

**FASCICLES
OF
FLORA OF INDIA**

FASCICLE 17

PAPAVERACEAE & HYPECOACEAE

H. S. DEBNATH AND M. P. NAYAR

BOTANICAL SURVEY OF INDIA

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PAPAVERACEAE†

A. L. de Juss. Gen. Pl. 235. 1789

H. S. DEBNATH* AND M. P. NAYAR*

Annual or perennial herbs, very rarely shrubs or trees, with latex. Leaves alternate, rarely opposite or whorled, entire to pinnately or palmately cleft, exstipulate, indumentum of small or barbellate hairs. Inflorescences cymose, rarely subumbellate or paniculate. Flowers solitary. Sepals 2 (-3), free, rarely united, caducous, imbricate. Petals 4-6 (rarely 8-12 or absent), in 1-2 (-3) whorls, free, imbricate, often crumpled in bud. Stamens usually numerous; anthers 2-loculed, dehiscing lengthwise; filaments filiform to winged. Ovary superior, unilocular, rarely bilocular; carpels 2-many; ovules numerous on parietal placentae, rarely solitary and basal, anatropous or campylotropous; styles usually 1 or obsolete; stigmas of different forms, disc like, capitate, 2-partite or 2-lobule, as many as carpels, alternate or opposite with placentae. Fruit a capsule, dehiscing by valves or pores, rarely indehiscent. Seeds usually small, smooth or striate or reticulate-pitted, with or without aril; embryo minute; endosperm oily and mealy.

26 genera and about 200 species in the temperate and subtropical regions of northern hemisphere, including eastern Asia and western north Africa. 5 genera and 26 species reported from India.

The family Papaveraceae is included in the order Papaverales by Cronquist (Evoln. & Classif. Fl. Pl. 154. 1968), Takhtajan (Flowering Plants: Origin and Dispersal 208, 1969); while Thorne [Aliso 6(4) : 57-66. 1968] included it in the order Berberidales, Engler (Syll. der Pflanzenfam. 120. 1898) and Hutchinson (Evoln. & Phyl. Fl. Pl. 505. 1969) in the order Rhoeadales and Bentham & Hooker f. (Gen. Pl. 1 : 49. 1862) in the order Parietales. Fumariaceae is recognised as a separate family by Cronquist, Takhtajan and Hutchinson. While Thorne, Engler and Bentham & Hooker f. included Fumariaceae in the family Papaveraceae itself. Takhtajan considered the genus *Hypecoum* as a separate family Hypecoaceae in the order Papaverales.

† Editor for Fam. Papaveraceae : N. C. Nair, Botanical Survey of India, Coimbatore.

* Botanical Survey of India, Howrah-711 103.

- 1a. Stigma lobes alternate to placentae. Capsules opening throughout its length:
 - 2a. Leaves ternately dissected into narrow segments. Sepals forming a hood or calyptra like cap. Stigmas 4-6 ...3. **Eschscholtzia**
 - 2b. Leaves pinnatifid-pinnatipartite. Sepals not forming any hood or calyptra like cap. Stigmas bifurcate ...2. **Dicranostigma**
- 1b. Stigma lobes opposite to placentae. Capsules usually opening by pores or by short valves, rarely throughout its length:
 - 3a. Styles absent. Stigmas discoid. Capsules opening by pores just beneath the persistent stigmas ...5. **Papaver**
 - 3b. Styles present or inconspicuous. Stigmas not discoid. Capsules opening by usually short valves:
 - 4a. Styles distinct, conspicuously broad and large. Stigmas forming a globular mass over the ovary ...4. **Meconopsis**
 - 4b. Styles inconspicuous (rarely very short). Stigmas not forming a globular mass over the ovary ...1. **Argemone**

1. ARGEMONE

L. Sp. Pl. 508. 1753; Gen. Pl. ed. 5 : 225. 1754; Benth. & Hook. f. Gen. Pl. 1 : 52. 1867; Hook. f. *et* Thoms. in Hook. f. Fl. Brit. Ind. 1 : 117. 1874; Fedde in Engl. Pflanzenr. 4, 104 : 271. 1909; Ownbey, Mem. Torrey Bot. Club 21(1) : 1-159. 1958.

Erect, prickly, often glabrous, annual herbs with yellow latex. Leaves petiolate, inciso-pinnatifid, sinuate-lobulate, middle and upper elliptic-oblong, lower obovate or oblanceolate, margin toothed, terminating into prickle, smooth to prickly. Buds subspherical to elliptical, oblong or obovate. Flowers white, yellow or orange, terminal, solitary, pedunculate. Stamens numerous, 2-loculed; filaments filiform; anthers linear, basifixed. Ovary ovate-oblong or subfusiform, unilocular, placentae parietal, ovules numerous; styles very short or obsolete; stigmas radiating, 3-7 lobed, lobes opposite the placental strands. Capsules elliptical to oblong, lanceolate or ovate, prickly (except *A. mexicana* f. *leiocarpa*) dehiscent by 3-6 short valves. Seeds numerous, subspherical-spherical, pitted.

Distrib. : *Argemone* consisting of about 22 species, is an exclusively American genus with the exception of one species which is endemic to the

Hawaiian Islands, but some species are naturalized as weeds in most of the warm countries of the world. In India the genus is represented by 3 species.

Ecol. : In India the species of this genus occur as weeds in the disturbed and waste places along roadways, fields and intermountain plains from sea level to 2000 m.

Key to the species

- 1a. Flowers bright yellow; stigmatic lobes closely crowded together and appressed to the styles at anthesis; styles inconspicuous, 0-1 mm long in fruit ...1. **A. mexicana**
- 1b. Flowers white (turning pale yellowish with age); stigmatic lobes divergent and not appressed to the styles; styles conspicuous in fruits, 1-3 mm long:
 - 2a. Capsules lanceolate or ovate-lanceolate. Sepal horns 6-8 mm long. Leaves whitish green, whitish tinge prominent along the midribs and veins ...2. **A. ochroleuca**
 - 2b. Capsules subellipsoid to subfusiform. Sepal horns 10-14 mm long. Leaves pale green ...3. **A. subfusiformis**

1. **Argemone mexicana** (Tournef. Elemens de Bot. P. 204, t. 121. 1694 et Inst. Ref. Herb. 1 : 239, 2 : t. 121. 1700) L. Sp. Pl. 508. 1753; Hook. f. et Thoms. in Hook. f. Fl. Brit. Ind. 1 : 117. 1874; Cooke, Fl. Pres. Bomb. 1 : 27. 1901 (Repr. ed. 1 : 29. 1958); Duthie, Fl. Upper Gang. Pl. 1 : 36. 1903 (Repr. ed. 1 : 37. 1960); Prain, Beng. Pl. 1 : 216. 1903 (Repr. ed. 1 : 142. 1963); Gamble, Fl. Pres. Madr. 1 : 35. 1915 (Repr. ed. 1 : 25. 1957); Haines, Bot. Bih. & Or. 1 : 23. 1921 (Repr. ed. 1 : 24. 1961); Kanjilal *et al*, Fl. Assam 1 : 65. 1934; Ownbey, Mem. Torrey Bot. Club 21(1): 29. 1958; Hara, Fl. East. Himal. 1 : 103. 1966; Santapau *et al* in Bull. Bot. Surv. Ind. 8, suppl. No. 1 : 8. 1966; Gandhi in Sald. & Nicol. Fl. Hassan Dist. 71. 1976; Bhandari, Fl. Ind. Desert 30-31. 1978.

Bhar-bhand, *Farangi-dhutura*, *Piladhutura*, *Shial-kanta* (Hind.); *Barosial kanta*, *Sial-Kanta* (Beng.); *Darudi* (Guj.); *Brahmadanti* (Mal.); *Bhat kateya*, *Bhatmil*, *Bherbhand*, *Kandiari*, *Katci*, *Satyanasa*, *Sialkanta* (Punj.); *Brahmadandi*, *Srigala kanta* (Sans.); *Birama-dandu*, *Kurukkumckedi* (Tam.); *Brahmadandi-chettu* (Tel.); *Baramdandi* (Urdu); *Kantukusam* (Or.).

Annuals, 30-125 cm tall, divaricately branched, spinescent or devoid of spines (in *f. leiocarpa*). Leaves sessile, semi-amplexicaul, elliptic-oblong,

3-22×2-8 cm, pinnatifid, sinuate-lobulate, segments inciso-dentate, margins acute, toothed with spines, lower surfaces prickly, upper surfaces smooth or both upper and lower surfaces of the leaves totally smooth (in *f. leiocarpa*). Buds 0.9-2.4×0.6-1.2 cm, very sparingly prickly or totally smooth (in *f. leiocarpa*). Flowers 4-7 cm in diam., subtended by 2-3 foliaceous bracts. Sepals 0.8-1.2×0.5-0.7 cm, sepal horns 6-9 mm long, imbricate, caducous. Petals 4-6, obovate. Stamens 8-10 mm long; anthers 2 mm long. Ovary ovate, 8-15×3-6 mm. Capsules oblong or elliptic-oblong, 1.0-3.9×0.5-2.1 cm, largest spines 4-9 mm long or the surfaces totally smooth (in *f. leiocarpa*). Seeds 1.6-2.0 mm long, deeply reticulate-suborbiculate.

1a. Plants spinescent ... *f. mexicana*

1b. Plants glabrous, devoid of any spines except leaf margin ... *f. leiocarpa*

f. mexicana

Type : Mexico : Jamaica, Carribies & S. Europe, Herb. Linn. No. 670/1 (LINN).

Fls. : Feb.-Mar. ; *Frts.* : Mar.-May.

Distrib. : INDIA : Throughout India, between sea level to 1500 m. Native of WEST INDIES.

Uses : The yellow juice of this plant is used as a medicine for dropsy, jaundice and cutaneous affections. It is also diuretic, relieves blisters and heals excoriations and indolent ulcers. The seed oil is used as a medicine for ulcers and eruptions.

Pollen : 3-colpate, zonal, operculate, operculum occupies much greater part of the colpa, margocolpate. Lumina more or less circular or angular at pole and margin of the colpa, large and sinuous at mesocolpium. Sporodum with uniform nexine thickness [Layka in *Pollen et Spores* 18(3) : 351-375. 1976].

Chr. No. : n=28 (Kaul in *Sci. & Cult.* 32 : 462-463. 1966); n=14, 28 (Mary *et al* in *Chromosome Inf. Serv.* 16 : 11-12. 1974).

f. leiocarpa (Greene) G. B. Ownb. Mem. Torrey Bot. Club 21(1). 37. 1958; Malik & Grover in *Indian Forester* 95 (2) : 123-124. 1969. *A. leiocarpa* Greene in *Pittonia* 3 : 345. 1898; Fedde in *Engl. Pflanzenr.* 4, 104 : 278, fig. 36 E. 1909.

Type : Charles L. Pollard, G. N. Collins and E. L. Mooris 2, collected at Key west Florida (Plants of subtropical Florida) March 9, 1899 (Lectotype ND; Isolectotype F, NY, US).

Fls. : Jan.-Mar.; *Frts.* : Feb.-Apr.

Distrib. : INDIA : Rajasthan (Udaipur).

Chr. No. : $n=14$, 28 (Mary *et al* in *Chromosome Inf. Serv.* 16: 11-12. 1974).

2. *A. ochroleuca* ssp. *ochroleuca*

A. ochroleuca Sweet, Brit. Fl. Gard. 3 : t. 242. 1829; Jafri *et* Qaiser in Nasir *et* Ali, Fl. W. Pak. 61 : 22. 1974; Nair in Rec. Bot. Surv. Ind. 21(1) : 7-8. 1978.

Fig. 1

Satyanashi (Punj.).

Annuals or perennials, 15-100 cm tall. Leaves oblanceolate, sinuate to pinnatifid, basal leaves deeply lobed, lobes oblong. Buds $0.8-1.5 \times 0.4-0.9$ cm. Flowers 2.5-3.5 cm across, subtended by 2-3 foliaceous bracts. Sepals 3, $8-12 \times 5-7$ mm. Petals 6, obcuneate-obovate, $2.8-3.0 \times 1.8$ cm. Stamens 0.8-1.0 cm long. Ovary $8-10 \times 5$ mm; stigmas 5-lobed. Capsules 1-4 (excluding style) $\times 0.4-1.7$ cm. Seeds 1.5-2.0 mm diam., finely reticulate.

Type : Cultivated in Britain from seeds collected in Mexico.

Fls. : Feb.-Apr.; *Frts.* : Apr.-June.

Distrib. : INDIA : A common weed in fields and embankments, Punjab, Delhi, Uttar Pradesh; Native of MEXICO.

Pollen : 6-pantocolpate, operculate, operculum confined to the middle region of the colpa, the other surface not occupied by operculum, finely granulate, certain colpa non-operculate. Lumina more or less circular or angular at pole and margin of the colpa, large and sinuous at mesocolpium. Sporodum with nexine thickness thrice at pole than that of the meridional region [Layka in *Pollen et Spores* 18(3) : 351-375. 1976].

Chr. No. : $n=14$ (Ernst in *Contr. Dudley Herb.* 5, 5 : 137-139. 1959); $2n=28$, 56 [Ownbey in *Mem. Torrey Bot. Club* 21, 1 : 1-159. 1958].

3. *A. subfusiformis* Ownb. in Brittonia 13 : 102, figs. 12-14. 1961; Malik & Grover in Indian Forester 95(7) : 480-481. 1969 *et* in Sci. & Cult. 41(5) : 220-223. 1975.

Annuals or subperennials, 40-100 cm tall. Leaves lobed, sinuses equal, margins dentate, teeth acute, lower surface prickly, upper surface very smooth. Buds $1.5-2.0 \times 0.8-1.2$ cm. Flowers 2.8-4.6 cm across. *Petals* cuneate, suborbicular. Stigmas 1.5-2.0 mm long. Capsules 3.9-4.5 (incl.



Fig. 1 : Habit of *Argemone ochroleuca* Sweet

stigma) $\times$ 1.4-1.5 cm, 3-4(-5) carpellate. Seeds more or less rounded, 1.8-2.5 mm long.

Type : ARGENTINA : LA RIOJA : Dept. Famatina, alt. 1620 m, 6th Feb.' 1942, T. Meyer 4243 (GH).

Fls. & Frts. : Apr.-Nov.

Distrib. : INDIA : Rajasthan (Udaipur); Native of ARGENTINA, BOLIVIA, CHILE, PERU, EUCADOR.

Pollen : 4-colpate, zonal, operculum occupies much greater part of the colpa. Lumina more or less circular or angular at pole and margin of the colpa, large and sinuous at mesocolpium. Sporodum with nexine thickness more at pole than that of the meridional region [Layka in *Pollen et Spores* 18(3) : 351-375. 1976].

Chr. No. : $n=14$, 28 (Mary *et al* in *Chromosome Inf. Serv.* 16 : 11-12. 1974).

Notes : Malik & Grover (*l. c.*) reported this species from Udaipur, Rajasthan. *A. subfusiformis* is distinguishable from *A. ochroleuca* by having larger flowers and subellipsoid-subfusiform capsules and from *A. mexicana* by oblong buds with larger sepal horns and spindle-shaped capsules.

2. DICRANOSTIGMA

Hook. f. *et* Thoms. Fl. Ind. 1 : 255. 1855; Fedde in Engl. Pflanzenr. 4, 104 : 210. 1909. *Chelidonium* subg. IV *Dicranostigma* Prain in Bull. Herb. Boiss. 3 : 576. 1895.

Annual or perennial, glaucous, puberulous herbs with woody root. Stems many, lower part without leaf, branched, alternate leafy bracts above. Leaves mainly radical, petioled, pinnatifid-pinnatipartite, segments distant, rhomboid, acute, sharply cut, terminal trifid. Pedicels ebracteate. Sepals 2, ovate. Petals 4, orange or yellow. Stamens many. Stigma lobes alternate to placentae. Capsules narrowly cylindrical or linear, softly hairy or glabrous. Seeds not cristate.

Distrib. : Ca 3 species in HIMALAYA and W. CHINA. In India the genus is represented by 1 species.

Dicranostigma lactucoides Hook. f. *et* Thoms. Fl. Ind. 255. 1855. *Stylophorum lactucoides* (Hook. f. *et* Thoms.) Benth. & Hook. f. Gen. Pl. 1 : 53. 1862; Hook. f. *et* Thoms. in Hook f. Fl. Brit. Ind. 1 : 119. 1872; Rau & Rao in Bull. Bot. Surv. Ind. 3 : 29. t. 1, 1961.

Plants 20-60 cm long, puberulous. Stems 3 or 4, slender, erectly branched above, ending with terminal flower. Leaves pinnatifid-pinnatipartite, segments 4-6 paired, radical leaves 12-25×3-5 cm, cauline 2.5 cm long; petioles 3.5-5.0 cm long, winged. Pedicels 5.0-7.5 cm long, slender. Sepals 1.5-2.0 cm long, acute, puberulous, horned at apex. Petals 2.5 cm long, orange. Stamens many; anthers linear-oblong. Ovary narrowly ovate, puberulous; styles distinct, 5 mm long; stigmas mitriform, crowned. Capsules 5.0-6.0×0.5 cm, cylindrical, acute, soft hairy. Seeds numerous, small, punctate.

Type : Himalaya : Garhwal, Rogila, 3333 m, *Strachey & Winterbottom* 3 (K).

Fls. : June-Aug.; *Frts.* : Sept.-Oct.

Distrib. : INDIA : Himalaya, recorded between 2700-4000 m, Uttar Pradesh; NEPAL.

3. ESCHSCHOLTZIA

Chamisso in Nees, *Horae Phys. Berol.* 74, t. 15. 1820; Benth. & Hook. f., *Gen. Pl.* 1 : 54. 1862; Fedde in Engl. *Pflanzenr.* 4, 104 : 144. 1909; Fedde in Engler & Prantl, *Natur. Pflanzenfam.* ed. 2, 17 b : 81. 1936; Jafri *et* Qaiser in Nasir *et* Ali, *Fl. W. Pak.* 61 : 25. 1974.

Annual or perennial glaucous herbs. Sap watery. Leaves ternately dissected into narrow segments, alternate, petioled. Flowers solitary, terminal or axillary, long pedicelled, large, showy. Torus turbinate with a broad, flat or recurved border surrounding the base of pistil, inner edge of which calyx, corolla, stamens inserted showing perigynous appearance. Sepals 2, oblong, deciduous, connate, forming a hood or calyptra like cap which is pushed off by the expanding petals. Petals 4, free, whitish or yellow. Stamens many, inserted at the base of petals; anthers long; filaments shorter than anthers, dilated base. Ovary linear, ribbed; styles very short; stigmas 4-6, filiform, unequal. Capsules linear, with a narrowed base, dehiscing by 2 valves from base to apex, ribbed. Seeds numerous, globose, reticulate.

Distrib. : *Eschscholtzia* consisting of about 10 species, distributed mostly in north America; in India the genus is represented by only one species.

Eschscholtzia californica Chamisso in Nees, *Horae Phys. Berol.* 74, t. 15. 1820; Fedde in Engl. *Pflanzenr.* 4, 104 : 154. 1909; Fedde in Engler & Prantl, *Natur. Pflanzenfam.* ed. 2, 17 b : 81. 1936; Jafri *et* Qaiser in Nasir *et* Ali, *Fl. W. Pak.* 61 : 26. 1974; Nair in *Rec. Bot. Surv. Ind.* 21, No. 1: 8. 1978.

Perennial, erect to diffuse herbs. Stems 30-50 cm tall, quadrangular scapose or leafy, dichotomously branched, glabrous or nearly so. Leaves 10-30 cm long, alternate, radical or cauline, ternately dissected into very narrow; segments linear, *ca* 1 mm broad, acute or subobtuse. Petioles 5-20 cm long, becoming shorter in the upper leaves. Flower buds ovate, 2.0-2.5 × 1.0-1.5 cm. Pedicels 6-20 cm long. Flowers solitary, axillary or terminal, 4-8 cm in diameter, showy. Sepals 2, united into a calyptra, deciduous, conical, *ca* 2 cm long, outer spreading rim of the receptacle 3-4 mm broad with parallel striations, inner rim erect, short. Petals 4, 1.5-6.0 × 1.0-4.0 cm, yellow, broadly obovate, shortly clawed. Stamens many; anthers 4-6 mm long, linear-lanceolate, basifixed, ditheceous; filaments short, 3-5 mm long. Ovary *ca* 8-10 mm long; styles short; stigmas 4, filiform, unequal, 3-4 mm long. Capsules 7-10 × 3-4 mm, longitudinally prominently ribbed, glabrous, dehiscent by 2 valves, straight. Seeds 2 mm in diameter, black, globose, reticulate.

Type : USA, 1820, Chamisso (B, P, W); USA, Douglas (K).

Fls. : Feb.-June; *Frts.* : May-Aug.

Distrib. : INDIA : Cultivated in Gardens as an ornamental plant, often runs wild; Native of NORTH AMERICA (CALIFORNIA, OREGON).

4. MECONOPSIS

Vig. Hist. Pavot. 48. 1814; Hook. f. *et* Thoms. in Hook. f. Fl. Brit. Ind. 1 : 118. 1872; Fedde in Engl. Pflanzenr. 4, 104 : 247. 1909 *et* in Engl. & Prantl. Pflanzenfam. ed. 2. 17 b : 98. 1936; G. Tayl., Acc. genus Meconopsis 1-130. 1934. *Cathcartia* Hook. f. in Bot. Mag. t. 4596. 1851; Hook. f. *et* Thoms. in Hook. f. Fl. Brit. Ind. 1 : 119. 1872.

Erect, perennial, monocarpic or polycarpic herbs, stout often with woody base. Stems scapose or leafy, usually simple, often branched. Leaves radical or cauline, entire to 2-pinnatifid-pinnatipartite, rarely palmatifid. Flowers solitary, terminal on scapose stems or on pedicels arising all along the central flowering axis, forming leafy racemes or in axillary cymes forming a leafy panicle. Sepals 2, caducous. Petals 4, more often 5-9 (-10), variously coloured, showy. Stamens many; filaments filiform, linear, mostly coloured like petals. Ovary sessile, ellipsoid-oblong or ovoid or obovoid or subglobose, usually with a distinct style. Stigmas of 2-12 free or confluent, more or less decurrent lobes, forming clavate or subglobose or capitate structure, with the lobes opposite to the placental ridges. Capsules ellipsoid oblong or ovoid-oblong or obovoid, usually dehiscent by interplacental valves

at apex only or rarely to the base. Seeds many, subreniform or ellipsoid-oblong, smooth or rugose, often papillose.

Distrib. : Ca 47 species in the south-central temperate Asia (except *M. cambrica* of western Europe) : PAKISTAN, INDIA, NEPAL, BHUTAN, BURMA, TIBET, CHINA. 16 species in India confined to Himalaya and 2 species are endemic in India.

Ecol. : In India the genus occurs in the alpine woods and scrub, meadows and scree slopes of the Himalaya from 2100 to 5800 m.

Key to the species

- 1a. Style base expanded into broad glabrous disc surmounting the ovary
...4. *M. discigera*
- 1b. Style when present, of uniform thickness throughout or swollen, but never expanded into a disc:
 - 2a. Polycarpic. Petals yellow
...16. *M. villosa*
 - 2b. Polycarpic (but then petals never yellow) or monocarpic. Petals yellow, blue, purple, red or rarely white:
 - 3a. Indumentum of soft hairs, if present:
 - 4a. Hairs if present non barbellate:
 - 5a. Leaves 2-pinnatifid-pinnatipartite. Capsules obovoid or pear-shaped. Plants scapose
...2. *M. bella*
 - 5b. Leaves entire to lyrato-pinnatifid. Capsules oblong or oblong-obovoid. Plants with leafy or subscapose stems
...8. *M. lyrata*
 - 4b. Hairs barbellate:
 - 6a. Indumentum of long-hairs mixed with short much branched hairs:
 - 7a. Leaves incised-serrate. Styles 0.3-0.5 cm long
...15. *M. superba*
 - 7b. Leaves pinnatifid to pinnatipartite. Styles 0.2-1.0 cm long:

- 8a. Flowers red to purple, blue or rarely white; petals 2-4 cm long. Plants with setose-villous and rarely puberulous hairs ...9. **M. napaulensis**
- 8b. Flowers yellow; petals 3-5 cm long. Plants villous with densely substellate or stellate hairs ...11. **M. paniculata**
- 6b. Indumentum of only long hairs:
 - 9a. Leaves imperfectly 1-2-pinnatifid-pinnatipartite ...12. **M. robusta**
 - 9b. Leaves entire to sinuate-dentate:
 - 10a. Flowers on leafless scapes from base ...13. **M. simplicifolia**
 - 10b. Flowers on leafy stems:
 - 11a. Basal leaves truncate or cordate at base ...3. **M. betonicifolia**
 - 11b. Basal leaves wedge-shaped at base ...5. **M. grandis**
- 3b. Indumentum of prickly bristles:
 - 12a. Stems scapose or leafy only at base:
 - 13a. Leaves deeply pinnatifid ...10. **M. neglecta**
 - 13b. Leaves entire to sinuate-lobed ...6. **M. horridula**
 - 12b. Stems leafy:
 - 14a. Leaves imperfectly 1-2-pinnatipartite ...1. **M. aculeata**
 - 14b. Leaves entire to sinuate-lobed:
 - 15a. Lamina oblong to ovate or broadly lanceolate, 2-6 cm broad. Upper flowers ebracteate, many-flowered. Capsules 1.0-1.5 cm long (excl. beak) ...7. **M. latifolia**

- 15b. Lamina narrowly oblanceolate, 0.8-4.0 cm broad. Upper flowers (like the lower ones) bracteate, 4-8 flowered. Capsules ± 4.5 cm long (excl. beak)

...14. *M. sinuata*

1. ***Meconopsis aculeata*** Royle, Illustr. Bot. Himal. 67, tab. 15, Mar. 1834; Hook. f. *et* Thoms. in Hook. f. Fl. Brit. Ind. 1 : 118. 1872; Coventry, Wild Fl. Kashmir 1 : 25, tab. 13. 1923; Blatter *et* Ethelbert, Beautiful Flrs. of Kashmir 1 : 29, Pl. 8. 1927; G. Tayl., Acc. genus *Meconopsis* 100. 1934; Jafri *et* Qaiser in Nasir *et* Ali, Fl. W. Pak. 61 : 24. 1974. *M. aculeata* var. *nana* Prain in Bull. Misc. Inf. Kew 1915 : 144. 1915. *M. aculeata* forma *normalis* Prain in Bull. Misc. Inf. Kew 1915 : 144. 1915. *M. aculeata* forma *acutiloba* Prain in Bull. Misc. Inf. Kew 1915 : 144. 1915.

Fig. 2

Stems 60 cm covered with 2-7 mm long bristles. Leaves oblong in outline, pinnatipartite, rarely 2-pinnatipartite, segments oblong or ovate or ovate-triangular, obtuse or rounded, a few acute, up to 30 cm long (incl. petiole), basal leaves on 2.5-10 (-15) cm long petiole, upper one sessile. Flowers on spiny pedicels, 1-15 cm long. Sepals broadly oblong-orbicular, 1-2 cm long. Petals 4, rarely 6, blue, purplish blue or red, obovate-suborbicular, 3.5×3.5 cm. Filaments 0.5-1.0 cm long; anthers 1.0-1.5 mm long. Ovary subglobose or ellipsoid; styles 0.2-1.0 cm long. Capsules dehiscent by 4-6 valves, 1.0-1.5 cm long. Seeds 1 mm long, subreniform.

Type : Peer Panjal, No. 9/8 (LIV).

Fls. : July-Aug.; *Frts.* : Aug.-Oct.

Distrib. : INDIA : Western Himalaya, recorded between 2400-4700 m, Kashmir, Himachal Pradesh, Punjab, Uttar Pradesh; PAKISTAN.

Exsicc. : Kashmir, Chilas, alt. 3300 m, B. M. Wadhwa & J. N. Vohra 611 (CAL); Gagangir, Sind Valley, alt. 4000 m, 22 Aug. 1940, Ludlow & Sherrieff 7981 (BM); Uttar Pradesh, Buhna-Bajmora, alt. 3500 m, 17 June 1959, Rau 10274 (CAL).

Uses : The root is officinal and is used as a narcotic in Kashmir.

Pollen : Pollen grains 3-colpate, spheroidal (20-24 μ diameter). It is included in Horridula type [Henderson in *Grana Palynol.* 6(2) : 196, 200. 1965].

Chr. No. : $n=28$ (Ratter in *Notes Roy. Bot. Gard. Edinburgh* 28 : 191-200. 1967).

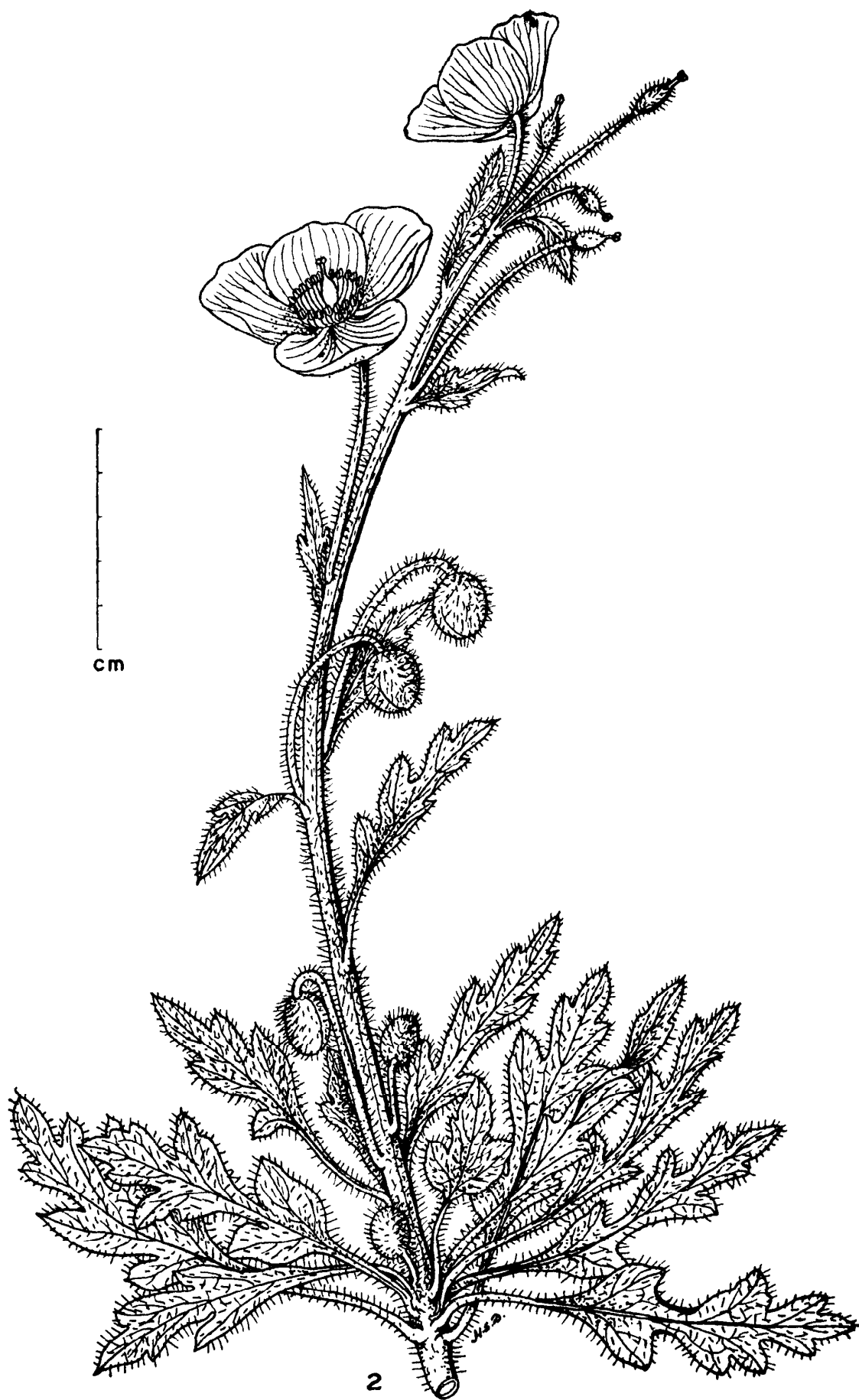


Fig. 2 : Habit of *Meconopsis aculeata* Royle

Notes : This species is very variable in habit, size, dissection of leaf blade, nature of inflorescence and size and colour of petals.

It is closely related to *Meconopsis horridula* but is easily recognizable by leafy stems, globose flower buds, pinnatifid-pinnatipartite leaves.

2. *M. bella* Prain in J. As. Soc. Beng. 63, 2 : 82. 1894 et 64, 2 : 321. 1896; in Ann. Roy. Bot. Gard. Calcutta 9, 1 : 3, tab. 4. 1901; Fedde in Engl. Pflanzenr. 4, 104 : 261, fig. 35 J. 1909; G. Tayl., Acc. Genus *Meconopsis* 105. 1934.

Short caudex, ca 2.5 cm long. Leaves all basal, glabrous or sparsely bristly, 1.5-6.0 cm long, irregularly pinnately or bipinnately lobed, ultimate segments usually 3 fid, obovate or obovate-oblong, obtuse or rounded; petioles 2.5-10.0 cm. Flowers solitary, scapes 1-25, erect, 2.5-10.0 cm long during anthesis, recurved, up to 20 cm long in fruiting condition. Sepals 2, glabrous or sparsely bristly, 0.7-1.0 cm long, oblong. Petals 4, rarely 5-6, pale blue or purple, obovate-suborbicular, entire to denticulate, 1.5-3.0 × 2.5 cm. Filaments 5-7 mm long; anthers 2 mm long. Ovary ellipsoid or obovoid-subglobose, glabrous or sparsely bristly; styles 2-5 mm long; stigmas 4-7 lobed. Capsules dehiscent by 4-7 valves, 1-2 cm long (incl. beak). Seeds 1.2-1.4 mm long, ellipsoid, ribbed.

Type : India : Sikkim, Peykeangla, Jongri, July 1887, *Dr. King* s. n., (Lectotype CAL, K).

Fls. : July-Aug.; **Frts. :** Sept.-Oct.

Distrib. : INDIA : Eastern Himalaya, recorded between 3900-4900 m, Sikkim; NEPAL, BHUTAN.

Exsicc. : Sikkim : Dzongri, *Prain's collector* s. n. (CAL); Tosa, alt. 4500 m, 29.7.1910, *W. W. Smith* 3926 (CAL).

Pollen : Pollen grains 3-colpate, spheroidal (20-24 μ diameter). It is included in *Horridula* type [Henderson in *Grana Palynol.* 6(2) : 196, 200. 1965].

3. *M. betonicifolia* Franch. Plant. Delav. 1 : 42, tab. 12. 1889; G. Tayl., Acc. genus *Meconopsis* 63. 1934. *Cathcartia betonicifolia* (Franch.) Prain in Ann. Bot. 20 : 369. 1906.

Fig. 3

Stems glabrous or scattered rufous hairs, 1.0-1.5 m tall. Leaves 10-15 × 5-7 cm, oblong to elongate-oblong, truncate or auriculate at base, subacute or obtuse or rounded, margin incisiocrenate, sometimes coarsely

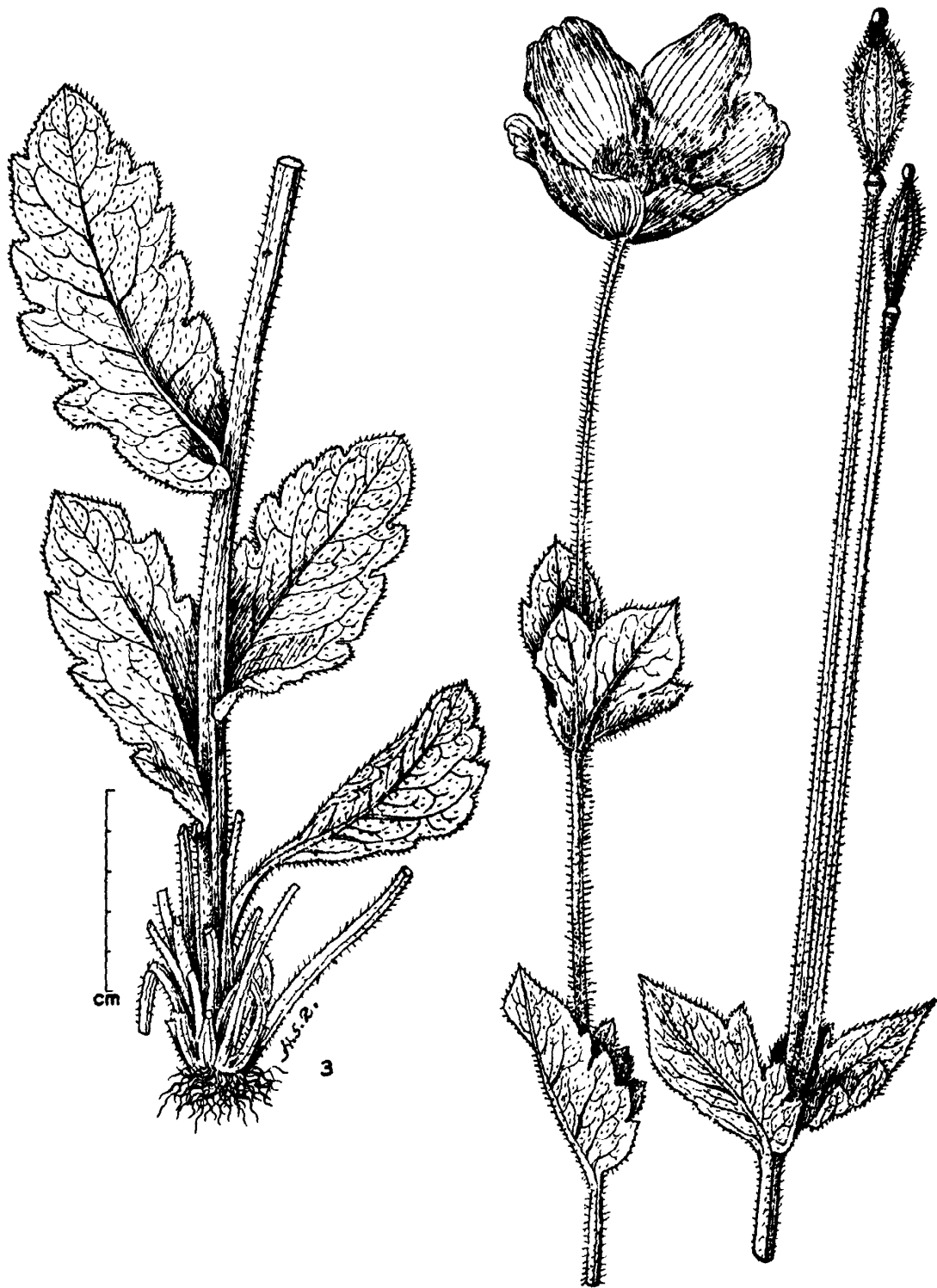


Fig. 3 : Habit of *Meconopsis betonicifolia* Franch.

or irregularly serrate, even lobed, basal cauline leaves on 20 cm long sheathed petiole, upper cauline leaves sessile. Flowers 6 cm diam. on 25-30 cm long pedicels. Petals 4-6, blue-violet, purple, broadly ovate, 5×5 cm. Ovary ellipsoid oblong; styles 1 cm long; stigmas 4-7 lobed. Capsules splitting by 4-7 valves. Seeds reniform with longitudinal rows of shallow pits.

Type : CHINA : Delavay 2152 (K, P).

Fls. & Frts. : July-Sept.

Distrib. : INDIA : Arunachal Pradesh; BURMA, CHINA, TIBET.

Pollen : Pollen grains without apertures, spheroidal (25-27 μ diameter). Exine about 1 μ thick with conspicuous spinules, 1.0-1.5 μ long, 1.0-1.2 μ broad at base, about 2.5 μ apart; between the large spinules very small, rather closely arranged spinules about 0.2 μ long and less than 0.1 μ broad [Henderson in *Grana Palynol.* 6(2) : 197. 1965].

Chr. No. : n=40 (Ernst, in *Madrono* 18 : 122-126. 1965); n=41, c. 40 (Ratter in *Notes Roy. Bot. Gard. Edinburgh* 28 : 191-200. 1967).

4. *M. discigera* Prain in *Ann. Bot.* 20 : 356, tab. 24, fig. 12. 1906; Fedde in *Engl. Pflanzenr.* 4, 104 : 266. 1909; G. Tayl., *Acc. genus Meconopsis* 108. 1934; Ohashi, *Fl. E. Him. Bull.* 8 : Plate 3b, 43. 1975.

Stems 40 cm tall clothed with golden brown, barbellate patent or deflexed bristles. Leaves oblanceolate or elliptic oblanceolate, subacute to rounded, entire or 3-lobed, basal leaves 15 cm long (incl. long petiole), upper one sessile. Flowers on 2-5 cm long pedicels, forming leafy racemes. Petals 4, obovate, red, purple or pale blue, 4-5×3-4 cm. Styles 5-6 mm long. Capsules oblong, 6-ribbed, appressed bristly, dehiscing by 6-10 valves, 1.2-2.0 cm long, crowned with ovate laciniate, reflexed, 5-7 mm long stylar disc lobes and persistent. Seeds reniform, longitudinally ribbed or obscurely reticulate.

Type : Sikkim, Gucha-la, 3300-3600 m, *Cave* s. n. (K).

Fls. & Frts. : July-Sept.

Distrib. : INDIA: Eastern Himalaya, recorded between 3355-4880 m, Sikkim; NEPAL, BHUTAN, TIBET.

Exsicc. : Sikkim, Gacheyla, Oct., 1908, *Ribu* 37 (CAL).

Pollen : Pollen grains with 7-8 distinct, scattered, pore-like areas, spheroidal (23-28 μ). Distance between apertures about 8-10 μ . Pores circular, 2.5-4.0 μ diameter, with indistinct margins. Exine about 1.0-1.3 μ thick

but slightly thinner at the margins of the pores, with minute spinules. Spinules about $1.2\ \mu$ apart, less than $0.1\ \mu$ long. No differentiation into sexine and nexine, infratectal bacula absent [Henderson in *Grana Palynol.* 6(2) : 193. 1965].

Chr. No. : $n=28$, $2n=56$ (Ratter & Milne in *Notes Roy. Bot. Gard. Edinburgh* 32 : 429-438. 1973).

Notes : Allied to *Meconopsis torquata* Prain, a Tibetan species, but is easily recognizable by 4-lobed, laciniate stylar disc, glabrous petals and a distinct style.

5. **M. grandis** Prain in J. As. Soc. Beng. 64, 2 : 320. 1895 *et* in Ann. Roy. Bot. Gard. Calcutta 9, 1 : 2, tab. 2. 1901; Fedde in Engl. Pflanzenr. 4, 104 : 263, fig. 35 D. 1909; G. Tayl., Acc. genus *Meconopsis* 68. 1934; Ohashi, Fl. E. Him. Bull. 8 : 43. 1975.

Fig. 4

Stems 40-100 cm tall, covered with appressed 5-8 mm long bristles. Leaves $7-20 \times 2-8$ cm, elliptic-oblong or oblanceolate to lanceolate, subglobose or acute, basal leaves on 10-31 cm long petioles, upper one sessile. Pedicels at least in fruiting condition attaining up to 64 cm long. Sepals broadly ovate-oblong, 3.0-3.5 cm long. Petals (4-) 5 (-9), purple or blue, obovate-suborbicular, $4-6 \times 6$ cm. Filaments 1.0-1.5 cm long; anthers 2 mm long. Ovary oblong or ellipsoid oblong; styles 0.5-1.5 cm long; stigmas 4-6 lobed. Capsules 3.5-4.5 cm long, ellipsoid-oblong or oblong, dehiscing by 4-6 valves.

Type : INDIA : Sikkim, Jongri, 3900 m, 23.6.1892, G. A. Gammie 199 (Syntype CAL, L).

Fls. : June-July; *Frts.* : Aug.-Sept.

Distrib. : INDIA : Eastern Himalaya, recorded between 3660-4575 m, Sikkim; NEPAL, BHUTAN, TIBET.

Exsicc. : Kashmir, Gulmarg, 3600 m, 18.9.1956, *Polunin* 56/817 (BM); Sikkim, Dzongri, 4200 m, June 1887, *King's collector* s. n. (CAL); Dzongri, Oct. 1902, *Prain's collector* s. n. (CAL).

Pollen : Pollen grains in rather loose, tetrahedral and rhomboidal tetrads, without apertures, spheroidal ($28-32\ \mu$ diameter) [Henderson in *Grana Palynol.* 6(2) : 198. 1965].

Chr. No. : $n=c. 59$ (Ratter in *Notes Roy. Bot. Gard. Edinburgh* 28 : 191-200. 1967).

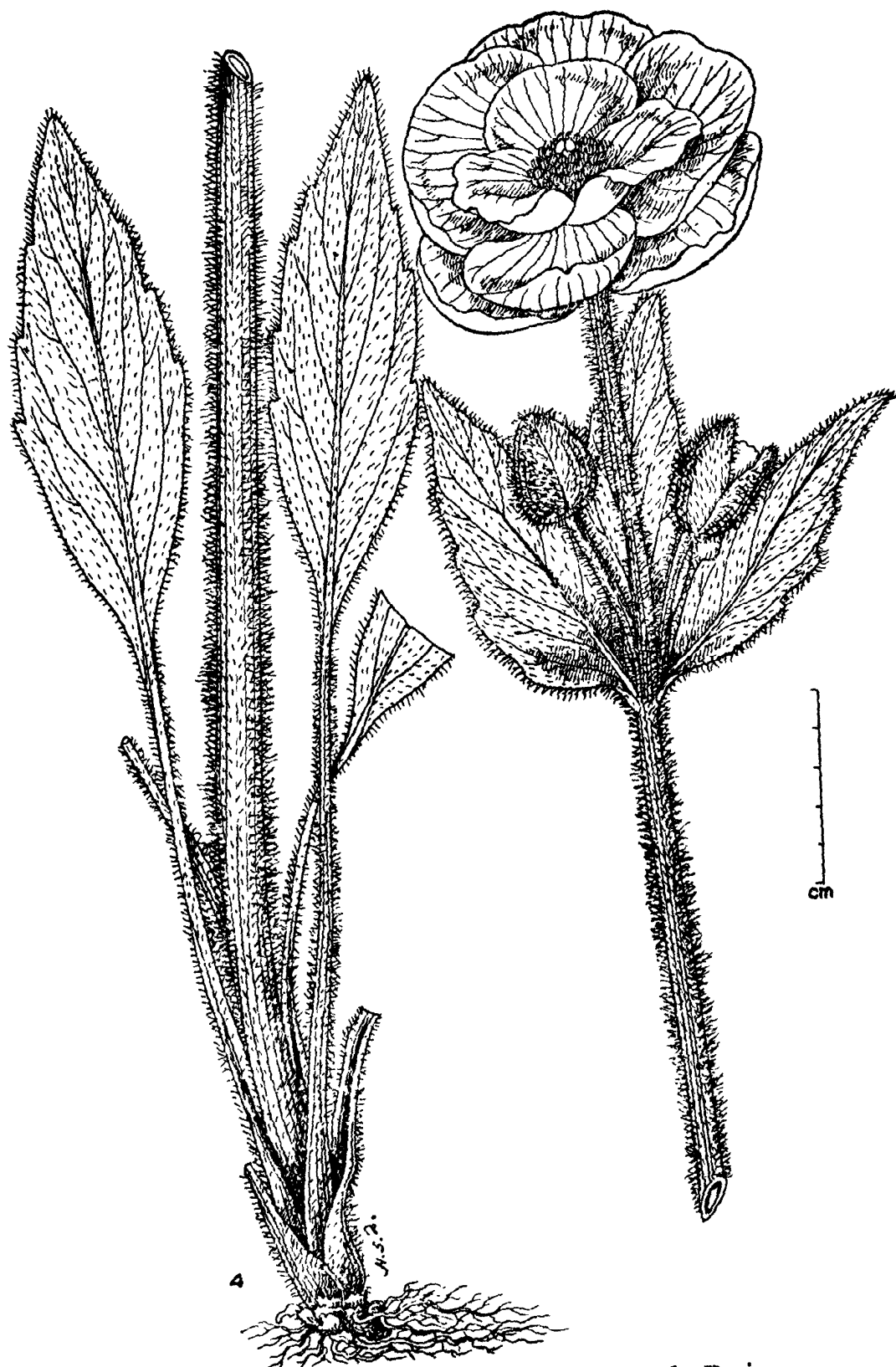


Fig. 4 : Habit of *Meconopsis grandis* Prain

Notes : Very similar to *Meconopsis integrifolia* (Maxim.) Franch., a Sino-Burmese species, but is easily recognizable by blue or purple flowers and sinuate-dentate leaves in contrast to yellow flowers and entire leaves of *M. integrifolia* (Maxim.) Franch.

It is readily distinguished from the rest of the Indian species by having involucre leaves and from closely allied species *M. simplicifolia* (D. Don) Walp. in having whitish staminal filament and pitted seeds.

6. *M. horridula* Hook. f. et Thoms. Fl. Ind. 1 : 252. 1855 et in Hook. f. Fl. Brit. Ind. 1 : 118. 1872; Prain in J. As. Soc. Beng. 64, 2 : 313. 1896; Fedde in Engl. Pflanzenr. 4, 104 : 257, fig. 35 K. 1909; G. Tayl., Acc. Genus *Meconopsis* 91. 1934; Biswas, Pl. Darjeeling & Sikkim Him. 1 : 126. 1966; Ohashi, Fl. E. Him. Bull. 8, 43: Plate 3 a, 1975. *M. racemosa* Maxim. in Bull. Acad. Imp. Sc. St.-Petersb. 23 : 310. 1877. *M. horridula* var. *racemosa* (Maxim.) Prain in J. As. Soc. Beng. 64, 2 : 313. 1896. *M. horridula* var. *rudis* Prain in J. As. Soc. Beng. 64, 2 : 314. 1896. *M. sinuata* var. *pratti* Prain in J. As. Soc. Beng. 64, 2 : 314. 1896. *M. rudis* (Prain) Prain in Ann. Bot. 20 : 347. 1906. *M. pratti* (Prain) Prain in Curt. Bot. Mag. 140 : sub. tab. 8568 in obs. 1914.

Stems covered with 0.3-0.7 cm long bristles. Leaves oblanceolate, linear-oblong-lanceolate or obovate-elliptic, acute or rounded, entire or sinuate-lobed, bristly, basal leaves 25 cm (incl. petiole) $\times$ 3.5 cm on 0.5-9.0 cm long, bristly petioles, upper ones sessile. Flowers on 2-15 cm long pedicels. Sepals 1-2 cm long. Petals 4-8, blue or rarely white, obovate, denticulate at the top, 2-3 cm long. Filaments 0.8-1.0 cm long. Ovary ellipsoid or ellipsoid-oblong or subglobose; styles 2-5 mm long; stigmas capitate or clavate. Capsules ellipsoid-oblong, oblong or subglobose, 1-2 cm long. Seeds 0.8 mm long, subreniform.

Type : INDIA : Sikkim, Alpina, 4300-5100 m, J. D. H. s. n. (CAL, G, K, L, P).

Fls. & Frts. : July-Sept.

Distrib. : INDIA : Eastern Himalaya, recorded between 3900-5800 m, Sikkim; NEPAL, BHUTAN, BURMA, CHINA, TIBET.

Exsicc. : Sikkim, Ningbil, 4200-4600 m, 5.8.1910, W. W. Smith 4077 (CAL); Tangka-la, 13.8.1882, King's collector s. n. (CAL); Tankra-la, 4800 m, 3.8.1891, G. A. Gammie 520 (CAL).

Pollen : Pollen grains 3-colpate, spheroidal (15-20 μ diameter). Apocolpium about 5 μ diameter. Exine about 0.8-1.0 μ thick. Sexine about 0.6 μ thick. Tectum with minute spinules. Spinules less than 0.1 μ long,

about $0.5\ \mu$ apart. Endosexine baculate. Nexine about $0.3\ \mu$ thick [Henderson in *Grana Palynol.* 6(2) : 196, 1965].

Chr. No. : $n=28$ (Ratter in *Notes Roy. Bot. Gard. Edinburgh* 28 : 191-200, 1967).

Notes : This species is highly variable in habit, size and shape of leaves, nature of inflorescence, number and colour of petals, shape and length of dehiscent sutures of capsules. Based on these variable characters, several taxa have been described in literature. But on studying the material, it is appropriately included by G. Taylor (1934) in the polymorphic species *Meconopsis horridula* Hook. f. et Thoms.

7. *M. latifolia* (Prain) Prain in Bull. Misc. Inf. Kew 1915 : 146, 1915; G. Tayl., Acc. genus *Meconopsis* 96, 1934; Jafri et Qaiser in Nasir et Ali, Fl. W. Pak. 61 : 24, 1974. *M. sinuata* var. *latifolia* Prain in Curt. Bot. Mag. 134 : tab. 8223, 1908.

Stems 30-100 cm tall, covered with yellowish brown or golden-brown 2-8 mm long bristles. Leaves oblong or ovate-lanceolate, acute or obtuse, sinuate-lobed or deeply incised-serrate, rarely pinnatilobed, basal leaves 8-30 (incl. petiole) $\times$ 2-6 cm on 2-8 (-10) cm long bristly petioles, upper ones sessile. Flowers on 1-4 cm long pedicels. Sepals 1.0-1.5 cm long, broadly oblong. Petals 4, pale blue or white, obovate or suborbicular, 2-3 (-3.5) cm long. Filaments 0.8-1.0 cm long. Ovary ovoid, bristly; styles 1.5-3.0 mm long. Capsules ellipsoid oblong, bristly, dehiscent by 4-7 valves, 1.0-1.5 cm long. Seeds 0.1 cm long, subreniform.

Type : Based on a plant cultivated at Kew, raised from seeds sent by Lt. Col. Appleton in 1906.

Fls. : July-Aug. ; *Frts.* : Sept.-Oct.

Distrib. : INDIA : Endemic to northern Kashmir Himalaya; 2100-4600 m.

Exsicc. : Kashmir, Butin Pansal, 3400 m, 13.8.1940, P. K. Pinfold 266 (BM).

Pollen : Pollen grains 3- and 6-colpate, spheroidal ($20-26\ \mu$ diameter). It is included in *Primulina* type [Henderson in *Grana Palynol.* 6(2) : 197, 200, 1965].

Chr. No. : $n=28$ (Ratter in *Notes Roy. Bot. Gard. Edinburgh* 28 : 191-200, 1967).

Notes : This species is intermediate between *M. aculeata* Royle and *M. sinuata* Prain. It is distinguished from *M. sinuata* in having broader leaves, shorter capsules and more flowered inflorescence. It differs from *M. aculeata* in having shorter pedicels and less dissected leaves.

8. *M. lyrata* (Cummins and Prain) Fedde (in Engl. Pflanzenr. 4, 104: 246. 1909, *nomen synonymum*) ex Prain in Bull. Misc. Inf. Kew 1915 : 142. 1915; G. Tayl., Acc. genus *Meconopsis* 73. 1934; Fedde in Engl. & Prantl, Nat. Pflanzenfam. ed. 2, 17b : 101. 1936; Ohashi, Fl. E. Him. Bull. 8 : 43. 1975. *Cathcartia lyrata* Cummins and Prain ex Prain in J. As. Soc. Beng. 64, 2 : 325. 1896. *C. polygonoides* Prain in J. As. Soc. Beng. 64, 2 : 326. 1896. *Meconopsis polygonoides* (Prain) Prain in Bull. Misc. Inf. Kew 1915 : 143. 1915. *M. compta* Prain in Bull. Misc. Inf. Kew 1918 : 212. 1918.

Stems 5-30 cm tall. Leaves 0.3-4.0 × 0.3-2.5 cm, ovate; oblong-ovate, spatulate or oblanceolate with a hastate or subcordate-rounded base, acute or rounded, basal leaves on 0.5-5.0 cm long petioles, often with bulbils in their axils, upper leaves sessile. Flowers on 2-15 cm long pedicels. Sepals 0.8-1.0 cm long, obovate-oblong. Petals 4 (-5-6), obovate-suborbicular, pale pink, blue or white, 0.7-1.8 (-2.0) × 1.0-2.0 cm. Stamens about 12-36; filaments 4-5 mm long; anthers 2 mm long. Ovary narrowly oblong or oblong-ellipsoid, glabrous; styles 2-4 mm long; stigmas 2-4 lobed. Capsules narrowly oblong or obovoid, glabrous, dehiscent by 3-4 valves, ca 2.5 cm long (incl. beak). Seeds falcate-ellipsoid, pitted.

Type : INDIA : Sikkim, Phullot, 3600 m, Aug. 1887, *Dr. King* s. n. (Lectotype CAL); Tankra, 2nd Aug., 1892, *Gammie* 415 (Syntype CAL); Chianie Nepal frontier 3900 m, Aug. 1888, *Dr. King* s. n. (Syntype CAL).

Fls. : July-Aug.; *Frts.* : Sept.-Oct.

Distrib. : INDIA : Eastern Himalaya, recorded between 2745-3965 m, West Bengal (Darjeeling), Sikkim; NEPAL, CHINA, TIBET.

Exsicc. : Sikkim, Sherabthang, 3900 m, 13.8.1910, *W. W. Smith* 4308 (CAL); Tankra Mt., 3900 m, 2.8.1892, *G. A. Gammie* 415 (CAL).

Pollen : Pollen grains 6-colpate, spheroidal (24-28 μ diameter). It is included in Primulina type [Henderson in *Grana Palynol.* 6(2) : 197, 200. 1965].

Notes : Very variable in leaf and petal shape and number of stamens. Based on these variable characters Prain recognized *M. polygonoides* (*l. c.*) and *M. compta* (*l. c.*) which cannot be maintained as distinct from *M. lyrata*.

The presence of bulbils in leaf axils is characteristic feature of this species. But Taylor (1934) reported the occurrence of bulbils in the leaf axils of *M. chelidonifolia* also.

9. *M. napaulensis* DC. Prodr. 1 : 121. 1824; Prain in J. As. Soc. Beng. 64, 2 : 317. 1896; Fedde in Engl. Pflanzenr. 4, 104 : 269, fig. 35 A. 1909; G. Tayl., Acc. genus Meconopsis 44. 1934; Hara, Fl. E. Him. 104: 1966; Biswas, Pl. Darjeeling & Sikkim Him.-1 : 126. 1966; Hara, Fl. E. Him. 2nd Report, 40. 1971. *Stylophorum nepalense* (DC.) Spreng. in L. Syst. Veg. ed. 16, 4. 2 : 203. 1827 *pro parte*. *Meconopsis wallichii* Hook. f. in Curt. Bot. Mag. 78 : tab. 4668. 1852; Fl. Brit. Ind. 1 : 119. 1872. *M. wallichii* var. *fusco purpurea* Hook. f. in Curt. Bot. Mag. 110 : 6770. 1884.

Monocarpic. Stems 0.5-2.0 m tall, covered with 0.7 cm long bristles. Leaves elliptic-oblong, imperfectly 1-2 pinnatipartite, segments ovate-oblong, sinuate-pinnatilobed, basal leaves *ca* 45 cm long on 5-20 cm long petioles, upper ones sessile, often entire. Flowers on 2.5-6.0 (-10.0) cm long pedicels. Sepals ovate-oblong, 1.5-2.0 cm long. Petals 4, red to purple or blue, often white, obovate-suborbicular, 2-4 cm long. Filaments 8-10 mm long; anther. 2.5 mm long. Ovary ellipsoid-oblong or ovoid; styles 2-10 mm long; stigmas 5-8 lobed. Capsules dehiscing by 5-8 valves, 1-3 (-3.5) cm long. Seeds 1.0-1.2 mm long, ovoid-ellipsoid-oblong, papillose.

Type : Wallich 8121 (Holotype G-DC, Isotype CAL).

Fls. : July-Aug.; *Frts.* : Sept.-Oct.

Distrib. : INDIA : Himalaya, recorded between 2700-4300 m, Uttar Pradesh, West Bengal, Sikkim, Assam; NEPAL, BHUTAN, CHINA.

Exsicc. : Sikkim : Megu, Sept. 1905, *Prain's collector* s. n. (CAL); West Bengal, Phullalong, 3030 m, 5.10. 1870, *C. B. Clarke* 13460 (CAL); Sandachpho, 3333 m, July 1881, *J. S. Gamble* 9481 (CAL).

Uses : The root has narcotic properties.

Pollen : Pollen grains 6-colpate, spheroidal (26-30 μ diameter). It is included in Primulina type [Henderson in *Grana Palynol.* 6(2) : 197, 200. 1965].

Chr. No. : $n=28$ (Ratter in *Notes Roy. Bot. Gard. Edinburgh* 28 : 191-200. 1967).

Notes : Very variable in colour of flowers, degree and density of indumentum and size and shape of leaves.

The specific epithet is often spelled as "nepalensis" and "nipalensis", but the correct spelling is "napaulensis" which is original spelling.

10. *M. neglecta* G. Tayl., Acc. Genus Meconopsis 102. 1934; Jafri *et* Qaiser in Nasir *et* Ali, Fl. W. Pak. 61 : 23. 1974; Dhar & Kachroo in Geobios N. Rep. 2 : 132. 1983.

Herbs, 10-20 cm tall. Stems covered with persistent leaf bases. Leaves 3.5×1.0 cm, radical, deeply pinnatifid, densely covered on both the surfaces with pungent spines, lobes oblong, round at the apex. Petioles 3.0-3.5 cm long. Scapes up to 12, up to 15 cm long, sparsely spiny. Petals 4, $1.5-2.0 \times 1.5-2.0$ cm, broadly obovate or suborbicular. Stamens numerous; filaments filiform; anthers yellow. Ovary ellipsoid, densely covered with pungent spines; styles distinct, *ca* 1 cm long; stigmas capitate.

Type : PAKISTAN : Chitral, Kafirstan, *S. M. Toppin* 761 (K).

Distrib. : Recorded between 3350-4000 m altitude; INDIA : Kashmir Himalaya, PAKISTAN : Chitral State.

11. *M. paniculata* Prain in J. As. Soc. Beng. 64, 2 : 316. 1896; Fedde in Engl. Pflanzenr. 4, 104 : 267, fig. 34 E. 1909; G. Tayl., Acc. genus Meconopsis 39. 1934; Hara, Fl. E. Him. 104. 1966; Ohashi, Fl. E. Him. Bull. 8 : 43. 1975. *Papaver paniculatum* D. Don, Prodr. Fl. Nepal. 197. 1825 *pro parte nomen illegitimum*. *Stylophorum napaulensis* auct. non DC., 1824; Hook. f. *et* Thoms. Fl. Ind. 253. 1855 *et* in Hook. f. Fl. Brit. Ind. 1 : 118. 1872 ("Nepalensis"). *M. paniculata* var. *elata* Prain in J. As. Soc. Beng. 64, 2 : 316. 1896.

Fig. 5

Stems 2 m long, covered with golden brown long bristles mixed with substellate short bristles. Leaves linear-oblong, pinnatilobed-pinnatipartite, segments ovate-oblong, acute-obtuse, basal leaves up to 60×14 cm on 30 cm long petioles, upper ones sessile. Flowers in 2-6 flowered cymes on 2-15 cm long pedicels. Sepals ovate-oblong. Petals 4(-5), yellow, obovate to suborbicular, 3-5 cm long. Filaments 0.7-1.5 cm long; anthers 2 mm long. Ovary globose or ovoid-ellipsoid; styles 0.5-1.5 cm long; stigmas 6-12 lobed. Capsules dehiscent by 6-12 valves, 1.5-3.5 cm long. Seeds 1.0-1.2 mm long, subreniform, minutely papillose.

Type : Nepal : Gossain Than, *Wallich* 1823 B (Syntype CAL, K).

Fls. : June-Aug.; *Frts.* : Sept.-Oct.

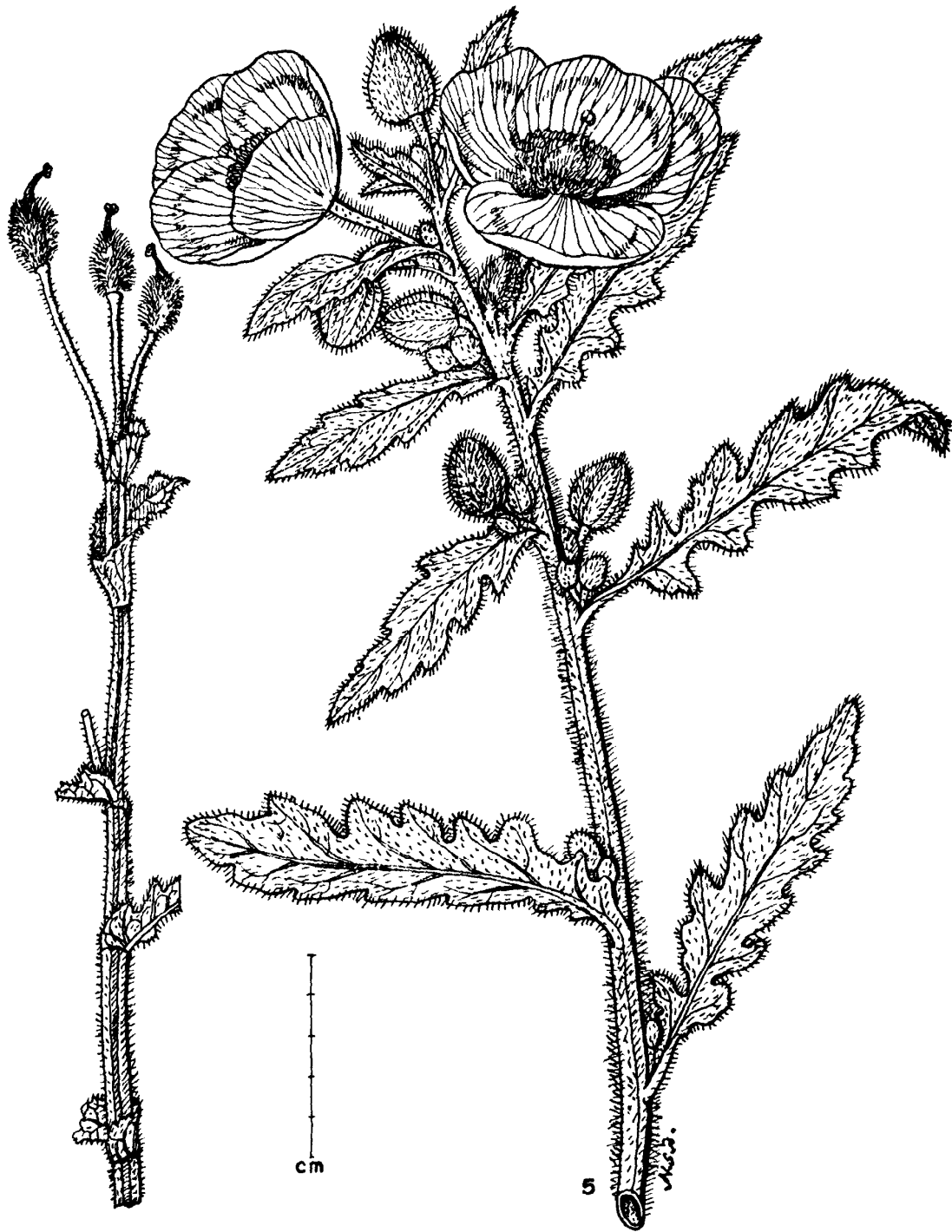


Fig. 5 : Habit of *Meconopsis paniculata* Prain

Distrib. : INDIA : Himalaya, recorded between 2100-4500 m, Uttar Pradesh, West Bengal (Darjeeling), Sikkim; NEPAL, BHUTAN, TIBET.

Exsicc. : Sikkim, Lachung valley (Yeumtong), 3600 m, 14.8.1892, *G. A. Gammie* 767 (CAL); Patangla, above 2100 m, 16.7.1877, *King's collector* 4158 (CAL); West Bengal, Phalloom, 3600-3900 m, *S. Kurz* s. n. (CAL).

Uses : The root stock has sweet taste and is used as salad by sherpas and is reported to be eaten by herdsman in East Nepal.

The root has narcotic properties (*Banerjee, J. Bombay Nat. Hist. Soc.* 53 : 153. 1955-56).

Pollen : Pollen grains 3- and 6-colpate, spheroidal (22-26 μ diameter). It is included in *Primulina* type [*Henderson in Grana Palynol.* 6(2) : 197, 200. 1965].

Chr. No. : n=28 (*Ratter in Notes Roy. Bot. Gard. Edinburgh* 28 : 191-200. 1967).

Notes : Very similar and was previously confused with *Meconopsis napaulensis* DC., but is easily recognized by their yellow flowers, pinnatifid-pinnatipartite leaves and minutely papillose seeds.

12. *M. robusta* Hook. f. et Thoms. Fl. Ind. 1 : 253. 1855 et in Hook. f. Fl. Brit. Ind. 1 : 118. 1872 *pro parte*; Prain in J. As. Soc. Beng. 64, 2 : 315. 1896 *pro parte*; Fedde in Engl. Pflanzenr. 4, 104 : 268, fig. 34 D. 1909 *pro parte*; G. Tayl., Acc. Genus *Meconopsis* 35. 1934.

Monocarpic. Stems 1-2 m tall covered with 5-6 mm long bristles. Leaves imperfectly 1-2 pinnatifid to pinnatipartite, segments ovate or ovate-oblong, acute or obtuse, basal leaves on 10-15 cm long petioles, upper ones sessile, often entire. Flowers on 5-20 cm long pedicels. Sepals 1.5-2.0 cm long, ovate-oblong. Petals 4, obovate. Filaments 1.0-1.5 cm long. Ovary ellipsoid or ellipsoid-oblong; styles 1.5-10.0 mm long; stigmas 6-9 lobed. Capsules dehiscent by 6-9 valves, 2-3 cm long. Seeds subreniform, papillose.

Type : In Himalaya temperate : Kumaon, alt. 2400 m, *Wallich* 8124 (Lectotype K, Isolectotypes CAL, E, P).

Fls. : July-Aug.; *Frts.* : Sept.-Oct.

Distrib. : INDIA : N. W. Himalaya, endemic to Kumaon between 2400-4000 m, Uttar Pradesh.

Exsicc. : Gharwal, 1869, *G. King* s. n. (CAL); Gulmar Pass 3600-3900 m, 27.8.1883, *J. F. Duthie* 1050 (CAL).

Pollen : Pollen grains 3-colpate, spheroidal (21-23 μ diameter). It is included in Primulina type [Henderson in *Grana Palynol.* 6(2) : 197, 200. 1965].

Chr. No. : 2n=28 (Sugiura in *Cytologia* 13 : 352-359. 1944).

Notes: *M. dhwojii* G. Tayl. ex Hay and *M. gracilipes* G. Tayl.—two central Himalayan (Nepal) species are closely allied to *M. robusta* Hook. f. et Thoms., but can be distinguished by flowers being in 1-3 flowered cymes. From the description of this species, it appears that they may be only forms of *M. robusta* Hook. f. et Thoms., as the inflorescence is quite variable in this species.

Prain (in *Kew Bull.* 1915: 171-174. 1915) in his extensive discussion on the typification of *M. paniculata* Prain, *M. napaulensis* DC. and *M. robusta* Hook. f. et Thoms., involving Wallich's specimens 8124, 8123B and 8121 pointed out that all these three Wallichian numbers were distinct and designated 8124 as the lectotype of *M. robusta*, 8123B as the type of *M. paniculata* Prain and 8121 as the type of *M. napaulensis* DC.

13. ***M. simplicifolia*** (D. Don) Walp. Repert. Bot. Syst. 1 : 110. 1842; Hook. f. et Thoms. in Hook. f. Fl. Brit. Ind. 1 : 118. 1872; Hook. f. Illustr. Himal. Pl. tab. 8. 1855; Prain in J. As. Soc. Beng. 64, 2 : 321. 1896; Fedde in Engl. Pflanzenr. 4, 104 : 263, fig. 35 F. 1909; G. Tayl., Acc. genus Meconopsis 50. 1934; Hara, Fl. E. Him. 104-105. 1966; Biswas, Pl. Darjeeling & Sikkim Him. 1 : 127. 1966. *Papaver simplicifolium* D. Don, Prodr. Fl. Nepal. 197. 1825.

Fig. 6

Stems short. Leaves all basal, 1.5-15.0 $\times$ 1.5-3.0 (-3.5) cm, oblanceolate-spathulate or lanceolate or elliptic-lanceolate-oblong, subacute to rounded or obtuse, entire to sinuately lobed, subsessile or petiolate; petioles 0.5-25.0 cm long. Flowers borne singly on 5-60 cm long basal pedicels, pedicels 1-2, produced from each rosette. Sepals 2.0-2.5 $\times$ 1.0-1.2 cm, broadly oblong. Petals 5-9 (-10), blue or purple, obovate, 2.5-5.0 $\times$ 1.5-3.0 cm. Filaments 0.8-2.0 cm long; anthers 2 mm long. Ovary ellipsoid or ellipsoid-oblong; styles 0.3-1.0 cm; stigmas 2-9 lobed. Capsules 3-6 cm long (incl. stylar beak). Seeds 3 mm long, ovoid-ellipsoid, densely papillose.

Type : Nepal : Gosaingthan, Wallich 8125 (Holotype CAL).

Fls. : May-July; **Frts. :** Sept.-Oct.

Distrib. : INDIA : Eastern Himalaya, recorded between 3000-4800 m, Sikkim; NEPAL, BHUTAN, TIBET.

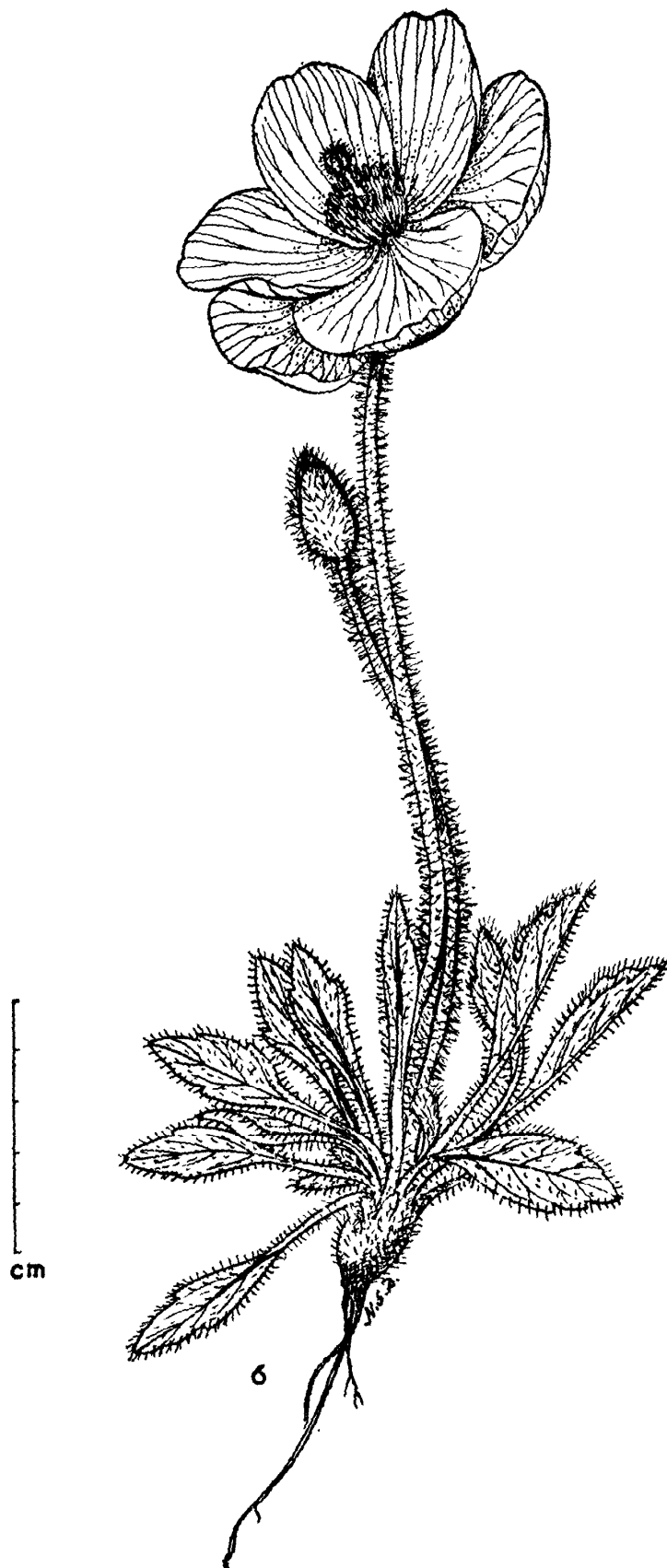


Fig. 6 : Habit of *Meconopsis simplicifolia* (D. Don) Walp.

Exsicc. : Sikkim, Dzongri, 4200 m, June 1887, *King's collector* s. n. (CAL); Yangsap, 3600 m, July 1888, *King's collector* s. n. (CAL); Zemu valley, 5000 m, 16.7.1909, *Smith & Cave* 1557 (CAL).

Pollen : Pollen grains without apertures, spheroidal (22-26 μ diameter). Exine with conspicuous spinules. It is included in *Betonicifolia* type [Henderson in *Grana Palynol.* 6(2) : 197, 201. 1965].

Chr. No. : $n=41$ or 42 (Ratter in *Notes Roy. Bot. Gard. Edinburgh* 28 : 191-200. 1967).

Notes : *M. simplicifolia* is very closely allied to *M. grandis*, but is easily recognizable by the following characters. In *M. simplicifolia* there is short stem, usually more densely hairy and the leaves more densely tufted than in *M. grandis*. Flowers are constantly borne on simple basal pedicels and the filaments are always coloured, where as it is white in *M. grandis*. Seed coat very densely papillose in *M. simplicifolia*, but pitted in longitudinal manner in *M. grandis*.

The combination has often been attributed to Hooker f. *et* Thomson (Fl. Ind. 252. 1855), but it was Walpers (*l. c.*) who first made the combination.

14. *M. sinuata* Prain in J. As. Soc. Beng. 64(2): 314. 1896 (excl. var. **pratti**); Ann. Roy. Bot. Gard. Calcutta 9, 1 : 5, tab. 6. 1901; Fedde in Engl. Pflanzenr. 4, 104 : 256, fig. 35.0. 1909; G. Tayl., Acc. genus Meconopsis 102. 1934.

Fig. 7

Stems 15-45 (-60) cm tall covered with 2-5 (-7) mm long bristles. Leaves obovate to oblanceolate or oblong, obtuse, sinuate-pinnatilobed, basal leaves 10-15 cm long (incl. petiole) on 2-5 cm long petioles, upper ones sessile. Flowers 4-8, pedicels 2-5 cm long during anthesis, up to 15 cm in fruiting condition. Sepals broadly acute-oblong, *ca* 1.5 cm long. Petals 4, blue, purple or violet, obovate, subacute to rounded, 2-3 cm long. Filaments 8-10 mm long; anthers 3.5 mm long. Ovary ellipsoid; styles 1.5-5.0 mm long. Capsules dehiscing by 3-4 valves, narrowly obovoid, *ca* 5.0 cm (incl. beak) $\times$ 0.8 cm. Seeds falcate-oblong, with longitudinal rows of shallow pits.

Type : INDIA : Sikkim, Patangla, *Dr. King* 4194 (Lectotype K); Jongri, Pey-King-la, Aug. 87, *Dr. King* s. n. (Syntype CAL).

Fls. : July-Aug.; *Frts.* : Sept.-Oct.

Distrib. : INDIA : Eastern Himalaya, recorded between 3660-4575 m, Sikkim; NEPAL, BHUTAN.

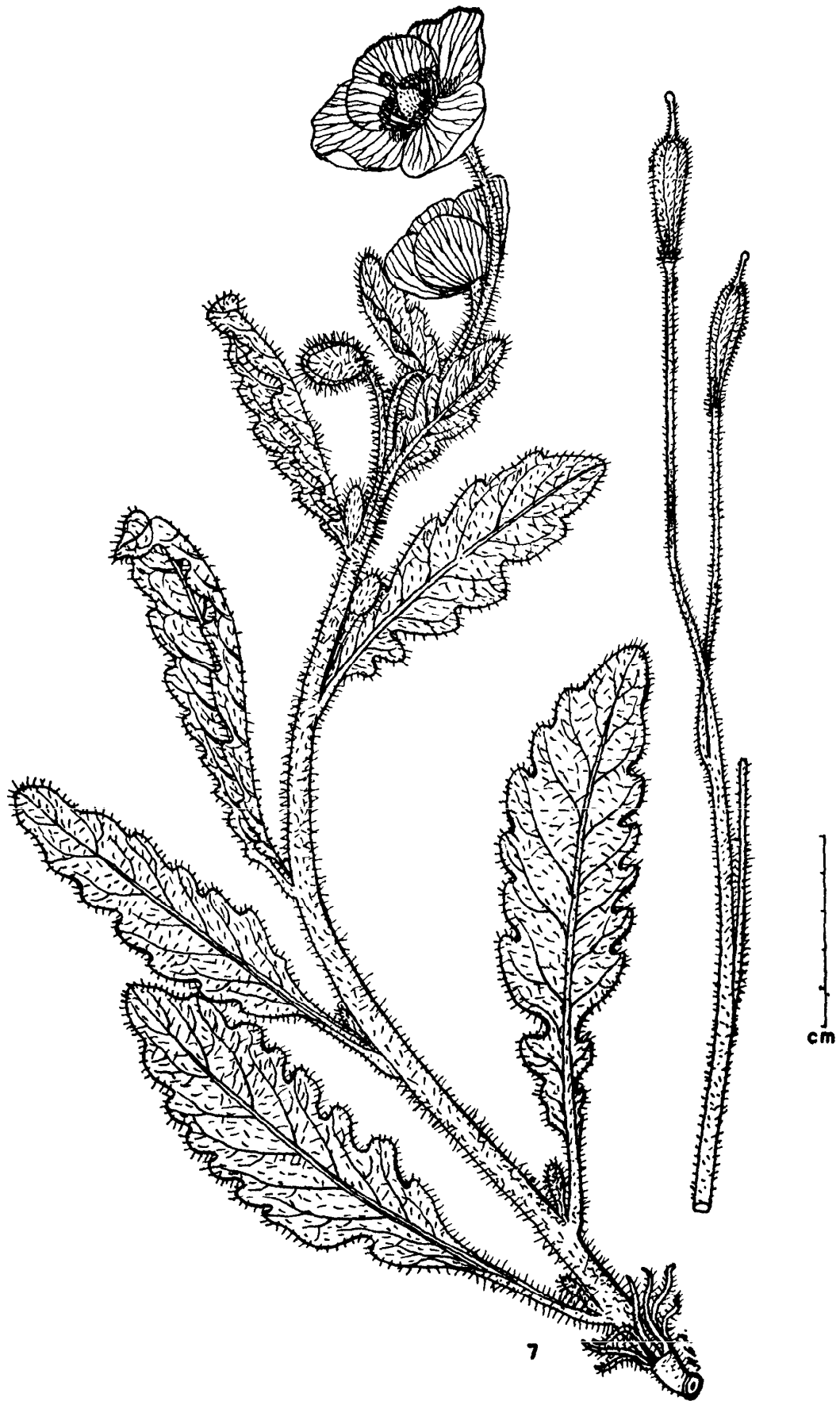


Fig. 7 : Habit of *Meconopsis sinuata* Prain

Exsicc. : Sikkim, above Changu, 3800 m, 6.7.1910, *W. W. Smith* 3147 (CAL); Patang-la, 3000 m, 16.7.1877, *King's collector* 4194 (CAL).

Pollen : Pollen grains 6-colpate, spheroidal (20-24 μ diameter). It is included in *Primulina* type [Henderson in *Grana Palynol.* 6(2) : 197, 200. 1965].

Notes : Readily distinguished from *M. latifolia* (Prain) Prain and *M. aculeata* Royle, to which it is allied by a combination of characters-bracteate, few-flowered inflorescence, capitate stigma and long, obovoid capsule.

15. *M. superba* King ex Prain in J. As. Soc. Beng. 64, 2 : 317. 1896; King and Prain in Ann. Roy. Bot. Gard. Calcutta 9, 1 : 4, tab. 2. 1901; Fedde in Engl. Pflanzenr. 4, 104 : 267. 1909; G. Tayl., Acc. genus *Meconopsis* 32. 1934.

Stems 1.5 m tall covered with 5-8 mm long bristles. Leaves elliptic-oblong or oblanceolate-oblong, acute, incised serrate, basal leaves 40.0 $\times$ 8.5 cm on *ca* 5 cm long petioles, upper ones sessile. Flowers on 2-5 cm long pedicels. Sepals 2.5-3.0 cm long, broadly ovate-oblong. Petals 4, white, ovate to sub-orbicular, 3.5-5.0 $\times$ 3.5-5.0 cm. Filaments 1.2-1.5 cm long; anthers 2 mm long. Ovary globose or ovoid-ellipsoid; styles 3-5 mm long; stigmas 12-16 lobed. Capsules dehiscent by 7-11 valves. Seeds subreniform, papillose.

Type : Bhootan, Himalaya, Ho-Ko-Chu, 16.6.1884, Dungboo 280, (Holotype CAL, Isotype P).

Fls. : July-Aug.; *Frts.* : Sept.-Oct.

Distrib. : INDIA: Eastern Himalaya, recorded between 3900-4200 m, Sikkim; BHUTAN, TIBET.

Pollen : Pollen grains spheroidal (26-30 μ diameter). No infratectal bacula, only an unstratified exine, with broadly triangular spinules and between these large spinules very minute ones often arranged in irregular rows. The intine is moderately thick [Henderson in *Grana Palynol.* 6(2) : 198, 200. 1965].

Notes : Allied to *M. paniculata* group, but is easily recognizable by incised-serrate leaves, non-substellate shorter bristles of tomentum, white petals and shorter styles.

16. *M. villosa* (Hook. f. ex Hook.) G. Tayl., Acc. genus *Meconopsis* 28. 1934; Fedde in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 17b : 98. 1936; Hara in Fl. E. Him. 105. 1966. *Cathcartia villosa* Hook. f. ex Hook.

in Curt. Bot. Mag. 77 : tab. 4596. 1851; Hook. f. Fl. Brit. Ind. 1 : 119. 1872; Biswas, Pl. Darjeeling & Sikkim Him. 1 : 125. 1966.

Fig. 8

Stems 60 cm tall covered with 3-5 mm long bristles. Leaves broadly ovate-cordate or orbicular, 3-palmatifid with palmatilobed segments, 3-10 × 3-10 cm, basal leaves on 15-30 cm long petioles, upper ones sessile. Flowers forming 1-7 flowered inflorescence, pedicels 2.5-12.0 cm long. Sepals 1.5-2.0 cm long, ovate-oblong. Petals 4, yellow, obovate-suborbicular, 2.5-3.5 × 4.0 cm. Filaments 8-10 mm long; anthers 2 mm long. Ovary narrowly oblong, glabrous; stigmas with 4-7 radiating lobes. Capsules dehiscent by 4-7 valves, 0.4-9.0 × 0.5 cm. Seeds 0.8-1.0 mm long, subreniform, longitudinally ribbed with fine transverse striations.

Type : INDIA : Sikkim, *J. D. Hooker* s. n. (Holotype K, Isotypes CAL, Fl, M).

Fls. & Frts. : July-Sept.

Distrib. : INDIA : Eastern Himalaya recorded between 2700-4300 m, West Bengal (Darjeeling), Sikkim; NEPAL, BHUTAN.

Exsicc. : Sikkim, Cholu Range-Baefonchey, 3300 m, 26.9.1892, *G. A. Gammie* 1298 (CAL); Dzongri, 1888, *King's collector* s. n. (CAL); West Bengal, Singalelelah, 3000 m, 7.10.1870, *C. B. Clarke* 12582 (CAL).

Pollen : Pollen grains 3-colpate, spheroidal (21-24 μ diameter). Apocolpium 5 μ diameter. Exine about 1 μ thick, spinuliferous. Spinules 4-6 μ apart, 1.5 μ high, 1.0-1.2 μ broad at base, with very small spinules, less than 0.2 μ high, scattered between them [Henderson in *Grana Palynol.* 6(2) : 191-209. 1965].

Chr. No. : $n=16$ (Ratter in *Notes Roy. Bot. Gard. Edinburgh* 28 : 191-200. 1967).

Notes : *Meconopsis villosa* (Hook. f. ex Hook.) G. Tayl. has been maintained under the genus *Cathcartia* Hook. f., till G. Taylor (*l. c.*) reduced the latter to *Meconopsis* Vig., G. Taylor (*l. c.*) showed that there are intermediates, that connect the former genus with the latter.

A detailed account on cultivation, garden-hybrids and known-hybrids of wild origin of various species of the genus has been dealt by G. Taylor *et* Cox in their book "An account of the genus *Meconopsis* 1934".

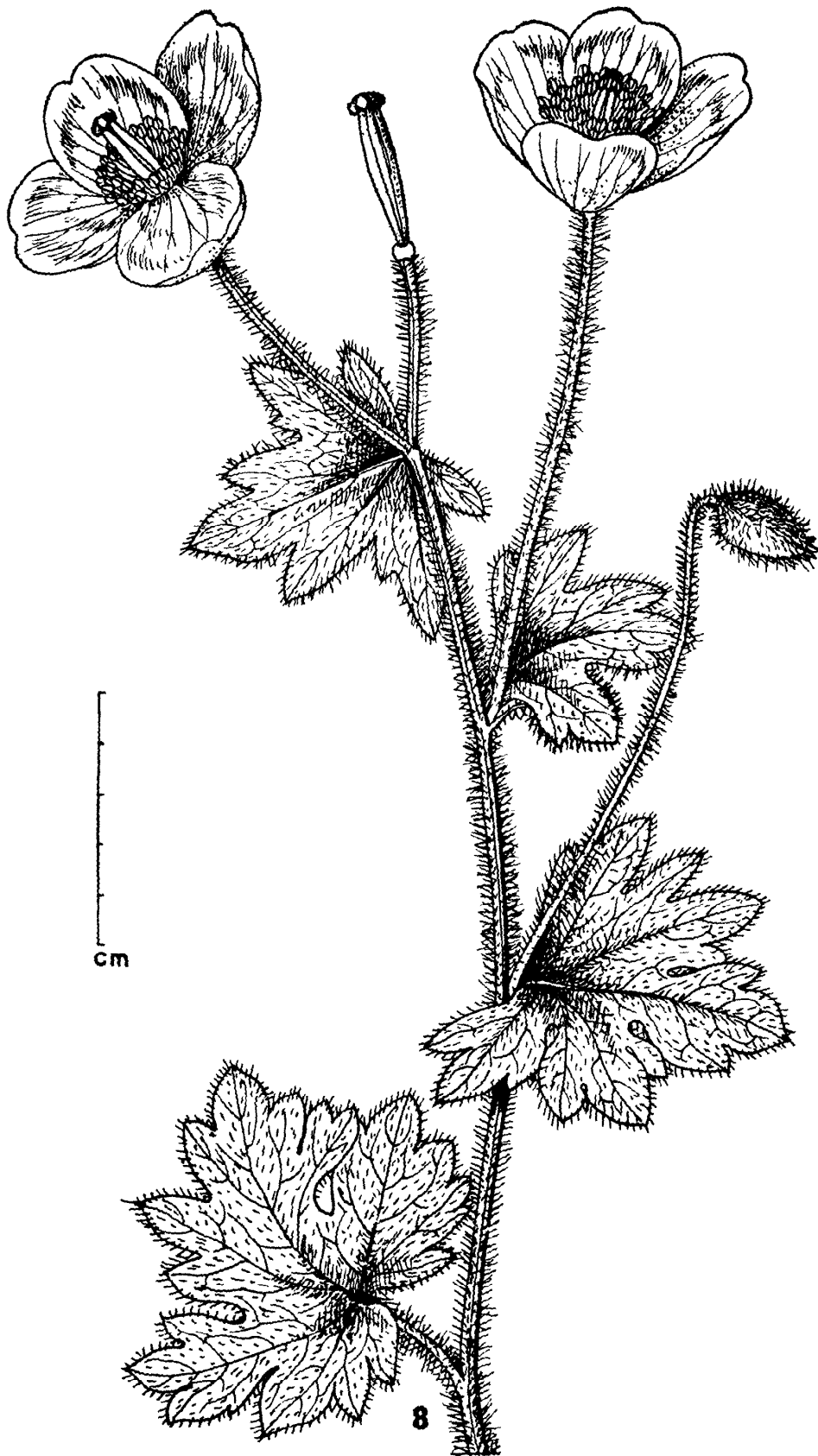


Fig. 8 : Habit of *Meconopsis villosa* (Hook. f. ex Hook.) G. Tayl.

DOUBTFUL AND EXCLUDED SPECIES

Meconopsis argemonantha Prain in Kew Bull. 1915 : 161. 1915 is known only from south-eastern Tibet.

M. auriculata Stapf in New Fl. Silva 2 : 272. 1930 is probably a garden hybrid between *M. betonicifolia* Franch. $\times$ *M. paniculata* (D. Don) Prain and according to Taylor and Cox (Acc. genus *Meconopsis* 65. 1934) it is known only in cultivation.

M. decora Prain in Bull. Misc. Inf. Kew 1915 : 143. 1915 is a hybrid between *M. latifolia* Prain $\times$ *M. napaulensis* DC. and according to Taylor *et* Cox (Acc. genus *Meconopsis* 97. 1934) it does not occur in wild condition.

5. PAPAVER

L. Sp. Pl. ed. 1 : 506. 1753; Gen. Pl. ed. 5 : 224. 1754; DC. Syst. 2 : 76. 1821; Prodr. 1 : 118. 1824; Elkan, Tent. Mon. Gen. Pap. 1837; Benth. & Hook. f. Gen. Pl. 1 : 51. 1867; Hook. f. *et* Thoms. in Hook. f. Fl. Brit. Ind. 1 : 116. 1872; Fedde in Engl. Pflanzenr. 4, 104 : 288. 1909; Fedde in Engler & Prantl, Natur. Pflanzenf. ed. 2, 17b : 1-45. 1936; Jafri *et* Qaiser in Nasir *et* Ali, Fl. W. Pak. 61 : 7. 1974.

Annual, biennial or perennial herbs with milky, whitish, yellowish or orange juice. Stems erect, ascending, mostly patent bristly, rarely glabrous. Leaves mostly pinnatifid or pinnatilobed or pinnatipartite, margin rarely entire, mostly incised, dentate or serrate, segments variously incised, basal leaves petioled, cauline sessile, usually hairy-bristly or glabrous. Flowers singly on long pedicels or on scapes when stems not present, ebracteate; inflorescences often paniculate, mostly patent or adpressed setose. Buds ovate or subglobose. Sepals 2(-3), free, deciduous, ovate-orbicular, minutely setose. Petals 4(-6), obovate-orbicular with little or no claw, mostly red, yellow, orange, lilac or white. Stamens numerous; filaments filiform or dilated; anthers small, orbicular to linear. Ovary mostly ovoid, rarely cylindrical-oblong, glabrous or setose, superior, ovules numerous on parietal placentae; stigmas sessile 4-20, borne on a disc margin crenate to deeply dissected, stigma rays opposite placentas, usually united into a continuous disc by a pyramidal convex or flat disc. Capsules narrowly cylindrical, sub-cylindrical, clavate, oblong or obovate or globular, glabrous or setose or rarely aculeate, dehiscing by pores just beneath the persistent stigmatic disc, 1-loculed, pyramidal convex or flat disc covering the capsule. Seeds very small, kidney-shaped, alveolate-reticulate, brown, black, dark-grey or white, without appendage.

Distrib. : *Ca* 50 species, in temperate Europe, Africa and Asia. In India the genus is represented by 5 species.

Ecol. : The genus occurs in waste places along road sides, river valleys, sandy meadows, subalpine and alpine zone from sea level to 5000 m.

Key to the species

- 1a. Stems very short, scapose with no cauline leaves; leaves all radical
...3. **P. nudicaule**
- 1b. Stems long or rarely short, scapose with cauline leaves; leaves not all radical :
 - 2a. Plants usually densely hispid or stiffly hairy. Cauline leaves not amplexicaule. Many flowered:
 - 3a. Stigmatic segments not keeled, marginal lobes shallow. Disc of capsule flat:
 - 4a. Terminal segments of leaf much longer than the lateral segments. Capsules campanulate, number of the rays of the stigma disc 9-13 (-15) ...4. **P. rhoeas**
 - 4b. Terminal segments of leaf almost equal to the lateral segments. Capsules oblong-ovate or clavate cylindrical, number of the rays of the stigma disc (5) 6-8 (-9) ...1. **P. dubium**
 - 3b. Stigmatic segments keeled, marginal lobes deeply dissected. Disc of capsule hemispherical ...2. **P. macrostomum**
 - 2b. Plants glabrous or nearly so. Cauline leaves amplexicaule. 1- or few-flowered ...5. **P. somniferum**
- 1. **Papaver dubium** L. Sp. Pl. 1196. 1753; Elkan, Tent. Mon. Gen. Pap. 25. 1837; Hook. f. *et* Thoms. in Hook. f. Fl. Brit. Ind. 1 : 117. 1872; Fedde, in Engl. Pflanzenr. 4, 104 : 313. 1909; Blatter, Beau. Fl. Kashmir 1 : 29. 1927; Nair, Fl. Bashahr Him. 22. 1977; *P. dubium* var. *laevigatum* (Bieb.) Elkan. Tent. Mon. Gen. Pap. 25. 1837 ; Aitchison, Cat. Pl. Punjab & Sindh 4. 1869. *P. dubium* var. *glabrum* (Royle) Koch, Synops. ed. 1 : 30. 1838.

Fig. 9

Caulescent or subscapose, 14-41 cm tall; stems basicauliramous. Leaves pinnatisect, sometimes pinnatifid, oblong-ovate, entire, often dentate, 2-10 × 2-3 cm. Peduncles 5-33 cm long. Buds ovoid, 8-16 × 4-8 mm. Flowers 3-7 cm in diam. Sepals caducous. Petals 2.4-2.8 × 3.0-3.6 cm, brick red to red. Stamens few; filaments 9 mm long; anthers broad elliptic, 1 mm long. Capsules 5-18 × 3-9 mm, glabrous. Seeds purplish black.

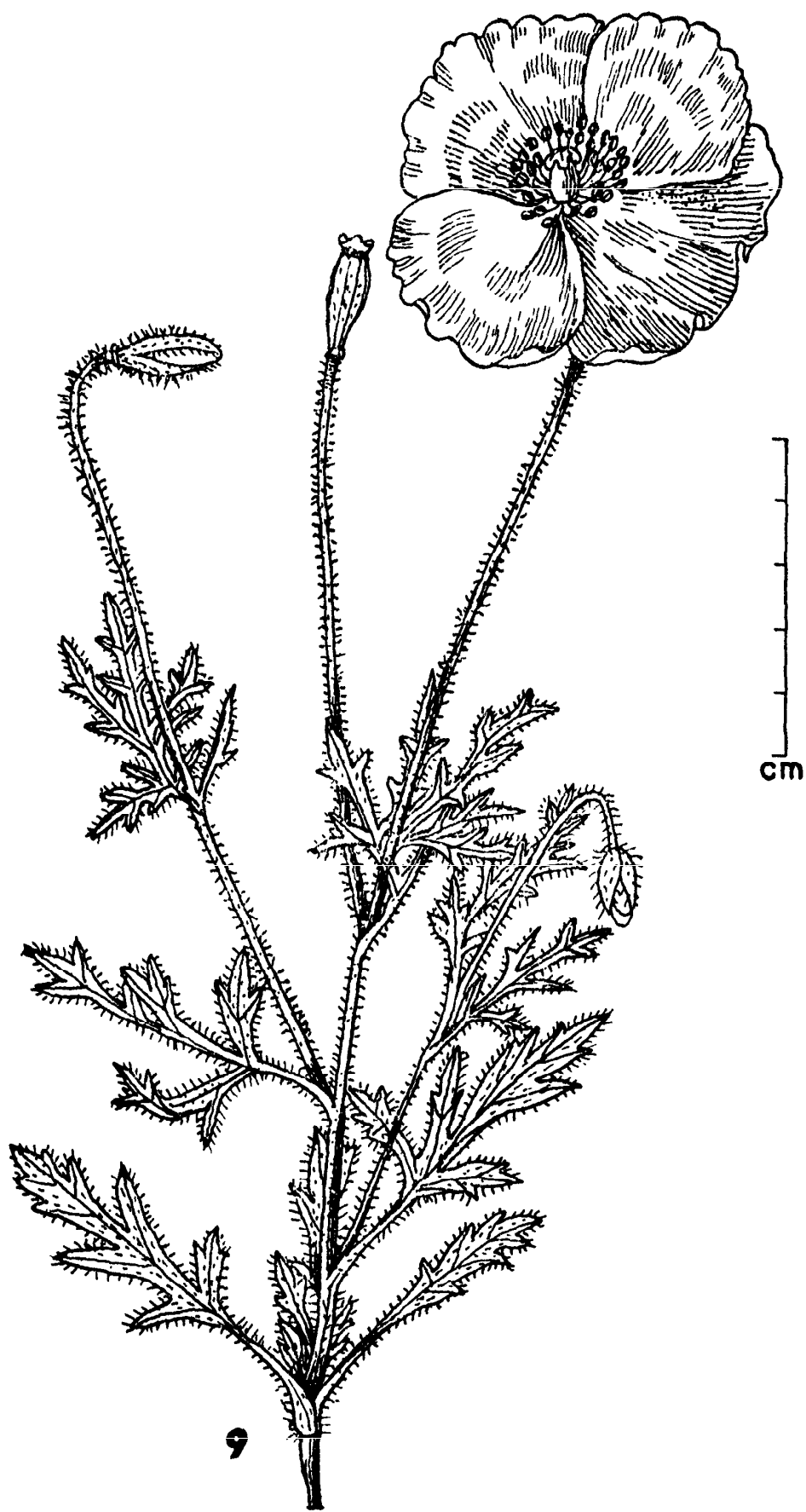


Fig. 9 : Habit of *Papaver dubium* Linn.

Type : Switzerland & Britain, Herb. Linn. 669/7 (LINN).

Fls. : Apr.-June; *Frts.* : June-Aug.

Distrib. : INDIA : Recorded between 1000-3000 m. Jammu & Kashmir, Himachal Pradesh, Punjab, Uttar Pradesh; PAKISTAN, USSR, IRAN, AFGHANISTAN, CENTRAL EUROPE (GERMANY, POLAND, CZECHOSLOVAKIA, HUNGARY, AUSTRIA, SWITZERLAND), ATLANTIC EUROPE (NETHERLANDS, BELGIUM, ENGLAND, FRANCE, PORTUGAL), BALKAN PENINSULA, AFRICA (NORTH).

Exsicc. : Himachal Pradesh: Kalpa, 3000 m, 3.6.1972, *Janardhanan* 47625 (CAL); Uttar Pradesh : Jeolikote, 1200 m, 5.2.1913, *Gill* 547 (CAL); Simla, 1700 m, 17.5.1876, *Gamble* 4233C (CAL).

Pollen : Monad, isopolar, radiosymmetric; tricolpate, colpus $30.0 \times 1.5 \mu$; spheroidal, P/E index 1.03; tectate, tectum thickness 1μ , intrareticulate; equatorial diameter $26.5-34.0 \mu$ (mean 32.6μ , $\sigma=2.8$) [*Rachele in Bull. Torr. Bot. Club* 101(3) : 134, fig. 1 H. 1974].

Chr. No. : $n=14$ (*Koul et al in Nucleus* 15 : 117-123. 1972); $2n=28, 42$ (*Koopmans in New Phytol.* 69 : 1121-1130. 1970).

Notes : *P. dubium* is a variable and complex species. Based on variable characters, several taxa have been recognized, which are collectively referred under a single polymorphic taxon *P. dubium* L. which is very closely related to *P. rhoeas*, but is easily recognizable by terminal segments of leaves almost equal to the lateral segments (it is much longer than the lateral segments in *P. dubium*); buds tapering to a more acute apex and are broadest below the middle (buds are blunt at the apex, broadest above the middle in *P. dubium*); capsule twice as long as wide.

2. ***P. macrostomum*** Boiss. *et* Huet (in Sched. Pl. Huet. 1855, *nomen nudum*) ex Boiss. in Boiss. Fl. Or. 1 : 115. 1867; Fedde in Engl. Pflanzenr. 4, 104 : 335. 1909; Singh & Kachroo, Forest Flora of Srinagar 25 & 27. 1976.

Fig. 10

Stems cauliramous, 20-40 cm long. Leaves pinnatisect or deeply incised, linear-lanceolate or oblong-lanceolate, entire or coarsely or sparsely dentate, 1-4 cm long. Peduncles 10-12 cm long. Buds ovate-oblong, $1.0-2.5 \times 0.6-1.1$ cm. Sepals caducous. Flowers 6 cm in diam. Petals 2-3 cm long, bright red. Stamens numerous; anthers 1.0-1.5 mm long. Capsules $0.9-2.0 \times 0.4-1.0$ cm, oblong ellipsoid or somewhat tubulose, glabrous. Stigmatic rays 5-10, crenate. Seeds 1 mm long, dark-brown, reticulate.

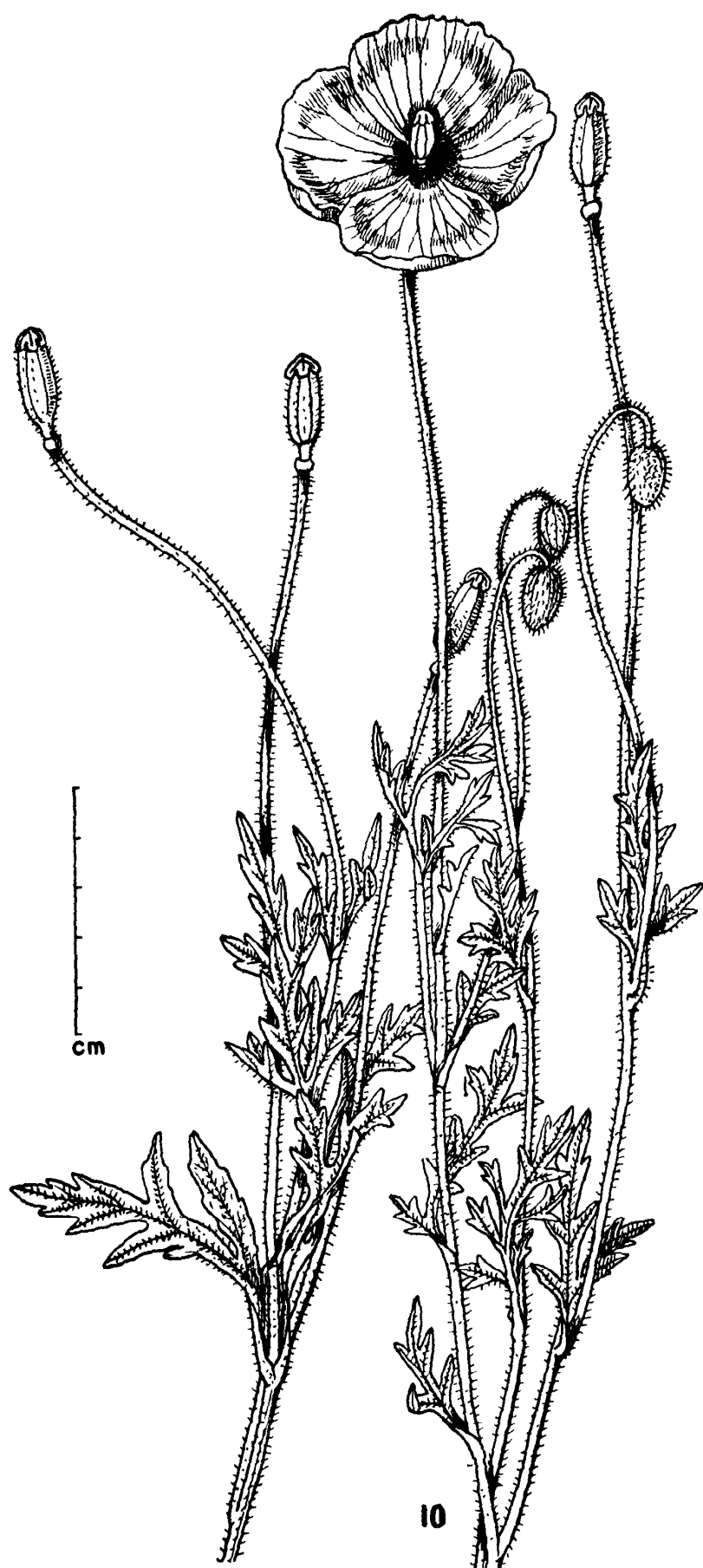


Fig. 10 : Habit of *Papaver macrostomum* Boiss. et Huet ex Boiss.

Type : Turkey: (Erzurum) Armenia, circa Tortum ad vias, 1853, *Huet* (G).

Fls. : Apr.-July; *Frts.* : July-Aug.

Distrib. : INDIA : N. W. Himalaya, recorded between 1500-3000 m: Jammu & Kashmir; PAKISTAN, USSR, IRAN, AFGHANISTAN, TURKEY, ARMENIA, KURDISTAN.

Exsicc. : Mussoorie, *King* s. n. (CAL).

Chr. No. : $n=7$ (Koul *et al* in *Nucleus* 15 : 117-123. 1972); $2n=14$ (Kawatani & Ohno in *Bull. Nat. Inst. Hyg. Sci.* 83 : 127-133. 1965).

Notes : Closely related to *P. dubium* but it differs by their robust habit, smooth, ellipsoid, glaucous capsules. It also differs from *P. rhoeas* by having elongated fruits, deeply lobed stigmatic disc with somewhat keeled rays reaching almost the end of the drooping lobes.

3. ***P. nudicaule*** L. Sp. Pl. 507. 1753; Hook. f. *et* Thoms. in Hook. f. Fl. Brit. Ind. 1 : 117. 1872; Fedde in Engl. Pflanzenr. 4, 104 : 376. 1909; Blatter *et* Ethelbert, Beau. Flr. Kashmir 1 : 28, Pl. 8. 1927; Coventry, Wild Flr. Kashmir, series 2 : 19, Plate 10, 1927; Kachroo *et al* Fl. Ladak 48. 1977. *P. croceum* Ledeb. Fl. Alt. 271. 1830, Popov in Kom. Fl. USSR 7 : 607. 1937.

Scapes 10-58 cm long. Leaves 2.0-8.5 cm long and widened at the base, leaf sheath $2-6 \times 1-3$ cm, pinnately 3-lobed, lobes usually pinnatifid, secondary lobes 11×5 mm. Flowers 1.5-5.0 cm. Buds ovoid-orbicular or suborbicular, $8-12 \times 5-9$ mm. Sepals concave, caducous. Petals 4, obovate-suborbicular, yellow to orange-yellow, 1.0-1.8 cm long and usually about as broad. Stamens many; anthers 1-2 mm long. Capsules oblong to oblong-globose, $0.8-1.5 \times 0.5-1.0$ cm. Stigmatic disc 7-8 ridged, pores 7-8.

Type : Siberia, Herb. Linn. No. 669/5 (LINN).

Fls. : May-July; *Frts.* : July-Aug.

Distrib. : INDIA : Western Himalaya, recorded between 3000-5000 m, Jammu and Kashmir, Himachal Pradesh; PAKISTAN, AFGHANISTAN, USSR, MONGOLIA.

Exsicc. : Kashmir, 3300 m, 15.8.1913, *Koebel* 126 (CAL); Ladak, 4500-5100 m, *Thomson* s. n. (CAL).

Chr. No. : $n=14$ (Koul *et al* in *Nucleus* 15 : 117-123. 1972); $2n=42$ (Hanelt in *Kulturpflanze* 18 : 73-88. 1970).

Notes : Very variable species in size and colour of flowers. Flower colour varies from pale yellowish to yellow, orange or saffron. Popov (in Kom., *l. c.* 607) mentioned the India-Himalaya distribution of *P. croceum* which he treated as a distinct species. But Jafri & Qaiser (in Nasir *et al.*, *l. c.* 10) considered *P. croceum* as a synonym under *P. nudicaule*. The differences between *P. croceum* and *P. nudicaule* are in flower colour (yellow and orange respectively) and in leaf segmentation (narrow and somewhat broader respectively). On these characters *P. croceum* cannot be maintained as a distinct species from *P. nudicaule*.

4. *P. rhoeas* L. Sp. Pl. 507. 1753; Elkan, Tent. Mon. Gen. Pap. 27. 1837; Hook. f. *et* Thoms. in Hook. f. Fl. Brit. Ind. 1 : 117. 1872; Fedde in Engl. Pflanzenr. 4, 104 : 293. 1909; Blatter, Beau. Flr. Kashmir 1 : 29. 1927; Babu, Herb. Fl. Dehra Dun 50. 1977; Nair in Rec. Bot. Surv. Ind. 21, 1 : 8. 1978. *P. hookeri* Backer ex Hook. f. in Bot. Mag. t. 6729. 1883; Nair in Rec. Bot. Surv. Ind. 21. 1 : 8-9. 1978.

Lal, Lalpost, Post, Postekhejia (Hind.); *Lalposht* (Beng.); *Lala, Lalkhaskhas* (Guj.); *Chovanna-kashakhasa* (Mal.); *Raktapostavrikshaha* (Sans.); *Sigupappostaka, Sivappugashagasha* (Tam.); *Erragassagassala, Errapostakaya* (Tel.); *Gulelalakebija, Khas Khashsiyah* (Urdu).

Caulescent, 18-50 cm tall, hispid. Leaves 5.5-18.5 × 3.0-7.5 cm, sinuate-pinnatifid to bipinnatifid. Peduncles 10-25 cm long, with dilated summit, hairy. Buds obovoid, 1.5-3.0 × 1-2.0 cm. Flowers 7.5 cm across. Sepals 2. Petals obovate-suborbicular, 3.7 × 3.3-6.5 cm. Stamens numerous, linear; anthers 1 mm long, oblong. Capsules campanulate, 12.0 × 7.5 mm, glabrous. Rays of the stigma disc 9-13 in number. Seeds dark brown.

Type : Europe, Herb. Linn. No. 669/5 (LINN).

Fls. : Apr.-July; *Frts. :* July-Sept.

Distrib. : INDIA : Himachal Pradesh, Punjab, Uttar Pradesh, West Bengal; EUROPE, AFRICA (NORTH).

Uses : The latex from the capsules is narcotic and has slightly sedative properties.

Pollen : Monad, isopolar, radiosymmetric; tricolpate, colpus 20 × 1 μ; spheroidal, P/E index 1.02; tectate, tectum 1 μ thick, intrareticulate; equatorial diameter 22-30 μ (mean 24.7 μ, σ = 2.6) [Rachele in *Bull. Torr. Bot. Club* 101(3) : 154, fig. 1G, 1974].

Chr. No. : n=7 (Koul *et al.* in *Nucleus* 15 : 117-123. 1972); 2n=14 [Mitra in *Sci. & Cult.* 30(7) : 344-345. 1964].

Notes : It is a very variable species in size, shape and hairiness of leaves, colour of filaments, black blotch on petals and shape of capsules.

P. hookeri is often regarded as separate species but it is only a robust and taller form of *P. rhoeas*.

5. ***P. somniferum*** L. Sp. Pl. 1 : 508. 1753; Roxburgh, Fl. Ind. 2 : 571. 1832; Elkan, Tent. Mon. Gen. Pap. 30. 1837; Hook. f. et Thoms. in Hook. f. Fl. Brit. Ind. 1 : 117. 1872; Duthie, Fl. Upper Gang. Pl. 1 : 36. 1903 (Repr. ed. 1 : 36. 1960); Prain, Beng. Pl. 1 : 215. 1903 (Repr. ed. 1 : 141. 1963); Fedde in Engl. Pflanzenr. 4, 104 : 338. 1909; Gamble, Fl. Pres. Madr. 1 : 35. 1815 (Repr. ed. 1 : 25. 1957); Haines, Bot. Bih. & Or. 1 : 23. 1921 (Repr. ed. 1 : 23. 1961); Maheshwari, Fl. Delhi 56. 1963; Biswas, Pl. Darjeeling & Sikkim Him. 1 : 25. 1966.

Afim, Afyum, Khas kash, Post, Postekbij (Hind.); *Posto, Post* (Beng.); *Aphina, Khuskhus, Posta* (Guj.); *Afium, Kashakasha* (Mal.); *Aphu, Khus khus, Posta* (Mar.); *Afim, Doda, Khaskhas, Khishkhash, Post* (Punj.); *Ahifen, Chosa, Khasa, Khakasa, Ullasata* (Sans.); *Abini, Gashagasha, Kasakasa, Postaka* (Tam.); *Abhini, Gasagasala, Gasalu, Kasakasa* (Tel.); *Khashkhash-sufaid* (Urdu).

Stems cauliramous, 10-100 cm long. Leaves simple, repand, serrate-dentate, rarely pinnatipartite or pinnatifid, 3-15 × 1-8 cm. Pedicels 3-20 cm long. Buds coriaceous, ovoid-oblong. 1.5-3.0 × 1.0-2.0 cm. Flowers 2-10 cm in diam. Sepals glabrous, evanescent. Petals 1.5-5.5 × 1.5-6.5 cm, obovate-orbicular, white, pink, red or purple. Filaments 0.5-1.0 cm; anthers 1.0-1.5 mm long, oblong-linear. Capsules 7 × 5-6 cm. Stigmatic disc scarious with 7-18 stigma rays. Seeds small, white, grey-black.

Type : South Europe, Herb. Linn. No. 669/8 (LINN).

Fls. : Apr.-June; **Frts. :** July-Aug.

Distrib. : INDIA : recorded up to 3000 m: Haryana, Delhi, Uttar Pradesh, Bihar, Sikkim, Assam, Manipur, Maharashtra, Karnataka, Tamil Nadu, Kerala; EUROPE.

Uses : *Papaver somniferum* (Opium poppy) is widely cultivated for its latex, which contains alkaloids (mainly *Morphine, Narcotine, Papaverine, Codeine, Thebaine*). Opium is used in diarrhoea, diabetes and rheumatism and also as an antidote to snake poison and scorpion sting. The seed is used in cooking and making sweets. Seed oil is suitable for making candles, soap, medicine and food.

Pollen : Monad, isopolar, radiosymmetric; tricolpate, colpus $22.5 \times 2.5 \mu$; spheroidal, P/E index 0.95; tectate, tectum 1.5μ thick, intrareticulate; equatorial diameter $29.5-39.0 \mu$ (mean 30.5μ , $\sigma=2.8$) [Rachle, *Bull. Torr. Bot. Club* 101(3): 154, fig. IF. 1974].

Chr. No. : $n=11$ (Koul *et al* in *Nucleus* 15 : 117-123. 1972); $2n=22$ (Mary & Malik in *Chromosome Inf. Serv.* 15 : 27-29. 1973).

HYPECOACEAE†

T. Nakai, Ordines Fam. Tribi Tokyo N-ED 240.1943

H. S. DEBNATH* AND M. P. NAYAR*

Annual, erect, ascending or prostrate, glabrous, often glaucous herbs with watery (not milky) sap. Stems or scapes several with a dense rosette of radical leaves. Leaves short petiolate, 2-4 pinnatisect, segments subsessile, palmately bipinnatisect into linear to narrowly obovate lobules exstipulate. Inflorescences dichasial, spreading; floral leaves much reduced and thinly dissected. Sepals 2, free, deciduous, ovate-triangular or oblong, much smaller than petals. Petals white, yellow or slightly pink-violet, 4 in two series, outer two trilobed or entire, obovate, inner two trilobed, lateral lobes linear, median lobe concave, stipitate. Stamens 4, free, opposite the petals; filaments winged or dilated, scarious, sometimes with a stipitate gland at the base; anthers linear. Ovary linear, unilocular; ovules numerous on two parietal placentae; styles short; stigmas bipartite, glandular at the tip, often recurved. Capsules linear, siliquiform, many seeded, lomentoid, disarticulating transversely, rarely dehiscent by 2 valves. Seeds small, grey, compressed, without aril, rough or smooth.

1 genus and *ca* 15 species in the temperate regions of Europe and Asia.
2 species in India.

The genus *Hypocoum* is placed in the family Papaveraceae by Engler and Diels (Syll. der Pflanzenfam., Ed. II Berlin. 1936), Fedde (Papaveraceae: Hypocoideae *et* Papaveraceae-Papaveroideae. W. Engelman, Leipzig 1936), Melchoir (Engler's Syll. der Pflanzenfam., 11 Band. Gebruder, Brontraeger, Berlin 1964), Thorne (*Nord. J. Bot.* 3 : 85-117. 1983) as a subfamily Hypocoideae. But Cronquist (Evoln. & Classif. Fl. Pl. 1968) resolved the situation by defining the order Papaverales as consisting of two families, the Papaveraceae and the Fumariaceae. He was of the opinion that the Asian genera *Hypocoum* and *Pteridophyllum* may form a connecting link between the two families and he placed this subfamily Hypocoideae under the family Fumariaceae. Hutchinson (The families of Flowering plants, 1959) and Dahlgren (*Bot. Notiser* 128 : 119-147. 1975) also placed it under the family

†Editor for Fam. Hypecoaceae : N. C. Nair, Botanical Survey of India, Coimbatore.

*Botanical Survey of India, Howrah-711 103.

Fumariaceae. But Takhtajan (*Systema et Phylogeniae Magnoliophytorum* 1966) raised this subfamily to the family status Hypecoaceae.

HYPECOUM

L. Sp. Pl. 124. 1753; Gen. Pl. ed. 5 : 60. 1754; Hook. f. *et* Thoms. in Hook. f. Fl. Brit. Ind. 1 : 120. 1872 (under Fumariaceae); Fedde in Engl. & Prantl, Natur. Pflanzenfam. ed. 2, 17 b : 69. 1936; Jafri *et* Qaiser in Nasir *et* Ali, Fl. W. Pak. 61 : 26. 1974.

Characters of the family.

Distrib. : Ca 15 species in PAKISTAN, NEPAL, BHUTAN, EASTERN ASIA (JAPAN & NORTH CHINA), USSR, NORTH AFRICA, WESTERN ASIA, CENTRAL EUROPE. In India the genus is represented by 2 species.

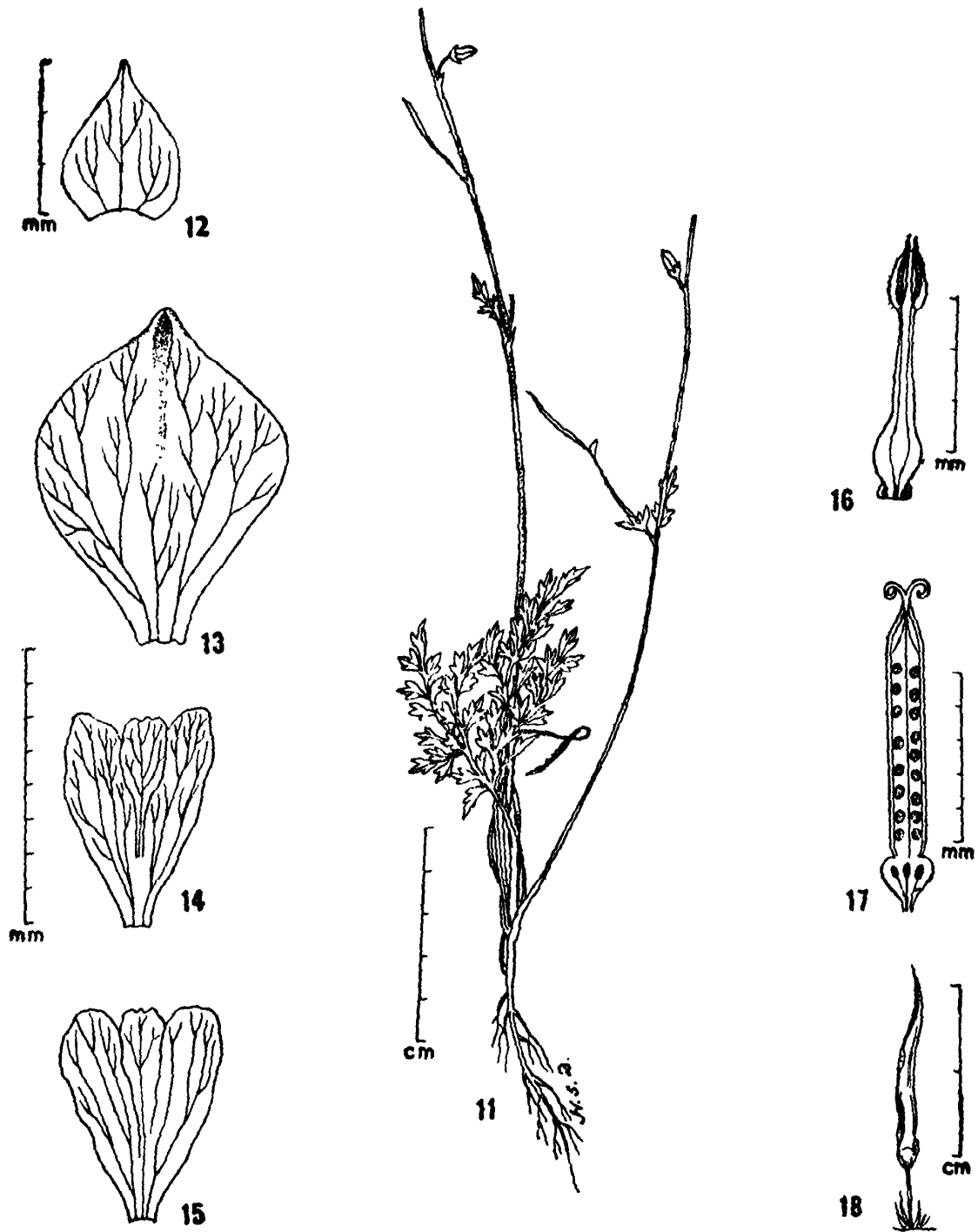
Ecol. : In India the genus occurs in cultivated land, fallow fields, weed infested places, rocky foot hill slopes and intermountain terrains up to 5030 m.

Key to the species

- 1a. Flowers white or slightly violet; middle lobe of the inner petals not fringed. Siliquas erect, with erect or horizontal pedicels
...1. **H. leptocarpum**
 - 1b. Flowers yellow; middle lobe of the inner petal with fringed margin. Siliquas pendulous on recurved pedicels
...2. **H. pendulum**
1. **Hypecoum leptocarpum** Hook. f. *et* Thoms. Fl. Ind. 1 : 276. 1855 *et* in Hook. f. Fl. Brit. Ind. 1 : 120. 1872 (under Fumariaceae).

Figs. 11-18

Annuals, 15-35 cm tall. Leaves rosulate, 2-3 pinnatisect, upper leaves sessile or subsessile. Flowers 0.8-1.5 cm across. Sepals 2, entire, 2.5-3.0 × 1.5-2.0 mm. Petals 4, in two whorls, outer 2, entire, not lobed, obtuse, apex keeled & subcoriaceous, 9-10 × 5-6 mm, inner 2, deeply 3-lobed, 5-6 × 4.0-4.5 mm, middle lobe spatulate, hooded. Stamens 4, each 5-6 mm long; filaments 3.5 × 1.0 mm; anthers 1.5 mm long, basifixed, 2-loculed, linear oblong, each anther locule with a minute apical projection and with two glands at the base of the filament. Ovary 1 mm long, syncarpous, superior; styles slender, 8.5 × 0.5 mm; stigmas 2, recurved, 1.5 mm long. Capsules narrowly linear, 1.2-3.5 × 0.1-0.2 cm. Seeds brown, oblong.



Hypecoum leptocarpum Hook. f. et Thoms.

Figs. 11-18 : 11. Habit. 12. Sepal. 13. Outer petal. 14. Inner side of the inner petal. 15. Outer side of the inner petal. 16. Stamen. 17. Gynoecium. 18. Capsule.

Type : Tibet, Temp. region, 3050-3660 m, *T. Thomson* s. n. (CAL, K).

Fls. & Frts. : June-Sept. (Oct.).

Distrib. : INDIA : Himalaya, Kashmir, Sikkim; TURKISTHAN, AFGHAN-ISTAN, PAKISTAN, NEPAL, BHUTAN, USSR, TIBET, CHINA, MONGOLIA, JAPAN.

Exsicc. : Sikkim: Kakuchu, 5000 m, 3. 8. 1909, *Smith & Cave* 1898 (CAL); Phari, 29.7.1877, *King* 4536 (CAL).

Uses : The latex contains opium alkaloid protopine which has narcotic action. (Henry, *The plant alkaloids* 299 & 305. 1949; Manske & Holmes, *The Alkaloids* 4 : 158. 1950-54).

Notes : *Hypecoum leptocarpum* Hook. f. et Thoms. varies very much in size and form. It may be noted that plants growing at lower elevations are usually taller than those that are at higher elevations.

The occurrence of this species at an elevation of 5500 m in Himalaya indicates its wide tolerance to severe conditions prevailing at that altitude, which is usually the upper limit for the existence of flowering plants.

2. ***H. pendulum*** L. Sp. Pl. 124. 1753; Sing in *Geobios* 2 (2-3) : 91. 1975. *H. caucasicum* Koch ex Ledeb, Fl. Ross. 1 : 94. 1842; *H. procumbens* auct. non L. Hook. f. et Thoms. in Fl. Ind. 275. 1855 et in Hook. f. Fl. Brit. Ind. 1 : 120. 1872; Sharma in J. Bombay Nat. Hist. Soc. 73 : 422-423. 1976.

Annuals, 5.0-24.5 cm tall. Leaves 2-3 pinnatisect, segments linear, cauline leaves palmatisect, sub-opposite. Flowers 0.8-1.2 cm across. Sepals 2, each 2.0×1.5 mm, entire or shallowly incised at the margin. Petals 4, in two whorls, outer 2 entire or obscurely 3-lobed, 7-10×4-6 mm, 2-lateral lobes a little broader than the median lobe and projecting laterally in dentate shape, inner 2, deeply 3-lobed, 4-7 mm long, middle lobe shorter or longer than the lateral lobes, emarginate and recurved, spathulate. Stamens 4, free, 5-6 mm long; filaments 4.5×0.5 mm, glands 2, present at the base of the filament; anthers 2 mm long, basifixed, 2-loculed, linear, locules with a minute apical projection. Ovary superior, 5 mm long; styles slender, 3.5×0.5 mm with two divergent stigmas, 1.5 mm long. Capsules 3.0-7.5×1.5-3.0 mm, indehiscent to pseudodehiscent. Seeds grey, 2.0×1.5 mm, obliquely semicircular.

1a. Siliquas articulating, epidermis not peeling off ...var. **pendulum**

1b. Siliquas disarticulating, epidermis peeling off ...var. **parviflorum**

var. **pendulum**

Type : Europe : France, Herb. Linn. No. 171/4 (LINN).

Fls. & Frts. : Mar.-July.

Distrib. : INDIA : Himalaya, Kashmir; PAKISTAN, USSR, AFRICA (NORTH), WESTERN ASIA (EGYPT, IRAN, AFGHANISTAN), S-W. & S-E. EUROPE (BULGARIA, FRANCE, GREECE, YUGOSLAVIA, TURKEY).

Notes : It differs from *H. procumbens* L. in having terete and cylindrical capsules.

var. **parviflorum** (Kar. & Kir.) Cullen in Rech. f. Fl. Iran. 34 : 25, t. 7, fig. 1, 2. 1966; Jafri *et* Qaiser in Nasir *et* Ali, Fl. W. Pak. 61 : 30. 1974. *H. parviflorum* Kar. & Kir. in Bull. Soc. Nat. Mosc. 15 : 141. 1842; Popov in Kom. Fl. USSR 7 : 580. 1937.

Type : "Hab. in arenosis songoriae and fl. Lepsa".

Fls. & Frts. : Mar.-July.

Distrib. : INDIA : Himalaya; PAKISTAN, AFGHANISTAN, IRAN, TURKEY, USSR.

Notes : Indian-Himalaya distribution of this variety was mentioned only by Popov (*l. c.*).

The two varieties *Hypecoum pendulum* var. *pendulum* and *H. pendulum* var. *parviflorum* are closely allied.

Fedde (in Engl. Pflanzenr. 4, 104 : 95. 1909), Cullen (*l. c.*), Jafri *et* Qaiser (*l. c.*) stated that outer petals of the var. *pendulum* are rhomboid, subtrilobed to trilobed whereas in var. *parviflorum* it is elliptic and entire.

Mowat *et* Tutin (Fl. Europea 1 : 251-252. 1964), Cullen (Fl. Turkey 1 : 236-238. 1965), Popov (*l. c.*), Aston (Muelleria 3.3 : 177-182. 1976) stated that outer petals of the var. *pendulum* are entire without a trace of lobes, where as in var. *parviflorum* they are obovate or oblong, obscurely 3-lobed.

After examination of the specimen it is seen that the character of the outer petals of the two varieties is variable and overlapping.

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