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FLORA

OF

THE UPPER GANGETIC PLAIN

AND OF THE

ADJACENT SIWALIK AND SUB-HIMALAYAN TRACTS

BY

J. F. DUTHIE, B.A., F.L.S.,

FORMERLY DIRECTOR OF THE BOTANICAL DEPARTMENT OF
NORTHERN INDIA,

CONIFERÆ TO JUNCACEÆ.

CALCUTTA
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1920
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Vol. III.

Part II.

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CLASS II.

GYMNOSPERMS.

CV.—CONIFERÆ.

Trees or shrubs, wood-cells studded with disks. *Leaves* usually alternate, rigid, linear or subulate, rarely broad, solitary or fascicled in membranous sheaths. *Flowers* monœcious or dioëcious; males in deciduous catkins; females solitary or in cones. *Perianth* none. **MALE** flowers: *stamens* many, filaments connate in a globose ovoid oblong or cylindric column; anthers 1- or more-celled, shortly stipitate or sessile round the axis of the column. **FEMALE** flowers: *ovules* one or more, sessile, naked, usually orthotropous, seated on a scale (an open carpel) which is free or adnate to the scale (bract) of a cone. *Seeds* often winged, testa thick or thin; albumen dense, fleshy; embryo axile, straight; cotyledons 2 or more; radiæ terete, often attached to a crumpled thread-like suspensor.—Species about 350, chiefly in cold regions, rare in Trop. Africa and America, absent in the W. Peninsula of India and in Ceylon.


Evergreen monœcious trees. *Leaves* dimorphic, the primary consisting of small membranous scales; secondary linear, in clusters of 2 or 3 or 5 in the axils of the primary, clusters girt at the base by a sheath of hyaline scales. **MALE** flowers in spikes. *Staminal column* ovoid, oblong or cylindric; anthers in many series, shortly stipitate, 2-celled, connective produced at the apex. **FEMALE** cones globose or ovoid, bracts spirally imbricate, ovuliferous scale much larger than the bracts; *ovules* 2, at the base of the scale, reflexed. *Ripe cone* ovoid or oblong, bracts obsolete or small; scales persistent, formed of the enlarged thickened usually woody ovuliferous scales the tips of which are often square and with a boss. *Seeds* 2, reversed, usually winged, the wing formed by the adhesion of the hard testa to a thin separable layer of the scale,
cotyledons 2 or more.—Species about 70, confined to the N. Hemisphere.

**P. longifolia**, Roxb. Fl. Ind. iii, 651; Royle Ill. 353, t, 85, f. 1; Brandis For. Fl. 506; Ind. Trees 690; F. B. I. V, 652; Watt Comm. Prod. Ind. 889; Kanjilal For. Fl. (ed. 2). 431; Gamble Man. 706; Collett Fl. Siml. 485, fig. 158.—Vern. Chir, chil (W. Him.), dhup (Oudh).—Long-leaved pine.

A large more or less deciduous tree with symmetrical branches high up on the trunk and forming a rounded head of light foliage. **Bark** rough, reddish-brown outside, dark-red within, cut by deep fissures into large irregular thin plates. **Leaves** in clusters of three, 9-12 in. or longer, linear, slender, subtriangular. **Sheaths** persistent, fimbriate, greyish-brown. **Male-spikes** ovoid, cylindric, about ⅔ in. long. **Fertile cones** on short stiff stalks, spreading or recurved, solitary or in whorls of 3-5, ovoid-conical, 4-7 in. long when mature and about 3 in. in diam. above the base. **Scales** 1½-2 in. long and ⅔ in. broad; apex much thickened and with a 4-6-lobed tip which is beaked in the centre. **Seeds**, including wing, ½-1 in. long; its wing obliquely oblanceolate, obtuse; cotyledons about 12.

Wild on the Saharanpur Siwalik range at 2-3,000 ft. It is cultivated in Dehra Dun and in many other places within the northern portion of the Upper Gangetic Plain. The tree flowers February to April, and the seeds are shed during the hot weather of the following year. The cones remain on the branches long after the seeds have been shed. **Distrib.**: Outer Himalayan ranges and in the valleys of the principal rivers from the Indus to Bhutan at elevations between 2,000 and 7,500 ft., reaching its highest altitude in Kumaon. In Sikkim and Bhutan it rarely rises to over 3,000 ft. The tree is gregarious in the Western Himalaya, where it forms pure forests over very extensive areas. The resin obtained from the sapwood of this tree is the most important of its products, which include tar, turpentine, colophany and charcoal as bye-products. The quantity of resin obtained per individual tree is much larger as compared with that of the ‘Blue pine’ (**Pinus excelsa**), but the quality is somewhat inferior. The timber is largely used by the hill men for building and other purposes. It is not very durable, especially when exposed to wet, and it is very liable both to insect and fungoid attacks, and is altogether inferior to that of the ‘Blue pine.’ This latter tree (**P. excelsa**) occurs abundantly in the Temp. Himalaya at elevations between 6,000 and 12,500 ft., extending from Kafristan on the west to Sikkim and Bhutan eastwards, except for certain gaps in Central and N.-W. Kumaon.—For
further particulars regarding these two Himalayan pines see Gamble’s “Manual of Indian Timbers” and Brandis’ “Forest Flora of N.-W. and Central India.”

The following non-indigenous conifers are met with in gardens within the area of the Upper Gangetic Plain:

**Thuja orientalis, L.**—A small evergreen tree of China and Japan, and sometimes known as the Chinese Arbor-Vitae.

**Cupressus sempervirens, L.**—A tall evergreen tree, indigenous in Persia, Syria and Asia Minor.—Cypress. Vern.—Sarás (Hind.) Largely cultivated in the plains of N.-W. India, especially the fastigiate variety.

**Juniperus macropoda, Boiss.**—Himalayan Pencil Cedar. A small or medium sized tree of the inner dry ranges of the Western Himalaya, ascending to 14,000 ft. in Ladák, and found as low down as 5,000 ft. on the Indus. It has been cultivated in the Saharanpur Garden, where it appears to thrive.—Vern. Dhup.

**Araucaria cunninghamii Ait.**—A tall handsome evergreen tree, introduced from Queensland. There used to be a fine specimen of this tree in the Saharanpur Garden.

**Araucaria bidwilli, Hook.**—The Bunya-Bunya pine of N.-E. Australia. This tree also thrives at Saharanpur and in other gardens of North-West India.

Belonging to the allied and remarkable family of Cycadaceæ some mention should be made of *Cycas revoluta*,Thumb., a Japanese species introduced into India, and often grown in gardens within the area of the Upper Gangetic Plain. It is a small palm-like evergreen tree with linear pinnately divided leaves arranged in terminal crowns.

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**CLASS III.**

**MONOCOTYLEDONS.**

**CVI. HYDROCHARITACEÆ.**

Aquatic usually submerged herbs. *Leaves undivided, usually narrow and ribbon-like, rarely with a distinct lamina. Flowers regular, monoecious or dioecious, rarely 2 sexual, enclosed in an**
entire or 2-leaved spathe; MALE flowers: stamens 3-12, in 1-4 series, anthers 2-celled. FEM. flowers: Solitary. Perianth superior. Sepals 3, green or petaloid. Petals membranous or none. Ovary 1-celled, inferior; placentas 3-6, parietal or intruded; and sometimes almost meeting at the axis; styles or style-arms 3-12; ovules many on each placenta, anatropous or orthotropous. Fruit globose or ovoid, dry or pulpy, rarely dehiscent. Seeds few or many, albumen none, embryo smooth or lineate.—Species about 50, in tropical and temperate regions of the world, some of them marine.

Stems branching, leafy; leaves small; spathe small, sessile:—

Leaves whorled or the lower ones opposite; styles undivided; ovules anatropous . 1. Hydrilla.

Leaves scattered, fascicled or somewhat whorled; styles notched; ovules orthotropous . 2. Lagarosiphon.

Stems none, or with stolons only, or a creeping rootstock:—

Leaves all long, narrow and sessile; male scapes several-fld.:—

Perianth single . . . . 3. Vallisneria.

Perianth double . . . . 4. Blyxa.

Leaves mostly or all petioled:—

Ovary not beaked; fruit without wings; leaves all petioled; male scapes 2-3-fld. . 5. Hydrocharis.

Ovary beaked; fruit winged, submerged; leaves narrow, the floating ones long-petioled; flowers solitary . . . 6. Ottelia.


A submerged leafy freshwater herb. Leaves short, usually opposite below, 3-4-nately whorled above. Flowers minute, dioecious, the males shortly pedicelled, solitary in a subglobose muricate spathe; females sessile, 1-2 in a tubular 2-toothed spathe. MALE flowers: Sepals 3, ovate or obovate, green. Petals 3, oblong or cuneiform. Stamens 3; anthers large, reniform, opening elastically. Pistillode minute. FEM. flowers: Sepals 3, linear, green,
Lagarosiphon.] Hydrocharitaceæ. 173

Petals 3, narrow. Ovary produced beyond the spathe in a filiform beak, 1-celled; styles 2-3, linear, undivided, stigmas fimbriate. Ovules anatropous. Fruit subulate, smooth or muricate. Seeds 2-3, minute, oblong, testa shortly produced at each end.—A single species found throughout India and in Ceylon extending to Britain and C. Europe, Mauritius, Madagascar, Trop. Asia and Australia.


Stems slender, 1 ft. or more long, branching, flaccid, often rooting at the nodes; branches with a short sheathing leaf at the base. Leaves sessile, 4-8 in a whorl, the lowest often opposite, ½-⅔ in. long, linear or linear-oblong, apiculata, entire or serrulate, midrib prominent. Flowers ⅓-⅔ in. long. Perianth-segments very variable. Fruit smooth or muricate.

Abundant throughout the area of this flora in still or slowly running water; common also in all India and in Ceylon. Distrîb: See under the genus. The small membranous spathes of the male-flowers ultimately split and liberate the flowers which rise to the surface of the water, where they float, expand and scatter their pollen. Sugar-refiners in India use this plant, whilst moist, for covering the surface of their sugar in order to produce a slow percolation of moisture (See Royle Ill. l. c.).


Submerged fresh-water herbs. Leaves scattered, fascicled or somewhat whorled; lower opposite, serrulate. Flowers dioecious. Male flowers minute, many in an ovoid 2-fid. axillary spathe. Sepals petaloid. Petals rather shorter. Stamens 2 or 3, filaments short, anthers ovate, with often 2 or 3 staminodes. Pistillode none. Female flowers: Staminodes none. Ovary oblong, produced into a filiform beak; styles 3, stout, notched; ovules many, orthotropous. Fruit ovoid oblong or linear, pericarp membranous. Seeds many, testa with a mucous coat.—Species about 12, in India, Africa and Madagascar.
HYDROCHARITACEÆ. [LAGAROSIPHON.]


Common within the area in tanks and streams. Distrib.: Throughout the plains of India and in Ceylon, extending to China and Japan.


Submerged tufted stemless stoloniferous herbs. Leaves very long, linear. Flowers dioecious, the males numerous, minute, in an ovoid 3-lobed shortly peduncled spathe, the females solitary in a tubular 3-toothed spathe terminal on a very long filiform spiral scape; sepals 3, petals 3, minute or none. Male flowers: Stamens 1-3, filaments rather thick, anthers didymous. Pistillode none. Fem. flowers: Staminodes 3, each 2-fid. Ovary narrow, not produced upwards; stigmas 3, broad, notched, ovules numerous. Fruit linear, included in the spathe. Seeds numerous, oblong, testa membranous.—Species about 4, in the warmer regions of both hemispheres.


Leaves radical, narrowly linear, varying in length with the depth of the water, translucent, entire, or serrulate at the tips. Male flowers many, minute, in shortly stalked spathes; when ready to open they become detached and rise to the surface of the water, the expanded perianth acting as a float. Female flowers solitary within a 3-toothed spathe and borne on a long spiral stalk, the uncoiling of which brings the flower to the surface to be fertilized by the floating males, after which the female scape coils up again into a close spiral.
dragging the young fertilized female flower to within a small distance of the muddy bottom of the water to ripen.

Abundant within the area. Distrib. More or less throughout India and in Ceylon, extending westwards to Spain, and in most warm regions of the World.


Annual, submerged, tufted, scapigerous herbs. Leaves linear, acute, entire or minutely serrulate. Flowers 2-sexual or dioecious; scapes long or short; males pedicelled, several in a tubular 2-toothed spathe, long-peduncled; 2-sexual or fem. flowers solitary, sessile within a tubular 2-toothed spathe. Sepals 3, linear. Petals 3, linear, longer than the sepals. Male flowers: Stamens normally 3-seriate, 1 or more often reduced to staminodes; anthers narrow, erect. Pistillodes 3, slender. Fem. flowers solitary. Staminodes none or minute. Ovary linear, 1-celled, beaked; style very short; stigmas 3, filiform, ovules many. Fruit linear, included in the ribbed narrow ventricose spathe; pericarp membranous. Seeds many, oblong, smooth or tubercled, often tailed.—Species 7 or 8, in Trop. Asia, Madagascar, Australia and in Sumatra.

Leaves not serrulate; flowers dioecious;

stamens 8 . . . . . . 1. B. Roxburghii.

Leaves serrulate; flowers 2-sexual; stamens 3 2. B. oryzetorum.


A submerged tufted annual. Leaves radical, 8-24 in. long, linear, entire, broad at the base, finely acuminate at the apex. Flowers dioecious, white. Male flowers: Scape straight, as long as or longer than the leaves. Stamens 8; filaments unequal, shorter than the petals. Fem. flowers: Scape shorter and thicker than in the males. Fruit 2-4 in. long. Seeds 3 ½ in. long, distinctly tuberculate, shortly tailed.

I have seen no specimens from the Upper Gangetic Plains, but being widely distributed in Bengal in still water it has in all probability been overlooked. It is said to be plentiful throughout the Bombay Presidency, and is found also in Malay Peninsula and in Australia.
HYDROCHARITACEÆ.


Bundelkhand (Edgeworth, No. 9002). Distrib.: Kashmir (Jacquemont), also on the Khasia Mountains.


Aquatic floating herbs. Leaves petioled, orbicular or reniform, entire. Flowers monoecious; males 2-3 in a peduncled 2-foliolate spathe; females solitary within a spathe. Sepals 3, herbaceous. Petals 3, white, membranous. Male flowers. Stamens 6 or 9; staminodes 6 or 3; filaments forked, anther-cells basifixed. Female flowers. Staminodes 6, in pairs. Ovary ovoid, 6-celled; ovules many; stigmas 6, linear, 2-fid. Fruit an ovoid or oblong fleshy berry, 6-celled. Seeds numerous; testa pulpy, filled with spiral vessels; embryo ovoid.—Species 2 or 3, in Europe and Asia.

H. cellulosa, Buch.-Ham. in Wall. Cat. 5042; Prain Beng. Pl. 997. H. Morsus-Ranae, F. B. I. V, 662 (in part); Royle Ill. 377.

Prain in his Beng. Plants follows Buchanan-Hamilton in considering this plant as specifically distinct from the European H. Morsus-Ranae, to which it has been referred in the Fl. Brit. Ind. The reniform leaves are much less deeply lobed at the base, and after flowering they become very much enlarged. The male flowers contain 12 antheriferous stamens, 3 of which are sterile. Within the area of this flora specimens of this plant were collected by Buchanan-Hamilton in the Gorakhpur district, and by the present writer in the N. Oudh district of Bahraich. The plant appears to be common also in N. and Central Bengal.


Submerged or partially floating fresh-water herbs with fibrous roots. Leaves radical, crowded, the submerged narrow and shortly
OCHIDACEÆ.

Petioled, the floating long-petioled, ovate-lanceolate oblong or cordate. *Flowers* solitary, 2-sexual, sessile within a tubular long-peduncled spathe. **Sepals** 3, linear or oblong. **Petals** 3, longer than the sepals, obovate or orbicular, with fleshy basal appendages. **Stamens** 6-15, in 2-5 series, anthers erect. *Ovary* oblong, beaked, almost 6-celled; styles 6, linear, 2-fid.; ovules many, placentas diffuse. **Fruit** oblong, 6-valved, enclosed in the spathe, 3-6-winged. **Seeds** many, oblong, testa pulpy.—Species 6 or 7, in tropical or subtropical regions of the world.


A succulent flaccid herb, submerged or partially floating. **Leaves** variable, 2-6 in. long, oblong or orbicular, cordate, membranous, undulate, 7-11-nerved; petioles trigonous. **Spathe** 1-1½ in. long, 1-flowered, 5-6-winged.; peduncles varying in length with the depth of the water; wings of spathe unequal, undulate; mouth 5-6-toothed. **Sepals** small, oblong, green. **Petals** suborbicular, about 1 in. broad, white with yellow base, reticulate-veined. **Ovary** narrowly oblong; placentas 6-12. **Fruit** 1-1½ in. long, ellipsoid, crowned by the persistent perianth.

Abundant within the area of this flora, in tanks and slow-running water. **Distrib.** Throughout India and in Ceylon, extending to Australia.

CVII.—OCHIDACEÆ.

Herbs of various habit, rarely shrubby, of two principal forms: either (1) terrestrial tuberous-rooted herbs with annual herbaceous simple stems and solitary or spicate or racemose flowers; or (2) epiphytes with perennial stems or branches variously thickened and often forming a pseudobulb, flowering from the top sides or base of the pseudobulb; bracts usually present. **Flowers** 2-sexual, irregular, often showy. **Perianth** superior, of 6 free or variously combined segments in two series; 3 outer segments (*sepals*) more or less alike, the 2 lateral sometimes connate in a short or long sac or spur-like base (mentum); 3 inner (*petals*) dissimilar, the 2 lateral alike, the other (*lip*) usually very differently shaped. **Stamens** and style united in a column opposite the lip; fertile anthers usually
one (2 in Cypridiceae), on the front or top or back of the column and free or adnate to it, 2-celled or by subdivision 4-celled; top of the column sometimes produced towards the lip into a beak (rostellum); pollen-grains usually coherent in each cell into 1, 2, or 4 pairs of oblong globose or pyriform waxy or powdery masses (pollinia), which are free or attached by pairs or fours immediately, or by a stalk (caudicle) to a gland. Ovary inferior, 1-celled, usually linear or twisted; stigma one or two viscid spots on the top or concave face of the column, opposite the lip and below the anther, rarely discoid and above the two anthers (in Cypridiceae); ovules many, minute. Fruit a capsule, usually opening by 3 or 6 longitudinal fissures, rarely fleshy and subindehiscent. Seeds many, minute, with a lax hyaline testa enclosing a homogeneous nucleus.—Species about 5,000, in temperate and tropical regions, rarely arctic.

Anther single:—

Pollinia waxy:—

Pollinia free, or those of each cell held together at the base by a viscid appendage, not attached by their bases or by a caudicle to the rostellum:—

Pollinia 4:—

Leaves equitant, coriaceous or fleshy.
Epiphytic her a . . . .
Leaves not equitant. Usually terrestrial herbs —
Leaves membranous, rarely coriaceous:—
Lip superior, with basal auricles; column very short .
Lip inferior, without basal auricles; column long .

Epiphytic herbs with coriaceous leaves:—

Stems solitary or caespitose, or composed of discrete pseudo-bulbs basally attached on a long or short rhizome; column prolonged into a foot:—
Lip not articulate on the foot of the column . . .

1. Oberonia.

2. Microstylis.

3. Liparis.

4. Dendrobium.
Lip articulate on the foot of the column and mobile . 5. Bulbophyllum.

Stems jointed, composed of elongated pseudobulbs attached to a woody core; leaves solitary or in pairs, chartaceous; column without a foot . . . . . 6. Pholidota.

Pollinia 8

Terrestrial herbs without pseudobulbs:

Scapes from a stout rhizome, flowering before the leaves appear .

Stems leafy; flowers large, appearing with the leaves . . .
Pseudobulbous epiphytes; column with a long foot . . . .

Pollinia attached singly or in pairs or fours through one or rarely two caudicles to a stigmatic gland:

Pollinia 2, rarely 4 in Cymbidium:

Terrestrial glabrous herbs with fleshy tubers or rhizomes, rarely pseudobulbous; flowers in peduncled racemes; leaves chartaceous or membranous, plicate —

Lip distinctly 3-lobed, saccate or spurred at the base; inflorescence straight . . . . 10. Eulophia.

Lip obscurely 3-lobed, widely ventricose at the base, but not spurred; inflorescence at first decurved . . . . 11. Geodorum.

Epiphytic herbs, rarely terrestrial or leafless, usually with long linear coriaceous leaves sheathing on a large fleshy pseudobulb; scapes racemose, column footless or very slightly produced; lip not spurred 12. Cymbidium.
Epiphytic herbs, never terrestrial; pseudobulbs none:—
Stem very short, leaves few, crowded, pendulous, broad, flat and softly coriaceous; flowers in long, often branching, racemes; lip with a long claw; midlobe 2-lobulate; lateral lobes fimbriate; spur bent.

13. **ORNITHOCHILUS.**

Stems more or less elongate; leaves coriaceous, flat, or fleshy and terete:—
Lip not spurred; leaves terete.

14. **LUISSIA.**

Lip spurred, adnate to the column or its foot; leaves flat, lorate:—
Column with a long foot.

15. **ÆRIDES.**

Column slightly produced into a foot:—
Spur with neither calli nor septum within:—
Spur compressed laterally, deep, pubescent at the mouth; side-lobes of lip none.

16. **RHYNCHOSTYLIS.**

Spur not compressed, rarely (in *Vanda*) reduced to a gibbous swelling:—
Side-lobes of lip usually large (small in *Vanda Roxburghii*), spur widely funnel-shaped, glabrous at the mouth; flowers usually large (small in *Vanda parviflora*) caudicle of pollinia short and broad.

17. **VANDA.**
Side-lobes of lip small or none; spur narrow and cylindric, or short and widely saccate; mouth naked or fimbriate; caudicle of pollinia very narrow

18. SACCOLOBIUM.

Spur within partially or completely occluded by calli:—

Spur occluded by a dorsal scale or by calli on the anterior or posterior walls, but without a septum . . .

19. CLEISOSTOMA.

Spur within partially occluded by calli and divided by a vertical antero-posterior septum into two lateral chambers . . .

20. SARCANTHUS.

Pollinia powdery or lamellate, not waxy:—

Anther terminal, pollinia 2 or 4; leaf solitary, radical, appearing after the flowers .

21. POGONIA.

Anther dorsal; pollinia 2, bipartite; leaves several, appearing with the flower, racemes drooping; lip with a concave or saccate much depressed hypochile jointed at a right angle to the epichile .

22. EPIPACTIS.

Stigma single, anticous; lip saccate, the sac usually setose within . . .

23. GOODYERA.

Stigmas two, distant, lateral; pollinia bipartite; lip saccate, the sac with calli of laminae within . . .

24. ZEUXINE.

Anthers two, each with one perfect cell; cells sessile on the column, remote or contiguous, always separate; pollinia 2, often bipartite, adnate with or without caudicles to separate glands; leaves flat, membranous. Terrestrial herbs . . . .

25. HABENARIA.

Epiphytic herbs, with usually very short often tufted stems. *Leaves* coriaceous or fleshy, usually ensiform distinct and equitant, very rarely terete. *Flowers* minute, in dense sub-cylindric spikes, or racemes, expanding centrifugally. *Sepals* broadly ovate or oblong, subequal. *Petals* as wide as or narrower than the sepals. *Lip* larger than the sepals, 2-4-lobed, the hypochile more or less concave. *Column* very short and stout, rarely winged. *Anther* terminal or incumbent; pollinia 4, cohering in pairs, waxy.—Species about 60, Indo-Malayan region, extending to China, Australia and the Pacific Islands.

- Lip without lateral lobes or basal auricles 1. *O. pachyrachis*.
- Lip with lateral lobes:—
  - Lip oblong, with small lateral lobes 2. *O. Falconeri*.
  - Lip obcordate, with large broad lateral lobes 3. *O. ensiformis*.


Stems very short, tufted. *Leaves* 3-4 in. long, narrowly ensiform and slightly falcate, acute. *Peduncle* of inflorescence, short, broad, compressed, adnate to a leaf nearly to its apex. *Spike* 4-5 in. long, equalling or a little longer than its leaf. *Flowers* minute, pale-brown, sunk singly in rather distant pits in the fleshy rhachis; bracts ovate-rotund, irregularly serrulate. *Sepals* elliptic, obtuse, glandular on the back, not reflexed. *Petals* smaller, linear-oblong, obtuse, subentire. *Lip* without lateral lobes or basal auricles, orbicular-elliptic, obtuse, concave, entire or slightly eclose at the apex and with a deep depression at the base. *Capsule* short, turgid, often gibbous; ribs not prominent.

Dehra Dun, on trunks and branches of trees (Vicary, Falconer, Duthie, etc.). Flowers after the rainy season. **Distrib.:** Outer ranges of Himalaya from Garhwal eastwards to Sikkim, up to 4,000 ft.; also on the Khasia Hills.

**Oberonia.** [ ORCHIDACEÆ. 183

*Stems* short. *Leaves* 1-2½ in. long, broadly ensiform, straight or falcate, acute, coriaceous. *Peduncle* of inflorescence, stout, shorter than the leaves, terete, bracteate. *Racemes* erect or decurved, longer than the leaves; rhachis stout, deeply grooved in fruit. *Flowers* minute, shortly stalked; floral bract longer than ovary, ovate-lanceolate, acuminate, the margins serrulate. *Sepals* and *petals* brownish-yellow. *Sepals* ovate, acute, reflexed. *Petals* spreading, falcately lanceolate, obtuse, longer and narrower than the sepals. *Lip* oblong or subquadrate, green, the upper surface glistening with many gland-like specks; lateral lobes small, with truncate emarginate tips; the aper with two small incurved obtuse lobes separated by a broad sinus. *Anther* obovate, its lip emarginate. *Capsule* ½-½ in. long, shortly stalked.

**Dehra Dun** (Wallich, Falconer, Duthie, etc.). Common as an epiphyte on mango trees. *Flowers* in Sep. *Distrib.*: Outer ranges of Himalaya from the Jumna to Sikkim, up to 3,500 ft.; also on the Khasia Hills and in Chota Nagpur and in the Konkan.


*Stems* 2½-3½ ft. long, *Leaves* 10-18 in. long and up to ¾ in. wide, linear-ensiform, acuminate, falcate. *Inflorescence* erect, shorter than the leaves, subtruncate, its peduncle 2-2½ in. long, bearing many minute lanceolate appressed pale bracteoles; raceme about twice the length of the peduncle; its rhachis thick, fleshy, terete; floral bracts longer than the ovary, convolute, ovate-rotund, subacute, erose. *Flowers* ½ in. long, not sunk in the rhachis, pale-brown. *Sepals* reflexed, subequal, broadly ovate, subacute, entire not ciliolate. *Petals* ovate, subacute, stiffly pubescent, the edges entire and ciliolate. *Lip* twice as long as the sepals, 3-lobed, with two large rounded entire basal lobes; mesochile subquadrat, smooth, slightly concave, bearing on its edges two large projecting blister-like processes; terminal lobe obreniform, with two rounded lobules separated by a broad subquadrat apical sinus, the whole surface and margins of lip, except the smooth mesochile, clothed with stiff hairs.

**Dehra Dun**, chiefly on sal trees (Falconer, King, Mackinnon, Duthie). *Flowers* during Nov. *Distrib.*: Up to 3,000 ft. on the adjacent Himalaya, extending eastwards to Nepal, Sikkim and the Khasia Hills; recorded also from the Nilgiris.
2. MICROSTYLIS, Nutt.; Fl. Brit. Ind. v, 686.

Terrestrial or epiphytic, rarely saprophytes, often pseudo-bulbous. Leaves one or more, membranous, plicate, continuous with their sheaths. Flowers small, in terminal racemes, resupinate. Sepals spreading or recurved, subequal. Petals narrower than the sepals and about as long. Lip adnate to base of column, usually flat, with or without basal lobes; apex emarginate or 2-3-lobed. Column usually very short with two short spreading arms. Anther subterminal, or accumbent, 2-celled; pollinia 4, ovoid or obovoid, waxy.—Species about 70, in temperate and tropical Asia and America.


Terrestrial, whole plant up to 7 in. high. Stem short, swollen below, rising from the base of the previous year’s pseudo-bulb. Leaves two or three, horizontal, unequal, the large 2½ in. long by 1 in. broad, ovate, obtuse, cordate and amplexicaul at the base, fleshy; upper surface dark brownish-green; the lower surface purplish; nerves 3-7, reddish-purple, prominent beneath, the interspaces bullate. Scape about 3 in. long, sharply 4-angular. Raceme about as long as the scape; bracts subulate, longer than the ovary, reflexed, persistent. Flowers sessile, about ½ in. long, dull-yellowish and reddish-purple. Dorsal sepal ovate-lanceolate, subacute; lateral shorter, subfalcate, edges of all reflexed. Petals linear, shorter than the sepals, reflexed. Lip with a prominent transverse rim dividing its basal and apical portions; basal lobes falcately ovate-lanceolate, often continuous or overlapping at the tips; apical portion deeply bifid and protruded, crimson-purple. Column with fleshy rounded arms. Anthers with a truncate or emarginate lip. Ovary clavate, not twisted.

Dehra Dun, on Kalanga hill, at 2-3,000 ft. (P. W. Mackinnon). Flowers July and Aug. DISTRIBUT.: Outer ranges of Garhwal Himalaya, up to 6,000 ft., easily distinguished from M. Wallichii by its leaf-coloration; also the flowers are smaller and the lip is very differently shaped.


Terrestrial or epiphytic herbs, with or without pseudobulbs. Leaves one or more, membranous or coriaceous, continuous with the sheath or thickened and jointed at the base. Flowers small,
in terminal racemes, resupinate or not. Sepals spreading or recurved, the margins usually revolute. Petals much narrower than the sepals and about as long. Lip adnate to the base of the column, usually broad, flat or deflexed from the middle, sometimes concave and with calli near the base. Column elongate, often arched, usually winged near the apex and tumid, or dilated and compressed at the base. Anther terminal; pollinia 4.—Species about 120, in temperate and tropical regions.

Leaf solitary, membranous: 1. L. dividan.
Leaves two, coriaceous: 2. L. longipes.


Leaf solitary, elongate, spathulate, obtuse, membranous. Scape angled, naked; bracts minute. Sepals linear. Petals filiform. Lip cuneate, angled on both sides at the base, then dilated, subquadrate, crenulate, apiculate. Column slender, curved, 2-toothed at the base. Anther not beaked.

Dehra Dun (Hort. W. Sanders). I have seen no specimens of this plant.


Epiphytic. Pseudobulbs close together in a row, cy indrie and stem like or swollen at the base, 3-6 in. long, with a few vertical striae and with tightly clasping sheaths. Leaves 2, jointed at the base upon the leaf-sheath or on pseudobulbs, 4-6 in. long, oblanceolate-oblong, subacute, to acuminate, sometimes aristate. Inflorescence erect, shorter or longer than the leaves; peduncle slender, terete, subulate; raceme twice as long as the peduncle, many-flowered; floral bracts linear-lanceolate, shorter than the pedicelled ovary. Flowers about \( \frac{1}{2} \) in. long, pale yellowish-green. Sepals 1-nerved, linear-oblong, subacute. Petals shorter than the sepals, linear, obtuse, reflexed, and with recurved margins as are the sepals. Lip about as long as the lateral sepals, broadly oblong, recurved from about the middle, inner margins at the base much thickened so as to form triangular processes but without true calli; margins entire, the apex broad and shortly apiculate. Column slightly curved and with small rounded wings.
Dehra Dun (Falconer, Mackinnon, Duthie). Flowers in Sep. Distrib.: Subtrop. Himalaya in Garhwal and Kumaon, up to 3,000 ft., and eastwards to Sikkim, Bhutan and the Khasia Hills, also on the Nilgiris and in Ceylon, extending to China and to the Malay and Pacific Islands. A widely distributed and polymorphic species. The Dehra Dun plant agrees best with Lindley’s L. spathulata, which has shorter and thicker pseudobulbs, rather broader leaves and shorter racemes than in the type. Hooker observes that it occurs frequently in company with the form having long pseudobulbs, and that intermediates abound.

4. Dendrobium, Swartz; Fl. Brit. Ind. v, 710.

Epiphytic herbs. Pseudobulbs short and fleshy or elongate and stem-like, usually tufted. Leaves usually sessile and with slender bases, never plicate. Flowers solitary or in fascicles or racemes, often large and showy. Sepals subequal, the lateral pair obliquely adnate to the foot of the column and forming with it a sac or mentum. Petals usually similar to the sepals. Lip sessile or clawed at the base, adnate to and incumbent on the foot of the column; side-lobes embracing the column, or spreading, or absent; terminal lobe broad or narrow, flat convex concave or saccate, the disk sometimes lamellate. Column short, with a long or short foot and with usually a nectar-secreting cavity at its extremity, the apex angled or 2-toothed. Anther 2-celled; pollinia 4, equal in length, usually all slightly coherent but sometimes in free pairs. Ovoid or oblong, slightly compressed, waxy.—Species 700 or more, in Temp. and Trop. regions of both hemispheres.

Flowers small, not exceeding \( \frac{1}{3} \) in. across, dull-yellow with stripes of red spots. 1. D. bicameratum.

Flowers about 1½ in. across or larger:—

Basal portion of lip convolute:—

Apical portion of lip pale-yellow, basal portion white. 2. D. primulinum.

Lip pale-yellow with purple veins at the base. 3. D. Pierardi.

Lip convolute throughout its length, pale-yellow with reddish-purple veins. 4. D. Gamblei.

Stems 12-18 in. long, clavate or fusiform. Leaves coriaceous, 3-4 in. long, linear-lanceolate to elliptic-oblung, obliquely and minutely 2-fid. at the apex. Flowers about ½ in. across, dingy-yellow speckled with stripes of red, densely crowded on a short sheathed peduncle; flowering bract sheathing the shortly stalked ovary. Dorsal sepal ovate-oblung, subacute; lateral pair triangular, concave, subacute. Petals about as long as the sepals, broadly elliptic, obtuse. Lip fleshy, concave, 3-lobed; side lobes small, erect, triangular, acute; mid-lobe very short, truncate, the disk fleshy and smooth. Column very short, with two large oblong nectar-secreting cells. Mentum urceolate. Anther fleshy.

Dehra Dun (Gollan, Gamble). Flowers in Aug. Distrib.: Outer Himalayan ranges of Garhwal and Kumaon, up to about 4,000 ft., and eastwards to Sikkim, the Khasia Hills, and Burma; it occurs also on Parasnath in Behar.


Stems 10-12 in. long, pendulous. Leaves about 4 in. long, broadly oblong, coriaceous, the upper ones smaller. Flowers solitary from the nodes of the leafless stems, shortly pedicelled, 2½ in. across; floral bracts minute, emarginate. Sepals and petals white, or tinged with pink or pale-blue. Sepals narrowly lanceolate, acuminate, spreading or reflexed. Petals smaller, linear-lanceolate, acute, erect or spreading. Lip broadly oblong (when spread flat), very shortly clawed, about 1½ in. long and nearly as broad, convolute towards the base, with a broad central lamellate band, margins strongly ciliate; basal portion white; apical portion pale primrose-yellow, puberulous; mentum rounded. Column produced into a rather long foot and with 2 horn-like processes at the apex, pale-blue. Anther puberulous, its lip toothed.

Dehra Dun, at Nálapáni (Gamble). Flowers in April. Distrib. Outer Himalayan ranges of Garhwal up to about 3,000 ft. There has been some confusion in regard to the distribution of this species. Under *D. crepidatum* in the Fl. Brit. Ind. V, 740 Sir Joseph Hooker remarks. "A specimen in Herb. Kew, marked 'Garhwal, Falconer'
is perhaps a cultivated one." This evidently refers to the two scraps of *D. crepidatum* glued down on the same sheet with Falconer's specimens of *D. primulinum*. There is also on the same sheet Falconer's original ticket referring to the specimens of *D. primulinum* and bearing the manuscript name of *D. petrocarpum*. Both *D. primulinum* and *D. crepidatum* were found by Falconer, and they were no doubt cultivated in the Saharanpur Garden and sent thence to Kew under one name. The supposition that *D. primulinum* was ever found wild in Sikkim is probably an error.


*Stems* slender, pendulous, 2-3 ft. long. *Leaves* sessile, 2-5 in. long, lanceolate to ovate-lanceolate, sub-acuminate, caducous. *Flowers* about 1 in. across, solitary or 2-3 together, on very short minutely bracteate peduncles which proceed from the slightly swollen nodes of the leafless stems, rose-coloured or pale-purple, the lip yellow with purple radiating veins at the base. *Sepals* subequal, oblong-lanceolate, subacute. *Petals* elliptic, obtuse, as long as the sepals, but broader. *Lip* sub-orbicular (when spread out), without side-lobes, the claw very short, edges shortly ciliate on the apical half, basal portion convolute, upper surface pubescent. *Column* about equalling its foot in length the latter with a nectary at its extremity. *Anther* with a curved erose lip. *Capsule* about 2 in. long.

Dohra Dun, on the banks of the Song river and in the adjacent forests (Gamble, Mackinnon). Flowers in May. **Distrib.** : Outer ranges of the Kumaon Himalaya up to about 3,000 ft., extending eastwards to Nepal, Sikkim and the Khasia Hills; also in Assam, Bengal, Chota Nagpur and southwards to S. India and Tenasserim, and extending to China.


*Stems* slender, pendulous, 1-2 ft. long, with short scarious sheaths at the nodes. *Leaves* sessile, up to 3 in. long, subfalcately ovate-lanceolate, subacuminate, thick, caducous; veins obscure. *Peduncles* solitary or in pairs from the nodes of the leafless stems; floral bract very small, lanceolate, acuminate. *Flowers* about 1 in. across, inodorous. *Sepals* and *petals* subequal, lanceolate, acuminate, with reflexed tips, pale greenish-yellow, 5-nerved. *Lip* about 1 in. long,
convolute throughout its length, broadly elliptic-oblong or subquadrangular when spread out; margins fimbriate-serrate except at the cuneate and clawed base; apex obtusely cuspidate; upper surface with a broad central grooved band villous towards the apex; veines reddish-purple, bifurcating within the margin. Column nearly \( \frac{1}{2} \) in. long, its narrow elongate foot with a small ovate lacinate nectary at its base; mentum elongate, slightly curved; and spur-like. Anther minutely papillose outside, its lip denticulate.

Decora Dun (Gamble) on trees. Flowers June-August. Distrib.: Garhwal Himalaya, up to 3,000 ft. Recorded also as occurring on the Nilgiri Hills. It is closely allied to \( D. \) macrostachyum, Lindl a species of S. India and Ceylon.

5. **BULBOPHYLLUM**, Thouars; Fl. Brit. Ind. v, 752.

Epiphytic herbs. **Pseudobulbs** from a creeping rhizome, rarely none, 1 (rarely 2)-leaved. Flowers on scapes from the rhizome and usually close to the pseudobulbs, solitary, capitate, umbellate, or in spikes or racemes. **Sepals** subequal or the lateral pair rather longer than the dorsal one and free or connate under the lip. **Petals** usually smaller than the dorsal sepal. **Lip** jointed on the foot of the column, mobile, small and usually much recurved. Column very short, often 2-aristate at the apex. **Anther** 2-celled; pollinia 4, free, the two inner smaller (rarely suppressed).—Species nearly 200, chiefly in tropical and sub-tropical Asia, a few in Africa, America and Australia.


Rhizome thread-like, branching; pseudobulbs crowded or distant, globular or ovoid, smooth, base broad. Leaf 2½ in. long, narrowly oblong, subacute, slightly narrowed to the sessile base, deciduous before the flowers open. Scrape filiform, about 4 in. long, the sub-erect peduncle longer than the raceme, bearing 1 or 2 minute bracts; raceme inclined. Flowers about 6, distant, secund, pale-yellow, \( \frac{1}{4} \) in. long; floral bracts minute, oblong, about as long as the short stalk of ovary. **Sepals** spreading; dorsal one ovate, concave; lateral pair longer, oblong-lanceolate, subacute, 3-nerved. **Petals** much shorter than the sepals, broadly ovate, acute, 1-nerved. **Lip** stalked, deflexed, oblong, obtuse, scaberulous. **Column** shortly toothed, its foot short and slightly curved. **Anther** papillose, its lip acute.
Dehra Dun (Gamble); flowers during June and July. Distr. Kumaon in the Gori Valley, up to 4,600 ft. (Duthie), and from Nepal eastwards to Sikkim and on the Khasia and Naga Hills.


Epiphytes with jointed and often branching stems, the internodes resembling pseudobulbs, or with tufted pseudobulbs. Leaves in pairs or solitary, membranous, many-nerved. Flowers small, racemose, subglobose, expanding from above downwards, usually drooping and distichous; peduncles ebracteate, terminal or from the base of the pseudobulb; floral bracts large, persistent. Sepals concave. Petals narrower than sepals. Lip more or less cymbiform, usually without side-lobes. Column without a foot, short, hooded or winged at the apex. Anther subglobose; pollinia 4, waxy, subglobose or clavate, cohering in pairs to one or two membranes.—Species about 20, in India, Malaya and China.

Leaf solitary . . . . . . . . 1. *P. imbricata*.
Leaves in pairs . . . . . . . . 2. *P. articulata*, var. *Griffithii*.


A pendent epiphyte. Pseudobulbs coëspitose, cylindric, thickened at the base, 2-3 in. long, or shorter and more ovoid, usually partly enveloped in large fibrous sheaths. Leaf solitary, 6-12 in. long, elliptic-oblongate or lanceolate, acute, tapering to the stout petiole, strongly 3-5-nerved. Inflorescence from the top of a pseudobulb, drooping, 8-10 in. long, lengthening in fruit; peduncle slender, as long as or longer than the dense many-flowered distichous raceme. Flowers about ½ in. long, white tinged with pink or yellow; fl. bract longer than the slender stalked ovary, convolute, subrotund, minutely apiculate, many-nerved, persistent, pale-brown. Sepals ½ in. long; dorsal sepal orbicular, 3-nerved; lateral pair connate at the base, cymbiform, winged along the keel. Petals linear-oblong, subacute. Lip 3-lobed, saccate between the large rounded lateral lobes; terminal lobe divided at the apex into two small oblong lobules. Column
broad, its upper half winged. Pollinia clavate, attached in pairs to two small membranes. Capsule about 1 in. long, ellipsoid.

Dehra Dun (Mackinnon, Gamble, Duthie). Flowers June-Aug. Distrib.: Outer ranges of the Garhwal and Kumaon Himalaya up to 4,000 ft., and eastwards to Nepal, Sikkim and Bhutan; also on the Khasia Hills, in Chota Nagpur, Chittagong, Konkan and Kanara, and south to S. India and Ceylon; extending to the Andaman Islands, Burma, Malay Pen., China, Pacific Islands and Australia.


Internodes of pointed stems terete, slightly furrowed, 3-5 in. long, the nodes bearing a few short broad scarious sheaths. Leaves 2, narrowly oblong-lanceolate, 3-4 in. long, tapering at each end. Racemes 1-2 in. long, decurved; peduncles from the top of the pseudobulbs; rhachis flexuose; floral bracts ½ in. long, oblong, obtuse, pale-brown. Flowers white tinged with brown and pink. Sepals ½ in. long, the dorsal one broadly ovate or suborbicular; lateral ovate-lanceolate, 5-nerved. Petals elliptic-lanceolate. Lip cymbiform, with a didymous terminal lobe; side-lobes none; base with 5 lamellate nerves. Column suborbicular; rostellum ovate-acuminate. Pollinia sub-globose.

Dehra Dun, on sáí trees (Mackinnon Gamble). Distrib.: Outer ranges of Garhwal Himalaya up to 4,000 ft. and eastwards to Sikkim and the Khasia Hills. This plant is similar in most respects to the type, but smaller in all its parts, and the leaves are much narrower.

7. PACHYSTOMA, Flume; Fl. Brit. Ind. v, 811.

Terrestrial herbs with rather thick rhizomes. Leaves solitary or in pairs, usually appearing after the flowers, long, narrow, many-nerved. Flowers rather small, pendulous, white or pale-purple, puberulous, in racemes or on long pale scapes with clasping striate sheaths; bracts often large and scarious. Sepals unequal, the dorsal one blunt, lateral subacute. Petals narrow, spathulate. Lip sessile on the footless column, erect; side-lobes oblong, acute; terminal small; disk with 3-5 deeply crested and fimbriate ridges. Column slender, clavate above. Anther dorsal; pollinia 8, pyriform, waxy, adhering to a single membrane.—Species 6-8, in India, Malaya and Africa.

An erect terrestrial herb, leafless when in flower. Rhizome rather stout, producing scapes and solitary leaves at intervals of about 2 in. Leaf longer than the scapes, linear, membranous, 4-5-nerved. Scapes about 12 in. high, clothed with many pale striate sheaths 1-2 in. long. Racemes many-flowered. Flowers about ½ in. across, greenish-white tinged with pink or purple, gland-puberulous; floral bract longer than the curved stalked pubescent ovary, erect, lanceolate, acuminate. Sepals unequal; dorsal oblong, rounded at apex; lateral pair spreading oblong-lanceolate, subacute. Petals narrowly spatulate, recurved puberulous as are the sepals. Lip sessile on the base of the column, 3-lobed, broadly oblong, gibbous at the base, pubescent; side-lobes acutely falcate; terminal one suborbicular, recurved and abruptly acuminate at the apex; upper surface of disk with 5 stout crested ridges extending from base to apex. Column dilated upwards, puberulous. Anther on the back of the column, indistinctly 8-celled.

Dehra Dun (T. Thomson, Mackinnon); also in many localities within the area of this flora from the Jumna eastwards to Moradabad and N. Oudh. Flowers in April. Distrib.: Outer Himalayan ranges from Garhwal to Sikkim; also on the Khasia Hills, and eastwards to the Nicobar Islands, and the Malay Archipelago to S. China. It occurs also in N. Bengal and Chota Nagpur and extends southwards to S. India, and Ceylon.

8. THUNIA. Reichb.; included under Phaius in Fl. Brit. Ind. v, 816.

Terrestrial, rarely epiphytic herbs. Stems slender or equally thickened along their entire length, elongate, leafy, with many foliaceous sheaths below. Leaves distichous, lanceolate, glaucous. Flowers appearing with leaves, large, showy, in terminal drooping racemes; bracts large, scarious. Sepals erecto-patent, subequal, lanceolate, acute. Petals like the sepals. Lip adnate to the base of the footless column, shortly spurred; side-lobes short, involving the column; mid-lobe fringed. Anther narrow, pendulous, incompletely 4-celled; pollinia 8, waxy, attached in fours to a granular membrane; rostellum 3-lobed.—Species about 9, in tropical and temperate regions of the Old World.

Pseudobulbs none. **Stems** stout, erect, tufted, 1-3 ft. long, bearing many tubular sheaths at the base. **Leaves** many, sessile, 1½-3 ft. long, narrowly elliptic-lanceolate or oblanceolate, acuminate, membranous, glaucous beneath, usually plicate. **Racemes** 4-6-flowered, 4-6 in. long, shortly peduncled and with a single elongated sheath. **Flowers** 2-2½ in. long; bracts equalling or exceeding the long-stalked ovary, oblong, cymbiform, acute, pale-coloured. **Lip** broadly oblong-panduriform when spread out; lower half convolute into a tube; upper portion cuneate, forming a rounded shell-like mouth slightly acuminate, the margins undulate and unequally dentate; upper surface with 7-9 crested ridges. **Spur** horizontal, slightly bifid. **Column** with a short foot, somewhat winged at the apex. **Pollinia** unequal, elongate. **Capsule** 1½ in. long, narrowly elliptic.

Dehra Dun (Gamble, Mackinnon), sometimes found as an epiphyte on sál trees. **Flowers** in June. **Distrib.**: Outer Himalayan ranges of Garhwal and Kumaon, up to about 4,000 ft. It extends eastwards to Sikkim, Assam, the Khasia Hills and Burma, and occurs also in Chota Nagpur. A variety with shorter and more congested racemes is mentioned by Cooke as having been found by Dalzell on the Matheran Hill in Konkan.


Epiphytic and usually pseudobulbous. **Pseudobulbs** often elongated and stem-like. **Flowers** never large, rarely showy, arranged in racemes spikes or heads or on 1-2-flowered pedicels, often pubescent or tomentose. **Sepals** free from each other, adnate to the long foot of the column and with it usually forming a spur-like or saccate mentum. **Petals** similar to the sepals. **Lip** sessile on the foot of the column and incumbent. **Column** short and straight or long and somewhat curved, prolonged below as a foot. **Anther** accumbent, imperfectly 4-celled or 8-celled; **pollinia** 8, pyriform or broadly obovoid, waxy, attached in fours by their
bases to a granular membrane, or sometimes all attached together to a single viscus.—Species over 300, chiefly in Tropical Asia.

Flowers in dense spikes, glabrous or sparsely hairy, not woolly . . . . . . 1. **E. convallarioides**.

Flowers distant, sessile, on scapes, densely woolly outside . . . . . . 2. **E. flava**.


**Pseudobulbs** tufted, flattened, 3-7 in. long, covered when young with large loose sheaths. **Leaves** four to six, subcoriaceous, 4-7 in. long, elliptic-lanceolate or oblanceolate, acute, many-nerved, but not plicate. **Spikes** produced on the young growths, cylindric, decurved; peduncle about 1 in. long, stout, naked below. **Flowers** many, white tinged with yellow, densely crowded, subglobose, about \( \frac{1}{2} \) in. across, inodorous; **floral bracts** equalling the sessile pubescent **ovary**, ovate, lanceolate, concave. **Sepals** broadly ovate, obtuse; lateral pair deeply concave. **Petals** oblanceolate-oblong, spreading, nearly as long as the sepals but narrower. **Lip** obscurely 3-lobed, cuneate, concave, apex subacute, the disk without lamellæ. **Column** rather slender, with a long curved foot. **Pollinia** clavate, attached to a large translucent viscus. **Capsule** oblong, obtuse, not winged.

Dehra Dun (P. W. Mackinnon), flowering during Aug. and Sep. **Distrib.**: Outer Himalayan ranges from Garhwal eastwards to Nepal and Sikkim, up to 4,000 ft., also in Tenasserim.


**Rhizome** stout, clothed with imbricating tubular sheaths. **Pseudobulbs** large, stem-like, of 4-6 nodes, 3-5 in. long, much compressed, sheathed at the base. **Leaves** 6-10 in. long, narrowly oblong, acuminate, tapering to the base, subcoriaceous. **Scapes** from the base of the pseudobulbs, about as long as the leaves, clothed with dense pale tomentum and with many sheaths at the base. **Flowers** distant, yellow, \( \frac{3}{4} \) in. across, densely white-woolly outside; floral bracts lanceolate, pilose, shorter than the pinkish pilose stalked ovary, shrivelling as the flowers open. **Dorsal sepal** small, lanceolate; lateral pair \( \frac{3}{4} \) in. long, triangular, spreading. **Petals** smaller than the dorsali
sepal, lying parallel over the column, narrowly oblong, tapering to the base and apex. Lip oblong, 3-lobed, tumid; side-lobes narrow, truncate at the apex, puberulous and with two long tapering ridges at their junction with the disk; terminal lobe oblong, acute, recurved, slightly 2-ridged, glabrous. Column erect, its foot at right angles to and longer than its body. Ovary pinkish and densely pilose. Pollinia small, compressed, attached to two granular membranes. Capsule cylindric, 1½-1¾ in. long.

Dehra Dun (Duthie, Mackinnon); flowering in April. Distrib.: Outer Himalayan ranges of Garhwal up to 4,000 ft. and eastwards to Bhutan; also in Chota Nagpur. In Sikkim specimens the base of the lip, on both surfaces, and the foot of the column are often blotched with reddish-purple.


Terrestrial glabrous herbs with fleshy tubers or rhizomes rarely pseudobulbous. Leaves appearing with or after the flowers, long narrow and usually plicate. Flowers in racemes, rarely panicked, on a tall erect sheathed usually lateral scape. Sepals free, spreading, subequal. Petals somewhat similar to the sepals. Lip adnate to the base of the column or to its foot, saccate or shortly spurred at the base; side-lobes erect, embracing the column, rarely suppressed; midlobe spreading or recurved; disk usually ridged or crested. Column with or without a foot, its apex entire and often oblique, the margins occasionally winged or lobed. Anther terminal, 2-celled, sometimes with two apical processes; pollinia 2, globose, attached by a caudicle to the flat gland of the rostellum.—Species over 300, in tropical or subtropical Asia and Africa.

Column not or only slightly produced into a foot:

Leaves appearing with the flowers:

Lip with a short bent spur; bracts as long or longer than the ovary:

Sepals spreading, linear-lanceolate, acuminate, green . . . . 1. E. herbacea.

Sepals erect, ovate-obtuse, yellowish-brown . . . . . . 2. E. Mackinnoni.

Lip saccate at the base; bracts shorter than the ovary . . . . . 3. E. explanata.
Leaves appearing after the flowers have opened:—

Terminal lobe of lip yellow . . . 4. E. Hormusjii.

Terminal lobe of lip purple . . . 5. E. campestris.

Column produced into a distinct foot:—

Lateral sepals inserted on the spur; basal lobes of lip obscure . . . . 6. E. nuda.

Lateral sepals inserted on the foot of the column; lip with distinct basal lobes:—

Flowers not exceeding 1 in. diam., greenish-yellow tinged with purple . 7. E. bicarinata.

Flowers large, exceeding 1½ in. in diam., lemon-yellow, often spotted or streaked with lilac:—

Terminal lobe of lip ½ as long as the rhomboid-oblung basal lobes; spur saccate, blunt . . . . 8. E. flava.

Terminal lobe of lip twice as long as the rounded basal lobes; spur short, curved, acute . . . . 9. E. obtusa.


Root tuberous, the tubers about 1½ in. long, broadly ovate. Pseudostem 4-6 long. Leaves 6-10 in. long, linear-lanceolate, variable in breadth, many-nerved, plicate. Flowering stem stout, 2-3 ft. high, with a few sheathing bracts towards the base. Raceme short, 8-10-fld.; floral bracts about as long as the ovary, linear-lanceolate, acuminate, scarious. Flowers appearing with the leaves, about 2 in. across, white, tinged with green, fragrant. Sepals ½-1½ in. long, spreading, linear-lanceolate, acuminate, green with pale margins; lateral pair adnate to the base of the column. Petals shorter than the sepals, pure white, elliptic or lanceolate, obtuse or acute. Lip ¾ in. long, white tinged with green at the base; side-lobes small oblong, rounded at the apex; midlobe oblong, rounded at apex, margins crenate; disk with five median fimbriate lamellae; spur very short subgeniculate, obtuse. Column stout, ⅓ in., curved and without a foot,
slightly winged. Pollinia transversely oblong, attached by a short broad caudicle to a triangular gland. Capsule about 1½ in., ellipsoid, slightly ribbed.

Dehra Dun (Mackinnon); Siwalik range (Vicary). Flowers during June and July. Distrib.: Outer ranges of W. Himalaya up to about 5,000 ft.; also found in the Bombay Presidency and in Mysore.


Rhizome composed of a series of flattened triangular-shaped tubers. Pseudostem up to 7½ in., proceeding from the summit of the bulb-like current year’s tuber. Leaves usually two, appearing with the flowers, up to 2½ ft. long and 2-3 in. wide, broadly lanceolate, acuminate, tapering into long sheaths and with a few leafless sheaths below, prominently nerved and plicate. Flowering stem much shorter than the leaves, rising from the side of the current year’s tuber and bearing 3 or 4 loosely sheathing bracts. Flowers 8-10, in a lax raceme, spreading or at length deflexed, ½-3 in. long; floral bracts equalling or exceeding the ovary, linear-lanceolate, acuminate, persistent. Sepals and petals erect, fleshy, yellow tinged with reddish-brown, the veins prominent outside; dorsal sepal ½ in. long, ovate, obtuse, subcordate at the base, the margin inflexed at the apex; lateral pair rather longer, unequal at the base. Petals shorter than the sepals, oblong-obovate, obtuse, their margins overlapping and inflexed at the apex. Lip 3-lobed, with long erect rather shallow side-lobes; its body streaked with purple on a yellow ground and with three prominent white lamellae which extend into a carunculate area to within the base of the terminal lobe; terminal lobe broad, yellow rounded and with undulate edges. Spur short, geniculate. Column short, broadly winged, its foot very slightly produced. Anther yellow, with two short purple horns at the apex, its lip bifid. Pollinia, transversely oval, attached by a broad caudicle to a shallow crescent shaped gland.

Dehra Dun (Mackinnon, Duthie); Siwalik range (Vicary); N. Oudh in the Bhaarih district (Duthie); N. W. India Royle. Flowers in July and Aug. Distrib.: Cent. Prov. in the Raipur district (J. Marten). This plant appears to be most nearly related to E. geniculata, King and Pantl., a very rare Sikkim species, but differing in the shape of the rhizome, the much broader leaves and in the shape and colouring of the lip.

Pseudobulb about 2 in. long, ovoid, annulated. *Pseudo-stem* 1½-2 in. long. Leaves young when the plant is flowering, attaining, when fully developed, about 10 in. in length and 4 in. in width, broadly elliptic-lanceolate, acuminate, tapering below into a short petiole 7-veined. Flowering stem about 10 in. long, arising from below the summit of the pseudobulb, bearing a few loose sheaths at its base. Raceme 5-6 in. long, laxly many-fl.d.; flowering bract lanceolate, acuminate, much shorter than the slender ovary. Flowers about 1 in. across. Sepals and petals subequal, spreading, white or yellowish streaked with reddish-purple. Sepals spathulate-lanceolate, acute. Petals broadly oblong, rounded at the apex. Lip a little shorter than sepals and petals, 3-lobed, subpanduriform when flattened out, adnate by its base to the lateral sepals; basal lobes rounded, erect, white with reddish-purple branching veins, forming at the base a short conical sac; terminal lobe yellow with purplish veins terminating within the margin, oblong, with a rounded emarginate apex, the margins reflexed; disk with two prominent crenate lamellae and a shorter interposed one, all three abruptly terminating within the margin of the apex. Column short, its foot slightly produced. Anther emarginate at the apex. Pollinia subglobose, attached to a short broad caudicle; gland conical.

Dehra Dun (Mackinnon); N. W. India (Falconer); Sub-Himalayan tracts of Rohilkhand and of the districts of Kheri and Gonda in N. Oudh (Duthie). Flowers in May. **DISTRIBUTION**: Outer Himalayan ranges of Garhwal, and in Nepal at Maghada in the Morung district (Buch.-Hamilton). This plant was regarded by Sir J. Hooker as an anomalous species with the habit of an Australian *Dipodium*.


Tuber depressed, transversely oval, about 1½ in. across; *Pseudo-stem* about 4 in. long, bearing two tightly fitting sulcate subacute sheaths. Leaves two, developing later than the flowers, narrowly elliptic, acuminate, plicate. Flowering stem stout, 8-12 in. long, rising from the summit of the tuber, clothed at intervals with a few loose membranous lanceolate acuminate sheathing bracts. Flowers 8-10 forming a rather lax raceme about 3 in. long, and about 1 in. across, at first spreading, at length deflexed; floral bracts variable in length, lanceolate, acuminate, membranous, brownish. Sepals and petals
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subequal in length, nearly ¼ in. long, narrowly oblong or obovate, acuminate or abruptly mucronate, white with pink veins and tinged with pale-green at the apex. **Lip** including spur a little longer than the sepals and petals; side-lobes deep-purple, erect, rounded, entire; between the side-lobes are three prominent whitish lamellæ; midlobe orbicular, yellow spotted with purple, and with a coarsely fimbriate disk, the margin undulate and irregularly erose. **Spur** cylindric, curved, obtuse, white, grooved in front. **Column** about half as long as the lip, with a very slightly produced foot. **Pollinia** oval, attached by a short stout caudicle to a shallow crescent-shaped gland.

Dehra Dun (Mackinnon); N. Oudh, in the Kheri district (Duthie). Flowers during April. **Distrib.** : Outer ranges of the W. Himalaya up to 5,000 ft. from Garhwal westwards to Hazara and the Chitral district, often in pine forests. This species is nearly related to *E. campestris*, differing chiefly by its shorter scapes, larger flowers and more congested racemes. The shape of the lip and the general colouring of the flowers are also very different. *E. campestris* is essentially a species of the plains, whereas *E. Hormusjii* extends up to the temperate region of the W. Himalaya where the climatic conditions are more favourable for leaf development.


Bletia Dabia, Don Prod. 30.—Vern. **Sang-misri** (Beng).

**Tubers** irregularly oblong, often lobed. **Leaves** two, rising from the apex of a slender sheathing pseudostem, developing long after the plant has flowered, 10-16 in. long, linear, acuminate, plicate. **Scape** 6-12 in. long, sheathed at intervals by loose membranous bracts; raceme laxly many-fl. **Flowers** drooping, subsecund, yellowish or green with pink or purple markings, about 1 in. across; **floral** bracts, membranous, linear or lanceolate, acuminate, usually longer than the slenderly stalked ovary. **Sepals** slightly attached to the base of the lip, linear-lanceolate, acute or acuminate, 5-7-nerved. **Petals** spreading, narrower than the sepals, oblong-lanceolate. 3-5-nerved. **Lip** as long as the sepals, cuneate-obovate or oblong; side-lobes short, rounded or subacute, incurved round the column; midlobe orbicular quadrate or oblong, crenulate, usually purple; **basal portion** of disk with three median lamellæ ending in a fimbriate or tubercled patch on the terminal lobe. **Spur** short, conical subclavate or
subacute. Column as long as the lip, slender, without a foot. Pollinia broad; caudicle stout; gland elongate. Capsule in. long, ellipsoid.


Tuber large, spherical, smooth. Leaves 10-14 in. long, rising from the side of a tuber and forming by their sheaths a short pseudo-stem, elliptic-lanceolate, acute, plicate, many-nerved, narrowed at the base into a long tubular sheath. Flowering stem stout, erect, firm, 2-3 ft. high, rising from the base of the pseudostem, with a few loose sheaths near the base and other more distant ones higher up. Racemes lax, about 1½ in. long, many-fld. Flowers usually pale-green or white with purple or pink or brownish markings; floral bracts lanceolate, acute, about half as long as the stalked ovary. Sepals about ¾ in. long, erect, greenish-purple, linear-oblong, acute, 7-nerved; lateral pair slightly falcate, inserted on the spur of the lip, the dorsal one rather narrower. Spur very short, conical, obtuse, purplish-green, ribbed at the mouth. Petals shorter than the sepals, white, obtuse, many-nerved. Lip as long as the sepals, white or pale yellow flushed with pink or purple, oblong; side-lobes short, rounded; midlobe, oblong, obtuse, with a crisped margin; disk with about 9 strong prominent nerves. Column short, with a distinct foot, dilated at the margins. Anther small, its apex with two small conical processes and a third depressed one in front. Pollinia transversely oblong, attached by a broad caudicle to a shallow gland. Capsule 1½ in. long, fusiform.

N. Oudh, in the districts of Kheri and Gonda (Duthie’s Collector). Flowers April-June. Distrib.: Trop. Himalaya from Nepal eastwards to Sikkim; also in Chota Nagpur, Assam, Khasia Hills, Manipur and Burma, and south to Bombay Presidency and Ceylon.


Tuber about 2 in. long, compressed, irregularly lobed. Leaves usually undeveloped at the time of flowering, 7-12 in. long, linear, acuminate, narrowed below into the long petiole. Scape erect, 10-20 in. high, with two tubular inflated sheaths at the base and a few shorter ones.
higher up. *Racemes* 3-5 in. long, oblong, rather densely flowered.

*Flowers* pale yellowish-green tinged with purplish-brown, 1 in. in diam.; floral bracts shorter than the stalked ovary, membranous, lanceolate. *Sepals* linear-oblong, acute, keeled, their edges reflexed and undulate; lateral pair inserted on the foot of the column, wider than the dorsal one and free from it at their bases. *Petals* narrowly elliptic, subacute, shorter and wider than the sepals. Lip adnate to the foot of the column, longer than the sepals, slightly saccate at the base, 3-lobed; side-lobes shallow, obtuse; veins reddish-purple, branching within the margin; terminal lobe tinged with yellow, transversely oblong, emarginate; disk with two short smooth ridges half as long as the side-lobes and ending in a free triangular tooth, in front of which rise five unequal carunculate ridges extending to the terminal lobe. *Anther* apiculate in front. *Pollinia* broadly triangular, attached by a broad caudicle to a thin angular gland.

Sub-Himalayan tract in Pilibhit and in the Kheri district of N. Oudh (Duthie). Flowers in March and April. *Distrib.*: N. Bengal, Sikkim, Assam, Khasia Hills, Manipur and Upper Burma.


A tall robust herb with a tuberous rhizome. *Leaves* about three forming when young a short pseudostem by their sheathing base appearing later than the flowers, attaining 4 ft. in length and about 4 in. in width when fully developed. *Flowering stem* stout, unbranched, 2-3 ft. high, clothed at the base with a few distant close-fitting sheaths and rising from a tuber beside the leaf-bearing pseudostem. *Raceme* 1-2 ft. long, bracts much shorter than the ovary, ½ in. long, ovate-lanceolate, acuminate. *Flowers* many, large, drooping, lemon-yellow. *Sepals* 1½ in. long, oblong-lanceolate, acuminate. *Petals* rather shorter than the sepals and much broader, obtuse or emarginate, many-nerved. Lip equalling the sepals in length, 3-lobed; side-lobes large, rounded or oblong, whitish towards the apex and spotted with purple at their yellow bases; midlobe oblong, yellow, the disk with two small pyriform basal calli and three crenate lamellae; spur a short blunt sac. *Column* about ½ in. long, produced at the base into a short foot. *Anther* emarginate at the apex and with a long anterior process. *Pollinia* obtusely angled, attached by a stout caudicle to a broad shallow gland.

Dehra Dun (Royle, Mackinnon); sub-Himalayan tracts of Rohilkhand and in the Kheri district of N. Oudh (Duthie). Flowers in June and July. *Distrib.*: Outer Himalayan ranges of Garhwal and
Kumaon to Nepal, up to 5,000 ft.; also in Chota Nagpur and Travancore, extending to Hongkong and China.


Height of plant 3-4 ft.; the leaves and scape rising from a horizontal oblong tuber. Pseudostem formed by the sheaths enclosing the bases of the leaves and scape. Leaves two or three, 12-18 in. long, linear, acuminate, plicate; veins sharply prominent. Flowering stem exceeding the leaves, with a few long tight-fitting acuminate sheaths towards the base. Flowers six to ten, in a lax raceme, appearing with the leaves, 1½ in. across, erect in bud, drooping and campanulate when open; floral bracts acuminate, less than half the length of the ovary. Sepals and petals prominently veined on the back, bright-yellow outside, pale-lemon within; dorsal sepal obovate, acute, ½ in. long; lateral pair rather shorter, falcately oblong, obtuse or subacute, adnate to the foot of the column. Spur short, curved subacute. Petals obovate, obtuse, about as long as the lateral sepals. Lip 3-lobed, longer than the sepals; side-lobes suborbicular, erect, whitish or pale-yellow, with lilac-coloured streaks at the base; midlobe bent upwards, the margin undulate. Disk with 5-8 prominent white ridges terminating within the margin of the apical lobe in a dull-yellow oblong grooved callus and prolonged towards the base into two sets of free fimbriate projections. Column about ¾ in. long, oblong, narrowly winged curving forward into a distinct foot at the purple-streaked base. Anther with a rounded or slightly emarginate apex and a long anterior projection. Pollinia subglobose, attached by a cylindrical caudicle to a crenulated obconical gland.

Dehra Dun, in swamps (W. Bell, Mackinnon, Duthie); Rohilkhand in the Pilibhit district, and at Chandanpur in the Gonda district of N. Oudh (Duthie's collector). Flowers during July and August.

Distrib.: Warm valleys in the vicinity of Mussoorie (Royle). After examining in the Royal Herbarium at Kew the single type specimen of Lindley's Cyrtopera obtusa, as well as Faloner's excellent drawing of the same plant under his manuscript name of Eulophia arundinacea, I had no hesitation in referring to it the E. campanulata which was described by me in the Journ. As. Soc. Beng. l.c. as a distinct species. Lindley was correct in his description of the column and its distinctly produced foot characteristic of the Cyrtopera section of the genus.

Terrestrial herbs with underground subglobose rhizomes. Leaves elliptic, plicate, their sheaths forming a pseudostem. Flowers rather crowded, narrow, forming a decurved corymbose raceme on a stout sheathed scape arising from the base of the pseudostem. Sepals erect, equal, oblong, subacute. Petals as long as the sepals but broader and blunt. Lip sessile on the base of the column; side-lobes suppressed; terminal lobe broad, rounded, bifid or emarginate; disk with a forked basal callus. Column less than half the length of the lip. Anther broad, 2-celled; pollinia 2, broadly ovoid, attached by a slender tapering caudicle to a small orbicular gland.—Species about 9 or 10 in India, Malaya and Australia.


Tuber globose, apiculate, \( \frac{1}{4} \) in. in diam. Pseudo-stem 3-6 in. long. Leaves 6-20 in. long, broadly elliptic, tapering at the base to a long sheath. Flowers about \( \frac{1}{2} \) in. long, pale-purple or rose-coloured, in racemes which are short corymbose and drooping when in flower, but elongate and erect in fruit; floral bract lanceolate, acute, exceeding the pedicelli ovary. Sepals \( \frac{2}{3} \) in. long, oblong, acute, 3-nerved, Petals as long as the sepals, oblong, obtuse. Lip pale-purple with darker markings, \( \frac{1}{3} \) in. long, ventricose at the base, and much thickened, subpandurate; side-lobes none; mid-lobe rounded, 2-fid. or emarginate; disk with a channelled ridge ending in raised yellow calli. Pollinia with elongate pits on their posterior surface.

Dehra Dun (Mackinnon). Flowers during June and July. **Distrib.:** Eastwards to Nepal, Sikkim and Bhutan; also in Assam, Bengal, Chota Nagpur, Burma, Malay Pen., Andaman Islands, extending to W. and S. India and Ceylon.


Epiphytes with a short stout pseudostem, rarely terrestrial or with an elongated leafy stem. Leaves coriaceous, usually long and
narrow, rarely rudimentary at the time of flowering. Flowers rather large, in many- or few-flowered suberect or drooping racemes, rarely 1-flowered; scape loosely sheathed; floral bracts various. Sepals and petals subequal, erect or spreading. Lip adnate to the base of the column and embracing it more or less by its convolute side-lobes; terminal lobe decurved; disk usually with two ridges. Column long, without a foot. Anther 1- or (imperfectly) 2-celled; pollinia 2, rarely 4, ovoid, pyriform cuneiform or subglobose, more or less partite, sessile on a small or large often strap-shaped gland.—Species about 50, in temperate subtropical and tropical Asia, a few in Africa and Australia.

A terrestrial almost leafless parasite; pollinia 4. . . . 1. C. macrorhizum.

An epiphyte, with long strap-shaped leaves; pollinia 2. . . . 2. C. aloifolium.


A terrestrial almost leafless parasite. Rootstock as thick as a goose quill, creeping branched and jointed. Scape very short, basal sheath up to 2 in. long. Raceme up to 6 in. long, 6-8-flowered; floral bracts ½-¾ in. long. Flowers 1½ in. across; pedicel with ovary 1 in. long. Sepals about ⅔ in. long, linear-lanceolata, acuminata, pale-yellow, tinged with pink, spreading or reflexed. Petals shorter and broader than the sepals, whitish streaked with pink. Lip about ¾ in. long, white with crimson or purple blotches along the margin; side-lobes narrow, erect, margins inflexed; midlobe oblong or subpan duliform, acute at the apex; disk with two thick whitish ridges between the side-lobes. Column about ¾ in. long, curved, inner surface streaked with crimson. Anther papillose outside. Pollinia 4, sessile on the crescent-shaped gland.

N. W. India (Royle, Falconer); Dehra Dun, Kalanga Hill (Mackinnon). Flowers during July and August. Distrib.: Outer Himalayan Ranges of Garhwal and Kumaon, up to 7,000 ft.; eastwards to Sikkim (but very rare); also in Assam and on the Khasia and Naga Hills. There is also a record of its having been found in Kashmir.

**Pseudostem** short. Leaves 12-18 in. long, linear-oblong, obtuse, fleshy, obliquely notched at the apex, slightly expanded at the sheathing base. Inflorescence shorter than the leaves; peduncle 3-4 in. long, bearing several tubular acute scarious sheaths near the base. Flowers yellowish-red, in many—flowered drooping racemes 9-15 in. long; floral bracts ovate, ½ in. long; pedicels with ovary ⅓ in. Sepals subequal, ob lanceolate-oblong, obtuse; lateral pair subfalcate. Petals as long as sepals, obtuse. Lip purplish, equalling the sepals, 3-lobed, its upper surface with two stout lamellæ broken and disconnected in the middle; lateral lobes narrow, blunt, entire; midlobe ovate-oblong, decurved. Column slightly thickened at the apex. Anther subquadrate, papillose. Pollinia 2, small; gland crescent-shaped.

**N. Oudh,** in the Bahraich district (Duthie). Flowers during April and May. **Distrib.:** Nepal Terai and Trop. Himalaya eastwards to Sikkim and Assam; also in W. and S. India, extending to Ceylon, Tenasserim, the Andaman Islands and Malay Peninsula.

**13. ORNITHOCILUS.** Wall.; Fl. Brit. Ind. vi, 76.

Epiphytic, without pseudobulbs. Stem very short. Leaves few, crowded, broadly oblong, softly coriaceous. Inflorescence supra-axillary, racemose or in panicles. Sepals subequal, spreading, incurved at the apex, lateral ones obliquely obovate. Petals smaller, cuneate-oblong, blunt. Lip much longer than sepals, adnate to foot of the column by a long broad claw with a rectangularly bent subcylindric spur at its junction with the terminal lobe; side-lobes shallow, subquad rate; terminal with three lobules; the two lateral recurved and pectinate; the central one triangular, entire or infolded; mouth of spur closed by two calli projecting from its back and front walls, the latter hairy. Column short, cylindric, with a short foot; rostellum short; stigma circular, surrounded by a hairy rim. Anther oblong; pollinia 2, subglobose caudicle broad, obcuneate; gland large.—Species 1 or 2, Indian and Chinese.


Leaves 3-7 in. long, oblong or ovate-lanceolate, obliquely tapering to the acute apex and narrowed to the sessile sheathing base, fleshy,
shining on both surfaces; when young; nerves inconspicuous. Inflorescence much longer than the leaves; racemes simple or sparingly branched; floral bracts lanceolate, much shorter than the long-pedicelled ovary. Flowers ⅓-½ in. across. Sepals and petals greenish-yellow and streaked with red, the former with four, and the latter with two, broad brown vertical bands. Lip with two pectinate lobules, brown passing into purple. Capsule 1 in. long, fusiform.

Dehra Dun (Mackinson), flowering in July. Distrib.: Outer Himalayan ranges of Garhwal and Kumaon up to 3,000 ft., extending eastwards to Sikkim, Bhutan, Khasia Hills, Burma and China.


Epiphytes with rigid terete sheathed usually erect stems, woody below. Leaves terete, fleshy, distant, spreading. Flowers usually small and dull-coloured, in short extra-axillary spikes; rhachis stout; floral bracts short, scarious persistent. Sepals subequal, or the decurved dorsal one smaller. Petals equaling the sepals or much longer, spreading. Lip sessile on the base of the column, divided into two parts, basal portion (hypochile) concave or flat; apical portion (epichile) decurved, broad and ridged, entire or crenate or undulate and with a more or less blunt apex. Column stout, much shorter than the lip; stigma usually large. Anther broad, 2-celled; pollinia 2, ovoid or subglobose, attached by a broad caudicle to a subquadrate or elongate gland. Capsule suberect narrow, ridged.—Species about 15, chiefly in Tropical Asia, a few in Australia.


Stem 4-9 in. long, very stout, not branched. Leaves fleshy, 4-6 in. long and about ½ in. thick, slightly tapering to the apex. Spikes stout, 4 or 5-flowered. Flowers ⅓ in. long, on short thick tubercles; flowering bracts broad, acuminate, persistent. Sepals unequal, green with faint purple lines; dorsal sepal oblong, blunt; lateral pair shorter, obliquely ovate, acute, keeled. Petals longer and narrower than the lateral sepals, oblong, blunt, all spreading. Lip longer than sepals, dull purple on a greenish ground; basal portion (hypochile) deeply concave and with erect rounded edges; epichile broadly cordate and tapering to the subtruncate emarginate apex; upper

Dehra Dun, epiphytic chiefly on sàl trees (Gamble, Mackinnon). Flowers during March and April. Dist.: Tropical Himalayan Valleys from Garhwal to Sikkim. It occurs also in Chota Nagpur.


Epiphytes with leafy stems; pseudobulbs none. *Leaves* lorate rarely terete. *Flowers* usually many and showy, in dense or lax decurved racemes, sometimes solitary; floral bracts minute. *Sepals* broad, spreading; lateral ones adnate to the base or foot of the column. *Petals* like the sepals. *Lip* adnate to the column, spurred; side-lobes large or small or none; midlobe longer than the side-lobes or smaller and incurved between them. *Column* short with a short or long foot. *Anther* 2-celled, beaked or not; *pollinia* 2, globose, sulcate; caudicle long or short; gland various.

—Species about 20, in E. Asia.

*Terminal lobe of lip large, hastate-ovate; flowers pink with purple spots.*

*Terminal lobe of lip small, linear or narrowly oblong; flowers white, spotted with lilac, very fragrant.*

1. *Æ. multiflorum*.


*Stem* stout, 4-10 in. long. *Leaves* 6-8 in. long, narrowly oblong, con-duplicate, recurved, slightly tapering to the oblique bifid apex, not narrowed to the base, often tinged with red. *Racemes* longer than the leaves, simple, axillary, densely many-flowered; peduncle long, clothed with short distant sheaths. *Flowers* ¾-1 in. across, deep-pink and with darker spots. *Sepals* and *petals* about equal, oblong, blunt. *Lip* twice as long as the sepals, triangular, adnate to the base of the column, acute or obtuse at the apex, margins erose; basal portion thick and with a retrorse tooth or callus across the mouth of the short rectangularly bent spur. *Column* with a short foot, its margins thickened and slightly winged near the base.
Anther depressed and with a long curved beak in front. Pollinia globular, caudicle filiform, gland narrow. Capsule up to 2 in. long subclavate, stoutly pedicelled.

Dehra Dun and Siwalik range, common on mango trees. Flowers during June and July. Distrib.: Outer ranges of Himalaya from Kangra to Nepal and Sikkim, up to about 4,000 ft.; also found in Assam, Chota Nagpur and N. Bengal.


Stem 4-12 in. long, very stout. Leaves 6-12 in. long and 1-1½ in. wide oblong, flat, keeled, tapering slightly to the blunt unequally bilobed apex, not contracted at the sheathing base. Racemes supra-axillary, deflexed, as long as or longer than the leaves, many-flowered; peduncle short, stout, with short distant sheaths. Flowers about 1 in. long, white, spotted with pink, fragrant; floral bract broad, sheathing, blunt, much shorter than the stalked ovary. Sepals unequal, obtuse, spreading, the dorsal one elliptic-ovate, the lateral pair larger. Petals oblong, falcate, shorter than sepals. Lip adnate to the short foot of column; side-lobes larger than the incurved almost linear emarginate midlobe. Anther triangular, depressed, beaked. Pollinia globose, caudicle linear, gland quadrate. Capsule about 1½ in. long, fusiform.

Dehra Dun (King, Gamble, Mackinnon); N. Oudh, in the Bahraich district (Duthie). Flowers during July and August. Distrib.; Trop. Himalaya in Garhwal and Kumaon and eastwards to Nepal and Sikkim; also in E. Bengal, Chota Nagpur and the Circars; extending to Tenasserim, Malaya and China.

16. RHYNCHOSTYLIS, Blume; Fl. Brit. Ind. vi, 32.

Epiphytes, without pseudobulbs. Stems elongate, stout, leafy. Leaves very coriaceous, linear-oblong, truncately or bluntly 2-lobed at the apex. Flowers in long drooping densely cylindric racemes, showy. Sepals spreading, broad, obtuse. Petals similar to the sepals but narrower. Lip adnate to the short foot of the column, the hypochile forming a deep wide pubescent sac without side-lobes; epichile obovate, acute, concavo with erect margins. Column short, stout, dilated at the base and with a very short
foot; stigma small. Anther terminal, rounded; pollinia 2, elliptic, attached by a long slender caudicle to a small oblong gland.—Species 2 or 3, Indian and Malayan.


Stems stout, 3-8 in. long, clothed with the sheaths of decayed leaves and emitting many stout branching roots. Leaves 6-18 in. long and ½-1½ in. wide, strap-shaped, spreading and recurved, obliquely præmorse or bluntly and unequally 2-lobed at the apex. Racemes dense, cylindric, longer than the leaves. Flowers about ¾ in. across, white or pale-pink, dotted with darker-coloured spots; bracts ½-¾ in. long, ovate, acute, persistent. Sepals veined, about ¾ in. long; lateral pair obliquely obovate-orticulclar; dorsal one obovate, rounded. Petals as long as the sepalis, elliptic-oblong, subobtuse. Lip dark-pink, with a saccate flattened spur; epichile variable in shape, ¾ in. long, oblong or cuneate-oblong at the base, widening towards the apex. Capsule 1-1½ in. long, acutely 3-angled and 6-ribbed, its pedicel short and stout.

Dehra Dun (King, Mackinnon, etc.); Siwalik range (Royle); N. Oudh, in the Gonda district (Duthie). Flowers during June and July.

Distrib.: Trop. Himalaya from the Punjab eastwards to Nepal, Sikkim and Bhutan, up to 4,000 ft., also in Assam, the Khasia Hills, Chota Nagpur, Konkan and Kanara; extending to Burma, S. India, Ceylon and the Malay Islands.


Epiphytes with leafy stems. Leaves thickly coriaceous or fleshy, flat and keeled or terete. Flowers usually large and often showy, in simple lax or dense racemes, sometimes solitary; floral bracts much shorter than the ovary. Sepals and petals subequal, spreading or connivent, narrowed at the base. Lip large, usually saccate or spurred at the base; side-lobes large or small, rarely absent, adnate to the short foot of the column or to the sides of the sac or spur; midlobe fleshy, various; disk usually ridged or amellate, sometimes carunculate. Column short, stout, the foot
short or none. Anther 2-celled; rostellum small; pollinia 2, didymous, subglobose or obovoid; caudicle short and broad or long and geniculate; gland usually large. Species about 20, in Tropical Asia and Australia.

Sepals and petals spreading:

Flowers small, less than 1 in. across, yellow except the bluish caruncles on the lip. . . 1. *V. parviflora*.

Flowers 1½-2 in. across; sepals and petals greenish-yellow mottled with brown; mid lobe of lip with purple caruncles. . . . 2. *V. Roxburghii*.

Sepals and petals incurved . . . . 3. *V. cristata*.


Stem stout, 3-6 in. long, enveloped in the sheathing bases of fallen leaves. Leaves 3-8 in. long by ½-⅓ in. wide (when flattened out), linear-oblong, conduplicate, keeled, unequally and obtusely 2-lobed at the apex. Inflorescence from below the leaves and about as long; peduncle as long as the raceme, bearing a few small scattered sheaths. Raceme few-flowered; floral bracts ovate, acute, deciduous. Flowers yellow except the blue fleshy ridges on the lip, less than ⅜ in. across. Sepals and petals spreading. Sepals spathulate, obtuse; the lateral pair shorter than the dorsal one. Petals as long as the lateral sepals, falcately spathulate-oblong, falcate. Lip ½ in. long, adnate to the short foot of the column, spurred; side-lobes erect, oblong, rounded, rising from the mouth of the spur; midlobe fleshy, obovoid; tip dilated, crenulated; disk with two broad bluish ridges. Column short, with a short thick foot. Anther depressed, slightly beaked in front. Pollinia subglobose, attached to a short broad caudicle. Capsule 1-1½ in. long, fusiform, with winged ridges.

Dehra Dun (Mackinnon). Flowers May and July. Distrib.: Outer ranges of Himalaya, up to 4,000 ft., from Carhwal eastwards to Nepal and Sikkim; extending to Assam and Burma; also in Chota Nagpur, the Konkan and S. India to Ceylon.

tessallatum, Sw.; Roxb. Fl. Ind. iii, 462. C. tessalloides, Roxb. l. c. 463.—Vern. Rasna, nai.
Stem climbing, 1-2 ft. long, emitting many thick white fleshy roots. Leaves bifarious, approximate, 6-8 in. long, narrow, complicate, keeled; apex praemorse. Racemes longer than the leaves; peduncle 6-10 in. long. Flowers 1 1/2-2 in. across. Sepals and petals subequal, spreading, clawed, obovate, undulate, yellowish (rarely bluish), tessellated with brown, their claws and outer surfaces white. Lip 5 in. long, bluish streaked with purple; side-lobes small, acute, rising from the mouth of the spur, 1/4 in. long, ovate, acute, erect; terminal lobe panduriform, with a purple dilated truncate 2-lobed apex, the margins deflexed; disk convex, with fleshy ridges; spur conical, obtuse, straight, hairy within. Column very short. Capsule 3-3 1/2 in. long, shortly stalked, clavate, sharply ridged.

Forests of Dehra Dun and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh (R. Thompson, Duthie). Often climbing on the branches of mango trees and Bassia latifolia (mahua). Flowers during the rains. Distrib.: Konkan, Gujarat and Kanara in the Bombay Prov.; also in Bengal, Behar, Chota Nagpur and Central Provs., extending south to Trivandrum and Ceylon. The roots are used medicinally in the Chanda district of C. Provinces for rheumatism and fever, and for allaying the pain caused by the stings of scorpions.


Stem 3-6 in. long, clothed with the remains of old leaf-sheaths. Leaves bifarious, crowded, 3-4 in. long, conduplicate, unequally bilobed at the truncate apex, dilated at the sheathed base. Raceme not exceeding the leaves, axillary, 2-5-fld. Flowers 1 1/2-2 in. across. Sepals and petals incurved, pale olive-green or yellowish. Sepals unequal, oblong, obtuse. Petals narrower than sepals, oblong. Lip adnate to base of column, longer than sepals, green blotched with dull purplish-brown; basal lobes erect, triangular; terminal lobe yellow streaked with purple, oblong, with two divaricate oblong lobules and a horn-like, deflexed fleshy beak; upper-surface with five carunculate ridges. Spur short, conical, obtuse. Column short, without a foot. Pollinia ovoid, attached by a short broad caudicle to a large quadrature gland. Capsule narrowly clavate, 2-2 1/2 in. long.

Dehra Dun (Mackinnon). Flowers during May. Distrib.: Outer ranges of Himalaya in Garhwal and Kumaon, up to 4,000 ft.; extending eastwards to Sikkim, Bhutan and Sylhet.
18. SACCOLABIUM. Blume; Fl. Brit. Ind. vi, 54.

Epiphytes, without pseudobulbs. Leaves coriaceous, flat or conduplicate, often keeled. Flowers usually small, in leaf—opposed or supra-axillary racemes corymbs umbels or panicles; floral bracts minute. Sepals and petals adnate to the column, subequal, spreading or reflexed. Lip sessile on the footless column, forming a cylindric or saccate spur; lateral lobes small or none; terminal one small, often hairy. Anther 1- or imperfectly 2-celled; pollinia 2, entire or bipartite.—Species 50, in E. Asia.

Spur cylindric, straight. 1. S. papillosum.

Spur short, at right angles to the ovary, widely saccate:—

Apex of leaves not setulose; terminal lobe of

lip papilloso-hairy. 2. S. calcicolare.

Apex of leaves setulose; terminal lobe of lip

fleshy and glabrous. 3. S. distichum.


Stems 2-3 ft., stout, erect, clustered, bearing many nearly horizontal leaves. Leaves coriaceous, 3-4 in. long, conduplicate, curved; apex truncate or deeply notched. Peduncle 1-2 in. long, leaf-opposed, about ½ in. long, bearing a subcorymbose 4-8-flowered raceme. Flowers ½ in. in. diam.; bracts triangular. Sepals and petals yellow barred and blotched with brown. Sepals subequal, oblong, subacute, spreading. Petals narrower than sepals, subspathulate. Lip longer than sepals, adnate to the base of the column; side-lobes none; terminal lobe decurved, ovate-oblong, obtuse, crenate; upper surface transversely rugulose, white with transverse purple bars. Spur cylindric, straight, half as long as the ovary and parallel to it, cylindric or slightly tapering, pale-yellow, hairy within. Column short. Anther broadly conical. Pollinia subovoid, deeply bipartite; caudicle slender, tapering to the small oblong gland. Capsule 1½ in. long, fusiform, ridged.

Dehra Dun, in swamps (Gamble, Mackinnon). Distrib.: Outer ranges of Himalaya in Garhwal and Kumaon and eastwards to Sikkim; also in Assam, Bengal, Ceylon and Burma.

Stem short, pendulous. Leaves 4-10 in. long, narrowly oblong, unequally bifid at the apex, slightly narrowed towards the base. Racemes much shorter than the leaves, corymbose, many-flowered; peduncle stout, bearing several short sheaths. Flowers crowded, ½ in. across; floral bracts small, broad and blunt. Sepals and petals pale-green with large brownish spots. Sepals unequal, spreading, the dorsal one obovate-oblong; lateral pair falcately oblong, narrower. Petals shorter than the sepals, oblong-ovate. Lip adnate to the lower half of the column, the base forming a short wide yellow sac about half as long as the ovary; side-lobes none; terminal lobe at right-angles to the sac, semicircular; its upper surface, except a triangular yellow patch at the base, pure white and covered with hair-like papillae. Column very short and thick. Anther depressed, shortly beaked. Pollinia broadly ovoid-elliptic, attached by a slender caudicle to a small cordate gland.

Dehra Dun (Mackinnon). Flowers in April and May. Distr.: Outer Himalayan ranges from Garhwal eastwards to Sikkim and Bhutan; also on the Khasia Hills, extending to Burma and the Malay Peninsula.


Stems pendulous, 5-10 in. long, branching, slender, leafy. Leaves 1 in. long, narrowly lanceolate, acuminate, with two or three fine setæ from the apex; base sessile and slightly oblique. Peduncles leaf-opposed, about equalling the leaves in length. Flowers 2-4, in a lax raceme, about ½ in. in diam., green, irregularly spotted with brown; floral bracts oblong, subacute. Sepals and petals subequal, oblong, elliptic, obtuse. Lip about as long as the petals, adnate to lower half of column, the base with a wide blunt sac at right angles to the ovary, its inner surface without hairs or calli; side-lobes none; terminal lobe yellow, semicircular, entire, smooth, fleshy; margins deflexed, the base with two blunt conical calli. Column short, broad. Anther shortly beaked in front. Pollinia elliptic; caudicle long, slender, cylindric, the gland elongate, bifid. Capsule fusiform, about ½ in. long.

Northern Oudh, in the Bahraich district (Duthie's collector). Flowers during April and May. Distr.: Outer Himalayan ranges in
Garhwal, up to 6,000 ft., and eastwards to Sikkim, the Khasia Hills and Manipur.

19. **Cleisostoma.** Blume; included under *Saccolabium* in Fl. Brit. Ind. vi, 59.

Epiphytic herbs. **Stems** more or less elongate. **Leaves** coriaceous or fleshy, flat or semiterete. **Flowers** in leaf-opposed racemes or panicles. **Sepals** adnate to the column, subequal, spreading. **Petals** like the sepals. **Lip** sessile on the footless column, the base with a large saccate or funnel-shaped spur which is sometimes dilated at the apex; its opening more or less occluded by 2 calli, the posterior of which is frequently 2-fid., and also sometimes by a dorsal scale, but never septate; the lateral lobes small or obsolete; apical lobe thickened, concave. **Column** short, thick, footless. **Anther** depressed; pollinia 2, often 2-fid.; caudicle single.—Species about 40 in. E. Trop. Asia and Australia.


**Stem** stout, compressed, 3-8 in. long, enveloped in the leaf-sheaths. **Leaves** 2½-3½ in. long., narrowly oblong, keeled, obliquely truncate, obtusely bifid, tapering to the shortly sheathed base. **Flowering stem** equalling or longer than the leaves; racemes many-flowered; peduncle and rhachis stout. **Flowers** about ½ in. across; bracts broad, blunt, much shorter than the short sessile ovary. **Sepals** and **petals** spreading, white with large purple spots. **Sepals** broadly ovate, obtuse. **Petals** smaller than the sepals, oblong. **Lip** fleshy, pink or purple, as long as the sepals. **Spur** addressed to and as long as the ovary, wide, blunt; lateral lobes of lip small; terminal one convex; oblong, blunt, margins thin, e erosc; upper surface smooth. **Column** very short and stout, with a large protuberance on either side of the rostellum. **Anther** with a long pointed beak. **Pollinia** obvoid; caudicle triangular, shallowly cordate, attached to a small orbicular gland.

Dehra Dun (Vicary, Mackinnon). Flowers during June and July. **Distr.** : Outer ranges of Trop. Himalaya in Garhwal and Kumaon, up to 3,000 ft., and eastwards to Sikkim, Bhutan, Assam, and on the Naga and Khasia Hills; also in Chota Nagpur and in Tenasserim.

Epiphytic herbs, with usually elongate stems. Leaves fleshy terete or flat. Flowers in extra-axillary racemes or panicles. Sepals subequal, spreading or reflexed, or the dorsal one concave and connivent over the column. Petals smaller than the sepals, spreading. Lip adnate to the base of the column, or to its foot, rarely jointed, the base with a funnel-shaped spur sometimes dilated at its apex, the opening more or less occluded by calli on its anterior and posterior walls, and always divided into two lateral compartments by a vertical antero-posterior septum; lateral lobes small more or less triangular and acute; apical lobe small, triangular or hastate. Column short, stout, often with a foot as long as or longer than itself. Anther depressed; pollinia 2, bifid.—Species about 35, in E. Trop. Asia.


Stem 1 ft. or more in length, robust, scendent, flexuous, emitting many elongate fibres. Leaves firmly coriaceous, crowded, almost imbricate, ½-2 in. long, distichously spreading, oblong, amplexicaul, apex obtusely 2-lobed. Racemes shorter than the leaves, subsessile, few-flowered, decurved; rachis stout; bracts minute, deciduous. Flowers about ½ in. across; sepals and petals 3-nerved, yellowish-green, striated with red. Sepals ovate-oblong, obtuse or subacute. Petals oblong. Lip white and pink, or purple; side-lobes short; terminal lobe larger than the sepals, triangular-ovate or cordate. Spur vertically septate, its mouth with a pubescent ridge. Column very short. Anther hemispheric. Pollinia sulcate, attached to a short caudicle broader than long; gland transverse, membranous.

N. Oudh, in the Bahraich district (Duthie). Flowers in Sep. DISTRIB.: Garhwál, in the Rámganga valley, also in Chota Nagpur, Behar, Cachar, Chittagong, Sundribans; extending to Tenasserim.


Terrestrial unifoliolate tuberous-rooted herbs; tuber stoloni ferous, each stolon bearing at its tip a tuber smaller than that of the parent. Leaf broadly cordate or orbicular, strongly plicate, rising from the same tuber as the flowers, but usually after the
ORCHIDACEÆ. [ POGONIA.]

appearance of the flower-scape, occasionally coetaneous. Flowers solitary few or several, racemose, often pendulous, on scapes rising from the tuber. Sepals subequal, narrow, connivent or spreading. Petals like the sepals. Lip adnate to the base of the column, sometimes slightly saccate at the base, rather narrow, the lower portion convolute round the column; lateral lobes small, usually triangular; apical lobe flat, ovate or orbicular, entire, or fimbriate. Column elongate, clavate upwards; stigma anticous, oblong or orbicular. Anther more or less incumbent, substipitate; pollinia 2 or 4, elongate, powdery, often coherent, without caudicle or gland. Species about 80, in Trop. Asia, America and Africa.—The above characters apply only to the section Nervílea, to which all the Old World species of Pogonia belong, and which differ by flowering before the leaves appear. All the other species, except one in Japan, are found in the New World, and their flowering stems bear leaves.

Leaves many-nerved; floral bracts longer than ovary, deflexed; lip slightly saccate at the base . . . . . . . 1. P. Gammieana.

Leaves 7-9-nerved; floral bracts erect; lip not saccate at the base . . . . . . . 2. P. Carinata.


Tuber globular warted, about 1½ in. in diam. Leaf glabrous, 5-6 in. across, reniform, abruptly acuminate, many-nerved, its margin much undulate; petiole about as long as the blade, sheathed at the base. Flowering stem stout, 3-12 in. long, peduncle bearing two or three long tubular acute and often bifid bracts. Raceme laxly 5-8 fld. Flowers about 1 in. long, drooping, pink streaked with white; floral bracts deflexed, longer than the truncate stalked ovary, linear-lanceolate, acuminate. Sepals and petals subequal, ob lanceolate, connivent. Lip pale-green, as long as the sepals, saccate at the base, elliptic-obovate (when spread out); lower half convolute and with two short side-lobes pointing forwards; epichile spreading, the margin deeply crenulate; disk hairy, with three parallel central ridges.

Dehra Dun (Mackinnon, Duthie); Siwalik range, in the Timli Pass (Duthie). Flowers in May, and the leaves appear about two months later. Distrib.: Trop. Himalaya in Garhwal and Kumaon, up to 3,000 ft.; also in Sikkim.
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Tubers globose or obovate, ½-¾ in. in diam., annulated and warty. Leaf 1½-2½ in. wide, ovate, acute or cuspidate, cordate or cuneate at the base, 7-9-nerved, glabrous; petiole 1-2 in. long, sheathed at the base. Flowering stem up to 1 ft. high, bearing 3 or 4 loose tubular acute or acuminate sheaths. Raceme laxly flowered; floral bracts twice as long as the stalked ovary, erect lanceolate, acuminate, 5-nerved. Flowers about 1 in. long. Sepals and petals, subequal, spreading, linear-lanceolate, acuminate, green. Lip ¾ in. long, straight, trough-shaped, not saccate at the base, 3-lobed above the middle, white tinged with yellowish green and with conspicuous pink-coloured veins usually bifurcate near within the margin; upper surface hairy especially on the ridges and veins; side-lobes erect, margins entire, terminal lobe not deflexed, ovate, bluntly acuminate; its margin irregularly crenulate. Column ¾ in., slightly curved, dilated at the apex. Anther triangular, beaked in front.

Sub-Himalayan tracts of Rohilkhand and North Oudh, in the districts of Pilibhit, Bahraich and Gonda. Flowers in May, the leaves appearing about one month later. Distrib. : Ramganga valley in Kumaon (T. Thomson); common in Bengal and eastwards to Burma; also in the Bombay Pres. and southwards to S. India.

22. Epipactis, Andans. ; Fl. Brit. Ind. vi, 125.

Terrestrial herbs with fibrous roots and leafy stems. Leaves sessile, plicate. Flowers in racemes, drooping; floral bracts elongating and often leaf-like. Sepals and petals broadly lanceolate, acuminate, strongly nerved. Lip adnate to the base of column, distinctly divided into hypochile and epichile; hypochile much deflexed, concave or saccate, joined to the epichile at a right angle, both with entire edges. Column short; stigma large, antorse; rostellum broad, prominent. Anthers erect, obtuse, its cells contiguous; pollinia 2, bipartite, very narrow. Species about 12, in the North Temp. Hemisphere.

Height of plant 1-2 ft. Stem leafy, slender, glabrous. Leaves 4-7 in. long, lanceolate, acuminate; uppermost shorter and much narrower; nerves prominent. Raceme 4-6 in. long, laxly fld., rhachis tomentose. Flowers 1-1½ in. across; flowering bracts ovate or linear-lanceolate, varying in size. Sepals spreading, unequal, concave, clothed with white hairs on a deep-lavender ground, green inside as are both surfaces of the petals, and marked with broad bands of reddish-brown; dorsal sepal lanceolate, acute; lateral pair much broader. Petals ovate, acute, tomentose on the stout midrib beneath. Lip rather shorter than the sepal; hypochile purple, trough-shaped, bearing granular unequal calli inside, with two larger obtuse nectar-exuding ones near the apex; epichile pale brown, lanceolate and with erect lobes; upper surface with a median ridge terminating within the white apex. Column stout, curved; stigmas large, subrotund and with two glands on the lower margin. Anther tumid.

Dehra Dun (Gamble, Mackinnon); banks of canal near Saharanpur (Duthie). Flowers during Feb. and March. Distrib.: W. Himalaya from the Simla Hills to Kumaon, up to 3,000 ft. and eastwards to Nepal and Sikkim, extending to upper Burma and China; it is found also on the N. W. frontier of India in the districts of Gilgit and Chitràl, and extends to Afghanistan and Syria.


Terrestrial leafy herbs; stem decumbent below. Leaves usually rather thick, with wide sheaths and often distinct petioles. Flowers small, numerous, in terminal, sometimes secund, spikes or racemes. Sepals subequal, often pubescent outside; lateral pair free, subconnivent or spreading; dorsal concave. Petals like the dorsal sepal and forming with it a hood over the column. Lip adnate to base of column, entire saccate or cymbiform at the base; apical lobe small, usually acute and decurved; basal sac with setae calli or ridges inside, rarely smooth. Column short, with projecting rostellum; stigma anticus, undivided. Anther usually pyriform, with a long erect beak; pollinia 2, clavate, sessile on a large or small gland.—Species about 25, in Europe, Temp. and Trop. Asia, North America, New Caledonia and the Mascarene Islands.

**Zeuxine.** J  **ORCHIDACEÆ.** 219

*Stem* 10-30 in. in length, very leafy below, glabrous, loosely enveloped by the wide leaf-sheaths. *Leaves* many, long-petioled; blade 4-8 in. long, elliptic or ovate-elliptic, tapering at each end, acute or acuminate; petiole stout, 1½-3 in. long. *Peduncle* bearing many lanceolate acuminate bracts which are hairy above and glabrous beneath. *Spike* 3-8 in. long, many-and densely fl.; rhachis pubescent. *Flowers* minute, subglobose, white tinged with green; fl. bract as long as ovary, ovate-lanceolate, acuminate, pubescent on the margin. *Sepals* glabrous, subequal, broadly ovate, obtuse. *Petals* clawed, cuneately obovate. *Lip* longer than sepals, with a large saccate base, its apex decurved, triangular, entire; interior of basal sac with two rows of long setae on the sides and an oblong callus at the apex of each row. *Column* very short, with a transverse depression below the broad anticous stigma. *Anther* pyriform, obtuse. *Pollinia* clavate-cylindric, sessile on a small oblong gland.

Dehra Dun (Mackinnon); N. Oudh in the Bahraich district (Duthie). Flowers in May. **Distr.**; Outer Himalayan ranges of Garhwal and Kumaon, up to 3,000 ft., and eastwards to Sikkim and Bhutan; also in Assam and on the Khasia and Naga Hills; found also in Bengal, the C. Prov. and S. India, extending to China, Hongkong and Java.


Terrestrial herbs with succulent glabrous stems. *Leaves* membranous, sometimes withering at the time of flowering. *Flowers* small, in racemes or spikes. *Sepals* subequal; lateral pair free, the dorsal one concave. *Petals* like the dorsal sepal, and with it forming a hood to the column. *Lip* adnate to base of column, cymbiform or saccate at the base; apical lobe shortly clawed or sessile, divided into two subquadrate more or less truncate diverging lobules, or entire, or with narrow decurved lobules, the basal sac with calli or laminae within. *Column* very short, its anterior face with lamellar or conical processes; stigmas 2, lateral, distinct. *Anther* membranous, sometimes ridged, the cells contiguous; pollinia pyriform, attached by an oblong gland to the erect rostellum. Species about 30, in Trop. Asia and in Trop. and S. Africa.

Whole plant 2-10 in. high. Stem and peduncle glabrous. Leaves 1-2 in. long, linear, acuminate, sessile on the hyaline truncate sheaths, gradually passing into linear bracts higher up. Racemes ½-2 in. long, densely-fid., glabrous; fl. bract ½ in. long, ovate-lanceolate, acuminate, much longer than the ovary. Flowers about ½ in. long, white or pink. Sepals unequal, the dorsal one ovate, concave, lateral pair obliquely lanceolate, connivent. Petals falcately oblone, obtuse, forming with the dorsal sepal a hood over the column. Lip yellow, as long as the sepals, cymbiform and saccate at the base; terminal lobe short, subquadrate, entire or bifid. Column very short, with two wings at its apex covering the anther; rostelloid with two short stout parallel arms. Anther depressed, very shortly beaked. Pollinia attached within the tip of a linear appendage of the gland. Capsule ellipsoid, about ½ in. long.

Common within the area in open turfy and usually moist ground. Flowers during February and March. Distr.: Abundant in grassy places throughout the greater portion of India, ascending to about 5,000 ft. on the outer Himalayan ranges; found also in Afghanistan, Ceylon, China, Japan, Java and the Philippines.


Terrestrial leafy herbs with undivided or lobed tubers or fleshy root-fibres. Leaves flat, with sheathing bases. Flowers small or large, in racemes or spikes. Sepals subequal, the lateral pair spreading reflexed or deflexed, or sometimes erect. Petals smaller or larger than the sepals, entire or 2-cleft, often connivent with the dorsal sepal to form a hood over the column. Lip adnate to base of column, entire, 3-lobed or 3-partite, its base spurred. Column short, usually broad; stigmas 2, distant or conjoined across the face. Anther-cells adnate to the front of the column, discrete, rarely touching, parallel or divergent below, their bases often prolonged into tubes containing the candsicles; staminodes rugulose, one on the outer side of each anther-cell, rarely filiform; pollinia 2, clavate or pyriform, usually grooved, sometimes 2-partite; candsicles long, short or obsolete; glands exposed, flat and discoid or elliptic and globular, or elongate with truncate ends. Species about 500, widely distributed in temp. subtrop. and trop. regions of the world.

Petals 2-partite, segments filiform; lateral sepals deflexed, tips filiform; flowers greenish ......... 1. H. graveolens.
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Petals entire; lip 3-partite or lobed—

Side-lobes of lip petaloid, truncate, much wider than the narrow linear midlobe; flowers white:

Side-lobes of lip pectinate to the middle; petals small; spur slender, twice as long as the ovary or longer .... 2. H. Susannae.

Side-lobes of flabelliform lip not pectinate:

Stem leafy upwards; spur slender, twice as long as the ovary .... 3. H. longifolia.

Leaves all radical; spur equalling or longer than the ovary .... 4. H. plantaginea.

Petals entire; lip 3-partite, the side-lobes very narrow and usually filiform:

Spur filiform, fusiform or long-clavate, as long as or longer than the ovary:

Anther-tubes long:

Leaves distinctly pale-margined; spur usually much longer than the ovary, funnel-shaped at the mouth and clavate at the apex .... 5. H. commelinifolia.

Leaves not margined; spur about as long as the ovary .... 6. H. pubescens.

Anther-tubes short:

Leaves three or more:

Leaves not margined; flowers green .... 7. H. turcifera.

Leaves pale-margined; flowers yellow .... 8. H. marginata.

Leaves two, radical, orbicular, cordate, margined; spur shorter than ovary .... 9. H. diphylla.

Spur small, globose ellipsoid or shortly clavate, much shorter than the ovary:

Leaves narrowly lanceolate or elliptic; flower small, white tinged with yellow and green; tubers glabrous .... 10. H. Lawit.
Leaves ovate or ovate-elliptic; tubers hairy:

Flowers in lax subsecund spikes, white, fragrant. . . . . 11. H. goodyeroides.

Flowers in dense cylindric spikes, white or pale-yellow, fragrant. . . . 12. H. constricta.

1. H. graveolens, Duthie, (n. sp.). H. digitata (not of Lindl.)

Stem 1-2 ft. high, stout, cylindric, lower portion clothed with closely fitting sheaths. Leaves 1½-3 in. long, broadly lanceolate or ovate-lanceolate, acuminate, 3-5-nerved; apex acuminate and with reflexed tips; margins undulate and coarsely toothed. Raceme laxly many-flowered, about 6 in. long, elongating in fruit; floral bracts subfoliaceous, narrowly lanceolate, acuminate, longer than the slender ovary, pale-margined. Flowers subsecund, about ½ in. in diam. Sepals unequal, the dorsal one erect, suborbicular, its apex bluntly acuminate, green on both surfaces, minutely pubescent on the back; lateral pair longer than the dorsal one, deflexed, subfalcately lanceolate, white towards the base and tapering into short filiform tips. Petals deeply partite; segments filiform, fleshy, white, with slender recurved green tips. Lip 3-partite, lateral lobes resembling the segments of the petals, but rather longer; midlobe linear, straight, longer than lateral ones. Spur shorter than the ovary, laterally compressed, white towards the dilated mouth and with a green clavate apex. Anthers-cells separate, with prominent diverging tubes. Staminodes herba"ceous, oblong or orbicular, margins erose. Pollinia obliquely ovate; caudicles slender, attached by the dilated base to small brownish glands. Stigmatic processes subcylindric, blunt, recurved, the entrance to the spur lying between their bases.

Dehra Dun, at Kansrao, in sal forest (Duthie, Mackinnon). Flowers during July. Distrib.: W. Himalaya in Garhwal and Kumaon in warm valleys. The flowers have a peculiarly pungent odour resembling that of Valeriana Wallichii. This plant is, I now consider, quite distinct from H. digitata of Lindley, under which name it was described and figured in the second part of Vol. IX of the Annals of R. Bot. Gard. Calc. p. 178, t. 128. In H. graveolens the leaves are mostly collected at about the middle of the stem; the lateral sepals are deflexed longer and with filiform tips, and the filiform segments of the 2-partite petals are recurved at the apex.

2. H. Susanna, R. Br. Prod. 312; Royle Ill. 367; F. B. I. vi, 137; Collett Fl. Siml. 501; Prain Beng. Pl. 1032; Duthie Ann.
Habenaria.]

Orchidaceae.


Height of plant about 2 ft. Tubers elongate, 3-4 in. long. Stem stout with many blunt funnel-shaped sheaths on its lower portion. Leaves 2-6 in. long, ovate-oblong, obtuse, the upper ones bract-like, acuminate, imbricate. Raceme 3-5-fld.; floral bracts longer than the ovary, cuculate, acuminate. Flowers subsessile, 3-4 in. in diam. white tinged with greenish-yellow, fragrant. Sepals very broad, spreading, the dorsal one suborbicular, about 1½ in. long and broad; lateral pair 1½ in. long, obliquely oblong, obtuse. Petals ½ in. long, linear falcate, acute, fleshy. Lip 3-lobed, about as long as the sepals, fleshy; side-lobes very broad, truncate, deeply pectinate; midlobe linear-spatulate, with recurved margins. Spur slender more than twice the length of the elongate ovary. Anther very broad, cells divergent; tubes long, adnate to the sides of the column. Pollinia linear, curved, yellow, about as long as their white flexuous caudicles; glands ovoid, white. Staminodes linear-oblong, with crisped margins. Stigma on the front of the column. Capsule with pedicel 2 in. long, ellipsoid, beaked.

Siwalik range (Royle). Flowers July-Sep. Distrib.: Outer Himalayan ranges in Garhwal and Kumaon up to 6,000 ft.; Chota Nagpur and in the hilly districts of Bombay and S. India, extending to Burma, China and the Malay Archipelago.


Stem 10-18 in. high, slender, leafy. Leaves 3-5 in. long, scattered erect, linear, acuminate, smaller upwards. Spike 2-2½ in. long, few and laxly flid.; floral bracts linear, acuminate, longer than the slender beaked ovary. Flowers medium-sized, white. Sepals minute, the lateral pair ½ in. long, oblong-lanceolate, 3-nerved, larger than the dorsal one. Petals gibbously ovate, as long as the dorsal sepal, 3-nerved. Lip flabelliform, ½-⅔ in. long and broad; side-lobes semicircular, entire; midlobe linear, shorter than the side-lobes. Spur slender, twice as long as the ovary, green. Anther beaked, cells parallel; tubes incurved. Stigmatic processes short, clavate, incurved towards the mouth of the spur. Rostellum long, erect, spatulate.

Siwalik range, on the Mohand Pass ("Portus Khereè") Royle. Distrib.: N. Bengal at Nathpur in Puranea (Buch.-Hamilton). I have seen no living or herbarium specimens of this plant.

Tubers ellipsoid, about 1 ½ in. long. Stem scapigerous. Leaves about three or four, radical, horizontal, 3-6 in. long, elliptic-oblong, sub-obtuse, membranous. Scape slender, 8-12 in. high, bearing many lanceolate acuminate bracts, the lowest often larger and leaflike. Spike 2-5 in. long, laxly flowered. Flowers subsecund, white; floral bracts lanceolate, acuminate or setaceous, half as long as the curved beaked ovary. Sepals subequal, about ½ in. long, strongly 3-nerved, white tinged with green; dorsal erect, ovate-oblong; the lateral pair falcately oblong, spreading. Petals linear-lanceolate, adpressed to and forming a hood with the dorsal sepal. Lip 3-lobed, flabelliform, clawed, twice as long as the lateral sepals, puberulous; side-lobes semiovate, entire or with undulate margins, often overlapping at their tips; midlobe a little shorter, linear-oblong, deflexed. Spur equal to or longer than the ovary, tapering to the apex, greenish-yellow. Anther broad, cells divergent; tubes short, upcurved. Pollinia globose or ellipsoid; caudicles curved, widening upwards from a narrow base; glands falcately ovate, connate when young. Stigmatic processes, large, fleshy, oblong; rostellum triangular, broad. Staminodes prominent with sinuate margins. Capsule ½ in. long, turgid, curved.

Dehra Dun (Falconer, Duthie). Flowers Sep. and Oct. DISTR.: Outer Himalayan ranges of Garhwal and Kumaon up to 7,000 ft.; also in Sikkim and Bengal and southwards to the Konkan and Deccan to Ceylon.


Sect. 2-3 ft. high, loosely sheathed at the base. Tubers ellipsoid or cylin-
dric. Leaves scattered, 3-6 in. long, oblong or oblong-lanceolate, sub-
cordate, acute and often subspinescent at the tips, margins pale. Spike 4-8 in. long, many-and loosely flowered; flowering bracts erect, nearly equalling the long-beaked ovary, scabерulous on both surfaces and ciliolate on the margins. Flowers 1 ½-2 in. diam., white, inodor-
ous. Sepals scabерulous; dorsal small, saccoate, with a short curved beak; lateral pair spreading, much shorter, hatchet-shaped, beaked.
the veins deeply looped or arched. Petals unequally oblong, smaller than the lateral sepals. Lip divided into three long filiform segments, about 1 in. long from its base to the tip of the mid-segment; lateral ones 1½ in. long, curved downwards; mid-segment channelled above, spreading, spaberulous; spur 1½-2½ in. long, slender and curved downwards, its upper portion funnel-shaped and white, its apex clavate and green. Anther-cells elongate, distant, diverging at the base; tubes long, straight. Pollinia small, oval; caudicles very long, dilated upwards, translucent; glands minute. Staminodes seated on the long arms of the column and curving round in front of the anther tubes. Stigmatic processes large, clavate, incurved; rostellum triangular.

Dehra Dun and Siwalik range, usually in open grassy places (Mackinnon, Duthie). Flowers during Aug. and Sep. Distrb. : Outer ranges of W. Himalaya from the Punjab to Kumaon, up to 5,000 ft., extending eastwards to Parasnáth, Chota Nagpur and Upper Burma, and south to Cent. W. and S. India.


Tubers elongate, stout, often divided, and with a few thick fleshy fibres from their summits. Stem 12-18 in. high, clothed at the base with a few tight-fitting pubescent sheaths. Leaves crowded towards the middle or base of the stem, 4-6 in. long, lanceolate, acuminate, tapering to the base, 7-9 nerves, undulate, not margined. Raceme with a few empty leaf-like bracts at its base, 8-10 in. long, lax, many-fl. pubescent; floral bracts longer than the long-beaked ovary, ovate lanceolate, acuminate, ciliolate. Flowers small, greenish-yellow. Dorsal sepal ¾ in. long, broadly ovate, a little shorter than the dimidiate-ovate obtuse deflexed lateral ones. Petals narrowly falcate, longer than the dorsal sepal and forming with it a hood over the column. Lip 3-partite, longer than the sepals; segments linear with filiform tips; midlobe shorter, obtuse, keeled beneath. Spur slender, about as long as the curved ovary. Anther-tubes long, flexuous, Pollinia ovate, obliquely attached to the long slender flexuous caudicles; glands flat; staminodes prominent. Stigmatic processes globose. Capsule curved and with a long beak, prominently ridged.

'Dehra Dun (Mackinnon). Distrb. : Outer ranges of W. Himalayas in Garhwal and Kumaon, up to 5,500 ft. (Royle, Falconer, Duthie).

Stem stout, 10-18 in. high, sheathed at the base, leafy below the middle bracteate, above. Leaves 3-4½ in. long, elliptic, acute or acuminate. Racemes 5-7 in. long, laxly many-fld. Flowers about ½ in. across from base to apex, green; floral bracts about as long as the ovary, lanceolate, acuminate. Sepals unequal; dorsal one ovate-oblong, obtuse, concave; lateral pair shorter, broadly and falcately lanceolate, acute or acuminate, spreading. Petals as long as the dorsal sepal and with it forming a hood over the column, oblong, retuse. Lip 3-partite, longer than the sepals; lateral segments filiform, diverging, curved, longer than the stouter blunt midlobe. Spur slender, longer than the ovary, laterally compressed, curved at the apex. Anther-cells contiguous, diverging at their base, the tubes rather short, up-curved. Pollinia falcately ovoid; caudicles slender, slightly curved; glands narrowly oblong. Staminodes large, broadly oblong. Stigmatic processes short. Capsule fusiform, decurved, shortly beaked, prominently ribbed.

Dehra Dun and Siwalik range (Mackinnon, Duthie). Flowers during Aug. and Sep. Distrib.: Outer ranges of W. Himalaya in Garhwal, up to 6,000 ft., and eastwards to Sikkim and Bhutan; also in Bengal, Assam, Orissa, and extending to Upper Burma.


Subescapigerous, glabrous. Tubers small, narrowly cylindric. Leaves few, subradical, sessile, ½-5 in. long, oblong or linear-oblong, obtuse, 3-5-nerved; margins pale-yellow. Scape 4-10 in. long; sheaths erect, lanceolate, acuminate. Spike 2-6 in. long, many-fld.; floral bracts nearly as long as the ovary, lanceolate, acuminate, with pale ciliolate margins. Flowers ½ in. across. Sepals green; dorsal one ½ in. long, erect, broadly ovate; lateral longer, falcately oblong-lanceolate, spreading or deflexed, 3-5 nerved. Petals ½ in. long, falcately oblong, closely adpressed to the dorsal sepal. Lip nearly ½ in. long, 3-partite nearly to the base, lateral segments narrowed into filiform tips; midlobe shorter and broader; the margins inflexed. Spur about as long as the curved ovary, laterally compressed at the fusiform apex. Anther-cells distant; tubes funnel-shaped, short, spreading. Pollinia obovate, with short geniculate caudicles; glands triangular. Staminodes elongate. Stigmatic processes long, adnate to the base of the column. Capsule about ½ in. long, fusiform, turgid.
Habenaria. ] ORCHIDACEÆ. 227

Dehra Dun and Siwalik range (Duthie). Flowers during August. Distrib.: Western Himalaya from Kashmir to Kumaon, up to 7,000 ft.; also in Bengal, and found as a weed in the Bot. Gard. Cuttack, extending to Burma and to W. and S. India.


Tubers small, elongate or globose. Leaves radical, usually two, 1-2 in. in diam.; orbicular cordate, margined, rather fleshy. Scape 4-10 in. high, with a few distant lanceolate acuminate bracts. Flowers many, distant, spreading, about ½ in. diam., white tinged with green; floral bract much shorter than the slender curved ovary. Sepals about ½ in. long; dorsal erect, ovate, concave, acute, obscurely nerved; lateral pair slightly longer, deflexed, obliquely ovate, acuminate, 3-nerved. Petals linear, white, as long as the dorsal sepal and forming a hood with it. Lip much longer than the sepals, 3-partite; segments filiform, white with green tips, lateral pair spreading and with spirally twisted tips; midlobe shorter, deflexed. Spur shorter than the ovary, inflated towards the acute inflated apex. Anther broad, the cells distant; tubes very short. Pollinia dimidiate-ovulate, obliquely attached to caudicles equaling them in length; glands very small, flat, circular. Staminodes large, petaloid. Stigmatic processes elongate, clavate, adnate to the mouth of the spur. Rostellum obscure.

Dehra Dun (Mackinnon). Flowers during Aug. Distrib.: Outer ranges of W. Himalaya in Garhwal (Falconer); eastwards to Bengal and Chota Nagpur, and southwards from Konkan and Kanara to Malabar.


Tubers ellipsoid or globose. Stem 6-12 in. high, slender, with a few short loose sheaths below the leaves. Leaves 3-5, clustered above the middle of the stem, 3-4 in. long, narrowly lanceolate or elliptic, acute, membranous. Spike 2-3 in. long, slender, narrow, many-flowered. Flowers small, crowded, spreading, white tinged with yellow and green; floral bracts ovate-lanceolate, acuminate, longer than the slender curved ovary. Sepals and petals ¼ in. long, white tinged with yellow at the base, connivent, obtuse; dorsal sepal elliptic, concave; lateral subfalcate linear-oblong. Petals oblong, obtuse, fleshy. Lip as
long as the sepals, broadly and obtusely 3-fid.; lobes rounded at the apex; midlobe twice as long as the lateral pair, its claw green tinged with yellow, and with a short ciliate ridge at its base. Spur small, globular, dark-green. Anther-cells parallel, tubes none. Pollinia obovate; caudicles nearly as long, attached to minute globular glands. Staminodes large, green, with broad white margins. Stigmatic processes short, clavate. Rostellum short, triangular, acute.

Dehra Dun (Mackinnon, Duthie). Flowers during July and August. Distrib.: W. Himalaya, in Garhwal (Herb. Calc.); Bengal and Bihar; C. Prov., in the Chanda district, and extending to S. India from the Konkan.


Tubers ellipsoid or ovoid, hairy. Stem stout, 1-2 ft. high, its lower portion clothed with many loose blunt sheaths. Leaves clustered above the middle of the stem, but not in whorls, 6-10 in. long, ovate or ovate-elliptic, acute, narrowed to the shortly sheathed base. Spike 4-8 in. densely flowered, its peduncle bearing a few lanceolate acuminate bracts. Flowers subsecund, white, fragrant, about ½ in. across; floral bracts narrowly lanceolate, acuminate, about as long as the slender curved ovary. Sepals unequal, tinged with brown, the dorsal one broadly ovate-lanceolate, concave, conniving with the petals and forming a hood; lateral pair oblong, involute, apiculate. Petals as long as sepals, trapeziform, blunt. Lip longer than the petals, 3-lobed; side lobes linear-oblong falcate, acute, slightly longer than the broad blunt midlobe, Spur minute, subglobose, much shorter than the sepals. Column short, broad. Anther-cells parallel, not contiguous, tube none. Pollinia pyriform, caudicles very short, the glands small, obovoid. Staminodes large, oblong, spreading, Stigmatic processes short, lying beneath and parallel to the staminodes.

Dehra Dun (Mackinnon). Flowers during July and August. Distrib.: Outer Himalayan ranges from Garhwal to Sikkim and Bhutan; also in Assam, Khasia Hills and south to Bengal, extending to China.

SCITAMINEÆ.


Tubers oblong, hairy. Stem stout, 2-3 ft. high, clothed at the base with wide blunt sheaths. Leaves five or six, on upper portion of stem, more or less whorled, 4-7 in. long, ovate-elliptic, acute or acuminate, narrowed towards the long sheaths; bracts on the peduncle linear-lanceolate, acuminate. Spike broadly cylindric, 4-8 in. long, many-and densely-flowered. Flowers spreading, white or pale yellow, sweet-scented; floral bracts large, erect, lanceolate, acuminate, about as long as the ovary. Sepals subequal, ½-¾ in. long, oblong, obtuse, ciliolate; lateral pair spreading, with involute edges. Petals larger than the sepals, obliquely ovate-lanceolate, somewhat gibbous on the lower side, spreading upwards in front of the dorsal sepals, but not connivent to form a hood. Lip as long as the petals, 3-lobed to about the middle; lateral lobes linear, acuminate, somewhat diverging at their tips; midlobe shorter, oblong, tapering to a blunt point. Column very short and broad. Anther-cells close together but not contiguous; tubes none. Pollinia obovoid, caudicles short, tapering to the large oblong-elliptic glands. Staminodes oblong, obtuse. Stigmatic processes clavate, spreading. Rostellum erect, 2-fid.

Siwalik range (Duthie); Dehra Dun, in sál forests (Mackinnon). Flowers during July and August. Distrib.: Outer Himalayan valleys in Kumaon and in Sub-tropical Sikkim; also in Assam, Chota Nagpur and Chittagong, extending to Upper and Lower Burma.

CVIII. SCITAMINEÆ.

Herbs, often large, frequently with a pseudostem of convolute leaf-sheaths, rarely with a woody caudex. Leaves radical or cauline, usually membranous; sheaths generally large, clasping the stem; lamina with a strong midrib; secondary nerves close pinnate, parallel. Flowers 2-sexual, rarely 1-sexual (as in Musa), irregular, solitary or spicate; bracts membranous or herbaceous, bracteoles membranous or none. Perianth 2-seriate, superior; outer segments 3, calycine, rarely petaloid, free and imbricate or connate in an entire toothed or spathaceous tube; inner segments petaloid, connate in a long or short corolla-tube, free or adnate to the petaloid staminodes; limb 3-partite, the segments
free or connate. Stamens only 1 perfect, the rest replaced by petaloid staminodes, or 5 perfect, and a sixth imperfect or obsolete; anthers linear, 2-celled, rarely of one cell on the margin of a petaloid connective. Ovary inferior, 3-rarely 2-or 1-celled; style usually slender, with 2 short stylodes crowning the ovary, stigma entire or subentire; ovules usually many, axile, rarely parietal, anatropous. Fruit a loculicidally 3-valved capsule or indehiscent and membranous or fleshy, usually crowned by the remains of the perianth. Seeds often arillate, albumen floury, embryo small.—Species 400-500, chiefly tropical.

Stamen only one perfect, others reduced to staminodes or wanting:—

Anther 2-celled; calyx tubular or spathaceous; style slender, embraced below the stigma by the anther:—

Ovary 1-celled; placentas 3, parietal; cor-tube long; flowers yellow . . 1. GLOBBA.

Ovary 3-celled; placentas axile:—
Lateral staminodes broad:—

Connective not spurred at the base; cor-tube long, slender:—

Filament short; connective broad, crested; stigma turbinate . . * KÖMPFERIA.

Filament long, narrow; connective very narrow, not crested; stigma subglobose . . . . 2. HEDYCHIUM.

Connective spurred at the base; cor-tube funnel-shaped; stigma 2-lipped, the lips ciliate; bracts forming a cone-like spike . . 3. CURCUMA.

Lateral staminodes small or none, rarely narrow and adnate to the lip; cor-tube cylindric:—

Flowers in a dense cone-like spike:—

Filament short; anther-cells contiguous, parallel; connective produced as a narrow appendage as long as the anther; stigma small, subglobose; spikes usually
produced direct from the rootstock, sometimes at the top of a leafy stem.

Filament forming with the produced connective an oblong petaloid process, with the contiguous linear anther-cells placed in its middle; stigma with a semilunar pit ciliate round the margin; spikes usually at the top of leafy stems.

Flowers in racemes or panicles at the top of leafy stems; filament long; anther-cells divergent at apex; stigma subglobose.

Anther 1-celled, laterally adnate to a petaloid filament; calyx of free sepals:

Staminal tube with 5 subsimilar slightly unequal petaloid segments, the 1-celled anther adnate to one of the smaller segments; ovary 3-celled; placenta many-ovuled.

Stamens 5 perfect, free, the 6th imperfect or absent; sepals united in a split spathelike tube; corolla short, included and enveloping the stamens and style; fruit fleshy, indehiscent; leaves very large.

The genera marked with an asterisk in the above key are not truly indigenous within the area of this flora.


Herbs with creeping rhizomes and erect stems. **Leaves** oblong or oblong-lanceolate. **Flowers** in terminal panicles, rarely in spikes, bracts usually deciduous, buds often replaced by bulbils. **Calyx** funnel-shaped, 3-lobed. **Corolla** 3-lobed, longer than calyx; lobes ovate, subequal. **Stamen** 1, filament long, incurved, with 2 dorsal appendages; anther oblong; connective simple, winged or spurred, produced beyond the cells. **Ovary** 1-celled; style filiform, placed in a groove of the filament, stigma turbinate; ovules many, on 3 parietal placenta. **Fruit** a globose capsule.
tardily dehiscent. Seeds many, small, ovoid, with a small white lacerate aril.—Species 60 to 70, in India, Malaya, China, Philippines and New Guinea.


Dehra Dun and on the Siwalik range. Flowers during the rains.—**Distrib.** Bengal, Chota Nagpur, Bihar, Sikkim, N. Circars (Roxburgh).


Herbs with perennial horizontal tuberous rootstocks; root-fibres not much thickened; stem elongate, leafy. *Leaves* distichous, oblong or lanceolate. *Flowers* usually in terminal spikes; bracts oblong, subcoriaceous, 1-or more-flowered. *Calyx* tubular, 3-toothed. *Corolla-tube*, long, slender; lobes equal, linear, spreading. Perfect *stamen* 1; filament long, slender, anther-cells contiguous, connective not produced; lateral staminodes linear or cuneate-oblong; lip large, bifid. *Ovary* 3-celled; style long, filiform, stigma subglobose; ovules many, superposed on axile placentas. *Fruit* a globose 3-valved capsule. *Seeds* many, small, with a lacerate aril.—Species 38, chiefly Indian and Malaya.


A tall herb with erect leafy stems, 4-6 ft. high; rootstock 1-2 in. in diam., fleshy, jointed. *Leaves* sessile, 9-14 in. long, lanceolate, finely acuminate, glabrous above, glabrous or sparsely pubescent beneath; base narrowed; sheath smooth; ligule membranous. *Flowers* pure white, fragrant, in dense oblong spikes 4-8 in. long; bracts closely imbricate, 3-4-fid.; the outer ones 1-2 in. long, ovate, obtuse; bracteoles 3, membranous. *Calyx* 1-1½ in. long, cylindric, green, shorter than the bracts. *Corolla-tube* 3 in. long; segments half as long as the tube, reflexed. *Lateral staminodes* 1½-2 in. long.
subobtuse, white. *Lip* $1\frac{1}{2}$ in. broad, suddenly contracted into a short claw; lobes short, rounded. *Stamen* $1\frac{1}{4}$ in. long; anther about $\frac{1}{4}$ in. *Capsule* oblong, glabrous, the valves orange-yellow within. *Seeds* with a crimson aril.

Dehra Dun (Duthie). Flowers during the rains. Distri.: Throughout India from the Himalaya and the Khasia Hills southwards to Chittagong, Bengal, Kanara, Konkan and Ceylon, extending to Malay Pen. and Islands. See Kew Bulletin (No. 9, 1912) for an account of the fibre yielded by this and allied species of *Hedychium*, and of its value as a material for paper-making. See also Watt’s "Comm. Products of India" p. 776.


Stemless herbs with tuberous rootstocks bearing sessile and long-stipitate tubers. *Leaves* usually oblong, often very large. *Flowers* usually in dense compound spikes, vernal or aestival and preceding the leaves or autumnal and coetaneous, crowned by a coma of enlarged coloured bracts; lower bracts ovate, membranous, enclosing several bracteolate fugitive flowers which open in succession. *Calyx* short, cylindric, minutely toothed. *Corolla-tube* funnel-shaped; segments usually ovate or oblong; upper longer, somewhat concave. *Stamen* 1, perfect, filament short, anther not crested; cells contiguous, spurred at the base; lateral staminodes oblong, petaloid, connate with the filament; *lip* orbicular, with a deflexed tip. *Ovary* 3-celled, style filiform; stigma 2-lipped, the lips ciliate; ovules many, on axile placentas. *Fruit* a tardily dehiscent globose membranous 3-valved capsule. *Seeds* ovoid or oblong, usually arillate.—Species about 40, mostly in S. E. Asia.


*Roo* G. small, emitting long fleshy fibres terminating in pale oblong pendulous tubers. *Leaves* (with petiole) 1-1½ ft.; blade lanceolate, acute $\frac{1}{4}$-1 ft. long. *Fl. spike* lateral, apart from and usually appearing earlier than the leafy spike, crowned by several enlarged empty pink bracts. *Flowers* yellow, longer than their bracts, 3 or 4 together in the axil of each bract opening in succession and quickly
SCITAMINEAE. [Curcuma.]

Fading; sheaths of pseudostem pale-green. Calyx 3-toothed. Corolla-tube \( \frac{3}{4} \) in. long, somewhat gibbous; upper lobe erect, concave, ovate, longer than the two lateral ones. Lateral staminodes oblong, united to the filament; the lower large, broad, spreading, notched; connective produced at the base in a fork. Capsule ovoid, ultimately opening by 3 valves. Seeds many, small.

Abundant in Dehra Dun and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. Flowering during the rains. Distrib.: Outer ranges of Central Himalaya, also in W. Behar and N. Bengal; extending to Bombay and S. India. A kind of starch resembling arrowroot is prepared from the tubers.

—A tall herb. Rootstock large, ovoid, with sessile cylindric tubers orange-coloured inside. Leaves very large, in tufts up to 4 ft. or more long, including the petiole, which is about as long as the blade, oblong-lanceolate, tapering to the base. Flowers in autumnal spikes, 4-6 in. long; peduncle 6 in. or more, concealed by the sheathing petiole; flowering bracts pale-green; bracts of coma tinged with pink.—This plant is much cultivated throughout India chiefly for the yellow dye obtained from the tubers, which also used as a condiment. The plant was probably introduced originally from China, though having all the appearance of being wild in Behar and Ch. Nagpur.


Herbs with elongated leafy stems and horizontal tuberous rootstocks. Leaves oblong-lanceolate. Flowers in spikes, usually radical, less often terminal, rarely lateral on the leafy stems; peduncle short or long; bracts persistent, usually 1-fld. Sepals 3, connate in a cylindric shortly 3-lobed calyx. Petals 3, connate in a corolla with cylindric tube; lobes lanceolate, the upper concave. Stamen 1 perfect; filament short; anther 2-celled; cells contiguous, with a narrow crest as long as themselves; lateral staminodes none, or adnate to the obovate-cuneate lip. Carpels 3, connate in a 3-celled ovary; ovules many, superposed; placentas axile; style filiform; stigma small, subglobose. Fruit an oblong capsule, tardily dehiscent. Seeds large, globose, arillate.—Species about 30 or more, in tropical regions of the Old World.
SCITAMINEAE.


Rootstock of many long-stalked oval tubers with a spicy fragrance. Stems slender, leafy, 3-4 ft. high. Leaves 12-18 in. long, linear, acuminate, ascending, usually pubescent beneath. Spike terminal, sessile, or somewhat prolonged beyond the sheaths of the upper leaves, erect or oblong-cylindric, 3-6 in. long; bracts closely imbricate, 1½ in. long, ovate, green with a narrow brown edge. Cor.-tube as long as the bract, segments pale-yellow. Lip pale-yellow, not spotted; midlobe ½ in. broad, orbicular, emarginate; basal auricles large, oblong, obtuse. Capsule bright-red, size of small olive, valves ovate. Seeds black, shining; aril large, lacerate, white.

Dehra Dun (Duthie), Banda (Edgew.), Gorakhpur (Burkill). Flowers in rains. Distrib. : Central Himal. from Kumaon to Sikkim; also Khasia Hills, Sylhet, Ch. Nagpur, and Chanda in Cent. Prov.

Z. officinale, Rosc.; Roxb. Fl. Ind. i, 47; F. B. I. vi, 246; Watt E. D.; Comm. Prod. Ind. 1139; Duthie in Field and Gard. Crops, part iii, 47, t. 100; Kanjilal For. Fl. (ed. 2) 405; Prain Beng. Pl. 1045; Cooke Fl. Bomb. ii, 736.—Vern. Adrak (fresh root), sunt (when dry)—Ginger.—A herb, with horizontal jointed tuberous rhizomes. Stems slender, 3-4 ft. high. Leaves 6-12 in. long, lanceolate, glabrous beneath. Bracts suborbicular, cuspidate. Cor.-lobes green. Lip and stamen purplish-black.—The ginger plant is much cultivated in Dehra Dun and throughout the Sub-Himalayan tracts of Rohilkhand and N. Oudh, and elsewhere in India. It has also been extensively introduced in the tropics of both hemispheres. The plant is known to have been grown in India and China for many centuries, but there is no record of its having been found in a truly wild condition. The usual vegetative mode of cultivating the ginger plant has brought about a tendency to cause sterility as in Musa and Citrus.

5. COSTUS, Linn.; Fl. Brit. Ind. vi, 249.

Herbs with long leafy stems; rootstock tuberous, horizontal. Leaves oblong, with broad sheaths. Flowers in dense globose or ovoid usually terminal spikes. Calyx short, funnel-shaped; teeth 3, ovate. Corolla-tube not longer than the calyx; segments large, oblong, subequal. Lip large, obovate with incurved margins. Stamen 1 perfect, filament forming with the connective an oblong petaloid process with the contiguous linear anther-cells situated in its middle; lateral staminodes minute or obsolete. Ovary 3-celled,
style filiform, stigma with a semilunar marginally ciliate foveola; ovules many, superposed. Fruit a globose or ovoid capsule, finally dehiscing on one side between the ribs. Seeds obovoid or subglobose, aril short.—Species nearly 100, in the tropics of both hemispheres. Many of them are cultivated for their handsome flowers.


An erect herbaceous plant, 4-6 ft. high. Stem somewhat woody at the base. Leaves sub sessile, arranged spirally, 6-12 in. long, oblong or oblanceolate, acute or acuminate, often cuspidate, glabrous above, silky-pubescent beneath, base rounded; sheaths coriaceous: ligule none. Flowers many, in dense terminal spikes 2-5 in. long; bracts bright red, 2½-1½ in. ovate, acuminate or pungently mucronate; bracteole solitary, ½ in. long. Calyx 1½ in. long, deltoid-ovate, cuspidate. Corolla-tube as long as calyx; lobes ovate-oblong, apiculate, lateral lobes about 1½ in. long, dorsal one rather shorter; lip suborbicular, white with a yellow centre, 2 in. or more in diam.; concave, plicate, crisp; disk pubescent and with a tuft of hairs at the base. Stamen 1½-1½ in. long, with a tuft of hairs at the base of the filament; connective petaloid, ½ in. broad, pubescent, produced into two glabrous appendages about as long as the linear anther-cells. Style slender, 1½ in. long; stigma with a semilunar ciliate mouth. Capsule ½ in. in diam., globose-trigonal, red. Seeds black, with a white aril.

Dehra Dun and Siwalik range, common in sál forest, and eastwards along the Sub-Himalayan tracts of Rohilkhand and N. Oudh, usually in moist shady places. Flowers during the rainy season. Distr.: Outer ranges of Himalaya, up to 4,000 ft., and more or less throughout India; also in Ceylon, Malay Pen. and Islands and in China.

The following non-indigenous plants belonging to this family are occasionally cultivated within the area of this flora:

Kempferia Galanga, Linn. Sp. Pl. 3, Roxb.; Fl. Ind. 15; F. B. I. vi, 219; Watt E. D.; Prain Beng. Pl. 1038; Cooke Fl. Bomb. ii, 726.—Vern. Chandra-mula. A stemless herb. Leaves appearing with the flowers, sessile, suborbicular, 3-6 in. long, spreading flat on the ground. Corolla-segments lanceolate; lip white with lilac throat. Lateral staminodes cuneate-ovate. More or less through-
out India, wild or cultivated, extending to the Malay Pen. and Islands, also in China. It is often grown in gardens within the area of this flora. The tubers are employed in perfumery and in Hindu medicine.


**Alpinia Nutans, Roscoe; Roxb.; Fl. Ind. i, 65; F. B. i. vi, 256; Watt E. D.; Gamble Man. 723; Cooke Fl. Bomb. ii, 738.—Stems up to 10 ft. high. Leaves 1-2 ft. long by 3-6 in., oblong-lanceolate. Flowers very handsome, in panicles 6-12 in. long, the rachis very hairy; bracts large, concave, ivory-white tinged with pink and variegated with red and yellow.—Mr. Gamble states that this planted in Dehra Dun at Rájawala, where it affords good fodder for elephants. It is also much grown as an ornamental plant in gardens. It is a native of the E. Himalaya and Burma, extending to the Malay Pen. and Islands.

**Canna Indica, Linn.; var. orientalis Rosc.; F. B. I. vi, 260. Prain Beng. Pl. 1047. C. indica, Linn.; Roxb.; Fl. Ind. i, 1.; Watt E. D.; Cooke Fl. Bomb. ii, 744.—Rootstock tuberous, with many fibres. Stems 3-4 ft. high. Leaves 6-18 in. long, oblong or elliptic-lanceolate, caudate-acuminate. Flowers distant. 2½ in. long, scarlet or yellow. The seeds are black and shining and are known under the name of Indian shot. This species is much grown in Indian gardens for its handsome flowers.

**Musa, Linn.—Tree-like herbs with stout stems composed of convolute leaf-sheaths. Leaves very large, oblong,spirally arranged. Flowers in an erect or decurved subterminal spike, practically 1-sexual, the lower female, the upper male; bracts large, spathaceous, ovate or orbicular. Calyx tubular, spathaceous, 3-5-lobed, slit to the base on one side. Petals connate, forming a unilateral corolla as long as the calyx or shorter, convolute round the stamens and style. Stamens 5, perfect, the 6th rudimentary or obsolete; filaments stout, filiform; anthers linear, erect, 2-celled. Carpels 3, connate in a 3-celled ovary; ovules many; style filiform from a thickened base; stigma 6-lobed, subglobose. Fruit oblong or fusiform, 3-gonous, fleshy, indehiscent. Seeds subglobose or angled by pressure, in cultivated forms often obsolete.—Species about 40, in tropical
regions mostly of the Old World. As a cultivated plant *Musa* has
spread extensively throughout the warmer regions of both hem-
ispheres, and more especially the kinds which yield the well-
known and highly valued *banâna* and *plaintain* fruit (*M. paradisiaca*
and its subspecies *sapientum*).

**M. PARADISIACA**, L. Sp Pl. (1753) 1043; K. Schum in Engl. Pflan-
zenreich iv, pt. 45 (1900), 19; Cooke Fl. Bomb. ii, 742; Rendle Fl. 
Pl., part 1, 331. M. paradisiaca, var. normalis, O. Kuntze Revis.
Gen. ii, (1891) 692. M. sapientum var. paradisiaca, Baker in 
F. B. I. vi (1893) 262; Watt E. D. and in Comm. Prod. Ind. 786;
Prain Beng. Pl. 1050; Kanjilâl For. Fl. (ed. 2), 405; Gamble 
Man. 723.—Vern. *Kach-kela*. The Plantain.—Male fls. and bracts
subpersistent. *Fruit* cylindric, up to 12 in. long, usually yellowish-
green when ripe, pulp hardly sweet and rather firm, only edible
when cooked.—A variety of the above (var. *sylvestris* of Prain)
is found apparently wild in Dehra Dun in the Khairi swamp and in
shady ravines of Nâgâsîdh Hill, also at Sahânsra-dhâra. It is
frequently met with at low elevations on the outer ranges of the
Himalaya, and has been recorded also from Chota Nagpur and
Chittagong. The fruit of this plant contains many seeds and is
not edible.

iv, pt. 45 (1900) 20; Cooke Fl. Bomb. ii, 742; Rendle Fl. Pl. part 
1, 331. M. paradisiaca, var. sapientum, O. Kuntze Rev. Gen. ii,
692. M. sapientum (sp.), L.; Baker in F. B. I. vi, 262; Watt 
The *Banana*.—Male fls. and bracts deciduous. *Fruit* oblong, usually
3-gonous, yellowish or reddish when ripe, the pulp is soft and sweet
and is edible uncooked.—Numerous forms or varieties of this sub-
species are cultivated throughout the warmer parts of India, the
quality of the fruit differing according to the climate. For further
particulars see Watt’s Comm. Prod. India.

**MUSA CHINENSIS**. Sweet in Hort. Brit. ed. 2 (1830) 596; Cooke Fl. 
Bomb. ii, 742. M. Cavindishii, Lambert.—Chinese or Dwarf *banâna*.
—Whole plant 4-6 ft. *Leaves* 6-8, forming a dense-rosette, 2-3 ft.
long and about 1 ft. broad, spreading, oblong; petioles short, stout,
deeply channelled, with broad crisped green edges. *Spikes* dense,
1-2 ft. long; bracts reddish-brown. Male fls. persistent. *Fruit*
4-5 in. long, 6-angled, yellow, with a thick skin, the flavour insipid
until dead ripe. A native of S. China and much cultivated in India
and other tropical countries. In the Saharanpur district the fruit
is ripened underground in earthenware vessels.
AMARYLLIDACEÆ.

CIX.—AMARYLLIDACEÆ.

Perennial herbs, rarely shrubs or undershrubs; rootstock a bulb tuber or corm, rarely an erect stock. Leaves radical, few or many. Flowers few or solitary, on terminal leafless scapes, often umbellate; bracts membranous or coloured, rarely herbaceous, the outer under the umbel 1-3, rarely many, the inflorescence occasionally racemose or panicked with scattered bracts. Perianth regular or irregular, 2-seriate, 6-lobed or partite, sometimes with a corona on the limb. Stamens 6, adnate to the base of the perianth-segments, rarely epigynous; filaments free or connate, anthers erect or versatile. Ovary inferior, 3-celled, style slender, stigma simple or 3-cleft; ovules many, 2-seriate on the inner angles of the cells, anatropous. Fruit inferior, usually a loculicidal capsule, rarely fleshy and bursting irregularly. Seeds few or many; albumen fleshy, enclosing the small embryo.—Species about 650, in temperate and tropical regions.

Leaves large, thick and fleshy, densely clustered at the top of a rootstock or a simple stem, spiny at the tip and usually armed along the edges; scape long, terminal, simple or branching towards the apex:—

Inflorescence simple and spicate or compound and thyrsoid; stamens in bud inflexed under the tips of the per-segments, much longer than the perianth; filaments filiform or flattened at the base; style filiform . . . . . . . 1. Agave.

Inflorescence loosely panicked; stamens about equaling the perianth; filaments thickened at the base; style thickened in the middle . . . . . . . 2. Furcraea.

Leaves thin and flat or, if somewhat fleshy, unarmed:—

Rootstock tuberous; leaves strongly nervèd flat or plicate; flowers in spikes or racemes; perianth yellow not showy:—

Fruit opening by 3 valves or circumscissile . . . . . . . 3. Hypoxis.

Fruit a succulent berry . . . . . 4. Cubculigo
AMARYLLIDACEÆ.

Rootstock a tunicate bulb; leaves not strongly nerved, flat, smooth; flowers usually umbellate at the apex of a scape; perianth white or pink, large and showy:—

Filaments attached to the perianth-lobes, but not connate. 5. CRINUM.

Filaments united towards their base by an intervening petaloid membrane. 6. PANC RATIUM.

1. AGAVE, Linn.—The following key to the species of Agave which are cultivated or have become naturalized in N. India is based on a paper in the Agricultural Ledger of 1906, No. 7, by Mr. J. R. Drummond and Sir David Prain:—

Leaves in section flat to concave, but never channelled throughout:—

Teeth minute, close set. 7. AGAVE SPECIES under letter A in D. & P. page 83.

Teeth larger, more or less remote:—

Leaves in a lax rosette or tufted, never less than 3 ft. long:—

Perianth-segments not constricted towards the tips:—

Leaves broadest in the middle, tapering to both ends:—

Leaves oblong-lanceolate, neck sharply constricted. 8. AGAVE AMERICANA, L. under letter B in D. & P. page 84.

Leaves linear-oblong, neck not constricted:—

Marginal prickles of upper portion of leaf pointing upwards, leaf deeply trough-shaped in upper fourth. 9. AGAVE SPECIES, under letter C in D. & P. page 85.

Marginal prickles pointing uniformly downwards; leaf flattish throughout. 10. AGAVE VERA-CRUZ, MILLER, under letter D in D. & P. page 86.
Leaves hardly widened in the middle, very narrow in proportion to length:—
Leaves linear-lanceolate, curving outwards throughout their length, terminal spine acicular.

Leaves narrowly oblong, not curving, stiff, erect; terminal spine conical from a stout base.

Perianth-segments narrowed from the middle to the ligulate tip:—
Leaves straight.

Leaves drooping from their upper ½ or less.

Leaves in a close globose rosette, never exceeding 3 ft.

Leaves in section channelled throughout.

1. Agave.

Agave sp. (a) D. & P. in Agril. Ledger No. 7 (1906), p. 84.

This is supposed to be the same as a plant cultivated in the Saharanpur Bot. Garden under the erroneous name of "A. Ixtilli." A plant reported to be naturalized in Burma seems to be very near to this, and is perhaps allied to A. Keratto, Miller. No information regarding the fibre is available, nor is the native country known.—Leaves deep-green with a glaucous bloom; marginal prickles minute, sharp, ruby-coloured when young, pointing both upwards and downwards; terminal spine brown, subulate.
**Amaryllidaceae.** [Agave.]


The American Aloe. Planted in parks and large gardens throughout India, but not naturalized, nor grown for its fibre. Outside India it is cultivated as an ornamental plant in gardens in N. Europe and N. America. Its native country is not known. The plant widely naturalized and commonly termed *A. americana* in S. Europe, is believed by *D. & P.* to be *A. Vera-Cruz* of Miller.—Trunk prostrate or ascending; leaves deep-green often variegated with white or pale-yellow stripes or borders, sometimes rather glaucous; marginal prickles mostly pointing downwards; terminal spine dull-brown, 1-2 in. long; perianth-lobes obtuse, amber-coloured.

*A. sp.* (c), *D. & P.* l. c. *page 85.—*

Considered to be closely allied to *A. Vera-Cruz*, Miller. It was formerly cultivated in the Saharanpur Bot. Gard. under the erroneous name of *A. Jacquiniana*. The plant was sent to Saharanpur from Europe but its native country is not known. The freshly cut leaves smell like rhubarb stalks, and their juice soon ferments.—Leaves oblong-linear from a very thick caudex, dark-green, glaucous; tips stiffly recurved; blade 6 ft. long or more and 8-12 in. at the widest part some way above the middle and there forming a deep trough by the bending of the leaf and the inward rolling of the margins; prickles very stout and black, those above the trough-like portion of the leaf spreading or ascending, the rest pointing downwards; terminal spine about ½ in. long, dark-coloured.


The common Grey Aloe of India.—Cultivated in Bot. Gardens from Calcutta as far as Lahore, also planted in hedges throughout the greater portion of India, and sometimes on the sides of railways, and it is said to be naturalized in Mysore. Distr.: naturalized throughout S. Europe, in S. France and Mediterranean Islands, also in N. W. Africa and the Atlantic Islands (not recorded from S. E. Europe or the Orient). Extending to S. Africa, Mauritius and Ceylon. Its native country is probably Mexico.—Leaves linear-oblong, many from a short stout trunk which is hidden by their thickened bases, sage-green and often very glaucous, early curving upwards, the ends usually more or less recurved or drooping, 4-6 ft. long, often
rather concave at the widest part which is above the middle, neck hardly constricted; marginal prickless broad, stout, blackish, spreading or decurved; terminal spine $\frac{1}{2}$ in. long, dark-brown.

A. Cantala, Roxb. Hort. Beng. 25; D. and P. (under E.), page 87. A. Cantula, Roxb. Fl. Ind. ii, 167; not of Dalz. and Gibbs. which is A. Wightii, nor of Prain which is A. Vera-Cruz, Miller.

Naturalized in many parts of India, extending from C. India to both E. and W. coasts to the N. W. Gangetic Plain and to the Sub-Siwalik tracts as far as the Ravi, absent in the arid strip between Gwalior and Delhi, where another species, the so-called A. mexicana, has found its way. (See under letter F in D. & P. I. c. p. 88.) It is also found in Burma. Its native country is not known for certain. This appears to be the first Agave to reach India, and it came probably from the Pacific coast of C. America. The fibre exported from Bombay with that of other species is often wrongly named A. vivipara. The freshly cut leaves smell like rhubarb.—Leaves linear-lanceolate in a lax but even tuft from a short ascending rootstock, pale-green or sometimes glaucous, very narrow in proportion to their length (4 ft. or more), the greatest width just above the middle being about 3 in., curving outwards gradually from their bases or bent over almost from their origin; upper surface more or less concave, sometimes trough-shaped in lower portions; marginal prickles large,alcate, always ascending. $\frac{1}{2}$ in. or more long, very sharp, pale-brown or garnet-coloured, from a small light-coloured cushion; terminal spine, acicular, cylindrical, reddish or dark brown $\frac{1}{2}$ in. long.

A. sp. (f) D. and P. l. c. pages 88 and 101.

According to D. and P. this species seems to be intermediate between A. Cantala and the Sisalana series. It differs from the former species by its stiff upright leaves which are never involute and hardly concave, do not bend outwards and are seldom recurved, even at the tips; also the flowers are more delicate in texture. Specimens were sent by Mr. Gamble to the Calcutta Bot. Gard. from Dehra Dun under the name of A. mexicana. It is planted and has become naturalized in many places within the Upper Gangetic Pl., and is often found in railway hedges in N. W. India. Its native country is not known. Further information is required regarding the quality of its fibre. Leaves tufted on a very short caudex, never forming a rosette, stiff erect, 4-5 ft. long, of uniform breadth and ending in the suddenly acuminate tip; marginal prickles distant, chestnut or garnet-coloured, their hooks sharp and ascending; terminal spine stout, conical, $\frac{1}{2}$ in. long or more, brown.
A. sisalana, Ferrine: D. and P. l. c. (under letter e), p. 89.  
True Sisal.—

The sisal-hemp was first known as a cultivated plant in Yucatan in 1834, whence it was introduced to Florida and there naturalized. From Florida it was brought to the W. India Islands and thence to India during the years 1835-1892. Its native country is not known for certain. It is cultivated in many parts of India as far north as Lahore, also in C. India, Bombay, Bengal, Mysore and Madras, also in Burma. Outside India it is grown in Australia, Fiji, Hawaii and E. Africa. Leaves 20-35, oblong-lanceolate, deep-green or sometimes glaucous, up to 6 ft. long, never forming a rosette, but closely tufted on the rhizome or on a short ascending caudex, neck not at all constricted; margins with or without prickles which, if present, are weak scattered and pale-coloured; terminal spine not channelled, glossy, purple or dark-brown.

A. sp. D. and P. l. c. page 90 (under letter H).

The finest of the naturalized Indian species of Agave. It is the large species which was wrongly named A. lurida at Saharanpur. Vern. Rambanskeora. It is regarded by D. and P. as closely allied to the Sisalana group. It occurs in many parts of Bengal and in the Gangetic Plain as far north as Saharanpur where it has run wild in the Botanical Gardens. It flourishes under the same condition as A. Wightii and is often found with it in the same hedge. It is cultivated also in Dehra Dun, Lucknow, Madras and Burma and often becomes naturalized in hedges. Its native country is not known. The freshly cut leaves have the scent of rhubarb. More information is required as to the quality of the fibre. Leaves oblong-lanceolate, not forming a rosette, the inner ascending from the stout caudex, the ends recurved for about ¼ of the total length and drooping, dull dark-green, often glaucous, reaching 7 ft. in length and 10 in. in breadth at the widest part; marginal prickles distant, stout, falcate, yellow-brown from a broad pale cushion; terminal spine not deciduous, stout, slightly recurved.


Vern. Bánskeora (Saharanpur). Small Aloe of India. Cultivated and naturalized in the Upper Gang. Pl. at Moradabad, in Dehra Dun, Saharanpur Bot. Gard., and from Delhi northwards to Ludhiana. It is the only Agave in N. India which develops a conspicuous trunk.
Furcraea.]

Amaryllidaceae. 245

Its native country is not known. A variegated form is often cultivated in gardens. D. and P. say that A. Wightii will doubtless hold its own as a hedge plant, especially in the drier provinces. The fibre is reported as good, but shorter than that of A. sisalana. —Leaves ensiform, linear-lanceolate, very many, 2½-3 ft. long, and up to 3½ in. at its widest part, inserted in a compact series on a stout usually conspicuous trunk which is partly procumbent or throughout ascending, forming a stiff even rosette 3-5 ft. in diam., pale green or often tinged with ashy grey; base thin, broadly amplexicaul; marginal prickles rather weak; about ⅛ in. apart, usually consisting of a small brown cushion carrying a semi-transparent garnet-coloured spine which is often sharply recurved parallel to the leaf edge, but ending in a finely barbed hook pointing upwards; terminal spine about ½ in. long, pale, slightly decurrent.


False Sisal. Cultivated only in Bot. and Horticultural Gardens at Calcutta, Saharanpur and Lahore; naturalized in Florida with A. sisalana, Perrine; native country not known. Very near to A. Ixtili, Karwinski, a native of Yucatan. —Leaves fleshy, linear, stiff, in section canaliculate, glossy apple-green, 2-4 ft. long, widest just below the middle, forming a compact radiating tuft, of which the outer leaves are nearly at right angles with the axis, the inner ones making gradually an acuter angle; marginal prickles reddish brown small but sharp; terminal spine ½ in. long or more, not decurrent, blackish, very sharp, inclining backwards.

2. Furcraea, Vent.

Only one species of this genus has shown any tendency to become naturalized in India. This has usually been identified with F. gigantea, Vent. but its exact identification with that species has not been satisfactorily determined by Drummond and Prain for want of specimens of the inflorescence. It is planted and has become naturalized within the area of this flora and in most of the public gardens of India. It is often grown as a hedge plant and sometimes on the sides of railway lines. In Southern India it is known as the "Mauritius Hemp." The fibre is much used in N. India, but it is not known to what extent it is in cultivation for this purpose. (D. and P. l. c. pages 105 and 147.)

Herbs with a tuberous rootstock, or a tunicate membranous or fibrous corm. Leaves radical, narrow, strongly nervet. Flowers solitary, or racemted, or in umbels. Perianth rotate, 6-partite, sessile on the top of the ovary and persistent. Stamens 6, adnate to the base of and shorter than the perianth-segments, filaments short; anthers erect, dorsifixed. Ovary 3-celled; style short, columnar; stigmas 3, erect, stout, distinct or connate; ovules 2-seriate in each cell. Fruit a globose or oblong capsule, opening by 3 valves or circumscissily. Seeds subglobose; testa crustaceous, shining, beaked at the tip.—Species about 50, chiefly in S. Africa.


A small dioecious herb. Rootstock subglobose or elongate, crowned with the fibrous remains of the old leaves. Leaves 6-12, subcoriaceous, keeled, 4-14 in. long, narrowly linear. Scapes 1-4, filiform, or 2-flowered, subglabrous or thinly clothed with pale-brown hairs; bracts setaceous. Perianth-segments 2-8 in. long, slightly hairy and yellow, the outer ones green outside. Anthers sagittate. Ovary clavate, ½-1 in. long, clothed with short shining golden-brown hairs. Capsules with thin walls, ultimately 3-valved, crowned with the erect per-segments. Seeds black, finely tuberculate.

Abundant within the area of this flora along the Sub-Himalayan tracts of Pilibhit and N. Oudh; also in Bundelkhand.—Distr.: Outer Himalaya from Kashmir to Sikkim up to 7,000 ft., and southwards through the hilly parts of Peninsular India; extending to Java, China, Japan and the Philippines.


Herbs with a tuberous rootstock, or a tunicate fibrous corm. Leaves often large, lanceolate and plicate or linear and flat. Flowers often 1-sexual, the lower flowers usually 2-sexual, spicate racemose or subcapitate. Perianth 6-partite, usually produced above the ovary as a solid stipe and bearing the rotate limb. Stamens 6, adnate to the base of the perianth-lobes, filaments short; anthers linear, erect. Fruit a berry. Seeds subglobose, testa crustaceous, black, often beaked. Species about 12, in tropical and sub-tropical regions.
Crinum. | AMARYLLIDACEÆ

C. ochroleucus, Gaertn. Fruct. i, 63, t. 13; Roxb.; Fl. Ind. ii, 144; F. B. I. vi, 279; Watt E. D.; Prain Beng. Pl. 1059; Cooke Fl. Bomb. ii, 748.—Vern. Musali-kand (Oudh), Mushali (Hind).

Rootstock tuberous, stout, with many fleshy root-fibres. Leaves membranous, sessile or stalked, 6-18 in. long, linear or linear-lanceolate plicate, glabrous or sparsely and softly hairy, the tips sometimes rooting when reaching the ground. Scape very short, clavate, flattened; the pedicels bracts and ovary hidden by the leaf and sheaths. Flowers bright yellow, distichous. Per-segments ½-⅓ in. long, elliptic-oblanceolate, acute, hairy on the back. Ovary lanceolate; cells 6-8-ovulate. Berry ½ in. long, hypogeous. Seeds ⅛ in. long; testa deeply grooved, black, shining.

Abundant in the Sub-Himalayan tracts of Pilibhit and N. Oudh, also in Merwara (Duthie, Burkill, etc.). Distr.: Outer Him. ranges from Kumaon eastwards, Khasia Hills, Manipur, south to Bengal. W. Ghats, Konkon and Nilgiri Hills extending to Java, China and the Philippines. The black root, a kind of musali is ground and eaten like flour at Balrampur in N. Oudh (Burkill). The roots are also much used medicinally.


Herbs with large tunicate bulbs. Leaves long, ensiform or lorate. Flowers large, umbellate, sessile or nearly so, with 2 spathe-like bracts at the top of a long solid scape; bracteoles linear. Perianth funnel-shaped or almost salver-shaped; tube long, straight or incurved, cylindric or with a wide mouth; lobes 6, recurved or spreading or connivent. Stamens 6, adnate to the throat of perianth-tube; filaments free. Ovary 3-celled; ovules 2—many in each cell; style filiform; stigma small. Fruit a subglobose membranous or coriaceous capsule, bursting irregularly. Seeds few, large, testa thick; albumen copious. Species about 75, in Trop. Asia, Africa, Australia, and America, mostly on seacoasts, and in India often found wild in rocky beds of rivers.

Perianth-tube straight, erect; lobes stellately patent; stamens spreading:—

Leaves 5 in. wide or wider; umbels 15-50 fld.; per-tube 3-4 in. long, equalling the linear lobes; neck of the very large bulb 4 in. or more across . . . . . . 1. C. ASIATICUM.
Leaves 2 in. wide or less; umbels 6-12 fld.; neck of bulb 2½ in. or less across:—
Bulb. with a fusiform stoloniferous base; per-tube 2½-3 in. long, equalling the linear lobes, which much exceed the stamens  2. C. defixum.
Bulb not stoloniferous; per-tube 3·5-4 in.; lobes lanceolate, about as long as the stamens.
Leaves obtuse or subacute; per-lobes 3·5-4 in. long, about as long as the tube  3. C. pratense.
Per-tube curved, declinate; lobes ascending; stamens declinate:—
Leaves 3-5 in. wide, margin scabrous, hardly waved; per-lobes oblong, almost white; anthers grey  4. C. latifolium.
Leaves 1·5-2 in. wide; linear lanceolate, margin smooth, distinctly undulate; per-lobes lanceolate, pinkish; anthers brown  C. latifolium var. zeylanica.
Leaves ½-1 in. wide; umbels 6-12-fld.; perianth 2½-3 in. long  2 C. defixum.
Perianth-lobes lanceolate; leaves 1-2 in. wide; flowers subsessile; bracts 2-3 in. long  3 C. pratense.
Perianth funnel-shaped; tube curved; lobes ascending, oblong or lanceolate; stamens decline; style longer than the filaments  4 C. latifolium.

1. C. asiaticum, L.; F. B. I., vi, 280; Prain Beng. Pl. 1061; Cooke Fl. Bomb. ii, 749. C. toxicarum, Roxb. Fl. Ind. ii, 134.—Cult. within the area of this flora and throughout trop. India. Wild on the Chittagong coast and in the Sundribuns.

2. C. defixum, Ker. Gawl., F. B. I. vi, 281; Prain Beng. Pl. 1061; Cooke l. c. 749. C. asiaticum, Roxb. l. c. 127 (not of Linn.).—Cultivated within the area of this flora and in other parts of India. Probably wild in Bengal and in the Central Prov. in swamps and rocky beds of rivers.
Dioscoreaceae.


Herbs with tunicate bulbs. Leaves linear or lanceolate, often 2-fariously. Flowers large, solitary or umbellate, sessile or stalked within 1 or 2 membranous spathes; bracteoles linear, hyaline. Perianth funnel-shaped; tube usually long, widened at the mouth; lobes 6, narrow, suberect, subequal. Stamens 6, shorter than perianth, adnate to the throat; filaments, connate below in a petaloid membranous cup; anthers dorsifixed. Ovary 3-celled; ovules many, 2-seriate in each cell; style long, filiform; stigma small. Fruit a large subglobose 3-cornered loculicidally 3-valved capsule. Seeds many, angular; testa thick, lax, black.—Species about 12, in S. Europe, Africa, and a few are cultivated in Indian gardens, and are often apparently wild within the area of this flora.

Zephyranthes tubispatha Herbert; F. B. I. vi, 277; Prain Beng. Pl. 1060. A bulbous plant with white flowers. It was introduced into India from Peru, and is much grown in gardens, and has become naturalized as an escape in many parts of India. Another species, Z. rosea Lindl., is also met with in Indian gardens, and in Dehra Dun it occurs as an escape from cultivation. It is wild in Cuba, and the flowers are red.

Polianthes-tuberosa, Linn.; Watt, E. D.; Cooke Fl. Bomb. ii, 753. A well-known garden plant within the area of this flora and in other parts of India. Roots tuberous; flowering stems 3-4 ft. high; flowers white and fragrant, in terminal racemes. Introduced from Mexico and known in India as the Tuberose.

CX. Dioscoreaceae.

Large usually climbing herbs and generally with a thick fleshy tuberous underground rootstock, rarely a cluster of tuberous
root, or with sometimes an epigeal and often woody tuber. 
Leaves alternate or opposite, simple or compound, costate and 
reticulate; petioles often angular and twisted at the base, some-
times articulate. Flowers small, usually 1-sexual, arranged in 
spikes or racemes, dioecious or monoeious in separate spikes, regular; 
bracts often minute, sometimes obsolete; male spikes or racemes 
simple or panicked; female simple, sometimes reduced to 1-2 
flowers; perianth superior, MALE flowers: Perianth campanulate 
or rotate, deeply 6-fid-or urceolate with narrow mouth and short 
spreading lobes. Stamens 6, inserted at the base of the perianth, 
all perfect or 3 reduced to staminodes, or only 3 and no staminodes, 
filaments incurved or recurved; anthers small, 2-celled, globose, 
oblance or didymous, or with the cells discrete on branches of the 
filament. Pistillode thick, columnar, 3-fid. or entire or obsolete. 
FEM. flowers: Perianth smaller than in male, 6-fid. or-partite, 
persistent. Staminodes 3, 6 or none. Ovary inferior, 3-quetrous, 
usually 3-celled; styles 3, very short; stigmas entire or 2-fid., 
recurved; Ovules 2 in each cell, superposed, pendulous. Fruit a 
berry or a 3-valved capsule. Seeds flat or globose; embryo 
small, enclosed in the fleshy and rather hard albumen.—Species 
about 160, in tropical and subtropical regions.—Tamus communis, 
L., the Black bryony, is a climbing plant with tuberous roots, and 
is frequently met with in hedges in many parts of Britain.

**Dioscorea.** Linn.; Fl. Brit. Ind. vi, 288.

Herbs with slender climbing, rarely procumbent, stems; tuber 
solitary, often large, underground or rarely epigeal, very rarely 
with clustered long-peduncled tubers at the base of stem. Leaves 
aromatic or sometimes opposite, entire or lobed or digitate, 
3-foliolate. Flowers 1-sexual and usually dioecious. MALE 
flowers: Perianth campanulate rotate or urceolate; lobes short, 
spreading. Stamens 6, free round a pistillode, or connate in a 
central column, or 3 alternating with 3 staminodes, or 3 without 
staminodes; anthers small, the cells contiguous or discrete. 
Pistillode thick and fleshy or none. FEM. flowers: Perianth-segments 
6, small, free. Staminodes 6, 3 or none. Ovary 3-celled, stigmas 
reflexed above the style. Fruit a 3-celled loculicidal capsule, 
the angles laterally flattened and almost winged. Seeds compressed, 
often with a large membranous wing; albumen fleshy or hard, 2-
laminate, embryo between the laminae with a suborbicular cotyledon.—Species about 150, in tropical and subtropical regions.—The tubers of *Dioscorea*, known as yams, contain much starch, and are largely cultivated in India and in other tropical countries.

The following key to the species of *Dioscorea* which occur either wild or cultivated within the area of this flora is based on Prain and Burkhill’s Synopsis of the Dioscoreas of the Old World (Africa excluded) and was published in Journ. and Proc. As. Soc. Beng. (N. S.) Vol. X No. 1, 1914.

Stems twining to the left:—

Section *Combilium*. Tubers produced in a bunch, spreading, edible. Leaves simple, cordate. Male flowers 1-2 together on a long spike-like raceme (when the 2nd flower is present it is placed cymosely on the pedicel of the 1st); perianth saucer-shaped, the stamens inserted near the margin. Seeds unknown:—

1. *D. aculeata*.

Section *Lasiophyton*. Tubers vertical. Leaves generally compound. Male flowers in spikes or spike-like racemes which are generally compound; perianth-lobes just united at the base, with the stamens inserted on them; filaments simple. Seeds winged on one side only, in elongated, reflexed or horizontal capsules:—

Male flowers not densely packed; stamens 3; leaflets 3 or 5 . . . . .

2. *D. pentaphylla*.

Male flowers densely packed; stamens 6; leaflets 3 . . . . .

3. *D. triphylla*.

Section *Opsophyton*. Tubers vertical. Leaves simple, cordate. Male flowers in characteristic dependent spikes; perianth-lobes with the stamens inserted at their bases; filaments free. Seeds with the wing developed on one side only, in elongated reflexed capsules:—

Leaves alternate, ovate-cordate, drying green; flower-spikes long; tubers sometimes slightly elongating . . . . .

4. *D. bulbifera*. 
Stems twining to the right; seeds with the wing developed all round:—

Section *Enantiophyllum*. Tubers vertical, usually edible. Leaves simple. Male flowers sessile, on short axes, opening but a little way; perianth-lobes free, with the stamens inserted at their bases; filaments simple. Seeds in capsules which are not reflexed but face forwards:—

Male flowers in spikes arranged on elongate leafless branches:—

Flowers of male plant on axes which are never zigzag alive or dry; buds usually flattened at the base:—

Special flowering branches conspicuously shorter than the leaves; capsules often rather glaucous . . . . 5. *D. Wallichii*.

Special flowering branches, when well-grown, longer than the leaves:—

Pubescence abundant on the leafless axes which bear the spikes of the closely packed male flowers which are covered with hairs, stamens 6 . . . . 6. *D. anguina*.

Pubescence absent entirely:—

Leaves hastate, network conspicuous below . . . . 7. *D. belophylla*.

Leaves cordate or ovate-cordate, thin, curling up on the midrib when drying; the first lateral pair of nerves rather close to the midrib . . . . 8. *D. glabra*.

Flowers of male plant on axes which become zigzag either in life or when dry; stems acutely angled or winged 9. *D. alata*.

Section *Combilium*.

1 *D. aculeata*. *Linn. Amæn. Acad. iv* (1754), 131; *Prain and Burkill in Journ. As. Soc. Beng. (N.S.), Vol. x* (1914); *D.


Leaves more or less hairy; flowers rarely produced; tubers few, unequal, mixed with many fibrous roots, the uppermost of which are armed with spines which protect the tubers from the ravages of pigs and other animals.—This variety is widely cultivated within the area of this flora, and is often found wild.


Leaves almost glabrous; flowers not developed; tubers ellipsoid, crowded, without spines.—Cultivated in the districts of Lucknow, Allahabad, Fyzabad, Jaunpur, Azamgarh, Ballia, Ghazipur and Benares. It is also grown in Java and in other of the Malay Islands.

**Section LASIOPHYTON.**


From Western India to the remotest parts of the Pacific, from the Himalaya and Yunnan southwards to Ceylon and to the islands in the Torres Straits.

**Var. Suli**, Prain and Burkill l. c. page 23.

Leaves grey, not shining.—Dehra Dun, Siwalik range, N. Oudh, Bundelkhand. **Distrib.**: Himalaya in Garhwal and Kumaon at low elevations, extending to the Khasia and Naga Hills.


Leaves sparsely clothed with reddish hairs; flowers small.—N. Oudh, Gorakhpur, Mirzapur. **Distrib.**: Ch. Nagpur, in the hilly portions.


Tubers short, stiff, armed; flesh insipid, firm; leaflets 3 or 5, clothed with reddish hairs.—Common within the area of this flora, also in Burma.

From India to New Guinea, occurring just within S. W. China and in Formosa. Linnaeus in 1853 applied the name "triphylla" to a form of *D. pentaphylla*; in 1754 he applied it as Prain and Burkill use it here.

**Var. daemona**, *P. and B. l. c. page 26.*

A pubescent plant, common in India. Within the area of this flora it has been recorded by Burkill from Saharanpur Government Garden, Siwalik range in the Mohand Pass, N. Oudh, Gorakhpur, Mirzapur, Gwalior and Bundelkhand. *Distrib.:* Central India and C. Provinces, extending to the less rainy portions of Java. Roxburgh says of *D. daemona* that the roots are dreadfully nauseous, even after being boiled.

**(Section OPSOPHYTON.**


From India to the remotest parts of the Pacific, ascending the Himalaya to 5,000 ft., and in S. China, in S. Japan, and in N. Australia. Introduced into Trop. America and Africa.

**Var. vera.** *P. and B. l. c. page 26;* D. *pulchella*, Rox b., l. c. 801:


**Var. sativa.** *P. and B. l. c.—Vern. Rāt-ālu* (Hind).—

Tuber very small; bulbs large, nearly smooth, greenish-brown; leaves large, broadly ovate.—Cult. in India and on the shores of Pacific. —(Otaheite Potato).

**Var suavior,** *P. and B. l. c. p. 26.*

Tuber and bulbs scarcely acrid.—Cult. in India, and recorded from Jhansi.
Var. crispa, Prain Beng. Pl. 1066; Roxb. l. c., 802; F. B. I. vi, 296; Watt E. D.—Vern. Zamin-kand.—Cultivated in N. India and on Himalaya up to 5,000 ft.

Section ENANTIOPHYLLUM.


India in hilly parts of Malabar Coast; thence inland to Tapti river and through Bundelkhand and Ch. Nagpur to the Circars, extending to Burma.


Capsule slightly glaucous.—Bundelkhand at Lalitpur (Duthie No. 15245); Distr. : See above, and exclude Burma.

6. D. anguina, Roxb.; Fl. Ind. iii, 803; Prain and Burkill l. c. p. 32. D. spinosa, Wall. Cat (1832) 5103, letters G and H.

India, in the Himalaya from C. Nepal eastwards; general where the moisture is sufficient on the south of the Ganges as far as Travancore (but not in Ceylon); Assam, northern Burma, Sumatra and Java.—I am indebted to Mr. Burkill for the following localities within the area of the Upper Ganges, Plain: Gorakhpur dist.; N. Oudh: in the Bahraich dist.; Bundelkhand: in the Jhansi and Banda districts; C. India: in the Bhopal and Indore districts.


A species demanding less rain than most of the others; met with along the Himalaya towards the west as far as the Kashmir Valley, and found also on the Salt Range; eastwards, as far as is known, its distribution terminates in Sikkim; southwards it occurs on hill crests as far as the Nilgiri Range; and it has once been recorded from the Khasia Hills. It is common within the area of this flora, especially in Dehra Dun and on the Siwalik range, also in N. Oudh, Bundelkhand and in the Mirzapur district.—Vern. Turhur, toree. The tubers are much eaten.

India, south of the Ganges in the moister parts, the Himalaya from C. Nepal eastwards, the plains of Bengal and Assam, also in Burma and Siam, extending to the Malay Pen. and Islands eastwards to Java.

Var. vera, B. and P. l. c. page 38.

Leaves ovate, thin, very glaucous on lower surface, tinged with red in drying.—Recorded from Dehra Dun (Duthie), and from the Kheri district of N. Oudh (Duthie’s collector No. 22827 (a), and from the Gorakhpur district (Duthie’s collector No. 22827).


Cultivated throughout the Tropics, wherever the rainfall is sufficient. It is certainly of eastern origin and was perhaps derived from D. Hamiltonii. In the W. Himalaya races exist, here classed under var. Tarri, which appear as if D. belophylla may possibly enter their composition. A plant widely cultivated is commonly polymorphic as regards the parts subjected to man’s influence, and D. alata is no exception; it shows a great variety of forms of tuber * * * D. alata sometimes flowers and very rarely fruits (Prain and Burkhill). Vern. Khám (Beng.).


Veins on lower surface of leaves conspicuous. Cult. in Kumaon and in the adjacent parts of the Himalaya.

Var. vera, P. & B. l. c.

Veins less conspicuous.

CXL.—LILIACEÆ.

Herbs, rarely shrubs or small trees, with fibrous roots, or with a creeping rootstock or a bulb or corm. Leaves cauline or radical, sometimes none. Flowers usually 2-sexual, axillary Wr terminal, solitary or geminate or arranged in umbels, spikes, racemes,
panicles or fascicles; bracts usually small and scarious, or spathe-like when the flowers are in umbels. Perianth herbaceous or peta-loid, usually 6-merous in 2 series, rarely, 4- or 8- or 10-merous, imbricate or rarely valvate in bud. Stamens 6, rarely 3 or fewer, hypogynous or adnate to the perianth, filaments free or connate; anthers oblong or linear, often dorsifixed. Ovary 3-celled, usually simple, often long, rarely short on none or with 3 styles; ovules 2 or more, on the inner angles of the cells, anatropous rarely orthothropous. Fruit a capsule or berry, usually 3-celled. Seeds 1 or more, globose or flattened; embryo small, terete, surrounded by the horny or fleshy albumen.—Species about 2,500, in all climates and countries.

Shrubs with perennial stems above ground; fruit berry-like:—

Stems climbing or straggling; leaves replaced by linear or needle-shaped scales (cladodes) . . . . . . . . 1. Asparagus.

Stems leafy, usually climbing; leaves 3-5-nerved, reticulate-veined . . . . 2. Smilax.

Herbs with annual stems or scapes rising usually from underground perennial root-stocks corms or bulbs, rarely (in Asphodelus) the plant wholly annual:—

Underground perennial stems large in proportion to the roots:—

Aerial annual stem climbing, leafy;
leaves broad, with tendril-like tips;
perianth large, showy; rootstock tuber-like, naked . . . . . . . . 3. Gloriosa.

Aerial annual stems or scapes erect;
leaves narrow; rootstock a globose coated corm or bulb:—

Perennial stem a solid corm covered with brown sheaths; annual stem leafy; flowers solitary or corymbose 4. Iphigenia.

Perennial stem a tunicated bulb;
annual scape simple, naked; leaves radical; flowers racemose:—

Seeds sub-globose; perianth stellate 5. Scilla.
Seeds flattened; perianth campanulate . . . . . 6. URGINEA.

Underground perennial stem very small or (in Asphodelus) sometimes none; root-fibres large, many, usually some or all fleshy or tuberous; leaves radical; capsule loculicidal:—

Ovules 2 in each cell; capsule 3-quetrous; leaves ½-terete or terete and fistular . . . . . . 7. ASPHODELUS.

Ovules 4 or more in each cell; capsule deeply 3-winged; leaves flat . . . . . 8. CHLOROPHYTUM.


Undershubs with a stout creeping rootstock. Stems erect, straggling or climbing, terete, grooved. Leaves minute, scale-like, bearing in their axils tufts of needle-like or flattened axillary cladodes. Flowers usually 2-sexual, small or minute, axillary, solitary fascicled or in racemes, pendulous; pedicels jointed, bracts minute or obsolete. Perianth petaloid, 6-partite, campanulate or funnelf-shaped. Stamens 6, adnate to the base of the perianth-segments, filaments free, anthers oblong. Ovary 3-gonons; style columnar; stigmas 3, recurved; ovules 2 or more in each cell. Fruit a globose pulpy berry. Seeds few or solitary by abortion; testa black, brittle, embryo dorsal, albumen hard.—Species about 100, in Europe Temp. and Trop. Asia and in Africa.

Branches 3-quetrous, smooth; spines suberect or subrecurved, ½ to 1 in. long; cladodes ½ to 1 in. long, in tufts of 2-6, slender falcate, acuminate, channelled beneath; ovules 6-8 in each cell.—A tall climbing much branched undershrub . . . . . . 1. A. racemosus.

Stem tall, stout, smooth; branches ashy-white, grooved and angled, the angles minutely scabrid; spines stout, straight, ½ to ¾ in. long; cladodes in dense tufts of 6-20, slender, terete, filiform, soft; ovules many in each cell.—A suberect shrub . . . . . 2. A. adscendens.
A tall much-branched scandant spinous undershrub with tuberous roots. *Stem* woody, terete; branches 3-quetrous, smooth, striate; spines suberect or subrecurved, $\frac{1}{4}-\frac{1}{3}$ in. long. *Cladodes* $\frac{1}{4}-1$ in. long. in tufts of 2-6, spreading, falcate, acuminate, channelled beneath. *Racemes* solitary or in fascicles, 1-2 in. long, simple or branched; pedicels very slender, $\frac{1}{4}$ in. long, jointed at the middle. *Perianth* $\frac{1}{2}$-$\frac{3}{4}$ in. in diam.; lobes spreading. *Anthers* minute, purplish. *Ovules* 6-8 in each cell. *Berry* $\frac{1}{2}-\frac{1}{4}$ in. in diam.

Very common within the area of this flora, flowering after the rains, when it becomes conspicuous by its masses of white fragrant flowers. *Distrib.*: Throughout trop. and subtrop. India, and in Ceylon, and up to 4,000 ft. on the Himalaya from Kashmir eastwards. It occurs also in Trop. Africa, Java, and Australia. The white tuberous roots of this plant are collected for food and constitute a kind of white musali. They are also used medicinally.


A suberect prickly shrub, with white tuberous roots. *Stems* tall, stout, suberect, terete, smooth, white, much branched; branchlets ascending, ashy-white grooved and angled, the angles minutely scabrid; spines $\frac{1}{4}-\frac{1}{2}$ in. long, stout, straight. *Cladodes* in dense tufts of 6-20, $\frac{1}{2}-2$ in. long, slender, filiform, terete, soft, suberect or curved. *Racemes* 1-2 in. long, many-fl.; pedicels jointed above or below the middle; bracts minute. *Flowers* 1 in. in diam. *Perianth*—segments spreading. *Ovules* many in each cell. *Berry* $\frac{1}{2}-\frac{1}{4}$ in. diam. 1-seeded.

Dehra Dun, in Sal forests; Rohilkhand (T. Thomson) N. Oudh, in the districts of Kheri and Gonda (Duthie). *Distrib.*: Western Himalaya from Kumaon eastwards to Hazara, extending to Afghanistan. The tuberous roots are pickled, and the young shoots are eaten as a vegetable.


Climbing shrubs rarely erect herbs, *Leaves* alternate, rarely opposite, persistent, 3-5-nerved and reticulate; petiole with
usually 2 tendrils above its base. Flowers small, dioecious, umbellate. Perianth of 6 free segments, incurved or recurved. Male flowers: Stamens 6 or more, free from the base of the perianth; anthers oblong, 2-celled, didymous, cells contiguous or separated on a forked connective. Pistillode none. Female flowers: Stamens 6 or 3. Ovary 3-gonous, style short or none; stigmas 3, stout, recurved; ovules 1 or 2 in each cell, orthotropous, pendulous. Fruit a globose berry. Seeds solitary, globose, oftener 2 and hemispheric, rarely 3; albumen horny, embryo small.—Species about 180, in temperate and tropical regions.

Umbels 2-3, very rarely more, alternate on a common peduncle:

1. S. macrophylla.

Petiole stout, always narrowly sheathing but not auriculate below the middle.

2. S. Roxburghiana.

Petiole rather slender, with 2 large, thickly coriaceous, indistinctly reticulate auricles below the middle.

Umbels 7-20, ternate or whorled on a common peduncle; petiole stout, with, in all except the uppermost leaves, 2 large leaf-like distinctly reticulate auricles below the middle. S. prolifera.

1. S. macrophylla. Roxb.; Fl., Ind. iii, 793 (no. of Willd.); F. B. I. vi, 310; Watt E. D.; Prain Beng. Pl. 1071; Kanjilal For. Fl. (ed. 2) 407; Brandis Ind. Trees 641; Cooke Fl. Bomb. ii, 763. S. retusa, Roxb Fl. Ind. iii, 793. S. ovalifolia, Roxb. l. c. 794.—Vern. Ramdatum

A large more or less prickly climber. Stems smooth, striate, armed with a few small distant prickles or almost unarmed. Leaves alternate, 3-8 in. long or sometimes much larger, broadly ovate or suborbicular, acuminate or cuspidate, glabrous, shining; main nerves usually 5, with reticulate venation between; petioles ½-1 in. long, stout, narrowly sheathing, but not auriculate below the middle, tendrils very long and slender. Umbels 2-3, rarely more, alternate on a common peduncle, many fl.; peduncles ½-⅓ in. long; bracts below the peduncles ovate, acute, ⅔-⅓ in long; pedicels of both male and female flowers arising from a mass of numerous minute bracts.

Male flowers: Pedicels ½ in. Perianth ⅓-½ in. long; segments linear, obtuse, erect when young, afterwards reflexed, the 3 outer ones broader. Stamens about as long as the perianth. Female flowers: Perianth as in male; pedicels elongating in fruit. Berry about the size of a large pea, smooth, green and turning to red when ripe.
Sub-Himalayan tracts from Dehra Dun eastwards to Rohilkhand and N. Oudh and Gorakhpur; also in Sal forests on the Siwalik range. Flowers in the rainy season. Distrib.: Trop. Him. eastwards from Kumaon to Assam, Bengal and Burma, and south to Central Provinces and Konkan, extending to Java. The root of this plant is pounded and the flour is made into bread at Bulrampur in N. Oudh (Burkill). The stem yields a strong fibre suitable for making brushes, and the thinner stems are much used as tooth-sticks (Kanjilal).


A large prickly climber with smooth terete branches, branchlets 4-angled. Leaves 5-8 in. long, oblong ovate or ovate-lanceolate, rounded cordate or cuneate at the base and with a bluntly acuminate tip, 3-5-costate from above the base; petiole rather slender, with 2 large coriaceous broad indistinctly reticulate auricles below the middle; the auricles of the old leaves 1-1½ in., produced behind into rounded lobes embracing the branch. Umbels many-flowered, 2-3 on a common peduncle, which is bracteate at the base. Pedicels of female flowers ½ in. long, slender. Staminodes 3. Stigmas long, recurved. Berries ½ in. in diam. Seeds 2, hemispheric, or solitary and globose.

Sub-Himalayan tracts of Rohilkhand and N. Oudh (Duthie). Distrib.: Trop. Himalaya from Garhwal eastwards; also in Bengal on Paras-náth, in Chota Nagpur, Chittagong and on the Khasia Hills.


A stout climbing shrub with prickly stem. Leaves variable, 4-5 in. long, oblong ovate or orbicular, coriaceous, nerves 3-7 from above the rounded or subcordate base; petiole 1-2 in. long, its sheath auricled at the base and amplexicaul round the stem; tendrils 2-4 in. long. Umbels 10 or more, many-flowered; peduncles ½-1½ in. long; pedicels about ½ in. long. Sepals ½ in. long, oblong-lanceolate. Petals as long but narrower. Stamens as long as sepals. Staminodes of female flower 3. Ovary oblong; stigmas deciduous. Berry oblong or globose, red when ripe.

Common on the Siwalik range in the Dehra Dun and Saharanpur divisions and abundant in the Sub-Himalayan tracts eastwards chiefly in sal forests. Flowers in September and October, and the fruit
ripenes from December to February.—Distr. : Outer ranges of Himalaya in Kumaon; also in Bengal, Behar, Central India, Ceylon and Burma. The stems yield a strong fibre sometimes used for making brushes, and the thinner stems as tooth-sticks.

3. GLORIOSA, Linn. ; Fl. Brit. Ind. vi, 358.

Climbing herbs with leafy stems springing from a naked tuberous rootstock. Leaves alternate opposite or 3-nately whorled, lanceolate, strongly nerved and with a long spiral tendril-like apex. Flowers large, showy, solitary, axillary, pedicels reflexed. Perianth petaloid, persistent; segments 6, subequal, spreading or reflexed, margins undulate or crisped. Stamens 6, hypogynous; filaments filiform; anthers linear, dorsifixed, versatile, extrorse. Ovary 3-celled; style filiform, deflexed, with 3 subulate arms. Fruit a large coriaceous septicidal capsule. Seeds few, subglobose; testa spongy, wing-like, embryo cylindric.—Species 3 or 4, in Trop. Asia and Africa.


A tall branching glabrous herbaceous climber. Rootstock a chain of arched fleshy cylindric tubers, 6-12 in. long, budding from the convex upper side; roots fibrous. Stem annual, leafy, 10-20 ft. long. Leaves sessile or nearly so, scattered or opposite, or sometimes ternately whorled, 3-8 in. long, ovate-lanceolate, acuminate, tip spirally twisted to form a tendril, base cordate. Flowers solitary or subcorymbose towards the ends of the branches, 3-4 in. across, persistent; pedicels 3-6 in. long, deflexed from the tip; perianth segments up to 2½ in. long, linear-lanceolate with crisply undulate margins, at first erect and greenish, afterwards becoming reflexed and turning to yellow or orange and finally scarlet. Filaments golden-yellow, 1½-1½ in., spreading; anthers nearly ½ in. long. Style up to 2 in. long; the arms ½ in. Capsule linear-oblung, about 1½ in. long.

Common in Dehra Dun among bushes and eastwards along the Sub-Himalayan tracts of Rohilkhand and N. Oudh, usually in the outskirts of forests, also in Bundelkhand and Merwara. Flowers June to October. Distr. : Throughout Trop. India and in Ceylon, ascending to 5,000 ft. on the W. Himalaya, and extending to Malaya, Cochin China and Trop. Africa.
4. **IPHIGENIA**, Kunth. ; Fl. Brit. vi, 357.

Herbs with small tunicate corms and erect leafy slender stems. **Leaves** few, scattered, linear, the upper bract-like. **Flowers** small, erect, solitary or corymbose. **Perianth** petaloid, 6-partite, stellately spreading, deciduous; segments equal, narrow, clawed. **Stamens** 6, hypogynous; filaments short, flat; anthers oblong, versatile, introrse. **Ovary** sessile, 3-celled; styles 3, shortly connate below, linear, revolute, stigmatic within; ovules many in each cell. **Fruit** a loculicidal capsule. **Seeds** subglobose; testa thin; albumen fleshy; embryo small—species 4, in India, Africa, Australia and the Philippines.


Corm \( \frac{1}{2}-\frac{3}{4} \) in. in diam., narrowed into a short neck, tunicate with pale-brown sheaths. **Stems** up to 10 in. high. **Leaves** sessile, alternate, few, coriaceous, the lower ones 6-8 in. long, becoming smaller upwards, all linear, sheathing at the base; nerves obscure. **Flowers** appearing before the leaves, purple, few or many, in a terminal erect raceme; pedicels \( \frac{1}{4}-1 \) in. long; bracts linear or subulate, the lower leaf-like. **Perianth-segments** \( \frac{3}{4} \) in. long, narrow, clawed, spreading, at length reflexed. **Stamens** \( \frac{1}{4} \) in. long. **Ovary** oblong, about as long as stamens. **Capsule** oblong or subovoid, \( \frac{3}{4}-\frac{5}{6} \) in. long, obtuse, 3-grooved. **Seeds** \( \frac{1}{6} \) in. in diam., brown.

Siwalik range (Duthie). **Distrib.:** Throughout India from the N.-W. Frontier to Burma, ascending Himalaya up to 7,000 ft. and to 4-5,000 ft. on Khasia hills; also in Ceylon and extending to Australia and the Philippines.


Herbs with tunicate bulbs. **Leaves** radical, linear, lorate or oblong. **Flowers** racemose, on a simple leafless scape; bracts small. **Perianth** petaloid, persistent, stellate or campanulate; segments 6, subequal, often recurved. **Stamens** 6, adnate at or near the base of the perianth-segments; filaments usually filiform; anthers ovate or oblong, introrse. **Ovary** 3-celled; ovules few in each cell; style filiform, stigma small, capitate. **Fruit** a globose 3-lobed loculicidal capsule; cells 1-2-seeded. **Seeds** obovoid or subglobose; testa thin, black; embryo shorter than the firm albumen.—Species about 80, in Europe and Temp. Asia.

Bulb ovoid or subglobose, 1-1½ in. in diam. Leaves appearing with the flowers, 3-6 in. long, oblong to lanceolate or oblanceolate, subacute, narrowed into a sheathing petiole, rather fleshy, undulate, obtusely keeled, sometimes rooting at the tips, dull-green above and often with darker blotches, paler and glaucous beneath. Scape 2-5 in. long, rather stout. Flowers greenish-purple, in cylindrical many-flowered racemes 2-4 in. long. Bracts minute, scarious; pedicels filiform, ½ to ¾ in. Perianth-segments ¼-½ in. long, linear-oblong, obtuse. Filaments ¼ in., purple; anthers ⅓ in. long, ellipsoid; style ½-¾ in. long. Capsule ½ long, membranous.

Bundelkhand (Royle); Gwalior (Maries). Distrib.: Behar, Chota Nagpur, Bombay Presidency and S. India to Ceylon; extending to Abyssinia.


Herbs with tunicate bulbs. Leaves radical, linear or lorate. Flowers racemose or on a long leafless scape, often appearing before the leaves; pedicels short or long, articulate, bracts small. Perianth petaloid, campanulate; segments 6, subequal. Stamens 6, adnate at or near the base of the perianth-lobes, included; filaments filiform or thickened at the base; anthers oblong or linear, introrse. Ovary 3-celled, often, 3-gonous, style tapering towards the base, ovules many in each cell. Fruit an oblong 3-quetrous loculicidal capsule. Seeds usually many in each cell, compressed; testa black, marginally winged, embryo rather large, albumen fleshy.—Species about 24, in S. Europe, W. Asia and Africa.


Bulb 2-4 in. long, ovoid. Leaves appearing after the flowers, 6-18 in. long, linear, acute, nearly flat. Scape erect, 12-18 in. long, brittle. Flowers distant, drooping or spreading, greenish-white; or dingy-brown; bracts minute, soon falling. Perianth campanulate; segments ⅝ in. long, oblong-lanceolate, obtuse, with 2 or 3 strong approximate median nerves. Stamens ⅝ in. or longer; filaments flattened.

*Style* obconic. *Capsule* ellipsoid, 1½ in. long; cells 6-9 seeded. *Seeds* ¼ in. long flattened, elliptic, black.

Siwalik range (Stewart), also plentiful eastwards in the Sub-Himalayan tracts of Pilibhit and N. Oudh. *Distrib.*: W. Himalaya up to 7,000 ft.; salt range of Punjab, and south to Konkan; also in Burma, and Behar and in Chota Nagpur, extending to Trop. Africa. The bitter and nauseous bulbs are used as a substitute for the true *squill* (U. maritima), also by weavers in N. India to give substance to their thread.

Annual or perennial herbs with slender fleshy root-fibres. *Leaves* radical, linear, 3-quetrous or terete, fistular. *Flowers* racemose on a simple or branched leafless scape. *Perianth* petaloid, marcescent; segments 6, free or shortly connate below. *Stamens* 6, hypogynous, shorter than the perianth-lobes; filaments dilated at the base and embracing the ovary, the summit of the filament inserted in a pit on the back of the connective, anthers versatile. *Ovary* 3-celled; style filiform, stigma somewhat 3-lobed; ovules 2, collateral in each cell. *Fruit* a globose loculicidal capsule with rugose partitions. *Seeds* usually solitary in each cell; testa black, rugose, albumen cartilaginous, embryo rather large.—Species 6 or 7, in S. Europe and eastward to India.


Annual. *Leaves* 6-12 in. long, terete, acute, sheathing at the base finely puberulous. *Scapes* several from the root, much branched above, 1-2 ft. *Flowers* white, laxly racemose, solitary in each bract; pedicels ½ in., jointed below the middle; bracts ½ in., broadly ovate, boat-shaped, scarious, with a strong brownish keel. *Perianth* ½ in. long; segments oblong, obtuse, with a brownish costa. *Stamens* ¼ in. long, acutely 3-gonous black.

Abundant within the area as a weed of cultivation and often becoming a peat. Flowers during the cold season. *Distrib.*: Plains of India in fields, and extending westwards to the Canary Islands and the Mediterranean region. The plant and seeds are sometimes eaten in India by famine-stricken people. (See Agricultural Ledger, No. 7, of 1902, p. 155.)
Herbs with a short hard rootstock emitting many fascicled roots, often thick and fleshy or tuber-like. Leaves radical, clustered, often broad, rarely linear or lorate. Flowers laxly racemose on a simple or branching leafless scape; pedicels usually fascicled in the axils of small scarious or large membranous bracts. Perianth petaloid, marcescent or persistent, rarely deciduous; lobes free, rotate. Stamens 6, hypogynous, free or the 3 inner adnate to the perianth-lobes, included; filaments filiform, often widened above the middle, anthers oblong or linear, introrse, the filament inserted in a pit on the back of the connective. Ovary 3-quetrous, style filiform, stigma small, ovules 4 or more in each cell. Fruit a coriaceous truncate 3-quetrous loculicidal capsule. Seeds broad, usually compressed, rugose, testa black, albumen rather hard; embryo often curved and rather large.—Species about 40, in tropical and sub-tropical regions.


Root-fibres cylindric, with ellipsoid tubers hanging from them. Leaves sessile, membranous, usually ensiform, falcate, acuminate, recurved, 8 in. long or more; margins crisped or undulate. Scape terete, naked, usually longer than the leaves. Flowers white, in simple or shortly branched racemes 2-4 in. long, bracts lanceolate, acuminate, the lower ones 1/2-3/4 in. long; pedicels ascending, 1/4-1/2 in. long, jointed below the middle. Per.-segments less than 1/4 in. long, oblong-lanceolate subacute, 7-9-nerved. Stamens shorter than the perianth; anthers narrowly linear, afterwards twisted. Capsule 3 in. long, obovoid, emarginate, shining, transversely veined; cells 4-6-seeded. Seeds black.

Gorakhpur (Visary): N. Oudh, in the districts of Gonda and Bhaireich (Duthie). Distr. B: Behar and W. Bengal; Central India and from the Konkan and N. Circars to Travancore, also in Burma and extending to Abyssinia.

Allium. Linn.; Fl. Brit. Ind. vi, 337.—This genus contain over 250 species and is distributed in northern Temperate regions. The 27 species recorded in the F. B. I. as growing wild in India are nearly all confined to the Himalayan ranges. The cultivated kinds about 5, are briefly mentioned below.
Leaves fistular:—

Leaves basal only; heads dense with flowers only. . . . . A. ascalonicum.

Leaves subdistichous; heads dense, with flowers and bulbils. . . . . A. Cepa.

Leaves flat:—

Heads bearing flowers only; bulb long, cylindric, simple:—

Heads lax; filaments simple, linear. . A. tuberosum.

Heads dense; filaments 2-toothed. . A. ameloprasum.

Head lax, bearing both flowers and bulbils; bulb short, compound . A. sativum.


2. A. Cepa, Linn.; Roxb. l. c. ii, 142; F. B. I. vi, 337; Watt E. D.; A. DC. l. c. 52; Duthie in F. and G. Crops Pt. iii, p. 5; Prain Beng. Pl. 1075; Cooke Fl. Bomb. ii, 775.—Vern. Piyáj (Onion).—Leaves fistular, bifarious. Umbels dense, with both flowers and bulbils—An important cold-season crop of Northern India.

3. A. tuberosum, Roxb. l. c. 141; F. B. I. vi, 343; Watt E. D.; Prain Beng. Pl. 1076.—Vern. Banga Gandina (Hind.) (Indian Leek). Bulb long, cylindric, simple. Leaves flat. Umbels lax, bearing flowers only. Filaments simple, linear. The plant is much cultivated in Bengal. Roxburgh states that the Hindus use it as an article of diet as leeks are in Europe.—Regel cites A. tuberosum as a synonym of A. odorum, L. and Sir Joseph Hooker has suggested that it might possibly be the cultivated form of that plant.

Pl. Cult. 81.—Vern. Gandina—(The Leek). Leaves flat. Umbels
dense, bearing flowers only. Filaments 2-toothed. Bulb long,
cylindric, simple.

5. A. sativum, Linn.; Roxb. l. c. 142; F. B. I. vi, 337; Watt
E. D.; Duthie in F. and G. Crops Pl. iv, 34, t. 66; Prain Beng.
Pl. 1076; Cooke Fl. Bomb. ii, 775.—Vern. Lasun or rasun (Garlic).
Leaves flat. Bulb short, compound. Umbels lax, bearing both
flowers and bulbils.

CXII.—POTERIACEÆ.

Fresh-water and marsh herbs, erect or floating. Leafy stems
1-foliolate, springing from the buried rootstock or from the joints
of the floating stem; basal leaves long-petioled, blade floating or
upraised. Flowers 2-sexual, slightly irregular, arranged in racemes
or spikes, rarely fascioled or in panicles at the ends of 1-leaved
stems or branches; bract under the inflorescence spathe-like,
bracts under the flowers minute or obsolete. Perianth inferior,
petaloid, marcescent, usually tubular; lobes 6, sub-2-seriate,
similar or the 3 inner smaller. Stamens 6 or 3, unequally adnate
to the perianth tube or to the base of the perianth-lobes, usually
declinate, the upper shorter, filaments free; anthers usually oblong,
with 2 parallel distinct cells, dehiscence introrse, longitudinal or
porous. Ovary free, 3-celled and with axile placentas, or 1-celled
and with 3 parietal placentas, each placenta with many 2-seriate
ovules, sometimes with only one fertile ovule in each cell, anatropous,
pendulous or suspended, style filiform or columnar; stigma
terminal, entire or lobed. Fruit a dry membranous loculicidally
3-valved capsule. Seeds ovoid or ellipsoid, small, testa longitudi-
nally ribbed, albumen horny or floury; embryo central, cylin-
dric.—Species about 36, found chiefly in Trop. Africa and America.


Aquatic herbs. Rootstock short or long, clothed with leaf-
sheaths. Leaves radical and solitary at the top of the emerging
stem or branches; radical long-petioled, all cordate-ovate, sagi-
tate or lanceolate. Flowers in a raceme, sessile within the axil of
the cauline leaf and fasciculately long-pedicelled, or pedunculate
and subspicately short-pedicelled; spathe complicate below the raceme. Perianth campanulate, tube none; lobes 6, distinct, sub-equal. Stamens 6, adnate to the base of the perianth-lobes or hypogynous, one normally larger than the others and with its filament toothed on one side; anthers basifixed, dehiscing by a terminal ultimately elongated slit. Ovary ovoid, sessile, 3-celled, with many ovules in each cell, style filiform, stigma minutely 3-lobed. Fruit an oblong membranous loculicidal capsule. Seeds many, ovoid, obtuse, many-ribbed, embryo cylindric in the centre of floury albumen.—Species about 6, in the tropics of the Old World.

Rootstock elongate, creeping; leaves hastate, sagittate or cordate; flowers on long stalks, subumbellate or racemose; inflorescence centrifugal . . . . . 1. M. hastæfolia.

Rootstock short, suberect; flowers on short stalks subspicate; inflorescence centripetal:
Leaves ovate or ovate-cordate; flowers rather numerous . . . . . 2. M. vaginalis.
Leaves linear or narrowly ovate; flowers few . . . . . M. vaginalis, var. plantaginea.


Rootstock stout, creeping and rooting below, spongy, clothed with the remains of the old leaf-sheaths. Leaves 4-8 in. long, sagittate, hastate or cordate, smooth and glossy, many-nerved; petioles of floral leaves tumid above and embracing the short stout peduncle; petioles of radical leaves 1½-2 ft. long with a broad sheathing base. Inflorescence centrifugal. Flowers in racemes or subumbellate, crowded, bright purplish-blue; pedicels up to 1 in. long. Perianth-segments ½ in. long, becoming twisted round the fruit when withering; the 3 inner ones obovate and wider than the 3 oblong outer ones, all with 3 strong parallel median nerves and reticulately veined between them and towards the margins. Filament of large anther ½ in. long, with an acute horn at one side; anthers linear-oblong, the large one
blue, the others yellow. Ovary ovoid, \( \frac{1}{8} \) in. long; stigma obscurely 3-lobed. Capsule \( \frac{3}{10} \) in. long, ellipsoid. Seeds \( \frac{1}{60} \) in. long, rounded at each end, pale, with many fine brown ribs.

Abundant within the area in streams and tanks. Distr.: Throughout India and in Ceylon, extending to the Malay Islands and China.


Rootstock short, suberect, spongy. Leaves very variable, 2-4 in. long, from linear to ovate or ovate-cordate, usually acuminate; petioles of lower leaves long, stout, terete; the peduncles emerging from the sheaths of the uppermost leaves. Flowers blue, usually spotted with red, in sub-spicate racemes globose in bud and then elongating as the flowers expand, the terminal flower opening first; pedicels \( \frac{1}{2} \-\frac{1}{4} \) in. Perianth campanulate; segments about \( \frac{3}{8} \) in. long, three of them narrowly obovate, the other three much narrower. Filament of large anther \( \frac{1}{2} \) in. long, with an acute horn on one side, those of the smaller anthers filiform. Ovary \( \frac{1}{10} \) in long, ellipsoid, glandular; stigma 3-lobed. Fruit less than \( \frac{1}{2} \) in. long, glandular outside. Seeds rounded at each end, pale and with many brown ribs.

Abundant within the area in rice-fields, and on the margins of tanks. Distr.: Throughout India from Kashmir to Assam and south to Travancore; also in Ceylon and extending to the Malay Islands, China, Japan and Trop. Africa.

Var. plantaginea, Solms-Laub.; F. B. I. vi, 363; Prain Beng. Pl. 1079. Pontederia plantaginea, Roxb. Fl. Ind. ii, 123. A much smaller plant with narrower leaves and fewer flowers on the racemes. Found at Moradabad by T. Thomson and by Mrs. Bell at Banda, but is probably plentiful within the area and in other parts of India. Outside India it occurs in Java and China.

CXIII.—COMMELINACEÆ.

Herbs, prostrate or erect, rarely climbing or shrubby. Leaves costate, with sheathing bases, nerves parallel. Flowers more or less irregular, usually 2-sexual, often cymose; cymes scorpioid, straight or reduced to one flower, sometimes panicked, often enclosed in spathe-like bracts; floral bracts usually small, opposite the pedicels or obsolete, sometimes herbaceous and distichously im-
Commelinaceae.

Bricate. Perianth inferior, 6-partite; the 3 outer segments herbaceous, often persistent, the inner petaloid, free or united below in a tube, spreading above, marcescent. Stamens 6, adnate to the base of the perianth-segments, all perfect or 2 or more reduced to staminodes; filaments often bearded with jointed hairs; anthers oblong or globose, often dissimilar. Ovary free 3-or 2-celled, style terminal, stigma small; ovules solitary or few, orthotropous, on the inner angles of the cells. Fruit a loculicidal capsule or indehiscent. Seeds angled, testa smooth or rugose, albumen floary; embryo minute, far from hilum.—Species about 300, in tropical and subtropical regions.

Stamens 2 or 3, perfect, with 1-3 staminodes:—

Cymes enclosed in spathaceous bracts . 1. Commelina.
Cymes panicled; bracts not spathaceous . 2. Anklema.

Stamens 6, perfect:—

Petals united below into a tube; cymes scorpioid . . . . . 3. Cyanotis.
Petals free; cymes secund, in thyrsoid panicles . . . . . 4. Floscopa.


Herbs, usually slender or creeping below. Leaves ovate-lanceolate, or linear, with lax sheaths, petioled or not. Flowers in usually 2-fid cymes emerging one at a time from a terminal complicate or funnel-shaped or hooded spathe; flowers of the upper cyme-branch small, deciduous, of the lower fertile; fruiting pedicel and capsule retracted within the spathe. Sepals 3, membranous, the 2 inner often connate at the base. Petals 3, longer than the sepals, one larger than the others and often clawed. Stamens 3, perfect, with 2-3 imperfect; anthers oblong, one usually longer than the others. Ovary 3-rarely 2-celled, two of the cells 1 or 2-ovuled, third cell, if present, 1-ovuled or empty. Fruit a loculicidal capsule hidden in the spathe by the decurving of the pedicel after flowering, the posticous cell indehiscent or obsolete, or the 2 anticous cells empty indehiscent and connate as a ligulate body, from which the posterior cell falls away. Seeds ellipsoid or angled; testa reticulate pitted
or rugose. Species about 100, in tropical and subtropical regions.

Anterior pair of cells of ovary 2-ovuled; posterior cell 1-ovuled or obsolete:—

Capsule 3-celled, the two anterior cells loculicidally dehiscent and each usually 2-seeded; posterior cell keeled, 1-seeded and deciduous at length dehiscent:—

Leaves lanceolate; spathes complicate, the margins free, or connate only at the very base:—

Seeds reticulate, cylindric; branches of cyme 1-3-fld.; spathe sometimes cordate at base.

1. C. nudiflora.

Seeds smooth, truncate at one end; spathe always rounded at base:—

Branches of cyme equal, 1-2 fl.d.; seeds appendaged, globose at the unflattened end.

2. C. salicifolia.

Branches of cyme unequal, upper 2-4 fl.d., lower 1-2 fl.d.; seeds with out appendages, subacute at the unflattened end.

3. C. Hasskarlii.

Leaves elliptic-ovate; spathe turbinate; capsule always 5-seeded; seeds rugose.

4. C. bengalensis.

Capsule 1-celled, with 2 superposed seeds truncate and appended at both ends, or with one subglobose seed; leaves linear; spathes deeply cordate at base.

5. C. attenuata.

All the cells of the ovary 1-ovuled; capsule 3-celled, subequally 3-valved; seeds free in the cells; spathe sessile or nearly so; capsule 3-gonous-obovoid.

6. C. obliqua.


Diffuse, nearly glabrous; root fibrous. Stems 2-3 ft. or more long-branched from the base; branches prostrate or subscandent, often rooting at the rather distant nodes. Leaves sessile, 1-3 in. lanceo-
late or ovate-lanceolate, acute or acuminate; sheaths loose, glabrous, usually with ciliate margins. Peduncles \(\frac{1}{4} - \frac{3}{4}\) in. long, spreading or erect. Spathe \(\frac{1}{4}\) or \(1\frac{1}{4}\) long; base rounded or cordate, with rounded lobes. Cymes usually two, 1-3 fld. Flowers \(\frac{1}{4} - \frac{3}{4}\) in. across, the two interior petals obovate with long claws, dark blue; the exterior one subessile, orbicular, pale blue or white, sometimes obsolete. Ovary 3-celled, of which two cells are 2-ovuled and the third 1-ovuled. Capsule \(\frac{1}{4}\) in. long, broadly oblong, acuminate, coriaceous, 5-seeded. Seeds oblong-cylindric, brown, tubercled and reticulate.

Abundant within the area. Distrib.: Throughout the hotter parts of India from the Punjab to Ceylon, extending to China, S. Africa and other tropical and subtropical countries.

2. C. salicifolia, Roxb.; Fl. Ind. i, 172; Clarke in DC. Mon. iii, 157; F. B. I. vi, 370; Watt E.D.; Prain Beng. Pl. 1082; Cooke Fl. Bomb. ii, 781.

Stems slender, glabrous, decumbent, sometimes rooting from the nodes. Leaves 3-6 in. long, linear-lanceolate, glabrous or nearly so; sheaths \(\frac{1}{4}\) in. to 1 in., ciliolate. Spathe 1-2 in., axillary ovate-lanceolate, acute or acuminate, rounded at base. Peduncles \(\frac{3}{4} - 1\frac{1}{2}\) in. long, slender. Flowers polygamous; branches of cyme equal, usually 1-2-fl.d. Sepals free, ovate, obtuse, the two inner connate below, larger than the outer. Petals dark blue, the two larger ovate with undulate margins and long claws, the smaller one broadly ovate, entire, subessile or with a very short claw. Stamina nodes 3, clavate. Capsule \(\frac{1}{4}\) in. long, quadrato, membranous. Seeds \(\frac{1}{4}\) in. long, black, powdered with white, smooth, ovoid or subglobose, with a whitish membranous appendage at one end.

Dehra Dun, on the Siwalik range; Sub-Himalayan tracts of N. Oudh; Merwara in Rajputana; Bundelkand. Distrib.: Eastwards to Assam, Burma and Bengal and southwards to the Konkan and S. India, extending to Java.


Stem much branched, glabrous or pubescent, sometimes scaberulous. Leaves 1-3 in. long, narrowly lanceolate, subacute; sheaths \(\frac{1}{4}\) in. long, with a broad base, ciliate. Spathe \(\frac{1}{4}\) in. long, axillary, ovate-lanceolate, cordate at the base and with rounded lobes, glabrous scabrid or hispid; peduncles \(\frac{1}{4} - 1\) in. long. Flowers in pubescent unequal cymes, the uppermost branch 2-4-fl.d., the lower 1-2-fl.d. Capsule \(\frac{1}{4}\) in. long, quadrato, apiculate, membranous. Seeds \(\frac{1}{4} - \frac{1}{2}\) in.
long, cylindric, truncate at one end, subacute or rounded at the other, without an appendage.

From Delhi to N. Oudh, apparently not common. Distrib. : Kumaon, Bengal, Assam; and from Mt. Abu south to Konkan and Poona.


Stems 2-3 ft. long, slender, dichotomously branched from the base; branches diffuse, glabrous or pubescent, creeping and rooting below. Leaves 1-3 in. long, ovate or oblong, obtuse, sessile or shortly stalked, pubescent or villous on both surfaces; base unequal-sided, rounded cuneate or cordate; nerves 7-11 pairs; sheaths hairy; margins ciliate with rufous hairs. Spathes 1-3 together, funnel-shaped or turbinate, auricled on one side. Sepals small, oblong, hairy. Petals blue, the larger one orbicular or transversely oblong. Ovary 3-celled, two of the cells 2-ovuled, the third cell 1-ovuled. Capsule ½ in. long, pyriform, membranous, 5-seeded. Seeds closely pitted.

Moradabad (T. Thomson), Pilibhit (Duthie); Bundelkhand (Edgeworth). Distrib. : Throughout India, and up to 6,000 ft. on the Himalaya, extending to China and Trop. Africa. In this species ripe seeds are sometimes matured underground from abnormal flowers borne on leafless branches coming from the lower nodes of the stems. These flowers are white and smaller than the blue aerial ones, which often fail to produce fertile seeds.


Stem 1-3 ft. long, slender, much branched, glabrous or sparsely hairy. Leaves 1½-3 in. long, linear or linear-lanceolate, acute or subacute; sheaths ciliate, often hardly distinct from the leaf-blade, spathes 1-1½ in., narrowly ovate-lanceolate, acute or caudate-acuminate, glabrous; base deeply sagittately cordate and with large auricles. Peduncles ½-1½ in., glabrous or pubescent. Flowers small, blue. Capsule ½ in. long, 1-celled, with 2 superposed seeds truncate and appendaged at both ends, or with one subglobose seed.

Bundelkhand (Mrs. Bell) and probably in other localities within the area. Distrib. : Chota Nagpur, Behar, Central India and South to Ceylon.

6. C. obliqua, Buch-Ham. in Don. Prod. 45 (not of Vahl), Clarke in DC. Mon. iii, 178; F. B. I., vi, 372; Watt E. D.; Collett Fl.


Aneilema.]

Commelinaceae.


A tall branching herb. Stems 2-3 ft. high, stout. Leaves 4-7 in. long, very variable, sessile or stalked, lanceolate or elliptic-lanceolate, acute or caudate-acuminate, membranous, glabrous scabrous or villous; sheaths about 1 in. long, the mouth bearded with long hairs. Spathes sessile or nearly so, ½-1 in. long and as broad as long, solitary or crowded in terminal heads, acute, funnel-shaped, glabrous or somewhat scabrous, usually filled with a clear, glutinous liquid. Flowers blue, about ½ in. across, in simple racemes; large petal orbicular, clawed. Ovary 3-celled, the cells 1-ovuled. Capsule ¾ in. long, 3-celled and subsequently 3-valved, 3-gonous-obovoid. Seeds ½ in. long, oblong or ellipsoid, smooth, puberulous, lead-coloured.

Very common within the area. Distrib.: Throughout India and in Ceylon, and up to 6,000 ft. on the Himalaya; it extends also to the Malay Islands.

2. ANEILEMA, R. Br.; Fl. Brit. Ind. vi, 374.

Herbs with simple or branched stems; roots often tuberous. Leaves usually alternate, sometimes all radical, occasionally clustered under the inflorescence, usually narrow and sessile. Flowers in axillary and terminal panicles: bracts not spathaceous; bracteoles small. Sepals 3, free, membranous. Petals 3, obovate, equal. Stamens 2 or 3, filaments naked or bearded; anthers oblong, one usually smaller or longer than the others. Staminodes 2-4; rarely with minute anthers. Ovary sessile, 2-3-celled. Fruit a loculicidal capsule. Seeds 1 or more in each cell, with a thick hard rugose or pitted testa.—Species about 60, in tropical and subtropical regions, chiefly in Asia.

Cells of ovary containing 2 or more ovules, of the capsule 2-or more-seeded:—

Seeds 1-seriate in each cell; flowers in terminal or subterminal panicles:—

Cells of the ovary with 3 or more ovules, of the capsule 3-7-seeded:—

Panicles terminating an erect leafless scape with large sheathing bracts; leaves all radical, narrowly ensiform; root tuberous......I. A. scapiflorum.
Panicles terminating leafy stems; root fibrous; stem slender; leaves sessile, small, oblong, auricled; panicle small, leafy below.

Cells of ovary with 2 ovules, of capsule usually 2-seeded; panicles subterminal rarely axillary; leaves linear or lanceolate.

Seeds 2-seriate (16 or more in each cell); pedicels axillary or terminal; stem stout, sparingly branched, creeping and rooting at the nodes, leafy; leaves linear-oblong.

Cells of ovary 1-ovuled, those of capsule 1-seeded; pedicels 1-3 in the axils of distant lanceolate bracts; stem slender, decumbent and rooting at the lower nodes; leaves long, linear; roots fibrous.

1. A. scapiflorum, Wight Ic. t. 2075; F. B. I. vi 375; Clarke in DC. Mon. iii, 207; Watt E. D.; Prain Beng. Pl. 1084; Cooke Fl. Bomb. ii, 786. Commelina scapiflora, Roxb. Fl. Ind. i, 175. Murdannia tuberosa Royle Ill. 403, t. 95,—Vern. Siyah musti (Hind.).

A tufted herb, with elongate fusiform tubers. Leaves all radical, erect, 4-8 in. long, narrowly ensiform, finely acuminate and slightly narrowed to the base. Flowers in erect elongate panicles on terminal leafless scapes; scape with panicle 8-18 in. long; sheaths on scape below the panicle 2-2½ in. embracing the scape, finely acuminate with an oblique mouth; upper bracts amplexicaul, often spotted. Sepals ½ in. long, elliptic-oblong, subacute, purple-green. Petals blue, ¾ in. long, obovate. Stamens 3, perfect, all bearded with blue hairs. Capsule ¾ in. long, obovoid. Seeds 5 or 6 in each cell, superposed, sharply 3-gonous.

Siwalik range, on the Mohand Pass and in Sub-Himalayan tracts from Rohilkhand to Gorakhpur (Duthie). Distrab.: Temp. and Trop. Himalaya from the Ganges eastwards to Bhutan; also in Bengal and southwards to Travancore and Ceylon, extending to Burma and China.

Aneilema.  [COMMELINACEAE.  277.

A dwarf annual, with fibrous roots, branching from the base; branches 6-10 in., decumbent and rooting below. Leaves sessile, the lower ones broadly linear-lanceolate; the upper oblong; cordate, amplexicaul, ½-1 in. long, acute; sheaths very short. Flowers about ½ in. across, in dichotomously branched few-fld. panicles; peduncles terminal and from the upper axes; pedicels longer than the capsules; bracts minute, ovate, amplexicaul, persistent. Stamens 3, perfect; anthers blue, filaments bearded; staminodes 3, shorter than stamens, usually naked. Ovary 3-celled, cells many-ovuled. Capsule 3-gonous, the cells 3-7-seeded. Seeds 1-seriate, minute, pale.

Banda (Edgeworth, under Commelina nana). Distribs.: Throughout India and in Ceylon, extending to Malaya and China, flowering during the rains. This plant will probably be found in other localities within the area of this flora. It appears to be common in Bengal as a field weed.


Roots fibrous. Stem simple or branched from the base; branches 6-12 in., procumbent and often rooting at the nodes. Leaves 2-5 in. long, linear-oblong or lanceolate, acute or acuminate, flat, glabrous or sparingly villous, base cordate rounded or narrowed into the sheath; sheaths hairy, the margins and mouth strongly ciliate. Flowers in subglobose or subcorymbose cymes at the ends of the branches of a terminal (rarely axillary) panicle; pedicels ½-½ in. long; bracts boat-shaped, caducous. Sepals ½ in. long, oblong, obtuse. Petals equal, suborbicular, blue or purple. Stamens 2 perfect, 2-4 sterile, filaments or perfect stamens only or all bearded with moniliform blue hairs. Ovary 3-celled; cells 2-ovuled. Capsule ½ in. long, subglobose, mucronate, 3-celled, with 3 seeds in each cell. Seeds 1-seriate, tuberculate, dark brown, truncate at one end, rounded at the other; inner face angular, outer face convex.

Dehra Dun and Saharanpur districts; Bundelkhand (Edgeworth), flowering during the rains. Distribs.: Throughout India and on the W. Himalaya up to 6,000 ft.; Khasia Hills and Burma, and from Bengal and Bombay southwards to Ceylon, extending to China and the Malay Islands.

COMMELINACEÆ. [ANEILEMA.

Stem 6-12 in. long, creeping and rooting at the nodes, leafy, sparingly branched. Leaves sessile, flat, 1½-2 in. long, linear-oblong, acute or subacute, glabrate, base cuneate. Peduncles ½-1½ in., rigid; pedicels axillary or terminal. Petals white or pink. Filaments all naked. Capsule linear-oblong, acute, 1½ in. long, Seeds 2-seriate, about 16 or more in each cell, seabrid or flocculent.

Upper Gangetic Plain, usually in wet ground; Moradabad (T. Thomson). Distrib. : Eastwards to Bengal and Assam and extending to Java.

5. A. vaginatum, R. Br. Prod. 271; Clarke in DC. Mon. iii, 216; F. B. vi, 381; Prain Beng. Pl. 1084; Cooke Fl. Bomb. ii, 79.

Root fibrous, the fibres stout and almost fleshy. Stem decumbent, 6-18 in. long, rooting at the lower nodes, very slender, flaccid; branches suberect, ending in filiform peduncles with distant bracts. Leaves 3-8 in. long, linear, acuminate, flat; sheaths short, open, ciliate. Flowers small, 1-3, fascicled in the axils of distant bracts along the filiform terminations of the branches; bracts ½-1½ in. long, strongly ribbed; pedicels very slender, puberulous, usually twice-jointed Sepals ½ in. long, obtuse. Petals orbicular, blue. Stamens 2, perfect, and with bearded filaments; sterile stamens 3-4, usually naked and shorter. Ovary 2-celled; cells 1-ovuled. Capsule globose, cuspidate; cells 1-seeded or empty. Seeds 3-gonously conic, truncate at one end narrowed at the other, slightly rugose, black.


3. CYANOTIS, Don; Fl. Brit. Ind. vi, 384.

Herbs, prostrate or creeping. Leaves small. Flowers in axillary and terminal scorioid cymes, formed of large imbricate 2-seriate secund foliaceous falcate bracteoles, the petals and stamens alone exserted, rarely with the corolla-tube exserted; flowers sometimes in exposed racemes or fascicled in the ochreate leaf-sheath. Sepals 3, subequal, free or connate below. Petals 3, subequal, often united in a tube below, limb orbicular. Stamens 6, all perfect, subequal, hypogynous or epigynous; filaments usually bearded, often inflated towards the apex, anthers oblong. Ovary 3-celled; ovules 2 in each cell, collateral, one erect the other pendulous. Fruit a 3-celled loculicidal capsule. Seeds usually 2 in each cell, superposed, cubical or pyramidal, usually rugose.—Species 35,
in the warmer regions of the Old World, from Africa and through India to S. China and N. Australia.

Flowers in cymes, enclosed in 2-seriate falcate imbricating bracteoles:—

Roots fibrous; stem and branches slender; leaves ovate-oblung, glabrous or with spreading hairs . . . . . . 1. C. cristata.

Roots tuberous; stem and branches stout; radical leaves ensiform; cauline lanceolate, hirsute . . . . . . 2. C. tuberosa, var. adscendens.

Flowers axillary, enclosed in the sheaths of the leaves; bracteoles small, slender, not imbricating . . . . . . 3. C. axillaris.

1. C. cristata, Schult. f. Syst. vii, 1150; Clarke in DC. Mon. iii, 247; F. B. I. vi, 385; Collett Fl. Siml. 534; Prain Beng. Pl. 1085; Cooke Fl. Bomb. ii, 794. Tradescantia imbricata, Roxb. Fl. Ind. ii, 120.

A slender branching herb with fibrous roots. Stem branched from the base; branches 6-18 in. long, creeping and rooting below, glabrous or with spreading hairs. Leaves sessile, ovate-oblung, flat, glabrous or sparsely hairy, the margins softly ciliate, base rounded or cordate; sheaths short, hairy. Flowers in scorioid recurved cymes which are longer than the bracteoles; peduncles ¼-4 in. long; bracts leaflike, ⅓-⅔ in. long, ovate, cordate, acuminate, ciliate; bracteoles ½ in. long, glabrous or ciliate with long hairs. Sepals lanceolate, acuminate. Filaments bearded above. Style naked. Capsule ¼-½ in. oblong, 3-gonous, truncate, nearly glabrous. Seeds ⅛ in. long, striate and with 2 large pits on two of the faces, black.

Bundelkhand (Edgeworth under C. imbricata). DISTRIBUTION: Throughout Trop. India, in hilly districts, and up to 4,000 ft. on the W. Himalaya; also in Burma, Ceylon, and Malay Islands, extending to Trop. Africa.


A creeping herb, with proliferous rooting nodes. Root of fusiform tubers. Stem up to 3 ft. long, swollen and hairy at the base. Leaves sessile, the radical and lower cauline 6-10 in. long, linear or ensiform
COMMELINACEÆ. [CYANOTIS.]

Villous, often purple beneath; upper cauline leaves much shorter; sheaths of radical leaves about 1 in. long, glabrous, those of cauline leaves shortly silky. Cymes ½-1 in. densely hairy, in the axils of short falcately decurved ovate acute bracts; bracteoles many, imbricate in 2 series. Sepals ½ in. long, linear-lanceolate, acute, densely villous and ciliate. Corolla ⅓ in. long, bluish-purple; lobes ⅔-⅜ in. ovate, subacute. Filaments—spirally twisted, densely bearded with blue hairs. Style thickened and with a tuft of hairs at the tip. Capsule ⅛ in. long, ellipsoid, hairy on its upper half. Seeds brown, obscurely rugose.

Agra (Jacquemont). Distrib.: Chota Nagpur; Bombay Pres. to S. India and Ceylon. A smaller and more glabrous plant than the type; flowers blue. The type occurs in W. India from the Konkan and southwards to Travancore.

3. C. axillaris, Schult. f. Syst. vii, 1154; Clarke in DC. Mon. iii, 244; F. B. L. vi, 388; Watt E. D.; Prain Beng. Pl. 1085; Cooke Fl. Bomb. ii, 795. Tradescantia axillaris, Linn.; Roxb.; Fl. Ind. ii, 118.

Roots fibrous. Stem annual, 6-18 in. long, stout or slender, diffusely branched, leafy, glabrous; branches suberect or creeping below or prostrate, glabrous or sparsely hairy, often coloured. Leaves sessile, 2-6 in. long, narrowly linear or linear-lanceolate, acute or acuminate, flat, more or less hairy; sheaths ¼ to ⅜ in., inflated, ciliate. Cymes reduced to axillary fascicles of violet-blue flowers clustered in the inflated sheaths; bracteoles small, almost concealed in the leaf-sheaths. Sepals ⅓ in. long, lanceolate, acuminate. Corolla-lobes broadly ovate, subacute. Filaments fusiform below the tip, bearded. Capsule about ½ in. long, oblong-ellipsoid, beaked, glabrous except the beak. Seeds ⅔ in. long, oblong, compressed, truncate at base rounded at the apex and with a very short conical tip, mottled with dark-brown and shining.

Bundelkhand, in marshy ground (Edgeworth); Agra (Munro); Rohilkhand, Cawnpore and N. Oudh (Duthie), etc. Distrib. Throughout India, in the plains, and in Ceylon, extending to Trop. Australia.


Erect or subscendent herbs. Leaves lanceolate. Flowers in terminal or axillary panicles of secund but not scorpioid cymes, bracts minute. Sepals 3, oblong, free. Petals 3, obovate, free. Stamens 6, all perfect or 1 imperfect; filaments filiform,
glabrous. Ovary 2-celled, style simple, ovules solitary in each cell. Fruit a compressed or didymous loculicidal 2-celled capsule. Seeds solitary in each cell, hemispheric.—Species about 12, in the warmer regions of the world.


Root fibrous. Stem rather slender; erect or subscandent, often creeping and rooting below; internodes long; branches ascending leafy below, glabrous or hairy. Leaves subsessile, 2-4 in. long, elliptic-lanceolate, acuminate, much narrowed at the base, scaberulous above; sheaths loose, short, glabrous or villous, the mouth fringed with long hairs. Panicles shortly stalked, pyramidal, with long erect or ascending many-fld. branches. Flowers small, pedicelled, subglobose, the lower ones bracteate, the upper without bracts. Sepals 10-15 in. long, rotund-ellipsoid, villous, Petals longer than sepals, broadly obovate, white lilac or pink. Filaments equal, longer than petals, purplish; anthers yellow. Ovary glabrous. Capsule 10-15 in. in diam., rather broader than long, abruptly acute at both ends, shining. Seeds transversely wrinkled on the back.

Dehra Dun, at Nala Pani, and probably elsewhere in marshy ground, within the area of this flora. **Distrib.** Throughout Trop. India and in Ceylon, extending to China and Trop. Australia.

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**CXIV.—JUNCAEÆ.**

Erect usually perennial herbs. Stems tufted or with a creeping rootstock. Leaves flat, terete or reduced to sheaths. Flowers small, in axillary cymes, 2-sexual, green or whitish and membranous, or brown and coriaceous, bracts small. Perianth inferior, segments or lobes 6, more or less 2-seriate, persistent, imbricate. Stamens 6, rarely 3, hypogynous or on the bases of the perianth segments, occasionally those of the inner series obsolete, filaments filiform, anthers basifixed. Ovary superior, 3 or 1-celled; style simple, with 3 brush-like stigmas; ovules 3, basilar in the 1-celled ovaries or many on the inner angles of the 3-celled ovaries, anatropous. Fruit a 1-3-celled capsule, loculicidally 3-valved. Seeds
erect; testa membranous, often produced at each end, albumen dense; embryo small, near the hilum.—Species about 200, cosmopolitan, but chiefly in damp cold regions.


Perennial, rarely annual, glabrous herbs. *Stems* simple under the inflorescence. *Leaves* radical or few near the base of the stem, linear or terete or reduced to sheaths. *Flowers* small, usually clustered in fascicles or 2-fld. cymules, either sessile or capitate or unequally peduncled and paniculate, the whole inflorescence terminal or sub-terminal on the scape-like stems, with 13 leafy bracts. *Perianth* with 6 free lanceolate or oblong glume-like segments, often with scarios edges, the 3 outer keeled or with a thickened midrib. *Stamens* 6, rarely 3, hypogynous or nearly so, anthers oblong or linear, erect, with longitudinal introrse dehiscence. *Ovary* free, 3 or 1-celled, style filiform; stigmatic arms 3, often spirally twisted. *Frut* a capsule, dehiscing by 3 valves with mesial placentas, rarely by 3 valves leaving the placentas persistent or connate in a central column. *Seeds* small, ovoid; testa striate reticulate or transversely lineate; embryo small, near the base of the fleshy albumen.—Species about 160, in temp. or arctic regions, rarely tropical.

Annual, leaves not septate; stems much branched; cymes scattered, few-flowered; lateral flowers 6-androus, terminal 3-androus 1. **J. bufonius.**

Perennial, leaves indistinctly and distantly septate; cymes terminal; flowers densely clustered in small heads, flowers all 3-androus . . . . . . . 2. **J. prismatocarpus.**

1. **J. bufonius,** Linn. Sp. Pl. 328; Royle Ill. 401; F. B. i, 392; Collett Fl. Simul. 535; Prain Beng. Pl. 1088.

A small pale-green tufted annual, up to 12 in. high. *Stems* erect or ascending, slender, much dichotomously branched from the base. *Leaves* few, chiefly radical, not septate, channelled above. *Cymes* many, scattered on the stem; bracts scarious. *Flowers* solitary or clustered, ½ in. long; the lateral ones open, 6-androus, terminal closed, 3-androus. *Sepals* and *petals* unequal lanceolate, acuminate, the margin broadly membranous. *Stamens* half as long as the
petals. Capsule shorter than and closely embraced by the perianth, obovoid, mucronate. Seeds very minute, finely reticulate.

Dehra Dun, Saharanpur, Etawah, and Merwara (Duthie); Agra (Munro); Moradabad (T. Thomson); Bundelkhand (Mrs. Bell). Distr.: Plains of N. India and up to 13,000 ft. on the Himalayan ranges; extending to China, S. Africa, Europe (including Britain) to the Arctic regions.


A perennial cespitose herb; rootstock very short. Stem erect, 18-24 in. long, terete or compressed, sometimes decumbent and rooting at the nodes. Leaves few, 2-10 in. long, shorter than the stem, soft, terete or flat or sometimes tubular and indistinctly externally septate. Cymes erect, irregularly compound; heads hemispheric, densely 6-10-fld.; lower bract leaf-like, erect, shorter than the cyme; floral bracts hyaline, lanceolate-acuminate. Flowers green or brown, in small sessile clusters in the axils and at the ends of the unequal branches of an erect terminal panicle. Sepals glume-like, ⅓-½ in. long. Stamens 3, much shorter than the perianth. Style short, stigmas long. Capsule equalling or longer than the perianth, prismatic or conical. Seeds minute, reticulate.

N. Oudh, in the Kheri district, Merwara, in tanks (Duthie); also probably in many other localities within the area of this flora, in wet ground. Distr.: Common in the plains of Bengal and the Punjab and up to 10,000 ft. on the Himalaya; also on the Bombay Ghats and the Khasia Hills and extending to Ceylon, Burma and Australia.