b*) male inflorescence, $\times\frac{3}{4}$, (*c*) female flowers, $\times 2$; Fig. 207, *Pouzolzia pentandra*, $\times\frac{1}{2}$; Fig. 208, *Morus alba*, (*a*) branch with pistillate spikes, $\times\frac{1}{4}$, (*b*) leaf, $\times\frac{1}{4}$, (*c*) female flowers, $\times 3$; Fig. 209, *Ficus bengalensis*, $\times\frac{1}{6}$; Fig. 210, *F. religiosa*, $\times\frac{1}{6}$.

The timber is used in the manufacture of tennis and badminton rackets, hockey sticks and other sporting goods. In the gardens the trees are much grown for the sake of the edible fruits. This is the mulberry which is chiefly used throughout North-Western India for providing food for the silk-worms.

Flowers during March and April. New leaves also appear about this time.

The trees of following other species of *Morus* are also here and there found at Lahore :—

M. indica *Linn.* ; *Fl. Brit. Ind., V, p.* 492. This is very similar to *M. alba* and may be only a variety of the same. Leaves are often deeply lobed, sharply serrate and largely caudate-acuminate. Female spikes are usually distinctly shorter than their peduncles ; style-arms are hairy or papillose and connate below for one-fourth their length. Fruit 1/2 in. long, black when ripe.

Occasionally cultivated in the gardens. There are several trees on the Race Course Road at Lahore. Flowers at the end of February, before *M. alba*.

M. lævigata *Wall.* ; *Fl. Brit. Ind., V, p.* 492. Fruit nearly white when ripe, 2-3 in. long, juicy, very sweet.

The plants are commonly cultivated for the sake of the edible fruit.

M. atropurpurea *Roxb.* ; *Fl. Brit. Ind., V, p.* 491. Fruits 3–6 in. long, cylindric, sweet, dark-purple.

A native of China, occasionally grown in the local gardens.

3. Pouzolzia *Gauz.*

Herbs. Leaves opposite and alternate, 3-nerved, with free stipules. Flowers unisexual, in axillary clusters. Male flower : perianth 3–5-lobed or -parted, segments valvate ; stamens 3–5, inflexed in bud ; pistillode clavate or globose. Female flower : perianth tubular, 2–4-toothed, fruiting sometimes angled, winged or swollen ; ovary included ; style jointed on to the top of the ovary and deciduous ; ovule erect. Fruit an achene closely invested by the perianth, crustaceous. Seed albuminous ; cotyledons ovate.

P. pentandra *Benn.* ; *Fl. Brit. Ind., V, p.* 583. An erect or decumbent herb, 2-3 ft. high, diffusely branched, nearly glabrous. Leaves subsessile ; the lower opposite, 1–4 in. long, oblong- or linear-lanceolate, acute or acuminate, strongly 3-nerved ; the upper mostly alternate, smaller, narrower. Flowers in clusters in the axil of the upper smaller leaves ; male pedicellate, with 5-partite perianth and 5 stamens. Fruiting perianth with 2 or 3 broad lateral wings. (Fig. 207.)

This species has been collected from the canal side at Lahore. Flowers during September-October.

4. Ficus *Linn.*

Trees or shrubs, sometimes scandent ; sap milky. Leaves alternate, rarely opposite, entire, lobed, serrate or toothed ; stipules connate,

covering the apical bud, often quite large, caducous, leaving an annular scar. Flowers minute, unisexual, on the inner surface of fleshy globose receptacles (commonly called figs), the mouth of which is closed by imbricate bracts; flowers often mixed with bracts and bracteoles. Male flower: perianth 2–6-fid or -partite, imbricate; stamens 1-2, rarely 3–6, erect in bud. Female flower: perianth of the male, or imperfect, or 0; ovary straight or oblique; style excentric; ovule pendulous. Gall flowers like the female, but longer stalked; ovary without ovule or seed, occupied by a pupa of some kind of small wasps belonging to the *Chalcideæ*. Achenes crustaceous or fleshy. Seeds with scanty albumen; embryo curved; cotyledons equal or unequal; radicle upcurved.

In the genus *Ficus*, there are five kinds of flowers, male, female, pseudo-bisexual, neuter and gall flowers. Pseudo-bisexual and neuter flowers are very rare and do not occur in the Lahore species. In *F. bengalensis*, *F. religiosa* and *F. infectoria*, male, female and gall flowers occur in the same receptacles, male near the top, gall in the middle and female at the bottom of the receptacles. In the other species male and gall flowers are found in one kind of receptacles and the female in another kind. The two kinds of receptacles are, however, externally quite similar.

Key to the species.

Figs sessile.
- Leaves obtuse at the apex .. .. 1. *F. bengalensis.*
- Leaves with a long drawn out tip .. .. 2. *F. religiosa.*

Figs pedunculate .. .. .. 3. *F. palmata.*

1. **F. bengalensis** *Linn.*; *Fl. Brit. Ind., V, p.* 499. A large ever-green tree; aerial roots numerous from the horizontal branches, which on reaching the ground thicken and form supports to the crown; young parts softly pubescent. Leaves 4–8 in. long, 2–5 in. broad, ovate or elliptic, entire, obtuse, rounded, subcordate or narrowed at the base, 3–7-nerved, thick and coriaceous; petiole 1/2–2 in. long, not jointed to the blade; stipules 3/4-1 in. long. Figs axillary, in pairs, 1/2-3/4 in. across, sessile, with rounded bracts at the base, globose, puberulous, red when ripe; male flowers many, near the mouth of the receptacle, 1-stamened.—*Banyan*; Vern., *barh* or *bor*. (Fig. 209.)

Commonly cultivated; often self-sown. The young plants grow on other trees, brick walls, sides of wells and in other similar situations.

2. **F. religiosa** *Linn.*; *Fl. Brit. Ind., V, p.* 513. A large deciduous tree, leafless for a short time during the hot weather, glabrous in all parts. Leaves 4–7 in. long, 2½–5 in. broad, broadly ovate, linear-acuminate at the apex, entire, 5–7-nerved, shining above; base rounded, truncate or cordate; petiole 3-4 in. long, jointed to the blade; stipules minute. Figs in axillary pairs, 1/2 in. across, sessile, with 3 bracts at the base, depressed-globose, glabrous, dark-purple when ripe; male flowers

few or in many figs 0, near the mouth of the receptacle, 1-stamened.—Vern., *Pipal.* (Fig. 210.)

As commonly grown as *Ficus bengalensis, often self-sown* and in similar situations.

3. **F. palmata** *Forsk.*; *Fl. Brit. Ind., V, p.* 530. A shrub or small tree, deciduous, young parts pubescent or tomentose. Leaves $1\frac{1}{2}$–5 in. long, orbicular-ovate, rounded, acute or apiculate, entire, dentate or serrate, often 3–5-lobed, rounded or cordate at the base, 3-nerved, membranous, scabrous above, tomentose beneath; petiole 1-2 in. long; stipules 1/3 in. long, ovate, acute. Figs axillary, solitary or in pairs, 1/2-1 in. across, on peduncles 1/2-1 in. long, with 3 or more acute bracts at the base, globose or pear-shaped, pubescent, yellowish-purple when ripe; male flowers numerous in the upper part of the receptacle, 3–6-stamened. —Vern., *Phaguri* or *Phagwra.*

Occurs as undergrowth in the forests on the Ravi bank. Also sometimes cultivated.

The following other species of *Ficus* are also grown :—

F. Carica *Linn., the cultivated fig.* It is very similar to and perhaps not specifically distinct from *F. palmata.* It is propagated by cuttings.—Vern., *anjír.*

F. infectoria *Roxb.* It is a good shade tree and is often planted in the plains. Leaves entire, ovate, acuminate, smooth, petiole jointed to the blade. Figs axillary, sessile or pedunculate, white when ripe.—Vern., *palákh.*

F. glomerata *Roxb.* A deciduous tree. Leaves elliptic-ovate or lanceolate, nearly symmetrical at the base, basal nerves 3. Figs on special leafless branches or in clusters on the old wood, red, orange or purple when ripe.—Vern., *gular.*

Occasionally planted in gardens and on road-sides. Occurs in Changa Manga forest plantations.

A few more species of *Ficus* are here and there planted in the Lahore gardens. For these reference may be made to Parker's ' A Forest Flora for the Punjab with Delhi and Hazara '.

LVIII. SALICACEÆ.

Deciduous trees or shrubs. Leaves alternate, stipulate, petiolate, simple. Flowers dioecious, both male and female in catkins, one under each bract, but without bracteoles; perianth 0; disk in the genus *Salix* of 1 or more glands, in *Populus* cup-shaped; stamens in male flowers 2-many; filaments free or partially united; anthers 2-celled; pistillode 0; ovary in the female flowers sessile or stipitate, 1-celled, containing a few to many anatropous ovules on 2–4 parietal or sub-basal placentas; style 0 or short; stigmas notched or lobed. Fruit on ovoid or lanceolate capsule opening by 2–4 valves and containing several or many minute exalbuminous seeds, each enveloped in a tuft of long silky white hairs.—*Genera* 2, *species about* 200, *chiefly in the north temperate countries.*

Key to the genera.

Petiole less than 1/2 in. long ; leaves lanceolate ; disk rounded of 1-2 glands	1. *Salix.*
Petiole more than 1/2 in. long ; leaves nearly or ovate ; disk cup-shaped	2. *Populus.*

1. Salix *Linn.*

Leaves usually shortly petioled, lanceolate. Disk of 1, usually posterior, or of 2 anterior and posterior glands ; stamens 1–12, usually 2. Capsule 2-valved.

The following two species are occasionally cultivated in the gardens and on the road-sides. The first, however, grows wild in the sub-himalayan districts.

Key to the species.

Male catkins 2–5 in. long ; stamens 5–10 ; female catkins 3–5 in. long ; capsule distinctly stalked	1. *S. tetrasperma.*
Male and female catkins up to 1 in. long ; stamens 2 ; capsule sessile	2. *S. babylonica.*

1. **S. tetrasperma** *Roxb.* ; *Fl. Brit. Ind., V, p.* 626. A small tree ; young branches silky. Leaves 2–6 in. long, lanceolate or ovate-lanceolate,

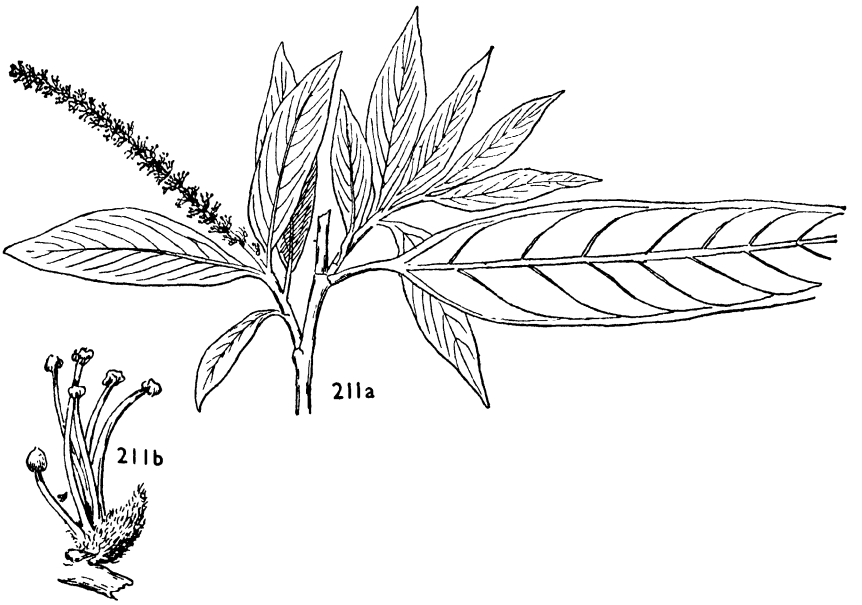

Fig. 211, *Salix tetrasperma,* (*a*) branch bearing a spike of male flowers, × ½, (*b*) male flower, × 4½.

usually serrulate, acute or acuminate, pale or white beneath ; petiole 1/4-3/4 in. long. Catkins appearing after the leaves, at the end of short leafy branchlets, drooping, hairy ; male 2–5 in. long, sweet-scented ; stamens 5–10 ; female catkins 3–5 in. long. Capsule about 1/5 in. long, stipitate, glabrous, 4–6-seeded. (Fig. 211.)

Occasionally planted in gardens at Lahore. There is a plantation of this species at Wazirabad on the banks of Chenab. It grows wild in the sub-himalayan districts and the Salt Range along streams. Flowers in March, according to Parker also sometimes in September in the Punjab plains.

2. **S. babylonica** *Linn.* ; *Fl. Brit. Ind.*, *V*, *p.* 629. A tree with drooping branches. Leaves 3–7 in. long, narrowly lanceolate, serrulate, acuminate, mostly glabrous ; petiole less than 1/2 in. long. Catkins appear with the leaves, 1/2-1 in. long ; stamens 2. Capsule glabrous, sessile.

It is grown both in the plains and the hills and can be easily recognized by its habit. Male trees are more common than the female. The wood is suitable for the manufacture of cricket bats. Flowers : February-March.

2. Populus *Linn.*

Leaves usually long-petioled, broader, often lobed ; 3–5-nerved at the base ; buds often sticky. Disk cup-shaped, often oblique, entire, toothed or lobed ; stamens 4 to numerous. Capsule 2–4-valved.

P. euphratica *Oliv.* ; *Fl. Brit. Ind.*, *V*, *p.* 638. A tall tree, 30–50 ft. high. Petiole 1/2–2 in. long, usually with 2 large glands at the top ; leaf-blades 2-3 in. long, very variable, rhomboid-orbicular or -ovate, sharply shortly lobed towards the apex ; longer, shortly petioled and narrowly oblong on young plants and suckers. Catkins lax, nodding ; male 1-2 in. long, female 2-3 in. long ; stamens 8–12 ; disk in female flowers with 8–12 linear segments. Capsule shortly stipitate, about 1/3 in. long, ovoid-lanceolate.

On river banks in the Punjab plains ; in the Shahdara Forest Plantation ; occasionally grown in the gardens. Leafless during January–March ; flowers during February.

LIX. HYDROCHARITACEÆ.

Aquatic, freshwater or marine, usually submerged herbs. Leaves radical, or on elongated stems and alternate, opposite or whorled. Flowers regular, rarely hermaphrodite, usually dioecious, enclosed in an entire or toothed spathe or arranged within two opposite bracts. Male flower : Sepals 3 ; petals 3 or 0 ; stamens 3–12 or sometimes numerous ; anthers 2-celled, opening by longitudinal slits ; pistillode usually present. Female flower : Mostly solitary, epigynous ; perianth superior ; sepals 3 ; petals 3 or 0 ; staminodes sometimes present ; ovary inferior, sometimes beaked, 1-celled, with 3–6 parietal placentas which sometimes protrude to the

middle of the ovary; style or style-arms usually 3–6; ovules many on each placenta, anatropous or orthotropous. Fruit globose or ovoid, dry or fleshy, rupturing irregularly. Seeds few or many, without endosperm, embryo straight, with a thick hypocotyl and usually inconspicuous plumule.—*Genera* 16, *species about* 50, *in tropical and temperate regions of the world.*

Key to the genera.

Leaves small, in whorls on slender branching stems 1. *Hydrilla.*
Leaves radical, long, narrow; stem stoloniferous .. 2. *Vallisneria.*

1. Hydrilla *Rich.*

A submerged leafy freshwater dioecious herb. Leaves short, in whorls of 3–8, or the lower opposite. Male flowers solitary, shortly

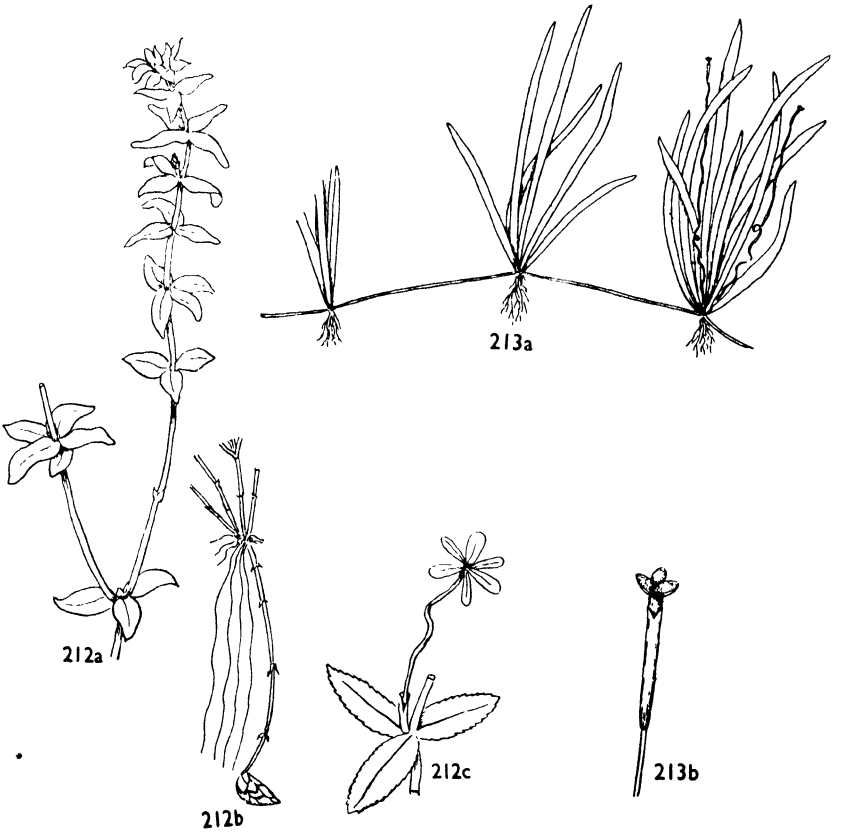

Fig. 212, *Hydrilla verticillata*, (*a*) branch, ×⅔, (*b*) perennating tuber, ×⅔, (*c*) flower, ×2; Fig, 213, *Vallisneria spiralis*, (*a*) plant with female flower, ×¼, (*b*) female flower, ×1½.

pedicelled, in a subglobose sessile muricate spathe ; sepals 3, ovate or obovate, green ; petals 3, oblong or cuneiform ; stamens 3 ; anthers large, reniform, opening elastically ; pistillode small. Female flowers solitary or in pairs, sessile, enclosed in a tubular 2-toothed spathe ; perianth similar to that of the male, but the parts linear ; ovary produced beyond the spathe into a filiform beak, 1-celled ; styles 3, linear, undivided ; stigmas fimbriate ; ovules anatropous. Fruit subulate, smooth or muricate. Seeds 2-3, oblong ; testa shortly produced at each end.

H. verticillata *Royle.* ; *Fl. Brit. Ind., V, p.* 659. Stems slender, up to 2½ ft. long, branched, often rooting at the nodes. Leaves 1/4-3/4 in. long, linear, linear-oblong or oblong, entire or serrulate, apiculate, midrib well marked. Flowers 1/6-1/4 in. long. (Fig. 212.)

Abundant in all still or slowly running waters,—Shalamar gardens, Chhota Ravi and various ponds.

2. Vallisneria *Linn.*

A submerged freshwater stoloniferous herb. Leaves all radical, very long, linear, giving a tufted habit to the plant. Flowers dioecious. Male flowers very numerous, minute, in an ovoid 3-lobed shortly peduncled spathe ; sepals 3 ; petals 0 ; stamens 1–3 ; pistillode 0. Female flowers solitary in a tubular 3-toothed spathe terminating a very long filiform spiral scape ; perianth similar to that found in the male flowers; staminodes 3, 2-fid ; ovary narrow, not beaked ; stigmas 3, broad, notched ; ovules numerous. Fruit linear, included in the spathe. Seeds numerous, oblong.

V. spiralis *Linn.* ; *Fl. Brit. Ind., V, p.* 660. Leaves varying in length with the depth of water, mostly 4–6 in. long and 1/4-1/3 in. broad, translucent, entire or serrulate at the tips. (Fig. 213.)

Quite common within the area and throughout India and in most of the tropical countries. Flowers throughout the winter months, November–March.

Male flowers when ready to open get detached and rise to the surface of water, the expanded perianth acting as a float. The female flowers reach the surface of water by the uncoiling of a long spiral stalk (scape) and are pollinated with pollen from the floating males. After pollination the stalk coils up again into a close spiral carrying the pollinated female flowers to the bottom of the water, where the seeds ripen.

LX. ORCHIDACEÆ.

Perennial herbs of diverse habit, mostly terrestrial with tuberous roots or root-stock or epiphytic. Stem leafy or scapose ; annual in the terrestrial forms ; in the epiphytic forms perennial, often thickened into pseudo-bulbs and bearing aerial assimilating roots. Leaves usually alternate, often distichous, entire, sheathing at the base, often fleshy. Flowers often showy, bracteate, usually hermaphrodite, zygomorphic,

solitary or borne in spikes, racemes or panicles ; perianth superior, of 6 parts in two whorls ; the outer three (sepals) more or less alike or the two lateral sometimes connate in a short or long sac- or spur-like base, petaloid or green ; the inner three (petals) dissimilar, the two lateral alike, the other (labellum) usually very different, often extremely complicated, prolonged into a sac or spur containing nectar or nectar-secreting tissue, usually on the anterior side of the flower due to the twisting of the ovary through 180° ; stamens and style united in a column opposite the labellum ; fertile anther usually one (2 in *Cypripedieæ*), on the front, top or back of the column, 2-celled, opening by longitudinal slits ; pollen granular or coherent in each cell into 1, 2 or 4, mealy, waxy or bony masses (pollinia), which are free or attached by pairs or fours directly or by stalks (caudicles) to a gland (a viscid portion of the rostellum) ; ovary inferior, 1-celled, with three parietal placentas, only very rarely 3-celled with axile placentas ; stigmas sometimes 3, fertile and above the two anthers (*Cypripedieæ*), but more frequently on the top or concave face of the column, opposite the labellum and below the anther, the lateral two fertile, the other sterile and transformed into a small outgrowth (rostellum) which lies between the anther and the stigmas ; ovules very numerous, minute, anatropous. Fruit a capsule, opening by 3 or 6 longitudinal slits. Seeds very numerous, minute, with a hyaline testa often drawn out at each end or rarely winged, without endosperm and with undifferentiated embryo.—*A large widely distributed family ; species about* 5,000 ; *mostly epiphytic in the tropics and terrestrial in the temperate regions and on the mountains.*

Key to the genera.

Herbs with underground fleshy tubers ; leaves appearing after the flowers ; column $\frac{1}{3}$ in. long	1. *Eulophia.*
Herbs without any prominent underground tubers ; leaves present at the time of flowering ; column very short	2. *Zeuxine.*

1. Eulophia *R. Br.*

Terrestrial herbs with fleshy underground tubers. Leaves often appearing after the flowers, long, narrow. Flowers in erect scapose racemes ; sepals free, spreading, subequal ; lateral petals nearly similar to the sepals ; labellum adnate to the base of column or to its foot, saccate or shortly spurred at the base ; side-lobes erect, embracing the column ; middle-lobe spreading or recurved ; column with or without a foot, apex entire, margins occasionally winged or lobed ; anther terminal, 2-celled, sometimes with two processes at its apex ; pollinia 2, globose, attached by caudicles to the rostellum.

E. Hormusjii *Duthie* ; *Ann. Roy. Bot. Gard. Calc., IX, part* 2, *p.* 125. Tubers 1-1½ in. in diameter, depressed. Leaves two, developing after flowering, narrowly elliptic, acuminate. Flowering stem 8–12 in. tall, stout ; bracts few, loose, membranous, lanceolate, acuminate, sheathing at the base. Flowers 8–15 ; sepals and petals nearly 1/2 in. long, narrowly oblong or oblanceolate, acuminate or mucronate, white with pink veins and with shade of pale-green at the apex ; labellum longer than sepals and petals, spurred at the base ; side-lobes deep-purple, erect, rounded, entire ; between the side-lobes are three prominent whitish lamellæ ; middle lobe yellow, spotted with purple, with a coarsely fimbriate disk, and undulate and irregularly erose margin ; column 1/3 in. long, with a short foot.

Rare. Only one specimen has been collected from near Lahore. It is probably a recent introduction from the hills, the seeds or tubers having been brought down by the canals.

2. Zeuxine *Lindl.*

Small terrestrial herbs without any [illegible] tubers. Leaves membranous, with sheathing bases. Flowers small, in short spikes ; sepals nearly equal ; dorsal concave, cohering with the petals ; lateral free ; labellum adnate to the base of the column, saccate at the base and with a shortly-clawed or sessile, entire or 2-fid, terminal lobe ; the basal sac with 2 hard projections or laminæ within ; column very short, 2-winged in front ; stigmatic lobes 2, lateral ; anther membranous, cells contiguous ; pollinia 2, pyriform, attached by an oblong gland to the erect rostellum.

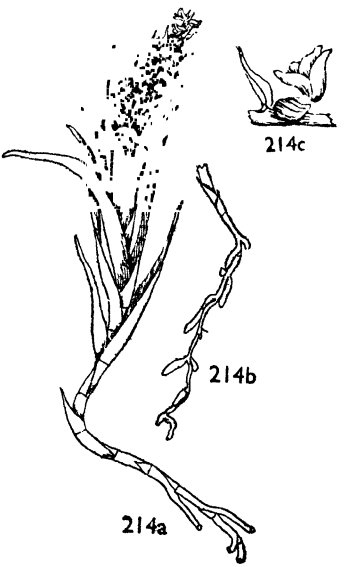

Fig. 214, *Zeuxine sulcata*, (*a*) plant, ×½, (*b*) roots, ×½, (*c*) flower, ×2.

Z. sulcata *Lindl.* ; *Fl. Brit. Ind., VI, p.* 106. A small glabrous herb 2–10 in. high, plants often gregarious, perennating by small underground shoots formed at the end of the growing season. Leaves 1-2 in. long, linear, gradually narrowing to the apex, sessile on the hyaline truncate sheaths. Spikes densely flowered, 1/2-1 in. long ; bracts 1/3 in. long, ovate-lanceolate, sharply pointed ; flowers nearly as long as the bracts, white or with shades of pink ; dorsal sepal ovate ; lateral sepals obliquely lanceolate, connivent ;

labellum yellow ; anther depressed, very shortly beaked, covered by the wings at the apex of the column ; rostellum with two short stout parallel arms. Capsule ellipsoid, about 1/2 in. long. (Fig. 214.)

Common in moist places. Flowers throughout winter, but more abundantly in the later part.

LXI. SCITAMINEÆ.

The following plants of this family are commonly cultivated in fields or gardens :—

1. **Curcuma longa** *Linn.* ; *Fl. Brit. Ind., VI, p.* 214. Turmeric ; Vern., *Haldi.*

2. **Zingiber officinale** *Rosc.* ; *Fl. Brit. Ind., VI, p.* 246. Ginger ; Vern., *Adrak.*

3. **Canna indica** *Linn.*, var. **orientalis** *Rosc.* ; *Fl. Brit. Ind., VI, p.* 260. It is commonly called Canna and is much grown in the gardens for the sake of its showy flowers.

4. **Musa paradisiaca,** subsp. **sapientum** *Schum.* ; *Engl. Pflanzenreich, IV, part* 45, 1900. The banana ; Vern., *Kelá.*

LXII. LILIACEÆ.

Herbs, mostly perennial, sometimes annual, rarely shrubs, with fibrous roots or with a creeping rhizome or a bulb or corm ; roots sometimes tuberous. Aerial stem erect or climbing, leafy or scapose. Leaves cauline or radical. Flowers usually hermaphrodite and regular, arranged in umbels, spikes, racemes, panicles or fascicles, or axillary or terminal and solitary ; bracts usually small and scarious or spathaceous when the flowers are arranged in umbels ; perianth leaves 6, in two whorls, petaloid, imbricate or the outer valvate in bud ; stamens 6, rarely 3, hypogynous or adnate to the perianth ; filaments free or connate ; anthers oblong or linear, 2-celled, opening mostly by longitudinal slits ; ovary superior, very rarely semi-inferior, mostly 3-celled with axile placentas, or rarely 1-celled with parietal placentas ; style generally one, entire or divided, rarely styles three ; ovules usually numerous, rarely only a few or solitary. Fruit a loculicidal or a septicidal capsule, or a berry. Seeds one or many, globose or flattened ; endosperm copious ; embryo straight or curved.—*A large world-wide family, in all climates and countries ; most abundant in temperate and sub-tropical regions.*

Key to the genera.

Inflorescence not umbellate	..	1. *Asphodelus.*
Inflorescence umbellate	..	2. *Nothoscordum.*

1. Asphodelus *Linn.*

Annual or perennial herbs with fibrous roots, fastigiate and united in the upper part. Leaves radical, sheathing at the base, linear, terete, fistular. Flowers bracteate, racemose on a usually much branched leafless scape; perianth white, withering without falling down, 6-partite; segments connate into a tube below; stamens 6, hypogynous; filaments dilated at the base and embracing the ovary; anthers dorsifixed, versatile; ovary 3-celled; style filiform; stigma sub-3-lobed; ovules 2, collateral in each cell. Capsule globose, loculicidal. Seed one in each cell, 3-quetrous; testa black; endosperm cartilaginous; embryo nearly as long as the endosperm.

A. tenuifolius *Cav.*; *Fl. Brit. Ind., VI, p.* 332. Annual. Leaves 6–12 in. long, finely puberulous. Scapes several, 1-2 ft. high; flowers white, laxly racemose; pedicel 1/4 in. long, jointed below the middle; bracts 1/10 in., broadly ovate, scarious, with a strong brownish midrib; perianth segments 1/4 in. long, oblong, obtuse, with brownish midrib; stamens $\frac{1}{8}$ in. long, black. Capsule 1/8 in. long, slightly more in diameter. (Fig. 215.)

A very common weed in cultivated fields during winter.

Fig. 215, *Asphodelus tenuifolius*, $\times \frac{1}{4}$.

2. Nothoscordum *Kunth*

Herbs with tunicate bulbs. Leaves radical, linear, plane. Scapes unbranched, naked. Flowers in terminal umbels; involucral bracts 2, connate; perianth marcescent; segments 6, connate at the base; stamens 6, filaments dilated at the base; anthers oblong, dorsifixed, introrse; ovary sessile, 3-locular, ovules many in each loculus; style filiform. Capsule membranous, 3-angled or 3-lobed, loculicidal; seeds angular-compressed or sub-plane; testa black, membranous or sub-crustaceous; embryo small.

N. fragrans *Kunth*; *Enum. Pl., IV, p.* 462. An alliaceous herb; bulbs 1/2-3/4 in. in diameter. Leaves up to 12 in. long, 1/3 in. broad. Scapes 12–18 in. long; umbels about 10-flowered; pedicels 1-2 in. long; perianth-segments 1/2 in. long, white. Capsule 1/3 in. across.

A native of N. America, Mexico, Africa and Mauritius. Recently introduced into this country. Common in some gardens as a weed at Lahore. Flowers: April–June.

The following are the common members of the *Liliaceæ* cultivated within the area:—

1. **Allium Cepa** *Linn.*, Vern. *piyaz* (onion).

2. **A. sativum** *Linn.*, Vern. *lasun* (garlic).

3. **Aloe vera** *Linn.* It is a native of North Africa, with thorn-edged, thick, soft, pale-green leaves and dull red flowers borne in simple erect spikes. It is called locally *ghee-kunvár*.

LXIII. PONTEDERIACEÆ.

Erect or floating fresh-water plants, with shoots of sympodial construction, the successive axes ending in inflorescences. Leaves with floating or raised parallel-veined blades, sheathing at the base. Flowers bisexual, usually slightly zygomorphic, arranged in racemes or spikes, subtended by a spathaceous leaf-sheath; perianth-segments 6, petaloid; stamens 6–1, epiphyllous, often somewhat unequal in length and one largest of all; anthers erect or versatile, opening by longitudinal slits or pores; ovary superior, 1- or 3-celled; placentation parietal or axile; ovules one to many on each placenta, anatropous; style slender; stigma nearly entire or lobed. Fruit a 3-valved loculicidal capsule. Seeds small, longitudinally ribbed; endosperm copious; embryo straight, cylindric.—*Genera* 6, *species about* 36; *in tropical and sub-tropical countries, chiefly tropical Africa and America.*

Key to the genera.

Perianth-segments nearly free	1. *Monochoria.*
Perianth-segments united at the base and forming a distinct tube	2. *Eichornia.*

1. Monochoria *Presl.*

Herbs with short or creeping root-stock. Leaves radical and solitary at the top of emerged stem or branches. Flowers racemed, campanulate; perianth-segments nearly free; stamens 6, one usually largest, with the filament toothed on one side; anthers basifixed, slits terminal, at length elongating; ovary ovoid, 3-celled, many-ovuled.

M. vaginalis *Presl.*; *Fl. Brit. Ind., VI, p.* 363. Root-stock short, suberect. Leaves very variable, up to 6 in. long, 1-2 in. broad, long-petioled, from linear to ovate and ovate-cordate, sheaths embracing the peduncles, blade few-nerved. Flowers blue, usually spotted with red, short-pedicelled, subspicate; perianth-segments 3/8 in. long, narrow;

large anther blue, horned; others yellow. Capsule less than 1/2 in. long, glandular on the outside.

Found in marshy places. Flowers during and after the rainy season and early winter months.

2. Eichornia *Kunth*

Water plants, rooted in the mud and rhizomatous, or free floating by means of the swollen petioles. Leaves in rosettes. Inflorescence sessile or peduncled, simply racemose or rarely panicled. Flowers with a well-developed perianth-tube and distinctly zygomorphic; perianth spreading or limb distinctly 2-lipped: stamens 6, declinate, irregularly inserted in the tube; anthers oblong, dorsifixed; ovary sessile, 3-celled, many-ovuled. Capsule membranous, included in the marcescent perianth, ovoid, oblong or linear.

E. crassipes *Solms.*; *in DC. Monog. Phan., IV*, 527. Adventitious roots very numerous. Leaves with long swollen petioles up to 20 in. long and ovate blades up to 4 in. long and only slightly less broad. Scapes 6–10 in. high. Flowers violet-blue.

Abundant in ponds and tanks, Chota Ravi, etc. It is originally a native of tropical America, but has now become widely naturalized in India and in certain parts of the country, especially in Bengal, has assumed the form of a pest.

LXIV. COMMELINACEÆ.

Annual or perennial herbs. Leaves with a distinct midrib and a basal closed sheath, sometimes shortly petioled above the sheath. Flowers regular or irregular, bisexual or polygamous, arranged in various manners, axillary clusters or terminal cymes or panicles, most often blue or white; perianth-segments 6, distinctly in two whorls; the outer three sepaloid, usually free, rarely united, imbricate, persistent; inner segments petaloid, free and imbricate, or united into a tube at the base, marcescent; stamens 6 or fewer by abortion or degeneration of some into staminodes, hypogynous, filaments free or rarely some united, often bearded with jointed, sometimes brightly coloured, hairs; anthers oblong or globose, basifixed, 2-celled, often dissimilar, opening mostly by longitudinal slits; ovary superior, sessile or shortly stipitate, 3- or rarely 2-celled, with terminal style and usually small capitate stigma; ovules few to one in each cell, axile, orthotropous. Fruit a membranous loculicidal capsule opening by 2 or 3 valves, rarely fleshy and indehiscent. Seeds usually angled; testa smooth, muricate, ridged or reticulate; albumen abundant, mealy; embryo minute, away from the hilum, its position indicated on the outside by a disk-like callosity (embryotega or embryostega).—*Genera about* 25, *species about* 300, *distributed in warmer parts of the world.*

Commelina *Linn.*

Slender herbs, often creeping and rooting from the nodes below. Flowers in usually 2-fid cymes, emerging one at a time from a terminal conduplicate spathe; flowers of the upper branch of cyme small, deciduous; of the lower fertile; fruiting pedicel and capsule retracted within the spathe; sepals 3, membranous, 2 inner often connate at the base; petals longer, one larger and often clawed; stamens 3 perfect and 2-3 imperfect; anthers oblong, one usually largest; ovary 3-, rarely 2-celled, 2 cells 1-2-ovuled, third cell if present 1-ovuled or empty. Capsule hidden in the spathe, the posterior cell often indehiscent or 0, or the 2 anterior cells empty, connate, indehiscent and forming a persistent ligulate body, from which the posterior cell falls away.

C. benghalensis *Linn.*; *Fl. Brit. Ind., VI, p.* 370. Stems variable in length, 1–3 ft. long, slender, diffuse, dichotomously branched from the base, glabrous or pubescent. Leaves 1–3 in. long, about half as broad, ovate or elliptic-ovate, obtuse or rounded at the tip, sessile or shortly petioled, sheath pubescent or villous or both and usually with long hairs at the mouth. Spathes 1–3 together, about 1/2 in. long and broad, turbinate, auricled on one side, pubescent or hirsute, upper branch of cymes 2-3-flowered, lower 1-2-flowered or absent; flowers blue. Capsule 1/4 in. long, pyriform, membranous, two cells 2-seeded, dehiscent; 3rd smaller, 1-seeded, tardily dehiscent. Seeds closely pitted, rugose.

An annual herb, especially abundant in shady places. Comes up during the rains. Flowers and fruits during August–November. Besides the normal flowers in this species, underground cleistogamous flowers are commonly formed on bracteate peduncles from the lower nodes. These are smaller in size and white compared with the blue aerial flowers. They regularly produce seed, while the aerial flowers often fail to do so.

LXV. JUNCACEÆ.

Generally perennial, sometimes annual, erect herbs, tufted or with a creeping sympodial rhizome; stems mostly leafy only at the base. Leaves mostly in a basal tuft, linear or cylindric, grass-like, sheathing at the base or entirely reduced to a sheath. Flowers small, inconspicuous, actinomorphic, hermaphrodite or unisexual and dioecious, rarely solitary, usually in paniculate or corymbose cymes, terminal or subterminal on the scape-like stems with a few leafy bracts; perianth-segments 6, in two whorls, free, lanceolate or oblong, glumaceous, often with scarious margins, persistent, imbricate; stamens 6 or 3, opposite to the perianth leaves, hypogynous or nearly so; anthers 2-celled, basifixed, introrse, opening by longitudinal slits; pollen in tetrads; ovary superior, 1-celled or 3-celled; style one or styles 3, long to almost absent; stigmas three, mostly

brush-like ; ovules numerous to 3, biseriate on the parietal placentas or basilar, anatropous. Fruit 1- or 3-celled capsule, loculicidally dehiscent. Seeds with a membranous testa, often produced at each end, endospermous ; embryo small, straight, in the middle of the endosperm.—*Genera about* 15, *species about* 200, *cosmopolitan, but more abundant in damp habitats.*

Juncus *Linn.*

Glabrous herbs. Perianth with the 3 outer segments keeled or the midrib thickened ; stamens 6 or 3 ; ovary 3-, rarely 1-celled ; style one, filiform ; stigmas often spirally twisted ; ovules many.

J. bufonius *Linn.* ; *Fl. Brit. Ind., VI, p.* 392. A pale-green densely tufted annual fibrous-rooted herb up to 10 in. high ; stems slender, trichotomously much branched. Leaves radical or associated with the flowers, up to 5 in. long, grass-like. Flowers pale-green, in biparous or helicoid uniparous, often flexuous, cymes ; bracts scarious, less than 1/4 in. long ; sepals 1/5 in. long ; petals slightly smaller ; both lanceolate, acuminate, with membranous margins ; stamens half as long as the sepals. Capsule shorter than and closely embraced by the perianth, obovoid and mucronate. Seeds numerous, minute, yellow or sometimes with a black lip, finely reticulate.

Ravi bank ; a winter annual.

LXVI. PALMÆ.

Trees or shrubs. Stem stout or slender, sometimes an underground rhizome, but usually above-ground, erect or sometimes scandent, sometimes very short or almost absent, often covered by the persistent bases of the leaves, only exceptionally branching ; primary root soon disappearing and replaced by roots from the base of the stem. Leaves mostly large, in a terminal crown or scattered in the scandent forms, usually pinnately or palmately compound, rarely simple, leaflets induplicate or reduplicate in bud, often sharp at the apex ; petiole sheathing at the base. Flowers small, actinomorphic, monoecious, dioecious, or sometimes bisexual or polygamous, usually 3-bracteolate, arranged in spikate or paniculate inflorescences (spadices) enclosed in bud by one or more large sheathing bracts (spathes) and situated either amongst or below the leaves, rarely terminal and ending the life of the tree ; perianth in two 2- or 3-merous whorls ; segments of each whorl free or connate, usually coriaceous, valvate or imbricate ; stamens usually 6, in two whorls, sometimes 3 or numerous ; anthers 2-celled, opening lengthwise, often versatile ; ovary superior, rudimentary or absent in the male flowers, 1–3-, rarely more-, celled, or apocarpous, of three one-

celled carpels ; stigma usually sessile ; ovule solitary, erect or pendulous from the inner angle of each carpel or cell of the ovary. Fruit various,—berry, drupe or apocarpic. Seeds free or adherent to the endocarp ; endosperm horny or bony, sometimes ruminate ; embryo small, in a pit in the albumen.—*A large family, genera about* 200, *species about* 1,500, *mainly tropical and sub-tropical.*

Phœnix *Linn.*

Low or tall dioecious palms. Stem columnar, covered for a considerable distance with bases of the fallen leaves. Leaves in a crown on the top of the columnar stem, pinnate ; leaflets lanceolate or ensiform, sides induplicate. Spadices several, branched, interfoliar, erect or drooping in fruit, enclosed by a complete coriaceous basal spathe. Flowers small, yellowish, coriaceous. Male flower : Calyx cupular, 3-toothed ; petals 3, obliquely ovate, valvate ; stamens 6 ; filaments subulate ; anthers erect, dorsifixed ; pistillode minute or 0. Female flower : Globose ; calyx similar to that of the male, accrescent ; petals rounded, imbricate ; staminodes 6, free or connate into a 6-toothed cup ; carpels 3, free ; stigmas sessile, hooked ; ovules erect ; usually only one carpel ripens. Fruit an oblong, terete, 1-seeded berry, with fleshy mesocarp and membranous endocarp. Seed oblong, ventrally grooved.

Key to the species.

No root suckers ; crown dense ..	..	1. *P. sylvestris.*
Root suckers copious ; crown open ..	..	2. *P. dactylifera.*

P. sylvestris *Roxb.* ; *Fl. Brit. Ind., VI, p.* 425. A tall palm, 30–50 ft. high ; stem solitary, rough from the persistent leaf-bases ; crown dense, hemispheric. Leaves 7–15 ft. long, greyish-green, glabrous ; leaflets 6–18 in. long and 3/4 in. broad, fascicled, 2–4-farious, shining, rigid, sharply pointed ; the lowest converted into long spines up to 4 in. long. Spadices 2-3 ft. long, erect ; spathes 12–18 in. long, scurfy, separating into two boat-shaped valves. Male flowers white, scented, numerous, angular. Female flowers distant, roundish. Fruiting spadix 3 ft. long, drooping, golden-orange in colour. Fruit 1-1¼ in. long, orange-yellow, edible. Seed about 3/4 in. long and nearly half as broad, rounded at both ends.—*Wild date palm* ; Vern., *Khajúr.*

This species is indigenous to the sub-himalayan districts of the Punjab, but cultivated or self-sown trees are common in and round about Lahore and in other parts of the plains. The leaves are used for making mats, baskets or hand-fans, etc. The trees are commonly tapped for the preparation of toddy or sugar in other parts of India, but this is not much practised in the Punjab. Flowers during the hot months.

2. **P. dactylifera** *Linn.*; *Sp. Pl.*, 1753, *p.* 1188. A tall palm up to nearly 100 ft. high; stem usually surrounded at the base by suckers clothed with the stumps of the petioles; crown open. Leaves on the average larger than in *P. sylvestris*, grey; leaflets distichous, making a very acute angle with the rachis. Male flowers white, in short compact panicles 6–9 in. long. Fruit 1-1/3 in. long, sweet, edible, reddish or yellowish brown. Seeds more or less acute at both the ends.—*Date palm*; Vern., *Khajúr*.

A native of Canary island, N. Africa and Arabia. It was probably introduced into India at the time of the first Mohammedan conquest in the beginning of the 8th century. It is naturalized in the South-Western Punjab and at Shahdara near Lahore. Flowers in the beginning of summer,—March-April.

This species differs from the former more in habit than in botanic characters, and it has been suggested by Drude in Pflanzenfamilien that it is not a distinct species. The above description is based on Parker's ' Forest Flora of the Punjab with Hazara and Delhi '. For more information reference may be made to the ' Palms of British India and Ceylon ' by Blatter.

LXVII. TYPHACEÆ.

Perennial, often tall herbs, with a creeping rhizome clothed with distichous scales. Leaves erect, distichous, linear, thick and spongy. Flowers minute, unisexual, very numerous, densely crowded in terminal superposed cylindrical spikes, the male above, the female below, often intermixed with hair-like bracteoles possessing dilated tips; perianth of slender hairs, or absent in the male. Male flower: Stamens 2–5; filaments free or variously connate; anthers linear, basifixed, tip of connective thickened. Female flower: Ovary superior, 1-celled, on a long slender stalk; ovule solitary, pendulous; style capillary, with a narrow or ligulate stigma. Clavate-tipped pistillodes frequent among the female flowers in some species. Fruit very minute, dry, falling off along with the hairy stipes, at length dehiscent; pericarp membranous. Testa of the seeds striate; albumen floury; embryo linear, nearly as long as the seed.—*One genus, Typha, in temperate and tropical regions, gregarious in fresh water and marshy places. Absent from S. America and S. Africa.*

Typha *Linn.*

Characters of the family.

T. angustata *Chaub. & Bory*; *Fl. Brit. Ind., VI, p.* 489. Mostly 5-6, but up to 10, ft. high. Leaves 3/4-1 in. broad, semi-cylindric above the sheathing base, often longer than the flowering stem. The male and the female spikes usually separated by a long interval. The female spikes pale-brown, up to 1/2 in. in diameter in the flowering condition and

up to 1 in. in diameter in the fruit. Bracteoles of female flowers subspathulate, equalling the linear stigmas; both longer than the perianth hairs; female flowers mixed with clavate-tipped pistillodes. Pollen simple, globose.

More or less distributed throughout Northern India. Leaves are used for making mats. Flowers during the rainy season.

LXVIII. ARACEÆ.

Colocasia antiquorum *Schott.*; *Fl. Brit. Ind., VI, p.* 523. It is much cultivated for its starchy tuberous corms.—Vern., *Kachalu, Arvi.*

LXIX. LEMNACEÆ.

Minute or small, gregarious, floating herbs, rootless or with a few simple roots; shoot (frond) not differentiated into stem and leaves, dorsiventral. Flowers monoecious, 1–3 together, naked or at first enclosed in a membranous spathe; perianth 0; male of 1 or 2 stamens with 1- or 2-celled anthers; female of a sessile, superior, 1-celled ovary with simple style and stigma and 1–7 basal orthotropous, semi-anatropous or anatropous ovules. Fruit 1–7 seeded, indehiscent or opening transversely. Seeds minute, with or without endosperm, and a straight axile embryo.—*Genera* 2, *species about* 20, *in the fresh waters of all tropical, sub-tropical and temperate countries.*

Key to the genera.

Fronds with roots	1. *Lemna.*
Fronds without roots	2. *Wolffia.*

1. Lemna *Linn.*

Fronds with one or more roots. Vegetative reproduction by daughter shoots formed from two lateral pockets. Flowers in small pockets on the margins of the frond, usually 2 male and 1 female together enclosed in a transitory membranous spathe. Male flower: stamens 1 or 2, anthers 2-celled, filaments slender. Female flower: ovary with 1–7 anatropous, semi-anatropous or orthotropous ovules.

Key to the species.

Fronds with several roots	1. *L. polyrrhiza.*
Fronds with one root.	
Fronds entire, branches obovoid, soon detached	2. *L. paucicostata.*
Fronds serrulate at the tip, hastate, branches persistent	3. *L. trisulca.*

1. **L. polyrrhiza** *Linn.*; Syn. **Spirodela polyrrhiza** *Schleid.*; *Fl. Brit. Ind., VI, p.* 557. Fronds up to 1/3 in. long, broadly obovate or orbicular, rather thick, green above and usually purplish beneath; daughter shoots with a small basal lobe; roots several. Spathe 2-lipped. Stamens in the male flower 2. Ovary in the female flower usually with 2 anatropous ovules.

This species along with *L. oligorrhiza* Kurz is placed by some authors in a separate genus *Spirodela* Schleid., distinguished from other species of *Lemna* by the presence of several roots and the daughter shoots of the frond bearing at their base a small lobe, which is considered to be a basal leaf.

2. **L. paucicostata** *Hegelm.*; *Fl. Brit. Ind., VI, p.* 556. Fronds about 1/8 in. long, oblong or obovate-oblong, asymmetric, entire, nearly flat on both sides; branches soon detached; root 1. Ovary in the female flower with a single basal orthotropous ovule.

3. **L. trisulca** *Linn.*; *Fl. Brit. Ind., VI, p.* 557. Fronds up to 3/4 in. long, lanceolate or oblanceolate, serrulate at the tip; daughter shoots hastate and remaining attached to the parent frond; root 1. Ovary in the female flower with a single semi-anatropous ovule.

2. Wolffia *Horkel.*

Fronds minute, like grains of sand, subglobose, flattened above, rootless; vegetative reproduction by proliferation of daughter shoots from the middle of the base. Flowers bursting through the upper surface; spathe absent. Male flower: solitary, stamen 1, anther sessile; 1-celled. Female flower: ovary globose; style short; stigma depressed; ovule 1, erect, orthotropous.

These are the smallest known flowering plants and occur as a green scum covering the water surface.

Key to the species.

Fronds subglobose beneath	..	1. *W. arrhiza.*
Fronds conical or subcylindric beneath	..	2. *W. microscopica.*

1. **W. arrhiza** *Linn.*; *Fl. Brit. Ind., VI, p.* 557. Fronds 1/20 in. long, nearly oblong, convex above, globose beneath.

2. **W. microscopica** *Kurz*; *Fl. Brit. Ind., VI, p.* 558. Fronds 1/30 in. long, flat above, conical or subcylindric beneath to a depth about twice as great as the length.

LXX. ALISMACEÆ.

Marsh or aquatic herbs, mostly erect, rarely with floating leaves. Leaves radical, entire; petiole long; basal sheath open. Flowers bisexual,

unisexual or polygamous, pedicellate, 3- or more-bracteate, arranged in umbellate or paniculate whorls ; perianth-segments 6, in two whorls, the outer 3 sepaloid, imbricate and persistent ; the inner 3 petaloid, usually white or pink, imbricate and deciduous ; stamens 6 or more, rarely 3, free, hypogynous ; anthers erect, 2-celled, opening lengthwise, extrorse ; carpels 3–6 or numerous, free ; ovules solitary, basal, or more on the inner angle in each carpel ; style usually persistent. Fruit a cluster of small achenes or follicles. Seeds small or minute, curved, without endosperm ; embryo horse-shoe-shaped.—*Genera about one dozen, species about* 60 ; *distribution world-wide, but mainly in northern hemisphere.*

Key to the genera.

Flowers 2-sexual ; receptacle flat	1. *Alisma.*
Flowers unisexual or polygamous ; receptacle convex	2. *Sagittaria.*

1. Alisma *Linn.*

Scapigerous perennial marsh herbs. Leaves lanceolate, cordate or sagittate. Flowers bisexual, in umbellate or paniculate whorls ; receptacle small, nearly flat ; stamens 6 or 9 ; carpels few or many ; stigma small and terminal ; ovule solitary, basal, anatropous. Achenes compressed or turgid, coriaceous or hard.

Key to the species.

Leaves coriaceous, rounded ; style slender ..	1. *A. reniforme.*
Leaves membranous, acutely lobed ; style very short	2. *A. oligococcum.*

1. **A. reniforme** *Don.* ; *Fl. Brit. Ind., VI, p.* 560. Leaves 2–5 in. long and 2½–7 in. broad, orbicular, cordate or reniform, broader than long, 13–17-nerved, coriaceous, tip round or retuse. Scape 1–3 ft. high ; flowers white or pinkish, in large paniculate whorls, long-pedicelled, 1/2 in. in diameter ; sepals as long as the petals, at first erect in fruit, finally reflexed. Achenes 5–8, not whorled, obovoid, dorsally ribbed, 1/12 in. long, awned with the persistent slender subterminal style ; endocarp thick, hard.

2. **A. oligococcum** *F. Muell.* ; *Fl. Brit. Ind., VI, p.* 560. Leaves 3–6 in. long and 2-3 in. broad, ovate-cordate, with acute lobes, 11–17-nerved, membranous, punctate. Scape 6–9 in. long ; bracts in the lower whorls very large, 2-3 in. long, lanceolate ; fruiting sepals reflexed.

Achenes 2–6, in a single whorl, turgid, dorsally keeled, keel tubercled; endocarp thick, hard ; style very short, terminal, deciduous.

Both these species of *Alisma* have not yet been collected from the vicinity of Lahore, but according to the Fl. Brit. Ind., they are found throughout the plains of Northern India from Punjab to Bengal, and may be expected to occur within the area of this flora.

2. Sagittaria *Linn.*

Aquatic herbs, erect in shallow water, with floating leaves in deep water. Leaves long-petioled, cordate or sagittate. Flowers in paniculate or spicate whorls, unisexual or polygamous ; stamens 6 to about 24 ; carpels numerous, crowded on a globose receptacle, laterally compressed ; style terminal or lateral ; stigma papillose ; ovule solitary, basal. Fruit a globose head of flattened achenes.

Key to the species.

Leaves broadly ovate, deeply cordate ; stamens in male flowers 6–10 ; achenes with a broad toothed wing all round	1. *S. guayensis.*
Leaves hastate or sagittate ; stamens in male flowers about 24 ; achenes with an entire wing	2. *S. sagittifolia.*

1. **S. guayensis** *H.B. and Kunth* ; *Fl. Brit. Ind., VI, p.* 561. Herbs with petioles, scapes and pedicels usually hairy. Leaves mostly floating, 1–4 in. long and 1–3 in. broad, broadly ovate, deeply cordate, obtuse, with radiating obscure nerves, membranous ; petiole long or short according to the depth of water. Scape 6–18 in. tall, stout. Flowers 2/3 in. in diameter, white, in a few close irregular whorls, shortly pedicellate ; flowers of the lower whorls usually ternate, bisexual, 9–12-androus ; in the upper whorls more numerous, male, 6–10-androus ; anthers cordate. Achenes numerous, flat, surrounded all round by a broad toothed wing.

Gujranwala ; flowers : October–February.

2. **S. sagittifolia** *Linn.* ; *Fl. Brit. Ind., VI, p.* 561. Aquatic with a thick stoloniferous rhizome ; stolons often ending in a tuber. Leaves in deep water strap-shaped, when floating lanceolate or elliptic, and in shallow water erect with hastate or sagittate blades 2–8 in. long ; petiole 8–18 in. long, trigonous, spongy. Scapes 6–18 in. long. Flowers in 3–5 whorls of 3–5 each, of lower whorls female, sessile or shortly pedicelled, of upper whorls male, longer stalked, 3/4 in. in diam. ; petals white, often with purple claws ; anthers sagittate. Achenes obliquely obovate, flattened, with a broad, entire or subcrenate wing.

This species has not been collected so far from the vicinity of Lahore, but may occur within the area.

LXXI. NAJADACEÆ.

(*Naiadaceæ.*)

Perennial or annual aquatic herbs. Leaves submerged or floating, opposite, alternate or verticillate, simple ; base sheathing and sometimes stipulate. Flowers small, inconspicuous, often green, bisexual, monoecious or dioecious, axillary solitary or in spikes, sometimes inflorescence enclosed in a spathe ; perianth wanting or of 2 or 4 segments or tubular ; stamens mostly 1–4, hypogynous or inserted on the perianth segments, free in the bisexual, solitary or connate in the male flowers ; anthers 1–4-celled ; carpels 1–4, rarely more, free ; style absent, short or long ; ovule solitary in each carpel, erect or pendulous. Fruiting carpels free, indehiscent. Seeds without endosperm ; embryo straight, usually with a large hypocotyl.—*Genera about* 15, *species about* 150, *widely distributed in the tropical and temperate parts of the world.*

Key to the genera.

Flowers bisexual ; perianth leaves 4, green ..	1.	*Potamogeton.*
Flowers unisexual ; perianth 0 or hyaline.		
Achenes 2–9, style long, stigma obliquely peltate	2.	*Zannichellia.*
Achene 1, style 0, stigmas 2–4	3.	*Najas.*

1. Potamogeton *Linn.*

Fresh water submerged herbs with creeping root-stock. Leaves submerged and thin, or floating and often leathery, opposite or alternate, entire or toothed ; stipules intrafoliaceous. Flowers small, bisexual, arranged in pedunculate axillary spikes rising from a membranous spathe, ebracteate ; perianth-segments 4, concave, green, valvate, shortly clawed ; anthers 4, sessile on the claws of the perianth-segments, 2-celled, extrorse ; carpels 4, sessile, free, 1-celled ; stigma subsessile or decurrent, persistent ; ovule solitary inserted in the inner angle of the cell, campylotropous. Fruiting carpels coriaceous or spongy, indehiscent. Seed sub-reniform, without endosperm ; embryo with a large foot.

Key to the species.

Leaves lanceolate, crisped and serrulate, mostly about 1/4-1/3 in. broad	1.	*P. crispus.*
Leaves filiform, 1/10 in. or less broad ..	2.	*P. pectinatus.*

1. **P. crispus** *Linn.* ; *Fl. Brit. Ind.*, *VI*, *p.* 566. Stems slender, compressed. Leaves all submerged, distichous, 1–4 in. long, 1/8-1/3 in. broad, sessile, semi-amplexicaul, narrowly or broadly lanceolate, crisped, serrulate, 3-nerved, translucent ; stipules small, caducous. Peduncle long, over 1 inch, curved, tapering upwards ; spike up to 1/2 in. long,

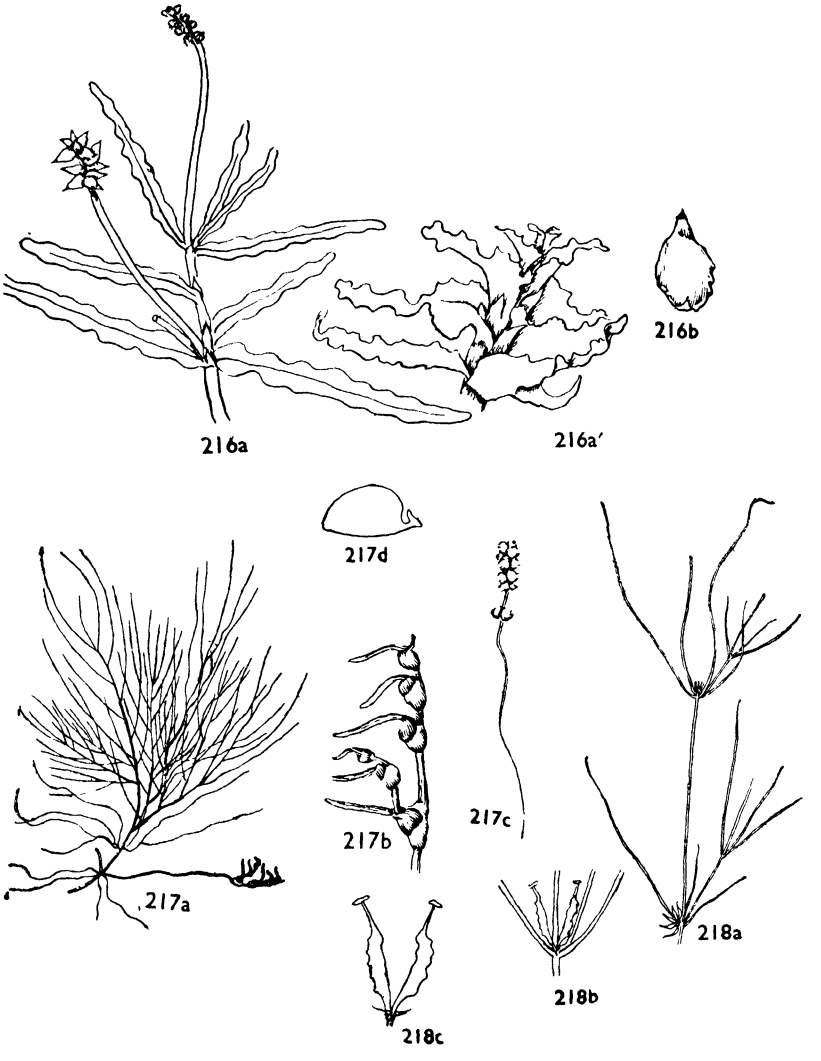

Fig. 216, *Potamogeton crispus*, (*a*) (*a'*) two shoots, one flowering and fruiting, × ¾, (*b*) achene, × 3 ; Fig. 217, *P. pectinatus*, (*a*) plant, × ¼, (*b*) tubers, × ¾, (*c*) inflorescence, × 1, (*d*) achene, × 3 ; Fig. 218, *Zannichellia palustris*, (*a*) branch, × ½, (*b*) a node bearing a female flower, × 2, (*c*) carpels, × 3.

few-flowered; flowers about 1/10 in. long. Fruiting carpels 1/8 in. long, obliquely ovoid, long-beaked. (Fig. 216.)

Common in ponds, Shalamar garden, etc. Flowers at the end of the winter. Size of the leaf and margin are very variable. Sometimes the margin is almost entire and only slightly crisped.

2. **P. pectinatus** *Linn.*; *Fl. Brit. Ind., VI, p.* 567. Stem filiform, densely branched. Leaves all submerged, mostly 3–6 in. long, 1/10 in. or less broad, filiform, opaque, 1–3-nerved, margins slightly thickened or recurved; stipules adnate to the leaf-sheath. Spike up to 1 in. long, on a long filiform peduncle; flowers few, in distant whorls, about 1/10 in. long. Fruiting carpels 1/6 in. long, broadly ovate or almost semicircular, turgid, smooth, hardly beaked. (Fig. 217.)

Distribution same as of *P. crispus*. Flowers: October–April.

2. Zannichellia *Linn.*

Submerged fresh or salt water plants, with slender root-stock and filiform stems. Leaves linear, alternate or opposite or crowded at the nodes, with a stipular sheathing base. Flowers minute, monoecious, a male and female enclosed in one membranous leaf-sheath. Male flower: A linear 2-3-celled anther; filament slender. Female flower: Perianth cupular, hyaline; carpels 2–9, usually 4, sessile, with long slender styles and oblique peltate stigmas; ovule solitary, pendulous, orthotropous. Fruiting carpels (achenes) sessile or stipitate, indehiscent. Seed with thin testa and a subcylindric embryo with the cotyledonary end twice folded on itself.

Z. palustris *Linn.*, sub-species **pedicellata** *Hook. f.*; *Fl. Brit. Ind., VI, p.* 568. Leaves 1/2–3 in. long, 1/12 in. or less wide. Flowers sessile, subsessile or shortly peduncled; anthers 2-celled. Achenes mostly 2–4, subsessile, back crenate or tubercled; style as long as the body of the achene or longer, rarely shorter. (Fig. 218.)

In ponds; fairly common.

3. Najas (*Naias*) *Linn.*

Submerged annual water plants. Stem filiform, much branched. Leaves small, opposite, alternate or whorled, linear, entire or toothed; base sheathing; within the sheath a pair of minute scales. Flowers minute, axillary, monoecious or dioecious. Male flower enclosed within a tubular or inflated, entire or 4-fid spathe; perianth hyaline, broadly tubular; stamen 1, subsessile; anther 1–4-celled, opening by longitudinal slits. Female flower: Perianth 0 or hyaline and adherent to the carpel; carpel 1, sessile, with 2–4 stigmas; ovule solitary, basilar, erect, anatropous. Achenes oblong, usually embraced by the leaf-sheath. Seed with

membranous testa, no endosperm and a straight embryo with large hypocotyl and radicle.

N. major *All.*; *Fl. Brit. Ind., VI, p.* 569. Leaves 1/2–1½ in. long, 1/10-1/6 in. wide, linear, dorsally spinous, pinnatifid-toothed; teeth 4–8 on either side, triangular; sheath with rounded entire sides. Flowers dioecious, solitary; spathe of the male flowers oblong, 2-3-toothed; anther 4-celled; carpel oblong; stigmas 2-3, filiform. Achene 1/12-1/8 in.

In ponds.

LXXII. GNETACEÆ.

This family contains 3 genera which differ widely from each other. Only the genus *Ephedra* is found within the area of the present flora. Its description alone is therefore given below.

Ephedra *Linn.*

Erect or subscandent rigid shrubs; branches opposite or fascicled, terete, striate, young green, older brownish. Leaves opposite or in whorls of 3, scaly, rarely produced into green linear blades. Cones solitary or fascicled, of decussately opposite bracts, lower of which are empty, upper with one axillary flower; bracts dry or fleshy in fruit. Male flower: Perianth of 2 opposite compressed membranous sepals; anthers 2–10, sessile or stipitate on the top of a column formed by the connate filaments; cells 2, globose. Female flower: A naked ovule with the outer coat produced into a long tube (tubillus). Seeds usually oblong, plano-convex; testa dry.—*Species about* 30; *distribution world-wide.*

E. foliata *Boiss.*, syn. **E. peduncularis** *Boiss.*; *Fl. Brit. Ind., V, p.* 641. A tall scandent shrub; stem up to 4 in. in diam. at the base; branchlets slender, dull green, internodes 1–4 in. long; leaves in whorls of 2 or 3, with green blades up to 1 in. long. Male cones ovate, solitary or 2 or 3 together, with peduncles 1-1½ in. long; flowers few or many; bracts rounded, connate; stamens 3 or 4; column equalling the perianth or shortly exserted. Female cones usually in pairs; tubillus straight, exserted. Fruiting bracts succulent, white. Seeds 1/4-1/3 in. long, dark-coloured.

Common at Changa Manga. Flowers during late winter (Feb.-March); fruits: April.

The following gymnosperms are commonly cultivated in the local gardens:—

Family Cycadaceæ.

Cycas revoluta Thunb.

Family Pinaceæ.

1. *Pinus longifolia* Roxb.—Vern., *Chir* or *Chil.*
2. *Thuja orientalis* Linn.—Vern., *Morpankh.*

Cupressus funebris End.—Weeping cypress; Vern., *Sarú.*

GLOSSARY OF BOTANICAL TERMS.

Note.—For more information Daydon Jackson's Glossary of Botanic Terms should be consulted.

A

Abortive. Imperfectly developed.

Accrescent. Enlarging with age, as the calyx in some Solanaceæ and Boraginaceæ.

Accumbent. Applied to cotyledons in a bent embryo when their edges lie against the radicle as in some Cruciferæ.

Achene. A dry indehiscent one-seeded fruit.

Achlamydeous. Flowers without a perianth.

Acicular. Needle-shaped.

Actinomorphic. Applied to flowers which are regular in shape, i.e., which can be divided into two similar halves along two or more planes.

Aculeate. Armed with prickles.

Acuminate. With a long gradually tapering tip.

Acute. With a sharp pointed tip.

Adhesion. The union of an organ with some other different organ, as the union of the calyx with the ovary, or that of the petals with the stamens.

Adnate. Attachment of an organ by its whole length, as the attachment of stipules to the petiole in a rose, or that of the calyx to the ovary in epigynous flowers.

Adventitious. Applied to organs which do not arise at their normal place, as roots from the stem, or buds from the leaf-margin.

Albumen. The nutritive substance found in some seeds in addition to the embryo. Also called ' endosperm '.

Alternate. Applied to leaves when they arise singly on the stem; also to parts of a flower when the members of a higher whorl are placed in the intervals between the members of the lower whorl, as petals alternating with sepals.

Amplexicaul. A leaf which embraces the stem by its base.

Anatropous. An ovule which has become inverted so that the micropyle is near the hilum at one end and the chalaza is at the other end.

Androecium. A term applied to the stamens collectively.

Angiosperms. Plants which have their seeds enclosed in an ovary.

Annual. Plants which grow and produce seeds in the course of a single season or year and thus complete their life-cycle within one year.

Anther. The portion of a stamen which contains the pollen. It usually consists of two halves or cells which open separately to let the pollen out.

Apetalous. Without petals.

Apocarpous. When the carpels in a flower are free from each other.

Appressed. When an organ, as a leaf or a hair, lies flat for its whole length against another organ.

Arborescent. Resembling a tree in shape or size.

Aril. An expansion of the funicle arising from the placenta and more or less enveloping the seed.

Arista. A bristle-like appendage ; an awn.

Aristate. Having an awn.

Armed. Provided with thorns or prickles.

Auricle. An ear-like appendage to a leaf, etc.

Awn. A bristle-like appendage.

Axil. The angle formed between the axis (stem, etc.) and any organ such as a leaf attached to it.

Axillary. Borne in the axil.

B

Baccate. Applied to a fleshy fruit.

Berry. A pulpy fruit with the seeds immersed in the pulp.

Biennial. Plant which completes its life-cycle in two years, the flowers, fruits and seeds being formed in the second year.

Bifoliate. Two-leaved.

Bifoliolate. With two leaflets.

Bilabiate. Two-lipped.

Bimerous. Composed of two members.

Bipinnate. When the axes of the second order of a leaf are also like the axis of the first order pinnate.

Bipinnatifid. When the segments of a pinnatifid leaf are also pinnatifid.

Bisexual. When both stamens and carpels are present in the same flower.

Blade. The expanded part of a leaf.

Bract. A leaf-like structure at the base of a flower.

Bracteate. Possessing bracts.

Bracteole. A small bract on the stalk of a flower.

Bulb. An underground shoot with a reduced stem and thick fleshy leaves, as in the onion.

Bulbil. A small bud produced in place of a flower or in the axil of a leaf which gets detached and gives rise to a new plant.

Bullate. Having a blistered appearance.

C

Caducous. Falling off very early.

Cæspitose. Growing in tufts.

Calyptrate. Applied to the calyx and corolla when these separate off as a whole in the form of a cap.

Calyx. The outermost, generally green, floral envelope.

Campanulate. Bell-shaped.

Campylotropous. An ovule which is so curved as to bring its micropyle, hilum and chalaza all close together.

Canescent. Becoming grey or hoary.

Capitate. Head-shaped, or collected into a head as the flowers of the Compositæ.

Capitellate. Diminutive of capitate.

Capsule. A dry dehiscent fruit consisting of more than one carpel.

Cariopsis. An achenial fruit in which the pericarp adheres to the seed, as in the grasses.

Carpel. A simple pistil or an element of a compound pistil answering to a leaf and bearing ovules.

Caruncle. A wart or protuberance near the hilum of a seed; also called strophiole.

Catkin. A spike of unisexual flowers which falls off as a whole after maturity, as in willows.

Caudicle. The stalk of a pollinium, as in *Calotropis* and the Orchids.

Cauline. Belonging to the stem.

Centrifugal. Applied to the inflorescence in which the flowers develop or open from the centre outwards.

Centripetal. Applied to the inflorescence in which the flowers develop from the outside towards the centre.

Chalaza. The part of the ovule from where its integuments arise.

Ciliate. Possessing hairs in the form of a fringe like the eye-lashes.

Circinate. Rolled in a coil from the tip towards the base, as the young fronds of a fern.

Circumscissile. Dehiscing transversely as if cut circularly around, as the capsule of *Anagallis*.

Cirrhose. Furnished with tendrils.

Clavate. Club-shaped.

Claw. The stalk-like narrowed base of a petal.

Cleistogamic or cleistogamous. Applied to flowers which are fertilised without opening.

Coccus. A part of a schizocarpic fruit.

Cochleate. Shaped like a spiral shell.

Collateral. Placed side by side.

Column. The solid central body formed by the fusion of the stamens and the style, as in orchids.

Coma. The tuft of hairs at the end of some seeds, as in *Calotropis*.

Commissure. The face by which two carpels adhere, as in Umbelliferæ.

Comose. Possessing a tuft of hairs.

Complanate. Compressed or flattened.

Conduplicate. Folded lengthwise.

Cone. The fruit of the pine and other gymnosperms.

Confluent. Blended into one.

Connate. United.

Connective. The part of the stamen which connects the anther-lobes.

Connivent. Coming into contact or converging.

Convolute. Rolled up longitudinally from one margin to the other.

Cordate. Heart-shaped.

Coriaceous. Leathery.

Corm. A bulb-like fleshy underground shoot with a thick solid central structure surrounded by thin scales.

Corolla. The inner envelope of the flower which is usually delicate and coloured.

Corolline. Like corolla or attached to corolla.

Corona. An extra whorl of parts arising as outgrowths either from the corolla or the stamens.

Corrugate. Wrinkled.

Corymb. A racemose inflorescence in which the lower flower-stalks are longer than the upper ones so as to bring all the flowers almost to the same level.

Corymbose. Arranged in a corymb.

Costate. Ribbed.

Cotyledons. The seed leaves or the first leaves of the embryo.

Cremocarp. A dry and seed-like fruit composed of two 1-seeded carpels, separating when ripe into two mericarps, as in the Umbelliferæ.

Crenate. Having rounded teeth.

Crustaceous. Of brittle texture.

Cryptogams. Plants which do not produce ordinary stamens, carpels and true seeds.

Cucullate. Hood-shaped.

Culm. The hollow stem of grasses.

Cuneate. Wedge-shaped.

Cupular. Like a small cup.

Cusp. A sharp rigid point.

Cuspidate. Possessing a sharp rigid point.

Cyme. A flower-cluster of determinate or centrifugal type. The main axis ends in a flower and the lateral branches, one or more, in their turn end in flowers and so on.

D

Deciduous. Falling in season, as petals falling after flowering.

Declinate. Bent or curved downwards.

Decompound. Divided several times.

Decumbent. Reclining, but with the summit ascending.

Decurrent. Applied to leaves when they are prolonged beyond their insertion and thus run down the stem.

Decussate. In pairs alternately at right angles.

Definite. Limited in number; applied to an inflorescence it indicates a cyme.

Dehiscence. The mode of opening of a capsule or an anther.

Dentate. Toothed, especially with salient teeth directed outwards.

Denticulate. Minutely toothed.

Diadelphous. Having stamens in two bundles.

Dichasial. Cymes in which two lateral shoots of nearly equal strength arise from the primary axis below the flower which terminates the apex, the process being repeated by each set of branches.

Dichlamydeous. Having both whorls of the perianth, calyx and corolla.

Dichotomous. Forked in pairs.

Diclinous. Applied to flowers which are unisexual.

Dicotyledons. Plants in which the embryo has two cotyledons.

Didymous. In pairs.

Didynamous. An androecium having four stamens in two pairs, one of the pairs being shorter than the other.

Diffuse. Widely or loosely spreading.

Digitate. A compound leaf in which all the leaflets arise from the same point at the tip of the leaf-stalk.

Dimerous. Applied to flowers or whorls of a flower, where each whorl consists of two parts.

Dimidiate. Halved, as when half an organ is so much smaller than the other half as to seem wanting.

Dimorphic. Having two forms.

Dioecious. Plants with male and female flowers on different individuals.

Disk or **Disc.** Development of the torus within the calyx or within the corolla and stamens; the central part of a capitulum in Compositæ as opposed to the ray florets; the expanded base of the style in Umbelliferæ.

Dissepiment. A partition in an ovary or pericarp caused by the cohesion of the sides of the carpels, sometimes spurious as in Cruciferæ.

Distichous. Arranged in two vertical ranks, as the leaves in some plants and flowers in many grasses.

Divaricate. Extremely divergent.

Dorsal. Relating to or attached to the back; in a leaf, the side away from the axis and therefore the lower surface.

Drupaceous. Resembling a drupe.

Drupe. A stone-fruit, such as a plum. The pericarp is usually differentiated into three layers, the epicarp thin and membranous, the mesocarp thick and fleshy, and the endocarp stony, inside which is the seed.

E

Echinate. Beset with prickles.

Emarginate. Notched at the apex.

Embryo. The rudimentary plant found in the seed.

Endocarp. The innermost layer of the pericarp.

Emergence. An outgrowth arising from a few superficial layers of an organ.

Endosperm. The nutritive material or albumen in some seeds in addition to the embryo formed within the embryo-sac.

Ensiform. Sword-shaped.

Entire. Even and untoothed.

Epicalyx. An involucre outside the calyx and resembling it.

Epicarp. The outermost layer of the pericarp.

Epigynous. Above the ovary, as the corolla in Compositæ.

Epipetalous. On the petals or corolla.

Epiphyte. Growing on an other plant, but not deriving its food from it.

Equitant. Applied to leaves when they are so placed as to appear astride one another.

Erose. Irregularly toothed.

Exstipulate. Without stipules.

Extrorse. Directed outwards.

Extra-axillary. Beyond or out of the axil.

F

Falcate. Sickle-shaped.

Farinaceous. Of the nature of starch or containing starch.

Fascicle. A cluster or bundle.

Fastigiate. Applied to branches which are parallel, erect and clustered.

Ferruginous. Rust-coloured.

Fid. A suffix meaning cleft, as 5-fid, meaning cleft into 5 parts.
Filament. The stalk of an anther; a thread-like body.
Fimbriate. With the margin bordered by long slender processes.
Fistular. Hollow throughout its length, as the leaf of onion.
Flabellate. Fan-shaped.
Flaccid. Limp, flabby.
Flagellate. Provided with whip-like runners.
Flagelliform. Like the lash of a whip.
Floccose. Covered with locks of soft hair or wool.
Foliaceous. Having the structure of or resembling a leaf.
Follicle. A fruit produced from a single carpel and opening by the ventral suture.
Fruit. Strictly the fertilised and developed ovary, but often with any external integral portion of it.
Fugacious. Soon perishing.
Funicle. The stalk of the ovule.
Furcate. Forked.
Fusiform. Spindle-shaped.

G

Gamopetalous. With united petals.
Gamophyllous. Applied to a perianth with united segments.
Gamosepalous. With united sepals.
Geminate. In pairs.
Gibbous. With a pouch-like enlargement at the base.
Glabrous. Smooth, without hairs.
Glabrescent. Becoming glabrous or nearly so.
Gland. A definite secreting structure on the surface of an organ.
Glandular. Furnished with glands.
Glaucous. Sea-green, bluish-green.
Globose. Nearly spherical.
Glochidium. A barbed bristle.
Glochidiate. Furnished with barbed bristles.
Glomerate. Compactly clustered.
Glumaceous. Resembling the glumes of grasses, chaffy.
Glume. One of the chaff-like structures which occur in the inflorescence of the grasses and similar plants.
Gregarious. Growing in company.
Gymnosperms. Plants having naked seeds, such as the pines.
Gynandrous. Applied to stamens which are fused with the pistil, as in orchids.

Gynobasic. Applied to a style which adheres by its base to a prolongation of the torus upwards between the carpels, as in the Boraginaceæ and Labiatæ.

Gynoecium. The pistil or carpels of a flower collectively.

Gynophore. An elongation of the torus forming a stalk to the pistil.

H

Habit. The general appearance of a plant, whether erect, prostrate, climbing, etc.

Habitat. The kind of locality in which a plant grows.

Halophyte. A plant which grows within the influence of salt water, or in soils rich in salt.

Hastate. Shaped like the head of a spear. Differs from sagittate in that the basal lobes are directed outwards.

Helicoid. Coiled like a snail-shell.

Herbaceous. Not woody.

Hermaphrodite. With the stamens and pistils in the same flower.

Heterogamous. Bearing two kinds of flowers as regards the sex organs.

Heterophyllous. Having leaves of different forms.

Hilum. The scar left on a seed where it was formerly attached to the funicle ; the place where the funicle is attached to the ovule.

Hirsute. With rather long, tolerably distinct hairs.

Hispid. Beset with rough hairs or bristles.

Hispidulous. Minutely hispid.

Homogamous. Bearing one kind of flowers.

Homogamy. The condition when pollen and stigma of a perfect flower ripen at the same time.

Hyaline. Colourless or translucent.

Hypocotyl. The axis of the embryo below the cotyledons.

Hypogynous. Inserted below the ovary.

I

Imbricate. Overlapping.

Imparipinnate. Applied to a pinnate leaf with an odd terminal leaflet.

Incised. Cut sharply and irregularly.

Incumbent. Applied to cotyledons when the back of one lies against the radicle.

Indefinite. Too many for easy enumeration ; applied to inflorescence, it means racemose.

Indehiscent. Applied to fruits which do not open.

Induplicate. With the edges folded inwards.

Inflorescence. The arrangement of the flowers on the floral axis.

Infundibuliform. Funnel-shaped.

Internode. The portion of the stem between two nodes.

Interpetiolar. Between the petioles, as the stipules of some Rubiaceæ.

Introrse. Turned inwards towards the axis.

Involucel. A secondary involucre, as in Umbelliferæ.

Involucre. A whorl of bracts surrounding several flowers or peduncles.

Involute. Applied to leaves with their edges rolled inwards (towards the upper surface).

L

Labiate. Lipped ; usually bilabiate, as in Labiatæ.

Lacerate. Torn.

Laciniate. Cut into narrow lobes.

Lamina. The blade or expanded part of a leaf.

Lanceolate. Applied to a leaf which is long and narrow, tapering towards both extremities or with the base somewhat broader than the apex.

Legume. A pod, the characteristic fruit of Leguminosæ, 1-celled and 2-valved.

Ligule. The thin, scarious, often hairy projection from the top of the leaf-sheath in grasses or from the upper surface of the petals in some flowers ; also the strap-shaped corolla of the ray flowers in Compositæ.

Ligulate. Furnished with a ligule.

Limb. The border or expanded part of a gamopetalous corolla as distinct from the tube or throat ; the lamina of a leaf or of a petal.

Linear. Several times longer than wide.

Lip. One of the two divisions of a bilabiate calyx or corolla ; also applied to that petal in Orchids which is different from and usually larger than the others.

Loculicidal. Applied to fruits which open by the dorsal sutures of the carpels.

Lodicule. One of the minute scales outside the stamens in the flower of the grasses.

Loment, Lomentum. A legume which is constricted between the seeds, usually falling apart at the constrictions when mature into one-seeded parts.

Lomentaceous. Resembling a loment.

Lunate. Half-moon-shaped.

Lyrate. Applied to a pinnatifid leaf with the terminal lobe rounded and much larger than the lower ones.

M

Marcescent. Withering without falling off.

Monadelphous. Applied to the stamens when they are united by their filaments into a tube or a column.

Moniliform. Like a string of beads.

Monochlamydeous. With only one whorl of the perianth.

Monocotyledons. Plants in which the embryo has only one cotyledon.

Monoecious. Applied to plants or flowers when unisexual flowers of both kinds occur on the same individual.

Mucronate. Tipped with an abrupt point.

Multifid. Cleft into many lobes.

Muricate. Rough with hard tubercles.

Muticous. Blunt, awnless.

N

Nerve. A simple or unbranched vein or slender rib.

Node. That part of the stem which normally bears a leaf or a whorl of leaves.

Nut. A hard and indehiscent one-seeded fruit.

Nutlet. A small nut.

O

Obcordate. Heart-shaped with the notch at the apex.

Obovate. Ovate with the broad end towards the apex.

Ochrea. Tube formed round the stem by the stipules, as in Polygonaceæ.

Ochreate. Having ochrea.

Offset. A lateral shoot used for propagation.

Operculum. A lid.

Operculate. Furnished with a lid.

Orthotropous. Applied to an ovule which has a straight axis, the hilum and the chalaza being at the base and the micropyle at the opposite end.

Oval. Broadly elliptic.

Ovary. The part of the pistil containing the ovules.

Ovate. Shaped like an egg with the broader end at the base.

Ovule. The unripe seed in the ovary.

P

Pale, Palea. The scale-like bracts within the glumes in the flowers of grasses ; also the scales on the floral receptacle of many Compositæ.

Palmate. Applied to a compound leaf in which the leaflets arise from the same point at the tip of the leaf-stalk, like the fingers in the hand.

Palmatifid. Lobed in the form of a hand.

Palmatipartite. Palmately lobed nearly to the base.

Panicle. An inflorescence in which the main racemose axis has its lateral branches again branched.

Paniculate. In the form of a panicle.

Papilionaceous. Applied to the butterfly-shaped corolla of the Papilionaceæ.

Papilla. A soft superficial protuberance.

Papillose. Covered with papillæ.

Pappose. Furnished with pappus.

Pappus. The tuft of hairs or scales representing the limb of the calyx in Compositæ.

Parasite. A plant which grows on and obtains its food from another plant which is called its host.

Parietal. Borne on or belonging to a wall; applied to a placenta arising from the wall of the ovary.

Partite. Cleft nearly to the base; parted.

Patent. Spreading.

Pectinate. Pinnatifid, with narrow segments set close like the teeth of a comb.

Pedate. Palmately divided or parted with the lateral divisions two-cleft.

Pedicel. The stalk of a single flower.

Pedicellate. Possessing a pedicel.

Peduncle. The general term for the stalk of a flower or the stalk of a cluster of flowers.

Pedunculate. Furnished with a peduncle.

Pellucid. Transparent or translucent.

Peltate. Target-shaped, as a leaf attached by its lower surface to the stalk instead of its margin.

Pendent. Pendulous, hanging down.

Penicillate. Shaped like a little brush.

Penninerved. Pinnately veined.

Pentamerous. Composed of five members.

Pentandrous. Having five stamens.

Perennial. A plant which lasts several years, not dying after flowering and fruiting once.

Perfect. Applied to a flower which is bisexual.

Perfoliate. Applied to a leaf when the stem apparently passes through it.

Perforate. Pierced through; having translucent dots which look like little holes.

Perianth. The floral envelopes, calyx, corolla, or both.

Pericarp. The wall of the ovary when it is forming the fruit.

Perisperm. Nutritive material in the seeds which is formed outside the embryo-sac, i.e., from the nucellus.

Petal. One of the parts of the corolla of a flower.

Petiole. The stalk of a leaf.

Petiolate. Having petiole.

Phanerogams. Plants with manifest flowers as opposed to Cryptogams.

Phyllode. A flattened petiole which takes the form and performs the function of a leaf.

Pilose. Covered with soft hair.

Pinna. A primary division of a pinnate leaf, which may be again compound.

Pinnate. Applied to a compound leaf in which the leaflets are arranged on the two sides of a common axis (rachis).

Pinnatifid. Pinnately cleft.

Pinnatipartite. Pinnately parted.

Pinnatisect. Pinnately parted down to the rachis.

Pinnule. A secondary pinna.

Pistil. The female organ of a flower collectively, consisting of one or more carpels.

Placenta. The place or process in the ovary to which the ovules are attached.

Plicate. Folded into plaits.

Plumose. Feathered.

Plumule. The primary leaf-bud of an embryo.

Pod. A legume, but also sometimes applied to other pod-like fruits.

Pollen. The dust-like grains inside an anther.

Pollinium. A more or less coherent mass of pollen grains, as in Orchidaceæ and Asclepiadaceæ.

Polyadelphous. With the stamens in many bundles.

Polyandrous. Having an indefinite number of stamens.

Polycarpellary. Applied to a pistil formed of several carpels.

Polygamous. The condition when unisexual and bisexual flowers occur on the same plant.

Polymorphic. With several forms.

Polypetalous. Applied to corolla with free petals.

Polysepalous. Applied to calyx with free sepals.

Prostrate. Lying flat on the ground.

Protandrous. Applied to a flower in which the anthers ripen earlier than the stigma.

Protogynous. Applied to a flower in which the stigma ripens earlier than the stamens.

Puberulous. Slightly hairy.

Pubescent. Clothed with soft hair or down.

Pulvinus. The swollen base of a petiole.

Pyrene. A nutlet or the small stones of a drupaceous fruit.

Q

Quincuntial. Applied to imbricate æstivation, when out of 5 parts, two are exterior, two interior and the fifth has one margin exterior and one interior.

R

Raceme. An (indefinite or centripetal) inflorescence in which the flowers are stalked and arranged on a long axis, the oldest being at the base and the youngest at the top.

Racemose. Bearing racemes, or raceme-like.

Radical. Arising from or near the root.

Radicle. The primary root of the embryo.

Raphe. The adnate funicle in an anatropous ovule, the cord or ridge connecting the hilum with the chalaza. It may be on the side of the ovule turned towards the axis (ventral), or on the face of the ovule away from the axis (dorsal).

Ray. The marginal portion of the head of flowers in Compositæ when distinct from the disk.

Receptacle. Usually applied to that part of the axis of a flower, which supports the sepals, petals, stamens and carpels. Also called torus or thalamus.

Regular. Applied to a flower which is actinomorphic; when the parts of each whorl in a flower are alike.

Reniform. Kidney-shaped.

Repand. With slightly uneven margin

Replum. A frame-like placenta from which the valves of a dehiscent fruit fall away; applied to the septum of Cruciferæ.

Resupinate. Upside down or apparently so.

Reticulate. In the form of network.

Retinaculum. The hook-like process to which the seeds are attached in many Acanthaceæ.

Retrorse. Directed backwards or downwards.
Retuse. With a shallow notch at the rounded apex.
Rhachilla. A secondary axis in the inflorescence of grasses.
Rachis. The axis of an inflorescence or of a compound leaf.
Rhizome. The rootstock; a stem of a root-like appearance prostrate on or underground, sending off roots and bearing scale-leaves.
Rhomboid. Approaching a rhombic outline; quadrangular with the lateral angles obtuse.
Rib. A primary vein of a leaf.
Rostellum. A narrow extension of the upper edge of the stigma in orchids.
Rostrate. Beaked.
Rosulate. Collected in a rosette.
Rotund. Rounded in outline, somewhat orbicular.
Rugose. Wrinkled.
Rugulose. Slightly wrinkled.
Ruminate. Looking as though chewed, as the albumen of nutmeg.
Runcinate. Saw-toothed or sharply incised, the teeth retrorse.
Runner. An elongated lateral shoot rooting at intervals. The intermediate parts are apt to perish and new plants are thus produced.

S

Sagittate. Shaped like an arrow-head.
Samara. An indehiscent winged fruit.
Saprophyte. A plant which lives on dead organic matter.
Sarmentose. Producing long and lithe runners.
Scabrid. Somewhat rough.
Scabrous. Rough to the touch.
Scale. Any thin scarious body.
Scaly. Bearing scales.
Scandent. Climbing, in whatever manner.
Scape. A leafless floral axis or peduncle arising from the ground.
Scapigerous. With flowers borne on a scape.
Scarious. Thin, dry and membranous, not green.
Scorpioid. Applied to a cymose inflorescence in which the main axis (paseud-axis) is coiled in a circinate manner, strictly with flowers two-ranked, these being alternately thrown to opposite sides.
Secund. Parts or organs directed to one side only.
Seed. The structure produced from the mature ovule.
Sepal. A segment, free or united with other segments, of the calyx.

Sepaloid. Resembling a sepal.

Septicidal. Applied to a capsule dehiscing by the ventral sutures, i.e., along the lines of the septa.

Septifragal. Applied to the dehiscence of a capsule when the valves break away from the septa.

Serrate. Beset with forwardly directed teeth on the margin.

Serrulate. Finely serrate.

Sessile. Without a stalk.

Seta. A bristle or bristle-shaped body.

Setaceous. Bristle-like.

Setose. Bristly.

Sigmoid. Doubly curved like the letter S.

Silicula. A short siliqua, not much longer than broad.

Siliqua. The fruit characteristic of the Cruciferæ, two valves falling away from a frame, the replum, on which the seeds are borne and across which a false partition is formed.

Sinuate. With a deep wavy margin.

Sinus. A recess or a re-entering angle.

Spadix. A spike with a fleshy axis, as in the aroids. The flowers are generally unisexual and the whole spadix is more or less enclosed in a large bract called the spathe.

Spathe. A large bract enclosing an inflorescence, as in the aroids.

Spathulate. Obovate with the basal end attenuated.

Spike. A racemose (indeterminate) inflorescence with sessile flowers on an elongated axis.

Spikelet. A secondary spike ; a cluster of one or more flowers subtended by a common pair of glumes as in the grasses.

Spine. A sharp-pointed woody or hard body.

Spinose. Furnished with spines ; spinous.

Spur. A hollow extension of some part of the flower, usually honey-secreting.

Spurious. False.

Squamose. Scaly or scale-like.

Squarrose. Rough or scurfy with spreading and outstanding processes.

Stamen. A male sporophyll in a flower; one of the elements in the androecium bearing an anther.

Staminal. Relating to the stamens.

Staminode. A sterile or abortive stamen.

Standard. The posterior and usually the largest petal of a papilionaceous corolla.

Stellate. Star-shaped or radiating like the points of a star.

Stigma. That part of the pistil which receives the pollen.

Stipe. Stalk, usually applied to the stalk of a fern frond or that of a pistil.

Stipel. An appendage of a leaflet corresponding to the stipule of a leaf.

Stipellate. Furnished with stipels.

Stipitate. Having a stipe.

Stipular. Relating to stipules.

Stipule. An appendage at the base of a leaf. There are usually two to each leaf.

Stipulate. Possessing stipules.

Stolon. A sucker, runner or any basal branch which is disposed to root.

Stoloniferous. Sending out or propagating itself by stolons.

Stone. The hard endocarp of a drupe.

Strigose. Beset with sharp-pointed, appressed, straight and stiff hairs or bristles.

Strophiole. An appendage at the hilum of some seeds. Also known as caruncle.

Style. The usually attenuated part of the pistil between the ovary and the stigma.

Subaerial. Situated almost on the ground level.

Suberose. Having a corky texture.

Submerged, Submersed. Growing under water.

Subulate. Awl-shaped.

Sucker. A shoot of subterranean origin.

Suffruticose. Somewhat shrubby.

Sulcate. Grooved or furrowed.

Supine. Prostrate with face upwards.

Suture. A junction or seam of union; a line of dehiscence.

Syncarpous. Composed of two or more united carpels.

Syngenesious. Applied to androecium when the anthers are cohering in a ring.

Synonym. A superseded or unused name.

T

Tegmen. The inner coat of a seed.

Tendril. A filiform organ for climbing.

Terete. Circular in transverse section; cylindrical.

Ternate. In threes.

Testa. The outer coat of a seed, usually hard.

Tetradynamous. Having four long and two short stamens, as in Cruciferæ.

Tetragonous. Four-angled.
Thalamus. Receptacle of the flower.
Throat. The orifice of a gamopetalous corolla or a gamosepalous calyx.
Thyrsus. A mixed inflorescence; a contracted or ovate panicle in which the main axis is indeterminate, but the secondary and ultimate axes are cymose.
Thyrsoid. Resembling thyrsus.
Tomentose. Densely pubescent with matted wool or short hairs.
Tomentum. Pubescence.
Torulose. Constricted at intervals.
Torus. Receptacle or thalamus of a flower.
Tricarpellary. Applied to ovary with three carpels, free or united.
Trichotomous. Three-forked.
Trifoliolate. With three leaflets.
Trigonous. Three-angled.
Trilobate. Three-lobed.
Trilocular. Three-celled.
Trimorphic. Having three forms.
Tripartite. Three-lobed nearly to the base.
Tripinnate. Three times pinnate.
Triquetrous. With three salient angles.
Truncate. As though cut off at the end.
Tuber. A thickened and short subterranean structure, usually a stem when it possesses buds or 'eyes' and scale-leaves, or a root as in some orchids.
Tubercle. A wart-like excrescence.
Tuberculate. Covered with wart-like excrescences.
Tuberous. Possessing tubers or resembling a tuber.
Tumid. Inflated, swollen.
Turbinate. Shaped like a top.
Turgid. Swollen but not with air.

U

Umbel. An inflorescence, properly indeterminate, in which all the pedicels radiate from the same point like the ribs of an umbrella.
Unarmed. Without thorns or prickles.
Uncinate. Hooked.
Undulate. Wavy.
Undershrub. A low shrub.
Unguiculate, Ungulate. Contracted at the base into a claw, clawed.
Urceolate. Pitcher-shaped, urn-shaped, hollow and contracted at the mouth.

Utricle. A small bladdery pericarp, as in some Chenopodiaceæ; a small bladdery structure.

V

Valvate. The condition when the parts of a floral whorl do not overlap.

Vein. A strand of vascular tissue in a flat organ, as a leaf; the branch of a nerve.

Velamen. A parchment-like layer of air-cells on the surface of the aerial roots of some orchids, aroids, etc.

Velutinus. Velvety.

Ventral. Applied to the upper surface of a leaf and the inner surface of a carpel, in opposition to dorsal.

Ventricose. Swollen or inflated on one side, as the corolla in many Labiatæ.

Venulose. Profusely veined.

Verrucose. Warty.

Versatile. Turning free on their support, as anthers on their filaments in some stamens.

Versicolor. Changing colour.

Verticil. A whorl.

Verticillaster. A false whorl composed of a pair of opposite cymes, as in Labiatæ.

Vexillum. The posterior and usually the largest petal in the papilionaceous corolla; the standard.

Villous. Covered with long soft hairs.

Virgate. Twiggy.

Viscid. Sticky.

Vitta. An aromatic oil tube in the pericarp, as in most Umbelliferæ.

Viviparous. A plant in which the seeds or buds germinate while still attached to it.

W

Whorl. The arrangement of organs in a circle round an axis.

X

Xerophyte. A plant which can subsist in dry localities, as a desert plant.

Z

Zygomorphic. Applied to flowers which can be divided into equal halves in one plane only.

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