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Edited by

B.V. SHETTY & V. SINGH



BOTANICAL SURVEY OF INDIA

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With contributions by
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Cover Photo : A fruiting twig of *Millettia tomentosa*

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71. CAMPANULACEAE

(V. Singh)

- Corolla white or purple. Capsules laterally dehiscent at the base or sides below the calyx - teeth. ... 1. *Campanula*
- Corolla blue. Capsules loculicidally dehiscent by 2 - 5 valves in upper region. ... 2. *Wahlenbergia*

1. CAMPANULA L.

- 1a. Capsules dehiscent by valves at the base :
- 2a. Annual herbs. Calyx - lobes 2.0 - 3.5 mm long. Corolla 5 - 6 mm long. Seeds much compressed, margined. ... 1. *C. benthamii*
- 2b. Perennial herbs. Calyx - lobes 5 - 6 mm long. Corolla 1.0 - 1.5 cm long. Seeds subcompressed. ... 2. *C. colorata*
- 1b. Capsules dehiscent by valves on the sides or towards the apex. ... 3. *C. fulgens*

1. *Campanula benthamii* Wall. ex Kitamura, Fl. Afgh. 377. 1960 ; Raizada. Suppl. Duthie, Fl. Gangetic Plain 138. 1976. *C. canescens* Wall. ex DC. Prodr. 7 : 473. 1839, non Roth, 1827 ; Clarke in Hook. f. Fl. Brit. India 3 : 439. 1881 ; Duthie, Fl. Gangetic Plain 1 : 499. 1903. *C. wallichii* Babu in Journ. Bomb. Nat. Hist. Soc. 65 : 808. 1968.

Erect, multicauline, annual herbs, 10 - 20 cm high. Basal leaves in rosette, 1.5 - 2.0 × 0.8 - 1.5 cm, obovate spatulate, narrowed into a petiole ; upper ones sessile, 1.0 - 1.5 × 0.2 - 0.5 cm, linear lanceolate to oblong, subacute. Flowers 5 - 8 mm long, solitary, sessile, forming a speciform panicle. Calyx - lobes linear - lanceolate, hairy. Corolla divided less than half way down. Capsules hemispheric, 3 - celled, hairy.

Fl. & Fr. : January - April.

Rare, in wet and shady habitats, particularly in the gardens and forests in the east of Aravalli.

Selected specimens : Bundi : Kota Dam, Singh 74403 (LWG) ; Jhalawar : Verma 3427 (BSA) ; Kota : Darah, Singh 74437 (LWG) ; Sirohi : Mt. Abu, Mehta 410 (JAC).

Leaves not perfoliate. Calyx glandular, 5 - nerved but not winged between the nerves.

... 2. *Plumbago*

1. DYEROPHYTUM O. Ktze.

Dyerophytum indicum (Gibs. ex Wt.) O. Ktze. Rev. Gen. Pl. 3 : 394. 1891. *Vogelia indica* Gibs. ex Wight, Ic. 3(4) : 5. t. 1075. 1846 & in Cal. Journ. nat. Hist. 7 : 17. 1847 ; Clarke in Hook. f. Fl. Brit. India 3 : 481. 1882 ; Duthie, Fl. Gangetic Plain 2 : 2. 1911.

Undershrubs, 1 - 2 m high, with terete branches. Leaves 3.5 - 8.0 × 2.0 - 5.5 cm, ovate or ovate - elliptic to suborbicular, obtuse or apiculate, undulate, coriaceous, more or less covered with scurfy scales. Flowers golden yellow, in 2 - 10 cm long, bracteate, branched spikes. Calyx - teeth about half the length of tube, acute. Corolla lobes obovate - oblong, emarginate. Capsules 5 - 8 mm long, glabrous, 5 - valved. Seeds pyriform, smooth, brown.

Fl. & Fr. : October - January.

Common in wastelands and open forests, particularly on dry rocky hill slopes.

Selected specimens : Ajmer : Mowa Bir, Duthie 6661 (DD) ; Barmer : Haldeshwar, Tiwari 1178 (BSJO) ; Jaipur : Ramgarh, Sharma 1810 (RUBL) ; Sirohi : Mt. Abu, Raizada 20771 (DD) ; Udaipur : Parkar 3383 (DD).

2. PLUMBAGO L.

Plumbago zeylanica L. Sp. Pl. 151. 1753 ; Clarke in Hook. f. Fl. Brit. India 3 : 480. 1882 ; Duthie, Fl. Gangetic Plain 2 : 2. 1911 ; Mahesh. Illus. Fl. Delhi f. 166. 1966. '*Chitrak, Chitraval*' (Hindi).

Erect or straggling undershrubs. Leaves 2.5 - 10.0 × 1.5 - 6.0 cm, ovate - lanceolate or oblong, acute, contracted at the base into a petiole, undulate - crispy, glabrous, white punctate beneath. Flowers white, in axillary and terminal, 5 - 30 cm long racemes combined into leafy panicles. Corolla - lobes oblong, apiculate. Styles glabrous. Capsules 5 - 6 mm long, oblong, longitudinally furrowed, enclosed within the persistent calyx. Seeds oblong, smooth.

Fl. & Fr. : Most part of the year.

Common in wastelands and open forests among bushes.

Selected specimens : Ajmer : Nagpahar, *Sharma* 1136 (LWG) ; Banswara : Garhi, *Kanodia* 7554 (BSA) ; Jaipur : Amer, *Sharma* 247 (RUBL) ; Kota : *Singh* 90102 (LWG) ; Sirohi : Mt. Abu, *Jain* 62177 (BSI).

CULTIVATED SPECIES

Plumbago auriculata Lam. Shrubs, with alternate or subverticillate, obovate leaves and blue flowers in panicles. Native of S. Africa ; cultivated for ornamental purposes.

Plumbago indica L. - Shrubs, with rosy - scarlet flowers. Native of Sikkim and Khasia hills ; cultivated for ornamental purposes.

74. PRIMULACEAE

(V. Singh)

- | | | |
|---|-----|---------------------|
| 1a. Leaves alternate or opposite. Flowers solitary, axillary. | ... | 1. <i>Anagallis</i> |
| 1b. Leaves in a basal rosette, often also alternate in upper region. Flowers in racemes or umbels : | | |
| 2a. Leaves in a basal rosette only. Flowers in umbels which are borne on several, leafless scapes. Ovary superior. | ... | 2. <i>Primula</i> |
| 2b. Leaves in rosette at base and alternate above. Flowers in axillary and terminal racemes. Ovary half - inferior. | ... | 3. <i>Samolus</i> |

1. ANAGALLIS L.

- | | | |
|---|-----|-----------------------|
| Leaves 3 nerved. Corolla blue. Filaments hairy. | ... | 1. <i>A. arvensis</i> |
| Leaves 1 - nerved. Corolla white. Filaments glabrous. | ... | 2. <i>A. pumila</i> |

1. *Anagallis arvensis* L. Sp. Pl. 148. 1753 ; Hook. f. Fl. Brit. India 3 : 506. 1882 ; Duthie, Fl. Gangetic Plain 2 : 6. 1911 ; Mahesh. Illus. Fl. Delhi f. 117. 1966. 'Neel' (Hindi).

Annual herbs, upto 60 cm high. Stem and branches 4 - angular. Leaves opposite, sessile, 1.5 - 2.0 × 0.5 - 1.5 cm, ovate - lanceolate, subacute, glabrous. Flowers axillary, solitary ; pedicels longer than leaves, recurved in fruits. Calyx deeply 5 - lobed ; lobes lanceolate,

acuminate, crenulate. Corolla - lobes fringed with minute glands. Filaments hairy. Capsules 4 - 6 mm in diam., globose, circumsciss, many seeded. Seeds flattened, subtrigonus.

Fl. & Fr. : December - March.

Native of Europe and Mediterranean region ; naturalized as a weed in cultivated fields and gardens during winters.

Selected specimens : Banswara : Pipalkhunt, *Singh* 4221 (BSJO) ; Ganganagar : 15 A, *Roy* 4080 (BSJO) ; Kota : Atru, *Singh* 90350 (LWG) ; Sirohi : Mt. Abu, *Mc Cann* 10 (BLAT).

2. *Anagallis pumila* Sw. Prodr. 1 : 40. 1788. *Centrunculus pentandrus* R. Br. Prodr. 427. 1810 ; Duthie, Fl. Gangetic Plain 2 : 6. 1911. *C. tenellus* Duby in DC. Prodr. 8 : 72. 1844 ; Wight, Ic. 6 : 14. t. 2000. 1853 ; Hook. f. Fl. Brit. India 3 : 506. 1882.

Erect, annual herbs, 5 - 15 cm high. Stems slightly margined. Leaves alternate, rarely opposite, 0.5 - 1.0 × 0.4 - 0.5 cm, ovate or obovate to suborbicular, acute or obtuse, cuneate at base, glabrous. Flowers axillary, solitary. Calyx divided upto base ; lobes 2 - 3 mm long, lanceolate - oblong, acute or mucronate. Corolla - lobes ovate - lanceolate, apiculate, eglandular. Filaments glabrous. Capsules as long as calyx, subglobose. Seeds trigonous, solid.

Fl. & Fr. : September - February.

Rare, weed in cultivated fields and nearby localities.

Selected specimen : Banswara : Kushalgarh, *Kanodia* 5708 (BSA).

2. PRIMULA L.

Primula umbellata (Lour.) Benth. Fl. Males. ser. 1. 6 : 191. 1962. *Drosera umbellata* Lour. Fl. Cochinch. 186. 1790. *Androsace saxifragifolia* Bunge in Mem. Acad. Sci. Petersb. 2 : 127. 1835 ; Hook. f. Fl. Brit. India 3 : 496. 1882 ; Duthie, Fl. Gangetic Plain 2 : 4. 1911.

Scapigerous, annual herbs, 3 - 20 cm high. Petioles narrowly winged ; leaves 1 - 3 cm in diam., orbicular - subreniform or broadly elliptic, subcordate or truncate at base, crenate - dentate - margined. Scapes 3 - 20 cm long, many, glandular hairy ; umbels 2 to 6 - flowered ; pedicels unequal, glandular hairy. Bracts ovate - lanceolate, acute. Calyx - lobes elliptic, enlarged after anthesis. Corolla white. Capsules globose, 5 - valved. Seeds angular, pitted.

Fl. & Fr. : December - March.

Rare, in wet and shady habitats in the forests. After the disappearance of radical leaves, the plant looks rather bare.

Selected specimen : Kota : Atru, Singh 90958 (LWG).

3. SAMOLUS L.

Samolus valerandi L. Sp. Pl. 171. 1753 ; Hook. f. Fl. Brit. India 3 : 506. 1882 ; Duthie, Fl. Gangetic Plain 2 : 7. 1911 ; Singh in Journ. Bomb. Nat. Hist. Soc. 77 (2) : 360. 1981.

Glabrous, decumbent or ascending, annual or perennial herbs, upto 50 cm high. Leaves spatulate or obovate elliptic, apiculate, entire. Flowers white ; pedicels geniculate at the insertion of bracts or above the middle. Calyx hemispheric ; lobes triangular. Corolla - lobes imbricate. Stamens alternating with 5 scaly staminodes. Ovary inferior. Capsules shorter than calyx. Seeds rugose.

Fl. & Fr. : January - March.

Rare, in moist and shady habitats on rocky grounds. So far known from Bhilwara alone.

Selected specimen : Bhilwara : Mandalgarh forest, Singh 7164 (BSJO).

75. SAPOTACEAE

(V. Singh)

- | | | |
|--|-----|---------------------|
| 1a. Corolla 6 - lobed. Fertile stamens 6. | ... | 2. <i>Manilkara</i> |
| 1b. Corolla more than 6 - lobed. Stamens more than 6 : | | |
| 2a. Petals with 2 - fid appendages on the back.
Calyx 8 - lobed. Stamens 8, alternating with
8 staminodes. | ... | 3. <i>Mimusops</i> |
| 2b. Petals not appendaged. Calyx 4 - lobed.
Stamens 16 or more ; staminodes absent. | ... | 1. <i>Madhuca</i> |

1. MADHUCA Ham. ex J. F. Gmelin

Madhuca indica J. F. Gmelin, Syst. Nat. 2 (1) : 799. 1791. *Bassia latifolia* Roxb. Pl. Cor. 1 : 20. t. 19. 1795 ; Bedd. Fl. Sylv. 1 : 41. pl. 41. 1870 ; Clarke in Hook. f. Fl. Brit. India 3 : 544. 1882 ; Duthie, Fl. Gangetic Plain 2 : 11. 1911. *Madhuca longifolia* (Koen.) Macbr. var. *latifolia* (Roxb.) Chevalier in Rev. Int. Bot. Appl. 23 : 149. 1943. 'Mahua' (Hindi).

Large, deciduous trees. Leaves crowded at the end of branches, 7-20 × 5-10 cm, elliptic obovate, obtuse or subacuminate. Stipules caducous. Flowers white or cream coloured, tomentose, in 3 to 5 flowered axillary clusters at the end of branches. Calyx tomentose, 4 lobed. Corolla tube succulent. Stamens 20-30, roughly in 2-3 series. Style exserted. Berries ovoid, fleshy. 1 to 4 seeded, tomentose.

Fl. : March - April ; *Fr.* : May - June.

Fairly common in the forests and wastelands, particularly in the southern and south-eastern parts of the state.

Selected specimens : Banswara : Ghatol, Singh 4202 (BSJO) ; Jhalawar : Aklera, Verma 3450 (BSA) ; Kota : Wadhwa 9223 (BSA) ; Pali : Lapi, Pandey 4668 (BSJO) ; Sirohi : Mt. Abu, Mehta 994 (JAC) ; Udaipur : Jaismand, Verma 37 (BSA).

2. MANILKARA Adans. *nom. cons.*

Manilkara hexandra (Roxb.) Dub. in Ann. Inst. Bot. Geol. Colon. Marseille ser. 3. 23 : 9. f. 2. 1915. *Mimusops hexandra* Roxb. Pl. Cor. 1 : 16. t. 15. 1795 ; Clarke in Hook. f. Fl. Brit. India 3 : 549. 1882 ; Duthie, Fl. Gangetic Plain 2 : 13. 1911. *Mimusops indica* A. DC. in DC. Prodr. 8 : 205. 1844 ; Wight, Ic. 4(4) : 13. t. 1587. 1850. 'Khirni' (Hindi).

Evergreen trees, 10-20 m high, with blackish grey, deeply furrowed bark. Leaves 7-10 × 3.5-6.0 cm, elliptic obovate or oblong, obtuse or emarginate, entire. Flowers white, in axillary fascicles of 2-6. Calyx-lobes 6, ciliolate. Corolla-lobes 16 or 24, in 2 or 3 series ; outer ones linear ; inner ones oblanceolate. Staminodes 6 or 8. Berries ovoid, reddish-yellow, 1-seeded, edible.

Fl. & Fr. : October - April.

Wild or self sown near villages ; also planted along the roads.

Selected specimens : Banswara : Ghatol, *Majumdar* 10220 (BSA) ; Jaipur : Chaumu, *Wadhwa* 8343 (BSA) ; Jhalawar : Jhalarapatan, *Majumdar & Mishra* 10043 (BSA) ; Kota : Rampura, *Verma* 1795 (BSA).

3. MIMUSOPS L.

Mimusops elengi L. Sp. Pl. 349. 1753 ; Wight, Ic. 4(4) : 13. t. 1586. 1850 ; Clarke in Hook. f. Fl. Brit. India 3 : 548. 1882 ; Duthie, Fl. Gangetic Plain 2 : 13. 1911. '*Morsali*' (Hindi).

Evergreen trees, with ringed, grey bark and milky sap. Leaves 5-15 × 3-7 cm, elliptic-oblong, acute or acuminate. Flowers white with pinkish tinge, axillary, solitary or fascicled, sweet-scented. Calyx deeply 8-lobed ; lobes in two series. Corolla 8-lobed. Stamens 8. Staminodes ovate-lanceolate, acute or acuminate, hairy on the back. Berries 3 × 2 cm, elliptic-oblong, fleshy, yellow, edible. Seed usually 1, oblong, black.

Fl. : February - March ; *Fr.* : April - June.

Rare, in the forests ; usually planted along the roads in cities.

Selected specimens : Banswara : Anand Sagar Forest, *Singh* 4611 (BSJO) ; Jaisalmer : Mool Sagar, *Wadhwa* 5242 A (BSA) ; Kota : Chhabra, *Singh* 90942 (LWG) ; Sawaimadhopur : Bayana, *Saran* 41869 (LWG) ; Tonk : Tordi, *Pandey* 4804 (BSJO).

CULTIVATED SPECIES

Manilkara sapota (L.) P. Royen (*Sapota achras* Mill., *Achras zapota* L.) '*Cheeku*' (Hindi). - Evergreen trees, with oblong-lanceolate to elliptic, acute leaves, white flowers and globose fruits. Staminodes absent. Native of S. America ; cultivated in orchards for edible fruits.

76. EBENACEAE

(V. Singh)

DIOSPYROS L.

1a. Stamens at the most upto 18 :

2a. Anthers awnless. Staminodes 8-16 :

- | | | |
|---|-----|-------------------------|
| 3a. Leaves subopposite and alternate. Corolla of male flowers tubular. Albumen of seeds ruminant. | ... | 3. <i>D. melanoxylo</i> |
| 3b. Leaves alternate only. Corolla of male flowers urceolate or campanulate. Albumen of seeds not ruminant. | ... | 1. <i>D. cordifolia</i> |
| 2b. Anthers awned. Staminodes 4. | ... | 4. <i>D. montana</i> |
| 1b. Stamens always more than 20. | ... | 2. <i>D. malabarica</i> |

1. *Diospyros cordifolia* Roxb. Pl. Cor. 1 : 38, t. 50. 1795 & Fl. Ind. 2 : 538. 1832 ; Duthie, Fl. Gangetic Plain 2 : 17. 1911. *D. montana* Clarke in Hook. f. Fl. Brit. India 3 : 555. 1882, *pro parte*. 'Tendu' (Hindi).

Large shrubs or small trees, 3 - 4 m high, with smooth bark. Leaves alternate, 2.5 - 9.0 × 1.5 - 3.0 cm, oblong, ovate - oblong or ovate - lanceolate, glabrous. Flowers creamy - white, axillary ; males in 3 - flowered cymes ; female ones solitary. Stamens in opposite pairs, united at the base ; anthers awnless, pubescent. Calyx of female flowers reflexed in fruits. Fruits 2.0 - 2.5 cm in diam., globose or ovoid, yellow when ripe.

Fl. & Fr. : Summer and rainy season.

Rare, in wastelands and forests, particularly in the east of Aravalli.

Selected specimens : Chittorgarh : Fort, Majumdar 10399 (BSA) ; Jaipur : Bairat forest, Wadhwa 8377 (BSA) ; Kota : Singh 74741 (LWG) ; Udaipur : Banki forest, Nautiyal & Raizada 25444 (DD).

2. *Diospyros malabarica* (Desr.) Kostal. Med. Pharmac. Fl. 3 : 1099. 1834. *Garcinia malabarica* Desr. in Lam. Encycl. 3 : 701. 1789. *Diospyros embryopteris* Pers. Syn. Pl. 2 : 624. 1807 ; Clarke in Hook. f. Fl. Brit. India 3 : 556. 1882 ; Duthie, Fl. Gangetic Plain 2 : 18. 1911.

Medium - sized trees, with spreading branches and smooth bark flaking off in large pieces. Leaves distichously spreading, 10 - 15 × 2.5 - 10.0 cm, oblong or oblong lanceolate, obtuse at base. Male - flowers in axillary, 2 to 7 - flowered cymes ; female flowers axillary, solitary. Calyx of female flowers dilated and subcordate at the base. Stamens 24 - 64, in pairs ; anthers with a line of hairs upto the middle. Fruits globose, 8 - celled, clothed with rusty scurfiness. Seeds 4 - 8, flattened, reddish - brown.

Fl. & Fr. : March - June.

Very rare ; included on the authority of Ramdeo (1969) from Udaipur and Sharma (1958) from Ajmer.

3. *Diospyros melanoxylon* Roxb. Pl. Cor. 1 : 36. t. 46. 1795 ; Clarke in Hook. f. Fl. Brit. India 3 : 564. 1882. *D. tupru* Buch. - Ham. in Trans. Linn. Soc. 15 : 111. 1827 ; Clarke in Hook. f. l.c. 3 : 563. 1882. *D. tomentosa sensu* Duthie, Fl. Gangetic Plain 2 : 15. 1911, non Roxb. 1832. 'Tendu, Timru' (Hindi).

Deciduous trees, 4 - 8 m high. Bark exfoliating in 4 - angular scales. Leaves 5 - 17 × 4 - 12 cm, ovate elliptic or oblong, coriaceous, pubescent, acute at base. Male flowers in subsessile, drooping cymes. Anthers 4 - 16, linear - lanceolate, not awned. Female flowers solitary. Sepals of fruiting calyx fulvous tomentose with recurved and wrinkled margins. Ovaries 4 to 8 - celled, hairy. Fruits 2 - 4 cm in diam., globose or ovoid, glabrous, yellow when ripe. Seeds obovate - oblong, blackish.

Fl. : April - May ; Fr. : June - November.

Fairly common in the forests and wastelands, particularly on and in the east Aravalli.

Selected specimens : Ajmer : Todgarh, Duthie 4730, 4730 A (DD) ; Banswara : Rowal Hindvela forest, Singh 2875 (BSJO) ; Jaipur : Sogar : Sharma 1059 (RUBL) ; Kota : Shahabad, Verma 614 (BSA) ; Sirohi : Mt. Abu. Mc Cann 5854 (BLAT).

4. *Diospyros montana* Roxb. Pl. Cor. 1 : 37. t. 48. 1795 ; Wight, Ic. 4(1) : 10. t. 1225. 1848 ; Clarke in Hook. f. Fl. Brit. India 3 : 555. 1882, *pro parte* ; Duthie, Fl. Gangetic Plain 2 : 15. 1911. 'Timru' (Hindi).

Shrubs or trees, with hairy twigs. Leaves 3 - 10 × 2 - 5 cm, ovate elliptic, acute, cuneate or cordate at base, pubescent beneath, chartaceous. Male flowers in cymes ; female ones solitary. Calyx - lobes 4, flat in fruiting stage. Corolla lobes 5, ovate, acute, pubescent. Stamens 15 ; staminodes present in female flowers. Pistillode conical. Fruits 2.0 - 2.5 cm in diam., globose, glabrous.

Fl. & Fr. : Summer and rainy seasons.

Occasional, in wastelands. Plants resemble closely *D. cordifolia* Roxb.

Selected specimens : Banswara : Bagidora, Kanodia 75630 (BSI) ; Bhilwara : Parvatipur, Singh 6595 (BSJO) ; Kota : Bara - bagh, Singh 74081 (LWG) ; Pali : Ranakpur, Shetty 1493 (BSJO) ; Udaipur : Kanodia 82310 (BSI).

DOUBTFUL TAXON

Diospyros tomentosa Roxb. Fl. Ind. 2 : 532. 1832.

Moderate sized tree, closely resembling *D. melanoxylon* Roxb. except that leaves are rounded or obtuse at the base and staminodes are 0-6.

Duthie (*l.c.*) considered *D. tomentosa* Roxb. & *D. melanoxylon* Roxb. as conspecific. Hiern (Trans. Camb. Philos. Soc. 12 : 147, 158, 159. 1873) considers them as distinct species. Enough material is not available in the hands of authors, therefore, it is not possible at this moment to comment with certainty on the taxonomy of these two taxa. However, there are possibilities of the occurrence of *D. tomentosa* Roxb. too in Rajasthan, if it is a distinct species.

77. OLEACEAE

(V. Singh)

1a. Fruit a capsule :

2a. Shrubs, with simple leaves. Capsules flattened. ... 2. *Nyctanthes*

2b. Trees, with imparipinnate leaves. Capsules obovoid, turgid. ... 3. *Schrebera*

1b. Fruit a berry. ... 1. *Jasminum*.

1. JASMINUM L.

Jasminum humile L. Sp. Pl. 7. 1753 ; Clarke in Hook. f. Fl. Brit. India 3 : 602. 1882 ; Duthie, Fl. Gangetic Plain 2 : 24. 1911. 'Pili-Chameli' (Hindi).

Semi evergreen, erect shrubs. Leaves alternate, 2 - 10 cm long, sometimes revolute ; leaflets 3 - 7, elliptic, ovate or lanceolate, acute or obtuse, paler beneath. Flowers in terminal corymbose cymes. Bracts small, linear. Calyx - tube c. 3 mm long ; teeth short. Corolla yellow ; tube 1.0 - 2.5 cm long ; lobes broadly ovate - obtuse, reflexed in open flower. Berries simple or didymous, globose - ellipsoid, 4 - 6 mm long, black when ripe ; juice crimson.

Fl. & Fr. : August - October.

Rare, found on Mt. Abu in wild state. Usually cultivated ornamentally in the gardens.

Selected specimen : Bundi : PWD Dak Banglow, Singh 74724 (LWG).

2. NYCTANTHES L.

Nyctanthes arbor tristis L. Sp. Pl. 6. 1753 ; Beddome, Fl. Sylv. 2 : 240. t. 240. 1872 ; Clarke in Hook. f. Fl. Brit. India 3 : 603. 1882 ; Duthie, Fl. Gangetic Plain 2 : 24. 1911 ; Kundu & Anima in Bull. Bot. Surv. India 10 : 397. 1969. '*Harsingar, Tamal*' (Hindi).

Large shrubs, with 4 angled branches. Leaves opposite, 4 - 11 × 2 - 7 cm, ovate or ovate - lanceolate, acute or acuminate, distantly serrate, scabrous with unicellular, warty trichomes and glandular hairs. Flowers white to orange, fragrant, sessile, 3 to 5 together on axillary, solitary or fascicled peduncles or in terminal 3 crotomous cymes. Bracts ovate. Ovule basal. Capsules 1.3 - 2.0 × 1.2 - 2.0 cm, orbicular, compressed, 2 celled, separating into 2, 1 seeded pyrenes.

Fl. & Fr. : August - November.

Abundant in the forests, often so densely that even movement becomes difficult ; also cultivated in the gardens for ornamental purposes.

Selected specimens : Banswara : Loharia forest, *Singh* 3013 (BSJO) ; Chittorgarh : Pratapgarh, *Majumdar* 12313 (BSA) ; Kota : Shahabad, *Majumdar & Murti* 10864 (BSA) ; Pali : Kan Pahar, *Pandey* 10380 (BSJO) ; Sirohi : Mt. Abu, *Mehta* 997 (JAC).

3. SCHREBERA Roxb. *nom. cons.*

Schrebera swietenoides Roxb. Pl. Cor. 2 : 1. t. 101. 1799 ; Clarke in Hook. f. Fl. Brit. India 3 : 604. 1882 ; Duthie, Fl. Gangetic Plain 2 : 25. 1911. '*Mokha*' (Hindi).

Deciduous trees, 10 - 20 m high, with scabrous, ash - coloured bark. Leaflets 7 - 9 pairs, opposite, 5 - 9 × 3 - 5 cm, ovate, abruptly acuminate, entire. Flowers white, in cymes. Calyx irregularly 4 to 6 - toothed. Corolla with brown glandular dots on the inner surface. Capsules 4 - 5 × 2.5 - 3.0 cm, pendulous, pear - shaped, woody, 2 valved, with white lines on the surface. Seeds winged.

Fl. & Fr. : February - May.

Occasional, in mixed forests on the hills. Trees appear beautiful when in full bloom.

Selected specimens : Bundi : Kota - Dam, *Singh* 74720 (LWG) ; Jhalawar ; *Verma* 3397 (BSA) ; Sirohi : Mt. Abu, *Blatter* 18105 (BLAT). Also reported from Kota (Jain and Kotwal, 1960) and Udaipur (Vyas, 1965).

CULTIVATED SPECIES

Jasminum arborescens Roxb. '*Chameli, Bana'kunda*' (Hindi) Scandent shrubs, with simple leaves and white flowers in lax cymes. Cultivated for ornamental purposes.

Jasminum auriculatum Vahl Scandent shrubs, with 1 to 3 foliolate leaves and white flowers in cymes. Cultivated for ornamental purposes.

Jasminum azoricum L. - Scandent or climbing shrubs, with 3-foliolate leaves and white flowers in axillary and terminal cymes or panicles. Cultivated ornamentally.

Jasminum grandiflorum L. '*Chameli*' (Hindi) - Scandent or climbing shrubs, with imparipinnate leaves having 4-7 pairs of leaflets and white flowers in lax panicles. Cultivated ornamentally.

Jasminum multiflorum (Burm. f.) Andrews (*Nyctanthes multiflora* Burm. f.) '*Gulcharia*' (Hindi) - Scandent shrubs, with simple leaves and white flowers in dense capitate cymes. Cultivated ornamentally.

Jasminum odoratissimum L. - Climbing shrubs, with pinnate leaves and yellow flowers. Cultivated for ornamental purposes.

Jasminum officinale L. '*Chameli*' (Hindi) - Climbing shrubs, with pinnate leaves and white flowers. Cultivated ornamentally.

Jasminum rottiarianum Wall. ex A. DC. - Scandent shrubs, with simple leaves and white flowers in terminal capitate cymes. Cultivated ornamentally.

Jasminum roxburghianum Wall. ex DC. '*Chameli*' (Hindi) - Climbing shrubs, with simple leaves and white flowers in trichotomous cymes.

Jasminum sambac (L.) Ait. (*Nyctanthes sambac* L.) '*Mogra*' (Hindi) Scandent or climbing shrubs, with simple leaves and white flowers which are solitary or in 3-flowered cymes.

78. SALVADORACEAE

(V. Singh)

SALVADORA L.

Leaves ovate-lanceolate, more than 1.5 cm in diameter. Flowers pedicellate. Fruits red when ripe. ...

2. *S. persica*

Leaves linear - lanceolate, upto 1.3 cm in diameter.

Flowers sessile. Fruits yellow when ripe.

... 1. *S. oleoides*

1. *Salvadora oleoides* Decne. in Jacq. Voy. Bot. 140. t. 144. 1844 ; Clarke in Hook. f. Fl. Brit. India 3 : 620. 1882 ; Duthie, Fl. Gangetic Plain 2 : 29. 1911 ; Mahesh. Illus. Fl. Delhi f. 119. 1966. '*Pilu, Khara, Jal*' (Hindi).

Evergreen trees, 3 - 5 m high, with short, twisted trunks and drooping branches. Leaves 6.5 - 10.0 × 0.7 - 1.3 cm, entire, coriaceous. Flowers greenish - white, in axillary, paniced spikes. Bracts ovate, acute, deciduous. Calyx - lobes 4, rounded. Stamens exserted, epipetalous. Drupes globose, 1 seeded.

Fl. & Fr. : February - June.

Common in dry sandy and saline soils, often on hard rocky grounds.

Selected specimens : Barmer : Rao : 66868 (BSA) ; Bundi : Mangli river, Verma 1861 (BSA) ; Jaipur : Amer, Sharma 3001 (RUBL) ; Jodhpur : Mandore, Verma 594 (BSJO) ; Sirohi : Vadakheda, Jain 60448 (BSI).

2. *Salvadora persica* L. Sp. Pl. 122. 1753 ; Wight, Ic. 4(4) : 18. t. 1621. 1850 ; Clarke in Hook. f. Fl. Brit. India 3 : 619. 1882 ; Duthie, Fl. Gangetic Plain 2 : 28. 1911. '*Pilu, Dhalu, Mitha Jal*' (Hindi).

Evergreen trees, 4 - 7 m high, with drooping branches. Bark grey-white. Leaves 3 - 8 × 1.5 - 3.5 cm, fleshy, acute. Flowers dull yellow, in compound panicles longer than leaves. Bracts ovate, shorter than pedicels, deciduous. Calyx-lobes rounded. Stamens exserted, epipetalous. Drupes globose, 1-seeded.

Fl. & Fr. : December - June.

Common in dry wastelands, often forming compact clumps.

Selected specimens : Banswara : Loharia, Singh 4240 (BSJO) ; Bikaner : Shivbari, Roy 2394 (BSJO) ; Jaipur : Amer, Parker 5953 (DD) ; Kota : Baran, Singh 90494 (LWG) ; Sirohi : Abu Road, Kaul 9386 (LWG).

79. APOCYNACEAE

(V. Singh)

1a. Plants armed with spines. Fruit an indehiscent berry.

... 1. *Carissa*

- 1b. Plants unarmed. Fruit of dehiscent follicles :
- 2a. Erect herbs. Seeds not comose. ... 2. *Catharanthus*
- 2b. Trees, shrubs or shrubby climbers. Seeds comose :
- 3a. Anthers conniving in a cone and adhering to the stigma :
- 4a. Corolla - throat villous or with fimbriate scales inside :
- 5a. Trees. Corolla - lobes overlapping to the left. ... 6. *Wrightia*
- 5b. Shrubby climbers. Corolla - lobes overlapping to the right. ... 4. *Ichnocarpus*
- 4b. Corolla - throat naked. ... 5. *Vallaris*
- 3b. Anthers free, not adhering to the stigma. ... 3. *Holarrhena*

1. *CARISSA* L. *nom. cons.*

- Spines paired. Berries about 1.5 cm in diameter. ... 1. *C. congesta*
- Spines solitary. Berries about 7 mm in diameter. ... 2. *C. spinarum*

1. *Carissa congesta* Wight, Ic. 4(2) : 1. t. 1289. 1848. *C. carandus* auct. plur. non L. 1767; Hook. f. Fl. Brit. India 3 : 630. 1882, *pro parte*; Duthie, Fl. Gangetic Plain 2 : 31. 1917, *pro parte*. 'Karaunda, Jal' (Hindi).

Erect or scandent shrubs, armed with straight, paired, horizontal spines. Leaves 2 - 6 × 1.5 - 4.0 cm, elliptic-oblong to ovate, acute, mucronate. Flowers white, in corymbose cymes. Calyx-lobes acute. Corolla-tube 10 - 15 mm long; lobes 5 - 7 mm long. Berries 1.3 - 2.5 × 1.0 - 1.5 cm, elliptic - oblong, fleshy, 2 - celled, 4 seeded.

Fl. : January - April ; *Fr.* : May - June.

Usually met with in the forests and wastelands ; abundant at Sitabari (Kota) ; also cultivated in the gardens for its edible fruits.

Selected specimens : Banswara : Anand Sagar, Singh 4614 (BSJO) ; Churu : Roy 4022 (BSJO) ; Jaipur : Raj. College, R. Singh Acc. No. 10479 (RUBL) ; Kota : Shahabad, Singh 91042 (LWG) ; Sirohi : Mt. Abu, Blatter 21982 (BLAT).

2. *Carissa spinarum* L. Mant. Pl. 2 : 559. 1771 ; Hook. f. Fl. Brit. India 3 : 631. 1882 ; Duthie, Fl. Gangetic Plain 2 : 32. 1911. 'Karaunda' (Hindi).

Large, thorny, evergreen shrubs. Leaves 1.3 - 3.0 × 1.0 - 2.5 cm, elliptic or broadly ovate-suborbicular, acute or mucronate, entire, often revolute-margined. Flowers white or tinged with pink, scented, in terminal and axillary, corymbose cymes. Calyx divided nearly to the base ; lobes acuminate. Berries subglobose, dark-purple at maturity, 4-seeded. Seeds ovate.

Fl. : January - April ; Fr. : May - August.

Rare ; in dry stony grounds in wastelands and open forests.

Selected specimens : Jhalawar : Aklera, Majumdar & Mishra 10035 (BSA) ; Kota : Chhabra - Gaugor, Singh 90948 (LWG) ; Sirohi : Mt. Abu, Mehta 896 (JAC).

2. CATHARANTHUS G. Don

Catharanthus pusillus (Murr.) G. Don, Gen. Hist. 4 : 95. 1837 ; Mahesh. Illus. Fl. Delhi f. 120 1966. *Vinca pusilla* Murr. Novi Comm. Soc. Reg. Sci. Gotting. 3 : 66. t. 2. f. 1. 1773 ; Hook. f. Fl. Brit. India 3 : 640. 1882. *Lochnera pusilla* (Murr.) K. Schum. in Engl. & Prantl, Pflanz. 4(2) : 145. 1895 ; Duthie, Fl. Gangetic Plain 2 : 34. 1911. 'Hingmu' (Hindi).

Erect, glabrous, annual herbs, 15 - 50 cm high. Leaves 3 - 7 × 0.7 - 2.0 cm, lanceolate, acute, entire. Flowers 1.0 - 1.5 cm long, white, sessile, axillary, solitary or paired. Corolla-tube upto 1 cm long, dilated at the top. Filaments short ; anthers exappendiculate. Carpels 2, free, glabrous or pubescent. Follicles 3.5 - 5.0 cm long, linear, pointed, many-ribbed. Seeds oblong, black, longitudinally muricately ribbed.

Fl. & Fr. : July - September.

Common and abundant in the fields, gardens, wastelands and forests.

Selected specimens : Banswara : Palceda, Singh 2829 (BSJO) ; Jaipur : Amer, Sharma 860 (RUBL) ; Kota : Kathoon, Singh 90586 (LWG) ; Sirohi : Mt. Abu, Blatter 2290 (BLAT) ; Tonk : Niwai, Shetty 1247 (BSJO).

3. HOLARRHENA R. Br.

Holarrhena pubescens (Buch. - Ham.) Wall. ex G. Don, Gen. Hist. 4 : 78. 1837. *Echites pubescens* Buch. - Ham. in Trans. Linn. Soc. 13 : 521.

1821. *Nerium antidysentericum* L. Sp. Pl. 209. 1753, *nom. ambig.* *Echites antidysentericum* (L.) Roxb. ex Flemm. in *Asiat. Res.* 2 : 166. 1810, *pro parte.* *Holarrhena antidysenterica* (L.) Wall. ex A. DC. in DC. *Prodr.* 8 : 413. 1844. *pro parte* ; Hook. f. *Fl. Brit. India* 3 : 644. 1882 ; Duthie, *Fl. Gangetic Plain* 2 : 35. 1911. '*Inderjo, Dudhie, Akariyo*' (Hindi).

Shrubs or small trees, 3-6 m high, with blackish brown bark. Leaves 5-30 × 5-15 cm, ovate elliptic, abruptly acuminate. Flowers white, in corymbose cymes. Corolla tube pubescent. Stamens inserted near the base of corolla tube. Follicles 20-40 × 0.5-1.0 cm, cylindrical, lenticelled. Seeds linear-oblong, compressed, comose.

Fl. : May-June ; *Fr.* : June-September.

Common in the forests in hilly tracts. Often confused for *Wrightia tinctoria* R. Br.

Selected specimens : Banswara : Chhatripoda forest, Singh 2977 (BSJO) ; Jaipur : Daosa, Wadhwa 8124 (BSA) ; Kota : Verma 3301 (BSA) ; Pali : Paras Ram Mahadeo, Shetty 1904 (BSJO) ; Udaipur : Jaisamand Kanodia 82247 (BSI).

4. ICHNOCARPUS R. Br. *nom. cons.*

Ichnocarpus frutescens (L.) R. Br. *Mem. Wern. Nat. Hist. Soc.* 1 : 62. 1811 *et in* Ait. f. *Hort. Kew.* ed. 2. 2 : 69. 1811 ; Wight, *IC.* 2 (2) : 2. t. 430. 1840-43 ; Hook. f. *Fl. Brit. India* 3 : 669. 1882 ; Duthie, *Fl. Gangetic Plain* 2 : 41. 1911. *Apocynum frutescens* L. Sp. Pl. 213. 1753. '*Kali Dudhi*' (Hindi).

Large twining shrubs. Leaves 4-10 × 3.5 cm, elliptic-oblong or ovate lanceolate, acute to acuminate, entire. Flowers greenish white, rarely rose coloured, in trichotomous cymes. Corolla-tube narrow below, globular in the middle and constricted in upper part with white hairs inside. Follicles 7-15 cm long, straight, cylindrical, rusty pubescent when young, glabrous at maturity. Seeds linear, black.

Fl. & Fr. : September-February.

Common among bushes in the forests, on the boundaries of fields and gardens. Plants prefer moist and shady localities in the east of Aravalli.

Selected specimens : Alwar : Siligarh, Hiralal 34522 (LWG) ; Jaipur : Jolana hills, Sharma 1366 (RUBL) ; Jhalawar : Asnawar, Verma 6888 (BSA) ; Kota : Darah, Jain 28759 (BSA).

5. VALLARIS N.C. Burman

Vallisneria spiralis (L.) Kuntze, Rev. Gen. Pl. 2 : 447. 1891. *Peltanthera solanacea* Roth, Nov. Pl. Sp. 132. 1821. *Vallisneria spiralis* Spreng. Syst. Veg. 1 : 635. 1825 ; Duthie, Fl. Gangetic Plain 2 : 37. 1911. *Echites dichotoma* Roxb. Fl. Ind. 2 : 19. 1832. *Vallisneria dichotoma* (Roxb.) Wall. ex G. Don, Gen. Hist. 4 : 79. 1837 ; Wight, Ic. 2 (2) : 2. t. 438. 1840-43. 'Dudhi bel' (Hindi).

Twining or straggling shrubs. Bark light grey. Leaves 5 - 11 × 2.0 - 2.5 cm, elliptic or ovate-oblong, glabrous, gland-dotted. Flowers white, in lax, axillary cymes. Calyx glandular. Anthers exserted, glandular, inserted near the base of tube. Follicles 10 - 15 cm long, cylindrical. Seeds ovoid, beaked ; coma silvery white.

Fl. & Fr. : December - April.

Rare, in valleys among bushes, often on the boundaries of fields and gardens ; also cultivated for ornamental purposes.

Selected specimens : Jaipur : *Maheshwari* 67 (DD) ; Kota : Shahabad, *Wadhwa* 9254 (BSA) ; Sirohi : Mt. Abu, *Jain* 62086 (BSI). Also reported from Alwar and Udaipur (Vyas, 1967 ; Ramdeo, 1969).

6. WRIGHTIA R. Br.

Follicles smooth, paired, cohering at the apex only i.e. two fruits produced by each flower.	...	2. <i>W. tinctoria</i>
Follicles rough with white tubercles, solitary due to complete fusion of two follicles i.e. one fruit produced by each flower.	...	1. <i>W. arborea</i>

1. *Wrightia arborea* (Dennst.) Mabb. in *Taxon* 26 : 533. 1977. *Periploca arborea* Dennst. *Schlüssel Hort. Malab.* 13, 23 & 25. 1818 & in *Fort. Allg. Teut. Gort. - Mag.* 3 : 32, 41 & 83. 1818. *Wrightia tomentosa* Roem. & Schult. *Syst. Veg.* 4 : 414. 1819 ; Wight, *Ic.* 2 (2) : 2. t. 443. 1841 ; Hook. f. *Fl. Brit. India* 3 : 653. 1882 ; Duthie, *Fl. Gangetic Plain* 2 : 39. 1911. 'Kala Kunda' (Hindi).

Trees, 6 - 15 m high, with ash-coloured bark. Leaves 3 - 11 × 1.5 - 5.0 cm, elliptic or ovate-oblong, acute or obtuse, tomentose. Flowers creamy-white, in terminal, tomentose cymes. Corona scales oblong. Anther-apex not ciliate. Follicles 15 - 20 × 1 - 2 cm, stout, cylindrical, not ribbed. Seeds linear-oblong ; coma longer than seeds.

Fl. : December - July ; *Fr.* : January - September.

Frequent in the forests in hilly tracts ; often planted in the gardens.

Selected specimens : Bhilwara : Banera, *Singh* 6018 (BSJO) ; Jaipur : Jalana hills, *Sharma* 981 (RUBL) ; Kota : Bara - bagh, *Singh* 74711 (LWG) ; Pali : Ghanerao forest, *Pandey* 4648 (BSJO) ; Sirohi : Mt. Abu, *Mehta* 645 (JAC) ; Tonk : Toda Rai Singh Forest, *Shetty* 552 (BSJO).

2. *Wrightia tinctoria* (Roxb.) R. Br. in Mem. Wern. Soc. 1 : 74. 1811 ; Wight, Ic. 2. (2) : 2. t. 444. 1841 ; Hook. f. Fl. Brit. India 3 : 653. 1882 ; Duthie, Fl. Gangetic Plain 2 : 38. 1911. *Nerium tinctorium* Roxb. Orient. Reper. 1 : 39. 1791, cum. tab. 'Dudhi, Karu, Kerni' (Hindi).

Deciduous trees or large shrubs, 5 - 10 m high. Bark fissured, greyish black. Leaves 4.5 - 15.0 × 2.5 - 7.0 cm, elliptic lanceolate or oblong, glabrous or pubescent. Flowers white, in dichotomous cymes. Corolline corona of many laciniate scales. Anther apex ciliate. Follicles 15 - 50 × 0.6 cm, cylindric, drooping, longitudinally striated, black. Seeds brown ; coma longer than seeds.

Fl. : March - May ; *Fr.* : June - October.

Common in the forests, particularly in hilly tracts.

Selected specimens : Banswara : Dagia Bowji, *Singh* 2859 (BSJO) ; Barmer : Balotra, *Shetty* 2258 (BSJO) ; Jaipur : Moti Dungri, *Sharma* 1599 (RUBL) ; Kota : Shahabad, *Majumdar* 10491 (BSA) ; Sirohi : Mt. Abu, *Jain* 62075 (BSI).

CULTIVATED SPECIES

Allamanda cathartica L. - Trailing shrubs, with bright yellow flowers in terminal cymes. Native of Brazil ; cultivated for ornamental purposes.

Alstonia scholaris (L.) R. Br. (*Echites scholaris* L.) - Trees, with oblanceolate leaves in whorls and greenish yellow flowers in cymes. Planted for ornamental purposes.

Baumontia grandiflora Wall. - Evergreen climbers, with elliptic-obovate leaves and white flowers in cymes. Native of E. Himalaya ; cultivated for ornamental purposes.

Catharanthus roseus (L.) G. Don (*Vinca rosea* L.) 'Sadaphuli' (Hindi) - Perennial herbs, with white or rosy, solitary, axillary flowers. Native of Tropical America ; cultivated for ornamental purposes.

Ervatamia divaricata (L.) Burkill (*Nerium divaricatum* L.) 'Chandni' (Hindi) - Evergreen shrubs, with white flowers in dichotomous cymes. Native of Tropical Asia ; cultivated for ornamental purposes.

Nerium oleander L. '*Kaner*' (Hindi) - Evergreen shrubs, with white or red flowers in cymes. Native of Mediterranean region ; cultivated for ornamental purposes.

Plumeria rubra L. - Small trees, with obovate - lanceolate leaves and white flowers with yellow eye. Native of America ; cultivated for ornamental purposes.

Rauvolfia serpentina (L.) Benth. ex Kurz (*Ophioxylon serpentinum* L.) - Woody shrubs, with elliptic leaves in whorls of 3 and white or pink flowers in corymbose cymes.

Thevetia peruviana (Pers.) Merr. (*Cerbera peruviana* Pers.) '*Pili-Kaner*' (Hindi) Shrubs or small trees, with linear leaves, yellow flowers and subglobose fruits. Native of Tropical America ; cultivated for ornamental purposes.

80. ASCLEPIADACEAE

(P.J. Parmar)

1a. Plants succulent :

- | | | |
|--|-----|------------------------|
| 2a. Twining shrubs. Stem jointed, cylindric.
Corolla pale yellowish. | ... | 13. <i>Sarcostemma</i> |
| 2b. Erect or ascending herbs. Stem not jointed,
quadrangular. Corolla purplish. | ... | 2. <i>Caralluma</i> |

1b. Plants not succulent :

- | | | |
|--|-----|------------------------|
| 3a. Erect herbs or shrubs (except <i>Leptadenia reticulata</i>) : | | |
| 4a. Follicles echinate. | ... | 8. <i>Odontanthera</i> |
| 4b. Follicles smooth : | | |
| 5a. Anthers with a membranous appendage.
Pollen - masses pendulous. Follicles
in pairs. | ... | 1. <i>Calatropis</i> |
| 5b. Anthers incumbent on the stigma,
without a membranous appendage.
Pollen - masses erect. Follicles solitary : | | |
| 6a. Calyx turbinate, 5 - lobed. Corolla
pale - greenish. Anther - tips
appendiculate. | ... | 6. <i>Leptadenia</i> |
| 6b. Calyx 5 - partite. Corolla dull -
brown. Anther - tips inappendiculate. | ... | 9. <i>Orthanthera</i> |

3b. Plants climbing or scrambling :

- 7a. All leaves deeply cordate :
- 8a. Cymes dichasially branched, sessile or shortly peduncled. ... 7. *Marsdenia*
- 8b. Cymes umbellate or racemose, not dichasially branched, long peduncled :
- 9a. Corolla salver-shaped ; lobes densely pilose within. Follicles echinate. ... 12. *Pergularia*
- 9b. Corolla rotate or shallowly campanulate ; lobes glabrous. Follicles smooth :
- 10a. Peduncles shorter than the petioles. Corolla purplish-crimson. ... 5. *Holostemma*
- 10b. Peduncles equalling or exceeding the petioles. Corolla greenish. ... 16. *Wattakaka*
- 7b. Leaves not or very shallowly cordate or only the lower ones cordate :
- 11a. Flowers in lax, dichasially branched or in dense umbellate cymes, but in latter case cymes paired at the nodes :
- 12a. Calyx - lobes acute. Corolla rotate. ... 15. *Tylophora*
- 12b. Calyx - lobes obtuse. Corolla campanulate. ... 4. *Gymnema*
- 11b. Flowers in umbellate or racemose cymes. Cymes solitary at the nodes :
- 13a. Flowers greenish - yellow :
- 14a. Cymes sub - sessile. Corolla divided to the base. ... 11. *Pentstemon*
- 14b. Cymes peduncled. Corolla tubular ; lobes twice as long as the tube. ... 14. *Telosma*
- 13b. Flowers white, often purplish - red within :
- 15a. Corolla tubular ; lobes connate with their tips. ... 3. *Ceropegia*
- 15b. Corolla rotate ; lobes not coherent with their tips. ... 10. *Oxystelma*

1. CALOTROPIS R. Br.

Corolla - buds ovoid ; corona - lobes hairy, shorter than the staminal column, with two obtuse auricles just below the apex. ...

1. *C. gigantea*

Corolla - buds hemispherical ; corona - lobes glabrous, equalling or longer than staminal column, without auricles. ...

2. *C. procera* subsp. *hamiltonii*

1. *Calotropis gigantea* (L.) R. Br. in Ait. Hort. Kew. ed. 2, 2 : 78, 1811 ; Hook. f. Fl. Brit. India 4 : 17, 1883 ; Duthie, Fl. Gangetic Plain 2 : 48, 1911. *Asclepias gigantea* L. Sp. Pl. 214, 1753. 'Shiv Aak' (Hindi).

Erect shrubs or small trees, with ash coloured bark, clothed with white pubescence all over. Leaves sessile, 6 - 18 × 3 - 10 cm, elliptic - oblong or obovate oblong, acute to acuminate at apex, semi-amplexicaul at base. Flowers in terminal and lateral umbellate cymes. Corolla 2 - 4 cm in diam., purplish or white. Follicles 7 - 10 × 3 - 4 cm, glaucous green, recurved. Seeds 5 - 6 mm long, broadly ovate, flat, comose.

Fl. & Fr. : Almost throughout the year.

Not common, found in wastelands.

Selected specimens : Bundi : Baijnath Mahadev temple, Singh 74732 (LWG) ; Jodhpur : Near Umaid Garden, Roy 2459 (BSJO) ; Sirohi : Mt. Abu, Mehta 647 (JAC) ; Udaipur : Sharma Acc. No. 12052 (RUBL). Also reported from Ajmer (Sharma, 1958), Jaipur (Bajpai & Verma, 1964), Jhunjhunu (Nair, 1956, 1961) and Bikaner (Sarup, 1958).

2. *Calotropis procera* (Ait.) Ait. f. subsp. *hamiltonii* (Wight) Ali in Notes Roy. Bot. Gard. Edinberg 38 (2) : 287 - 290. f. 1 C D. 1980. *C. hamiltonii* Wight, Contrib. Bot. Ind. 53, 1834. *C. procera* auct. non (Ait.) Ait. f. 1811 ; Wight, Ic. 4 (1) : 17. t. 1278, 1848 ; Hook. f. Fl. Brit. India 4 : 18, 1883 ; Duthie, Fl. Gangetic Plain 2 : 48, 1911. 'Madar, Aak' (Hindi).

Erect shrubs or small trees, covered with white pubescence; branches many from the base. Leaves 5 - 12 × 1.5 - 8.0 cm, broadly ovate, ovate - oblong, elliptic or obovate, acute at apex, cordate at the base. Flowers in umbellate, lateral cymes. Corolla c. 2.5 cm in diam., pure white to whitish - purple. Follicles 6.5 - 9.5 × 3 - 5 cm, ellipsoid or ovoid, recurved, tip not invaginated in the fruit. Seeds 6 - 8 mm long, flat, broadly ovate ; coma silky, upto 5 cm long.

Fl. & Fr. : Throughout the year.

Fairly common throughout the state in wastelands.

Selected specimens : Ajmer : Taragarh, *Duthie* 4739 (DD) ; Alwar : Malarwa, *Parmar* 9662 (BSJO) ; Banswara : Ghatol, *Singh* 2896 (BSJO) ; Bikaner : Near Charkara, *Roy* 1648 (BSJO) ; Jaisalmer : Sam, *Pandey* 7802 (BSJO) ; Jhalawar : Aklera, *Verma* 3453 (BSA) ; Sirohi : Mt. Abu, *Kaul* 9577 (LWG).

2. CARALLUMA R. Br.

Caralluma edulis (Edgew.) Benth. & Hook. Gen. Pl. 2 : 782. 1876 ; Hook. f, Fl. Brit. India 4 : 76. 1883 ; Bhandari, Fl. Ind. Desert 220. f. 70. 1978. *Boucerosia edulis* Edgew. in Journ. Linn. Soc. Bot. 6 : 205. t. 1. f. 1 - 8. 1862. 'Pimpa' (Hindi).

Erect, succulent herbs, 15 - 60 cm high ; branches subterete, 4 - angled. Leaves 0.6 - 1.3 cm long, linear or ovate - lanceolate, acute, caducous. Flowers 1 - 3, in the axils of leaves, all along distal nodes. Corolla campanulate, c. 7 mm long, purplish inside ; lobes ovate - lanceolate, acute, glabrous within. Corona in two rows ; outer cupular, 5 - lobed, each lobe produced into 2 distinct, subulate teeth ; inner one linear, subacute. Follicles 8 - 17 cm long, lanceolate, terete, smooth. Seeds brown, winged on the margins ; coma c. 2.5 cm long.

Fl. & Fr. : February - September.

Rare, in desertic habitats.

Selected specimens : Jaisalmer : *Bhandari* 2141 (JAC) ; Mohangarh, *Wadhwa* 5071 (BSA).

3. CEROPEDIA L.

- | | | |
|--|-----|---|
| 1a. Erect herbs. | ... | 1. <i>C. attenuata</i> |
| 1b. Twining herbs : | | |
| 2a. Leaves fleshy : | | |
| 3a. Leaves orbicular or ovate, emarginate or apiculate, long - petioled. | ... | 2. <i>C. bulbosa</i> var. <i>bulbosa</i> |
| 3b. Leaves linear to lanceolate, sessile. | ... | 3. <i>C. bulbosa</i> var. <i>lanceolata</i> |
| 2b. Leaves membranous : | | |
| 4a. Corolla - lobes equal or longer than tube. | ... | 4. <i>C. sinuifolia</i> |

4b. Corolla - lobes shorter than the tube :

- | | | |
|----------------------|-----|--------------------------|
| 5a. Plants glabrous. | ... | 4. <i>C. candelabrum</i> |
| 5b. Plants hirsute. | ... | 5. <i>C. hirsuta</i> |

1. *Ceropegia attenuata* Hook. Ic. Pl. ser. 2 : 5. t. 867. 1852 ; Hook. f. Fl. Brit. India 4 : 67. 1883 ; Sharma & Tiagi, Fl. North - East Rajasthan 237. 1979 ; Ansari, Fasc. Fl. India 16 : 9. 1984.

Tall, tuberous herbs. Stem usually one, rarely two or three from same tuber, hairy above. Leaves sessile, $4.8 \times 0.7 - 1.0$ cm, linear, acute, tapering at base. Cymes axillary or extra - axillary, shortly peduncled, 1 to 2 flowered. Corolla tube inflated in lower part, narrowed above, enlarge near the mouth, yellowish - green outside, striated with purple inside. Outer corona of 5, bifid, ciliate lobes. Follicles c. 7.5 cm long, straight, tapering to a fine point. Seeds 4.0×1.5 mm, ovate - oblong, comose.

Fl. & Fr. : July - October.

Rare, in exposed rocky grounds.

Selected specimen : Jaipur : Galta, Sharma 2270 (RUBL). Ansari (*l.c.*), however, mentioned it endemic to Goa, Karnataka and Maharashtra.

2. *Ceropegia bulbosa* Roxb. Pl. Cor. 1 : 11. t. 7. 1795 ; Wight, Ic. 3(2) : 4. t. 845. 1844 - 1945 ; Hook. f. Fl. Brit. India 4 : 67. 1883 ; Duthie, Fl. Gangetic Plain 2 : 66. 1911 ; Ansari, Fasc. Fl. India 16 : 10. 1984.

var. bulbosa

Twining, perennial herbs, with an underground, tuberous stem. Leaves $2.5 - 4.5 \times 2.0 - 3.5$ cm, glabrous. Cymes pedunculate, 6 to 10 - flowered. Corolla 1.5 - 2.0 cm long ; tube inflated at base, funnel - shaped at the mouth, glabrous within ; lobes linear, hairy within. Follicles 8.5 - 9.0 cm long, glabrous, terete. Seeds linear - oblong, with membranous wings.

Fl. & Fr. : July - December.

Rare, in exposed rocky habitats, particularly on hillocks.

Selected specimen : Jodhpur : Mandore, Tiwari 625 A (BSJO).

3. var. *lushii* (Grah.) Hook. f. Fl. Brit. India 4 : 68. 1883 ; Cooke, Fl. Bombay 2 : 176. 1904 ; Ansari, Fasc. Fl. India 16 : 11. 1984. *Ceropegia lushii* Grah. in Bot. Mag. t. 3300. 1834. *C. esculenta* Edgew. in J. Linn.

Soc. 5 : 204. 1862. *C. bulbosa* Roxb. var. *esculenta* (Edgew.) Hook. f. *l.c.* 4 : 68. 1883.

Very similar to the type, but can be easily distinguished by its linear to lanceolate, sub sessile leaves.

Fl. & Fr. : July - December.

Frequent among bushes on the outskirts of forests.

Selected specimens : Barmer : *Bhandari* 1543 (JAC) ; Jaipur : Ramgarh, *Sharma* 1343 (RUBL) ; Jhalawar : Lotiajhil, *Wadhwa* 5499 (BSA) ; Jodhpur : Mandore (on hills), *Tiwari* 625 B (BSJO) ; Udaipur : *Kanodia* 82209 (BSI).

4. *Ceropegia candelabrum* L. Sp. Pl. 211. 1753 ; Hook. f. Fl. Brit. India 4 : 70. 1883 ; Cooke, Fl. Bombay 2 : 176. 1904 ; Ansari, Fasc. Fl. India 16 : 12. 1984. *C. elliotii* Hook. f. *l.c.* 4 : 70. 1883.

Glabrous twiners. Leaves variable, petioled, linear to orbicular. Flowers many, in lateral umbellate cymes ; pedicels shorter than peduncles. Corolla 3.0 - 4.0 cm long ; tube inflated in lower half ; lobes truncate or narrowed into a beak, 5 - 8 mm long, hairy within. Outer corona of 5 truncate hairy lobes ; the inner corona linear - spatulate.

Fl. & Fr. : August - March.

This species is a denizen of South India and included here on the authority of Nair (1956, 1961) and Nair & Nathawat (1957) who reported it from Jhunjhunu and Sikar districts respectively.

5. *Ceropegia hirsuta* Wight & Arn. in Wight, Contrib. 30. 1834 ; Hook. f. Fl. Brit. India 4 : 71. 1883, includ. all vars. except var. *vincifolia* (Hook.) Hook. f. ; Cooke, Fl. Bombay 2 : 177. 1904 ; Ansari, Fasc. Fl. India 16 : 16. pl. 3. f. 7. 1984. '*Khilara*' (Hindi).

Coarse, tuberous twiners, hirsute all over except the corolla. Leaves variable, 5 - 6 × 3.5 - 3.8 cm, linear - lanceolate or ovate - cordate, acuminate. Flowers few, in lateral umbellate cymes. Corolla 2.5 - 6.0 cm long ; tube depressedly inflated at the base, funnel - shaped above, yellow, striated with green at the base ; lobes purple, hairy inside. Outer corona of 5, bifid lobes ; inner corona erect, linear. Follicles 10.0 × 0.5 cm, finely pointed. Seeds narrowly oblong.

Fl. & Fr. : July - October.

Fairly common at Mt. Abu than elsewhere.

Selected specimens : Sirohi : Mt. Abu (Kaylas Walk), *Mehta* 1057 (JAC) ; Near Hanumanji's temple, *Mehta* 558, 101 (JAC).

6. *Ceropegia vincaefolia* Hook. in Bot. Mag. t. 3740. 1839 ; *emend.* Ansari in Bull. Bot. Surv. India 13 : 187. 1974 et Fasc. Fl. India 16 : 31. 1984. *Ceropegia hirsuta* Wt. & Arn. var. *vincaefolia* (Hook.) Hook. f. Fl. Brit. India 4 : 72. 1883 ; Cooke, Fl. Bombay 2 : 177. 1904.

Coarse, tuberous climbers ; branches glabrous. Leaves 5 - 10 cm long, variable, narrowly lanceolate or ovate cordate, obtusely acuminate to acute. Flowers in few flowered umbellate cymes ; peduncles hirsute ; pedicels glabrous. Corolla 3 - 8 cm long, greenish, blotched with purple ; tube inflated at base, funnel shaped at mouth ; lobes pubescent inside. Outer corona of 5, erecto - patent, emarginate, fleshy lobes tipped with long hairs ; the inner one ligulate - oblanceolate, glabrous. Follicles linear - lanceolate, finely pointed, glabrous.

Fl. & Fr. : July - October.

Rare, in the forests among clumps of shrubs at Mt. Abu.

Selected specimens : Sirohi : Mt. Abu, *Carl* 6625, 6626, 6628, 6627 (BLAT), *McCann* 6010 (BLAT).

4. GYMNEMA R. Br.

Gymnema sylvestre (Retz.) R. Br. ex Schult. in Roem. & Schult. Syst. Veg. 6 : 57. 1820 ; Wight, Ic. 2(1) : 3. t. 349. 1840 ; Hook. f. Fl. Brit. India 4 : 29. 1883 ; Duthie, Fl. Gangetic Plain 2 : 53. 1911. *Periploca sylvestris* Retz. Obs. Bot. 2 : 15. 1781.

Much branched, twining shrubs. Leaves 3.5 - 5.5 × 2.5 - 3.5 cm, ovate, elliptic or oblong, acute or apiculate, rounded at base, sub - coriaceous. Flowers minute, spirally arranged in lateral pedunculate or nearly sessile cymes, greenish - yellow. Corolla - lobes imbricate. Ridges of corona protruding beyond the mouth of corolla. Follicles usually solitary, 6 - 8 × 0.8 cm, straight or slightly curved, terete, lanceolate, tapering, glabrous. Seeds c. 1.2 × 0.5 cm, narrowly ovoid - oblong, glabrous, brown.

Fl. & Fr. : April - January.

Frequent in the deciduous forests in the east of Aravalli.

Selected specimens : Banswara : Shergarh forest, *Singh* 3084 (BSJO) ; Jaipur : *Jain* 49627 (BSI) ; Jhalawar : Asnawar, *Verma* 6876 (BSA) ; Kota : *Verma* 422 (BSA) ; Sawaimadhapur : Ranthambhore, *Sharma* 3240 (RUBL).

5. HOLOSTEMMA R. Br.

Holostemma ada-kodien Schult. in Roem. & Schult. Syst. Veg. 6: 95. 1820. *H. rheedit* Wall. Pl. As. Rar. 2: 51. 1831; Wight, Ic. 2 (3): 7, t. 597. 1842; Hook. f. Fl. Brit. India 4: 21. 1883. *Asclepias annularia* Roxb. Fl. Ind. 2: 37. 1832. *Holostemma annulare* (Roxb.) K. Schum. in Engl. & Prantl, Pflanz. 4(2): 250. t. 51 J-K. 1895. *H. rheedianum auct.* non Spreng. 1825; Duthie, Fl. Gangetic Plain 2: 50. 1911.

Extensive, perennial twiners; stem terete, sparingly branched. Leaves 7-17 × 5-15 cm, broadly ovate, acuminate, cordate at base, with gland-pit on the midrib beneath, glaucous. Flowers in axillary, few-flowered lax cymes. Corolla fleshy, white, purple inside. Anthers completely connate, with membranous appendages and one pendulous pollen-mass in each cell i.e. 10 in all. Follicles 10-12 × 5-6 cm, turgid, boat-shaped, green, linear-oblong, glabrous. Seeds 0.7 × 0.5 cm, ovate, compressed, glabrous; coma c. 3 cm long.

Fl. & Fr. : June - October.

Rare, in deciduous forests on the outskirts.

Selected specimens : Banswara : Shergarh forest, Singh 3082 (BSJO); Misc.

Locality : Mehibir forest, Puri 37553 (BSI). Also reported from Jodhpur by Sarup (1954).

6. LEPTADENIA R. Br.

Erect, bushy shrubs, leafless or nearly so.

1. *L. pyrotechnica*

Twining shrubs. Leaves well developed,

2. *L. reticulata*

1. *Leptadenia pyrotechnica* (Forsk.) Decne. in Ann. Sci. Nat. ser. 2. 9: 269. 1838; Mahesh. Illus. Fl. Delhi f. 128. 1966. *Cynanchum pyrotechnicum* Forsk. Fl. Aegypt. - Arab. 53. 1775. *Leptadenia spartium* Wt. & Arn. in Wight, Contrib. 48. 1834; Hook. f. Fl. Brit. India 4: 64. 1883; Duthie, Fl. Gangetic Plain 2: 63. 1911. 'Khim, Khimparlo, Thaliawar' (Hindi).

Erect, much-branched bushy shrubs, upto 1.5 m high, with watery sap. Leaves when present, 2.5-6.5 × 0.2-0.3 cm, sessile, narrowly linear to linear-lanceolate, caducous. Flowers in lateral umbellate cymes, greenish-yellow. Corolla-lobes valvate. Outer corona of 5 small scales; staminal corona of raised, undulate, fleshy ring. Follicles 7.0-14.0 × 0.5-0.8 cm, terete, lanceolate, tapering to a slender beak, glabrous. Seeds 5-7 mm long, ovate-lanceolate, glabrous; coma 2.5-3.5 cm long.

Fl. & Fr. : August - January.

Common throughout the state in dry habitats, particularly in the desertic zone.

Selected specimens : Alwar : Khoh - Dariba, *Parmar* 9638 (BSJO) ; Barmer : Sheo, *Tiwari* 927 (BSJO) ; Banswara : Paloda, *Singh* 2809 (BSJO) ; Jaisalmer : Devikot, *Shetty* 3358 (BSJO) ; Tonk : Rajmahal, *Shetty* 456 (BSJO).

2. *Leptadenia reticulata* (Retz.) Wt. & Arn. in Wight, *Contrib.* 47. 1834 ; Wight, *Jc.* 2(1) : 4. t. 350. 1840 ; Hook. f. *Fl. Brit. India* 4 : 63. 1883 ; Duthie, *Fl. Gangetic Plain* 2 : 63. 1911. *Cynanchum reticulatum* Retz. *Obs. Bot.* 2 : 15. 1781. 'Jhumka' (Hindi).

Twining shrubs, with watery sap and corky deeply cracked bark. Leaves 3.0 - 17.5 × 1.5 - 7.0 cm, broadly ovate to ovate - lanceolate, acute at apex, rounded at base, sub coriaceous. Flowers in lateral, many flowered umbellate cymes, greenish. Corolla - lobes valvate. Outer corona of 5, fleshy quadrate - truncate lobes ; staminal corona annular. Anthers without terminal appendages. Follicles 5 - 9 × 2 - 3 cm, oblong or broadly lanceolate, with a thick curved beak. Seeds c. 1 cm long, narrowly ovoid ; coma 3 - 4 cm long.

Fl. & Fr. : Almost throughout the year.

Common in wastelands, open forests and on the edges of fields and gardens, particularly in the east of Aravalli.

Selected specimens : Banswara : Paloda, *Singh* 2845 (BSJO) ; Dungarpur : *Majumdar & Mishra* 10337 (BSA) ; Kota : Rampura, *Vermia* 1788 (BSA). Also reported from Jodhpur by Sarup (1954).

7. MARSDENIA R. Br.

Marsdenia tenacissima (Roxb.) Moon, *Cat. Pl. Ceylon* 21. 1824 ; Wight, *Jc.* 2(3) : 7. t. 590. 1842 ; Hook. f. *Fl. Brit. India* 4 : 35. 1883 ; Duthie, *Fl. Gangetic Plain* 2 : 57. 1911. *Asclepias tenacissima* Roxb. *Pl. Cor.* 3 : 35. t. 240. 1815. 'Jiti Marua bel' (Hindi).

Extensive, woody twiners, with thick root - stock and sticky latex. Leaves 7 - 20 × 5.5 - 12.0 cm, broadly ovate cordate, acuminate, densely hairy. Flowers in large drooping panicles composed of alternate drooping branches of umbellate cymes, yellowish green. Staminal corona basal, of linear flattened lobes. Follicles 6 - 15 × 2.0 - 4.5 cm, ovoid - lanceolate, acute, longitudinally rugose, valvety pubescent. Seeds 1.2 × 0.8 cm,

broadly ovate - oblong, margined ; coma of white silky hairs, 3 - 4 cm long.

Fl. & Fr. : May - August.

Common on the edges of fields and gardens, in the wastelands and open forests, particularly in the east of Aravalli.

Selected specimens : Banswara : Shergarh forest, *Singh* 3085 (BSJO) ; Bharatpur : Ghana Bird Sanctuary, *Parmar* 8616 (BSJO) ; Jhalawat : Ghotdi, *Wadhwa* 7555 (BSA) ; Pali : Kotra village, *Shetty* 1452 (BSJO) ; Sirohi : Mt. Abu, *Mehta* 889 (JAC) ; Tonk : *Maheshwari* 52986 (LWG).

8. ODONTANTHERA Wight

Odontanthera varians (Stocks) Mabberley in *Manilal Bot. Hist. Hort. Malab.* 89. 1980. *Mastostigma varians* Stocks in *Hook. Ic. Pl.* 9 : t. 863. 1852. *Glossonema varians* (Stocks) *Hook. f. Fl. Brit. India* 4 : 16. 1883 ; *Cooke, Fl. Bombay* 2 : 150. 1904 ; *Bhandari, Fl. Ind. Desert* 222. 1978. 'Dodha' (Hindi).

Small, erect, annual or perennial herbs, 10 - 15 cm high. Leaves opposite. 2.5 - 7.0 × 1.8 - 5.0 cm, lower rotund ovate, sub - cordate, obtuse or retuse ; upper ones elliptic, acuminate, hairy on both sides. Flowers in subsessile, umbellate, 2 to 8 - flowered cymes, white or yellow. Corona - lobes c. 0.25 cm long, entire or bifid. Follicles 2.5 - 5.0 cm long, ellipsoid, covered with soft scattered spines. Seeds 4 - 6 mm long, broadly ovate, acute, flat with papery margins, sinuate - dentate at the broader end.

Fl. & Fr. : August - December.

Rare, in the rocky habitats in western desertic zones of the state.

Selected specimens : Barmer : *Bhandari* 1608 (JAC) ; Jaisalmer : Bojka, *Shetty* 3350 (BSJO) ; Range Management area, *Tiwari* 823 (BSJO) ; Pokaran Lavan, *Jain* 4946 (BSI) ; Kuri, *Stower* B - 40 (BSI) ; Vinjorai, *Wadhwa* 5308 A (BSA) ; Budhi Nala, *Wadhwa* 4987 (BSA) ; Mohangarh, *Wadhwa* 5075 (BSA).

9. ORTHANTHERA Wight

Orthanthera viminea Wight, *Contrib.* 45. 1834 ; *Hook. f. Fl. Brit. India* 4 : 64. 1883 ; *Duthie, Fl. Gangetic Plain* 2 : 65. 1911. 'Mahur - ghaz' (Hindi).

Small, erect, leafless shrubs ; young branches pubescent. Flowers in compact woolly cymes, dull brown ; peduncles 0.8 - 2.5 cm long. Sepals as long as corolla - tube. Corolla villous outside, glabrous within, salver - shaped. Follicles erect, 7.0 - 12.5 cm long, linear, compressed, smooth, with thin pericarp. Seeds 0.25 - 0.35 cm long, dark brown, flat, comose.

Fl. & Fr. : March - July.

Included on the authority of Sarup (1954) from Jodhpur. Duthie (*l.c.*) also mentioned its distribution in Rajasthan, but authors could not trace any specimen of it from Rajasthan in Indian herbaria.

10. OXYSTELMA R. Br.

Oxystelma esculenta (L. f.) R. Br. ex Schultes, Syst. Veg. 6 : 89. 1820 ; Hook. f. Fl. Brit. India 4 : 17. 1883 ; Duthie, Fl. Gangetic Plain 2 : 51. 1911. *Periploca esculenta* L. f. Suppl. 168. 1781. *Oxystelma secamone auct.* non (L.) Karst. 1880 - 83 ; *sensu* Sant. & Irani in Univ. of Bombay Bot. Mem. 4 : 67. 1960 ; Mahesh. Illus. Fl. Delhi f. 125. 1966. 'Dudhi - ki - bel' (Hindi).

Twining, glabrous herbs or undershrubs. Leaves 4 - 9 × 0.4 - 0.8 cm, linear lanceolate, acute or acuminate at apex and acute or rounded at base. Flowers in drooping, few flowered, lateral, subumbellate cymes. Corolla rotate, white outside, pink inside, with purplish reticulations. Outer staminal corona cupular, adnate to the base of column ; inner of 5, free lobes, 2 keeled within. Follicles 4 - 7 × 1 cm, ovoid - lanceolate, acute. Seeds ovate or sub orbicular ; coma upto 2 cm long.

Fl. & Fr. : May - February.

Common in marshy habitats, particularly in the east of Aravalli in association with *Typha angustata* Bory & Chaub.

Selected specimens : Banswara : On the way to Kushalgarh, Singh 3026 (BSJO) ; Bharatpur : Ghana Bird Sanctuary, Parmar 8634 (BSJO) ; Jaipur : Ramgarh, Singh Acc. No. 8172 (RUBL) ; Jaisalmer : Masya dam, Jain 40565 (BSA, BSI).

11. PENTATROPIS Wight & Arnott

Pentatropis spiralis (Forsk.) Decne. in Ann. Sci. Nat. ser. 2. 9 : 327. t. 11. 1838 ; Hook. f. Fl. Brit. India 4 : 19. 1883. *Asclepias spiralis* Forsk. Fl. Aegypt. - Arab. 49. 1775. *Pentatropis cynanchoides* R. Br. in Salt. Voy. Abyss. App. 64. 1814 ; Duthie, Fl. Gangetic Plain 2 : 52. 1911.

Slender, twining undershrubs, with watery sap. Leaves $1.5 \times 0.6 - 1.8$ cm, thick, ovate, ovate-lanceolate or elliptic-oblong, acute to obtuse at apex, mucronate, rounded or subcordate at base, glabrous. Flowers in 3 to 7 flowered, lateral umbellate cymes, yellowish-green with a reddish eye. Corolla lobes with long, linear tails. Follicles 7.9×1.5 cm, lanceolate, tapering to a beak, glabrous. Seeds ovate, flattened; coma 2.0 - 2.5 cm long.

Fl. & Fr. : January - October.

Fairly common throughout the state, preferably in loamy soils.

Selected specimens : Bharatpur : Achanera, *Parmar* 8665 (BSJO); Bikaner : Kolayat, *Roy* 2053 (BSJO); Jaipur : Amber, *H. Lal* 34626 (LWG); Jaisalmer : Devikot, *Wadhwa* 5302 (BSA); Tonk : Tordi Sagar, *Shetty* 1104 (BSJO).

12. PERGULARIA L.

Pergularia daemia (Forsk.) Chiov. in *Result. Sci. Miss. Stefan. - Paoli Somal. Ital.* 1 : 115. 1916. *Asclepias daemia* Forsk. *Fl. Aegypt. - Arab.* 51. 1775. *Cynanchum extensum* Jacq. *Misc. Aust. Bot.* 2 : 353. 1781. *Daemia extensa* (Jacq.) R. Br. in *Mem. Wern. Soc.* 1 : 50. 1811; Wight, *Ic.* 2(3) : 7. t 596. 1842; Hook. f. *Fl. Brit. India* 4 : 20. 1883; Duthie, *Fl. Gangetic Plain* 2 : 52. 1911. '*Gadaria ki bel*' (Hindi).

Hispid, twining undershrubs. Leaves $3 - 9 \times 2.5 - 6.0$ cm, ovate, acuminate, cordate at base. Flowers in drooping, lateral corymbose cymes, pale yellowish green. Basal staminal corona of 5-lobed membrane; upper of 5, laterally compressed lobes adnate to the anthers. Follicles in pairs, $5 - 8 \times 1.0 - 1.5$ cm, reflexed, slightly curved, lanceolate, tapering to a point, pubescent, softly echinate all over. Seeds 7×5 mm, ovate, truncate at apex, dentate-margined, densely velvety pubescent; coma 3 - 4 cm long, white, hairy.

Fl. & Fr. : March - December.

Common among bushes on the edges of fields, gardens, fringes of forests and wastelands.

Selected specimens : Alwar : Sariska Tiger Reserve, *Parmar* 9593 (BSJO); Banswara : Paloda, *Singh* 2848 (BSJO); Barmer : Kundal, *Pandey* 8024 (BSJO); Jaipur : Road to Amber, *Sharma* 313 (RUBL); Kota : *Wadhwa* 1990 (BSA); Pali : Rajpuradam, *Shetty* 1502 (BSJO).

13. *SARCOSTEMMA* R. Br.

- 1a. Flowers in terminal and lateral umbels. Style-apex oblong-fusiform, much exerted. ... 1. *S. intermedium*
- 1b. Flowers in terminal umbels only. Style-apex conical, not exerted :
- 2a. Follicles 10 - 12 cm long, lanceolate, tapering at both ends, slightly divergent. ... 2. *S. viminale* subsp. *viminale*
- 2b. Follicles 5.5 - 8.5 cm long, cylindric not tapering towards base but little towards the apex. ... 3. *S. viminale* subsp. *stocksii*

1. *Sarcostemma intermedium* Decne. in DC. Prodr. 8 : 538. 1844 ; Wight. Ic. 4(1) : 17. t. 1281. 1848 ; Hook. f. Fl. Brit. India 4 : 27. 1883 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 155. 1976.

Leafless, pendulous or scandent shrubs. Flowers in lateral and terminal, sessile umbels, whitish. Inner processes of corona oblong. Stigma fusiform, simple or bifid. Follicle 7 - 10 cm long, broad at the base and narrowed at the tip, thinly coriaceous, slightly divergent. Seeds 5 - 6 × 2 - 3 mm, oblong, flattened, rounded at the base, truncate at the apex ; coma c. 1.8 cm long.

Fl. & Fr. : June - September.

Rare. in dry rocky habitats. Reported from Ajmer district only.

Selected specimen : Ajmer : *Laurie* 191 (DD).

2. *Sarcostemma viminale* (L.) R. Br. in Mem. Wern. Soc. 1 : 51. 1811. *Euphorbia viminale* L. Sp. Pl. 452. 1753. *Cynanchum viminale* (L.) L. Mant. Pl. Alt. 2 : 392. 1771. *Asclepias acida* Roxb. Fl. Ind. 2 : 31. 1832. *Sarcostemma brevistigma* Wt. & Arn. in Wight, Contrib. 59. 1834 ; Wight, Ic. 2(3) : 7. t. 595. 1842 ; Hook. f. Fl. Brit. India 4 : 26. 1883. *S. acidum* (Roxb.) Voigt, Hort. Sub. Calc. 542. 1845 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 154. 1976.

subsp. *viminale*

Much-branched, leafless, straggling shrubs. Flowers sweet-scented, in sessile, many-flowered, terminal umbels. Bracts lanceolate, puberulous. Pedicels 1.0 - 1.5 cm long, pubescent. Corolla rotate, glabrous, pale greenish-white, divided nearly to the base ; lobes ovate or oblong, obtuse. Follicles usually solitary, 10 - 13 × 0.7 - 1.0 cm. Seeds 3 - 6 mm long, flattened, ovate ; coma c. 1.8 cm long.

Fl. & Fr. : June - October.

Fairly common throughout the state, particularly west of Aravalli, in dry rocky habitats.

Selected specimens : Ajmer : Puri 37585 (BSI) ; Barmer : Haldeswar Mahadev R.F., Pandey 7944 (BSJO) ; Bhilwara : Amarpura, Singh 6234 (BSJO) ; Jaisalmer : Bhandari 1052 (JAC) ; Jodhpur : Kailana, Singh 4490 (BSJO) ; Pali : Jawai, Shetty 1448 (BSJO).

3. subsp. *stocksii* (Hook. f.) Ali, Fl. W. Pakistan 150 : 31. 1983. *Sarcostemma stocksii* Hook. f. Fl. Brit. India 4 : 27. 1883 ; Cooke, Fl. Bombay 2 : 159. 1904.

Very similar to subsp. *viminale*, but can be distinguished by its smaller divericate follicles which are cylindric, straight and rod-like. Seeds 6-7 mm long, narrowly oblong, with truncate apex ; coma c. 2.5 cm long.

Fl. & Fr. : June - October.

Rare, in rocky habitats ; so far reported from Jodhpur district only.

Selected specimen : Jodhpur ; Chopasni, Puri 23268 (BSI).

14. TELOSMA Coville

Telosma cordata (Burm. f.) Merrill in Philipp. J. Sci. 19 : 372. 1912. *Asclepias cordata* Burm. f. Fl. Ind. 72. t. 27. f. 2. 1768. *A. pallida* Roxb. Fl. Ind. 2 : 48. 1832. *Pergularia pallida* (Roxb.) Wt. & Arn. in Wight, Contrib. 42. 1834 ; Wight, Ic. 2(3) : 6. t. 585. 1840-1843 ; Hook. f. Fl. Brit. India 4 : 38. 1883 ; Duthie, Fl. Gangetic Plain 2 : 59. 1911.

Twining undershrubs ; branches pale, more or less pubescent. Leaves 5-9 × 3.5-6.0 cm, membranous, ovate, shortly acuminate, cordate at base. Flowers in many-flowered umbellate cymes, pale creamish to white. Pollen masses clavate or subcylindric. Follicles 10 × 2 cm, woody, lanceolate, shortly acuminate. Seeds ovate-oblong, strongly margined, glabrous, comose.

Fl. & Fr. : August - December.

Occasional, found in open dry wastelands and foot of Aravalli.

Selected specimens : Ajmer : Tiagi 19 (DD) ; Banswara : Kushalgarh, Singh 3754 (BSJO) ; Bhilwara : Bhilon ki Jhopari (along Bcawar Road), Singh 6213 (BSJO) ; Jaipur : URF, Sharma 2138 (RUBL) ; Pali : Near Desuri, Shetty 1865 (BSJO).

15. TYLOPHORA R. Br.

Tylophora hirsuta (Wall.) Wt. & Arn. in Wight, Contrib. 49. 1834 ; Hook. f. Fl. Brit. India 4 : 43. 1883 ; Duthie, Fl. Gangetic Plain 2 : 61. 1911. *Gymnema hirsutum* Wall. Tent. Fl. Nap. 50. 1824 ; Wight, Ic. 4(1) : 16. t. 1272. 1848.

Twining undershrubs, often clothed with spreading hairs. Leaves 4.5 - 12.5 × 1.5 - 8.0 cm, ovate to ovate lanceolate, acute to acuminate at apex, rounded to subcordate at base, glabrous or pubescent. Flowers in umbelloid cymes, white to pale green. Calyx segments hirsute. Corolla pubescent within. Follicles 3.5 - 7.5 × 0.5 - 0.7 cm, usually solitary, tapering upwards, smooth. Seeds c. 6 mm long, compressed, truncate, dark brown, comose.

Fl. & Fr. : May - November.

Rare, in the interior forests, in shady habitats.

Selected specimen : Banswara : Punapathar forest, Singh 2927 (BSJO).

16. WATTAKAKA Hassk.

Wattakaka volubilis (L. f.) Stapf in Curtis, Bot. Mag. sub. t. 8976. 1923. *Asclepias volubilis* L. f. Suppl. 170. 1781. *Hoya viridiflora* R. Br. in Mem. Wern. Nat. Hist. Soc. 1 : 27. 1811 ; Wight, Ic. 2(3) : 6. t. 586. 1840 - 1843. *Dregea volubilis* (L. f.) Benth. ex Hook. f. Fl. Brit. India 4 : 46. 1883, incl. var. *lacuna*. *Marsdenia volubilis* (L. f.) Cooke, Fl. Bombay 2 : 166. 1904 ; Duthie, Fl. Gangetic Plain 2 : 56. 1911.

Large twining shrubs. Leaves 6.0 - 15.5 × 4.0 - 11.5 cm, broadly ovate or suborbicular, acuminate, glabrous or softly pubescent, with a few small glands just above the petiole, rounded or cordate at base. Flowers in lateral, drooping umbellate cymes, yellowish-green. Follicles 5 - 10 × 2.0 - 4.5 cm, slightly tapering to a blunt point, rugosely striate. Seeds ovate ; coma 4 - 5 cm long.

Fl. & Fr. : April - September.

Common in wastelands, forests and edges of fields and gardens.

Selected specimens : Ajmer : Jain 49686 (BSI) ; Alwar : Sariska, Parmar 10206 (BSJO) ; Barmer : Haldeshwar Mahadev forest, Pandey 7973 (BSJO) ; Dungarpur : Sagwara, Kanodia 82175 (BSI) ; Jaipur : Doasa, Wadhwa 8242 (BSA) ; Kota : Wadhwa 9226 (BSA) ; Pali : Ghanerao forest, Pandey 4640 (BSJO) ; Udaipur : Jaitamand, Kanodia 82258 (BSI).

CULTIVATED SPECIES

Asclepias curassavica L. Erect undershrubs. Flowers showy, bright crimson or light orange in extra-axillary umbellate cymes. Commonly cultivated in the gardens for ornamental purposes.

81. PERIPLOCACEAE

(P.J. Parmar)

- | | |
|---|------------------------|
| 1a. Corolla 5 - 6 cm long, dark-violet or purple ; tube much longer than the calyx-lobes. ... | 2. <i>Cryptostegia</i> |
| 1b. Corolla 0.3 - 1.5 cm long, brownish-yellow, pale - yellow, creamy white or greenish outside and purplish within ; tube about as long as or shorter than the calyx-lobes : | |
| 2a. Leafy twining shrubs. Corona-lobes 5, free : | |
| 3a. Flower-buds produced into a slender beak. Corolla 10-15 mm long, yellowish-white. ... | 1. <i>Cryptolepis</i> |
| 3b. Flower-buds ovoid, not beaked. Corolla 5.0 - 6.5 mm long, dull purplish-brown. ... | 3. <i>Hemidesmus</i> |
| 2b. Leafless erect shrubs ; leaves, when present, small. Corona-lobes 5, connate. ... | 4. <i>Periploca</i> |

1. CRYPTOLEPIS R. Br.

Cryptolepis buchananii Roem. & Schult. Syst. Veg. 4 : 409. 1819 ; Wight, Ic. 2(2) : 6. t. 494. 1841 ; Hook. f. Fl. Brit. India 4 : 5. 1883 ; Duthie, Fl. Gangetic Plain 2 : 45. 1911. '*Karmata ki bel*' (Hindi).

Twining shrubs, with lenticelled stems. Leaves 5 - 15 × 2.5 - 8.0 cm, elliptic to oblong-ovate, acute to shortly acuminate, glabrous, green above, whitish beneath. Flowers in axillary paniced cymes. Corolla-lobes linear to linear-lanceolate, acute. Coronal-scales 5, clavate. Stamens at the base of the corolla-tube ; filaments free. Follicles 5 - 12 × 1.2 - 2.5 cm, tapering at the apex, glabrous. Seeds 6 - 7 mm long, ovate-oblong, compressed, black ; coma 3 - 4 cm long, white.

Fl. & Fr. : May - August.

Rather common in dry deciduous scrub forests, especially in the eastern parts of the state.

Selected specimens : Ajmer : Todgarh, *Duthie* 4749 (DD) ; Banswara : *Singh* 2874 (BSJO) ; Jhalawar : Bakani, *Wadhwa* 9525 (BSA) ; Kota : Shahabad, *Verma* 612 (BSA) ; Sirohi : Mt. Abu, *Jain* 46592 (BSI) ; Udaipur : *Majumdar* 11666 (BSA).

2 CRYPTOSTEGIA R. Br.

Cryptostegia grandiflora R. Br. in *Edwards*, Bot. Reg. 5. t. 435. 1820 ; *Wight*, Ic. 3(2) : 3. t. 832. 1844 ; *Hook. f.* Fl. Brit. India 4 : 6. 1883 ; *Raizada*, Suppl. *Duthie*, Fl. Gangetic Plain 152. 1976. '*Rubber ke bel, Rubber - gugli*' (Hindi).

Large, evergreen, glabrous, straggling shrubs with milky sap. Leaves opposite, 5-11 × 3-6 cm, coriaceous, elliptic-oblong, obtuse or retuse, acute at base. Flowers in 2- to 3- cymose cymes, pale purple or pink. Calyx 5-lobed. Corolla funnel-shaped. Corona-lobes divided into filiform segments. Stamens short, at the base of the corolla. Follicles woody, 8-13 × 2.0-3.8 cm, sharply 3-angled or winged, ovoid-oblong, tapering to the apex. Seeds numerous, 8-9 mm long, ovate-oblong, compressed ; coma 2.5 cm long, silky-white.

Fl. & Fr. : April - September.

Native of Madagascar ; commonly naturalized in wastelands ; also cultivated in the gardens for ornamental purposes.

Selected specimens : Banswara : Pipalkunt, *Singh* 2919 (BSJO) ; Bharatpur : Ghana Bird Sanctuary, *Parmar* 8708 (BSJO) ; Ganganagar : Nohar, *Roy* 6447 (BSJO) ; Jaipur : Amber, *Sharma* 465 (RUBL) ; Jodhpur : Birai dam, *Singh* 3565 (BSJO) ; Kota : *Wadhwa* 9493 (BSA) ; Udaipur : Nathdawara, *Kaul* 8582 (LWG).

3. HEMIDESMUS R. Br.

Plants glabrous.	...	1. <i>H. indicus</i> var. <i>indicus</i>
Plants pubescent.	...	2. <i>H. indicus</i> var. <i>pubescens</i>

1. *Hemidesmus indicus* (L.) R. Br. in *Ait. f.* Hort. Kew. ed. 2. 2 : 75. 1811 ; *Wight*, Ic. 2(3) : 7. t. 594. 1842 ; *Hook. f.* Fl. Brit. India 4 : 5. 1883 ; *Duthie*, Fl. Gangetic Plain 2 : 45. 1911. *Periploca indica* L. Sp. Pl. 211. 1753. '*Dudhli*' (Hindi).

var. indicus

Scandent undershrubs, with woody root-stock. Leaves opposite, 4-15 × 0.8-2.5 cm, elliptic-oblong to linear-lanceolate, acute to obtuse and apiculate at apex, acute or rounded-truncate at base. Flowers in axillary, subsessile cymes, dull yellow with purple eye. Follicles 10-15 × 0.5-1.0 cm, tapering to a point, slightly falcate, glabrous. Seeds 6-8 mm long, ovate-oblong, compressed, black; coma upto 4 cm long.

Fl. & Fr. : Almost throughout the year.

Common in the scrub forests in the east of Aravalli.

Selected specimens : Banswara : Ghatol, *Kanodia* 75473, 75239 (BSI); Dungarpur : Sagwara, *Kanodia* 82152 (BSI); Jhalawar : Aklera, *Wadhwa* 1939 (BSA); Tonk : *Maheshwari* 52980 (LWG).

2. **var. pubescens** (Wt. & Arn.) Hook. f. *Fl. Brit. India* 4 : 5. 1883. *Hemidesmus pubescens* Wt. & Arn. in Wight, *Contrib.* 63. 1834; Wight, *Ic.* 4(2) : 6. t. 1320. 1848.

Very similar to type variety, but can be distinguished by its pubescent branchlets, leaves beneath and inflorescence.

Fl. & Fr. : Throughout the year.

Rare, in wastelands and open forests.

Selected specimen : Jhalawar : Lotia Jhil, *Wadhwa* 5378 (BSJO).

4. PERIPLOCA L.

Periploca aphylla Decne. in Jacq. *Voy. Bot.* 109. t. 116. 1844; Hook. f. *Fl. Brit. India* 4 : 12. 1883; Duthie, *Fl. Gangetic Plain* 2 : 46. 1911.

Erect, branched, generally leafless shrubs, with milky juice. Leaves, when present, 6-8 × 3-4 mm, ovate-oblong, thick, acute. Flowers in c. 2.5 cm long, axillary and terminal cymes. Calyx-segments with scarious margins. Corolla greenish out side, purplish within. Follicles 4-10 × 0.5-0.6 cm, rigid, woody, cylindric-conical, beaked. Seeds 5-6 mm long, oblong, compressed, reddish-brown, glabrous; coma about 2.5 cm long.

Fl. & Fr. : July - October.

Included on the authority of Sarup (1951 & 1954), Blatter & Hallberg (1918 - 1921) and Bhandari (1978) from Jodhpur and Jaisalmer districts.

82. SPIGELIACEAE

(P.J. Parmar)

MITREOLA L.

Mitreola petiolata (J.F. Gamel.) Torr. & Gray, Fl. North Amer. 2 : 45. 1845. *Ophiorrhiza mitreola* L. Sp. Pl. 150. 1753. *Cynoctonum petiolatum* J.F. Gamel. Syst. Nat. ed. 13. 2 : 443. 1791. *Mitreola paniculata* Wall. ex G. Don, Gen. Hist. 4 : 171. 1837 ; Wight, Ic. 4(4) : 14. t 1600. 1850. *M. oldenlandioides* Wall. ex DC. Prodr. 9 : 9. 1845 ; Clarke in Hook. f. Fl. Brit India 4 : 79. 1883 ; Duthie, Fl. Gangetic Plain 2 : 68. 1911.

Erect, annual herbs, 10 - 50 cm high. Stem 4-angled, narrowly winged. Leaves $2.7 \times 0.8 - 3.0$ cm, ovate-lanceolate or ovate-elliptic to deltoid, acute, glabrous. Stipules interpetiolar, deltoid or ovate. Flowers terminal or axillary, in dichotomous cymes on cincinniform branches, white. Bracts and bracteoles linear, persistent. Capsules 4 - 5 mm broad, wedge-shaped, deeply emarginate, two horned. Seeds ellipsoid, 3-angled, with a ventral cavity.

Fl. & Fr. : September - December.

Common in wet and shady habitats in the forests. So far reported from Banswara district only.

Selected specimens : Banswara : Punapather forest, Singh 3675 (BSJO) ; Bhapor, Kanodia 75222 (BSA) ; Kaling Wadhvasi Khora - nala, Kanodia 75639 (BSA) ; on the way to Hudiani Dongri (Ghatol), Kanodia 75472 (BSA).

83. BUDDLEJACEAE

(P.J. Parmar)

BUDDLEJA L.

Flowers white, in drooping spikes.	...	1. <i>B. asiatica</i>
Flowers orange, in terminal panicles.	...	2. <i>B. madagascariensis</i>

1. *Buddleja asiatica* Lour. Fl. Cochinch. 1 : 72. 1790 ; Clarke in Hook. f. Fl. Brit. India 4 : 82. 1883.

Evergreen, perennial, straggling shrubs. Leaves lanceolate or oblong, entire or serrulate, obtuse to acuminate, white tomentose beneath. Flowers

in drooping spikes, densely tomentose outside, white. Capsules ovoid, enclosed in the persistent calyx. Seeds not tailed.

Native of China ; usually cultivated in the gardens for ornamental purposes. It flowers from January - April.

2. *Buddleja madagascariensis* Lam. *Encycl.* 1 : 513. 1785 ; Leenh. in van Steenis, *Fl. Males.* I. 6 : 340. 1962.

Large, scrambling, evergreen shrubs. Leaves ovate-oblong, entire or serrulate, densely white tomentose beneath. Flowers orange, in large terminal panicles. Capsules ovoid, enclosed in the calyx.

Native of Madagascar ; occasionally cultivated in the gardens for ornamental purposes. It also flowers during winters.

84. GENTIANACEAE

(P.J. Parmar)

- 1a. Corolla regular. Stamens all perfect :
- 2a. Ovary 2-celled. ... 4. *Exacum*
- 2b. Ovary 1-celled :
- 3a. Corolla with one or two glandular nectaries at the base of each lobe. ... 6. *Swertia*
- 3b. Corolla-lobes eglandular :
- 4a. Flowers white, in sessile axillary clusters. ... 3. *Enicostema*
- 4b. Flowers pink, in dichotomous cymes. ... 2. *Centaurium*
- 1b. Corolla irregular. Only 1 stamen perfect :
- 5a. Flowers yellow. Stigma sub-entire. ... 5. *Hoppea*
- 5b. Flowers pink or white. Stigma distinctly 2-lobed. ... 1. *Canscora*

1. CANSCORA Lam.

- 1a. Calyx-tube winged. Long stamens appendaged. Stigma hispidulous. ... 2. *C. decussata*
- 1b. Calyx-tube striate or keeled, not winged. Long stamens not appendaged. Stigma glabrous :

- 2a. Leaves decurrent along the whole length of the internode. ... 1. *C. decurrens*
- 2b. Leaves not decurrent along the stem :
- 3a. Stem and pedicels winged. ... 4. *C. heteroclita*
- 3b. Stem and pedicels terete or 4 - angled. ... 3. *C. diffusa*

1. *Canscora decurrens* Dalz. in Kew Journ. Bot. 2 : 136. 1850 ; Clarke in Hook. f. Fl. Brit. India 4 : 103. 1883 ; Cooke, Fl. Bombay 2 : 192. 1904.

Erect, annual herbs, upto 30 cm high. Stem 4 winged ; branches opposite and alternate. Leaves sessile, 3.5 × 1.0 - 2.5 cm, oblong, attenuated towards the base, acute at apex, membranous ; upper leaves much smaller than the lower, ovate or lanceolate, acute. Flowers solitary or in few flowered, sub trichotomous cymes, pale rose or white. Calyx not winged. Stigma 2 lobed. Capsules cylindrical, 2 valved. Seeds reticulate, rugose.

Fl. & Fr. : September - December.

Rare, in wet and shady habitats in the east of Aravalli.

Selected specimens : Banswara : Jhola, Kanodia 51148 (BSI) ; Jhalawar : Shyamgarh, Verma 10087 (BSA) ; Kharagpura, Verma 6821 (BSA) ; Kota : Rapi stream, Wadhwa 9331 (BSA) ; Udaipur : Kalighati, Jain 48538 (BSI).

2. *Canscora decussata* (Roxb.) Schultes & Schultes f. Mant. Syst. Veg. 3 : 229. 1827 ; Clarke in Hook. f. Fl. Brit. India 4 : 104. 1883 ; Duthie, Fl. Gangetic Plain 2 : 77. 1911. *Pladera decussata* Roxb. Fl. Ind. 1 : 418. 1820.

Erect, annual herbs, upto 60 cm high. Stem and branches 4 - winged. Leaves 1.2 - 4.0 × 0.4 - 1.5 cm, narrowly ovate to oblong - lanceolate, acute, sub - cordate to rounded at base, 3 nerved. Flowers solitary or in lax, few flowered cymes, white. One stamen longer than others. Capsules 6 - 8 × 2 mm, linear oblong, obtuse at apex, tipped by persistent style, shorter than calyx.

Fl. & Fr. : September - December.

Rare, in wet and shady habitats in the forests along Aravalli range.

Selected specimens : Banswara : Wadita Hillage forest, Singh 3690 (BSJO) ; Bari Ghata forest, Kanodia 75403 (BSI) ; Pali : Kanpahar - Bijapur forest, Pandey 19443 (BSJO).

3. *Canscora diffusa* (Vahl) R. Br. Prodr. Fl. Nov. Holl. 451. 1810 ; Clarke in Hook. f. Fl. Brit. India 4 : 103. 1883 ; Duthie, Fl. Gangetic Plain 2 : 76. 1911. *Gentiana diffusa* Vahl, Symb. Bot. 3 : 47. 1794. *Canscora tenella* Wight, Ic. 4(2) : 7. t. 1327. f. 3. 1848.

Much branched, erect, c. 30 cm high, annual herbs. Leaves sessile, 1.5-5.0 × 0.8-2.5 cm, ovate lanceolate, acute, truncate or cuneate at the base. Flowers in diffuse paniculate cymes, pink. Pedicels filiform. Anthers dimorphic, oblong sagittate. Capsules narrowly oblong, as long as the calyx, membranous.

Fl. & Fr. : October - March.

Common in wet and shady places along Aravalli range.

Selected specimens : Banswara : Punapathar forest, Singh 3660 (BSJO) ; Bhilwara : Bijolia, Singh 7159 (BSJO) ; Pali : Goramghat, Pandey 4685 (BSJO) ; Kota : Kunda Khoh, Wadhwa 9244 (BSA) ; Sirohi : Mt. Abu, Jain 46560 (BSI).

4. *Canscora heteroclita* (L.) Gilg in Engl. & Prantl, Nat. Pflanzen. 4(2) : 76. 1895. *Gentiana heteroclita* L. Mant. Pl. Alt. 560. 1771. *Canscora sessiliflora* Schultes & Schultes f. Mant. Syst. Veg. 3 : 230. 1827 ; Clarke in Hook. f. Fl. Brit. India 4 : 104. 1883 ; Sharma & Tiagi, Fl. North East Raj. 243. 1979.

Erect herbs, upto 20 cm high ; branches short and broadened towards the base. Leaves few, in rosette ; lower ones 0.6-1.5 × 0.5-1.2 cm, broadly ovate, obtuse, truncate and 3-nerved at base ; upper ones c. 3 × 1 mm, linear-lanceolate, one-nerved. Flowers in dichasial cymes. Bracts linear-lanceolate. Corolla pinkish-red ; tube c. 8 mm long ; lobes of upper lip slightly spreading. Capsules linear-cylindric, brownish. Seeds irregularly rhomboid.

Fl. & Fr. : October - March.

Rare, in wet and shady habitats. So far collected only from Jaipur district.

Selected specimen : Jaipur : Baragaon, Sharma 2019 (RUBL).

2. CENTAURIUM Hill

Centaurium centaurioides (Roxb.) Rolla Rao & Hemadri in Journ. Bomb. Nat. Hist. Soc. 67 (2) : 357. 1970. *Chironia centaurioides* Roxb. Fl. Ind. 1 : 585. 1832. '*centauroides*', non *Erythraea centaurioides* Hort. Gotting ex Griseb. 1839. *Erythraea roxburghii* D. Don in Lond. & Edin.

Phil. Mag. & Jour. Sci. 8 : 77. 1836 ; Wight, Ic. 4(2) : 7. t. 1325, 1848 ; Clarke in Hook. f. Fl. Brit. India 4 : 102. 1883 ; Duthie, Fl. Gangetic Plain 2 : 74. 1911.

Small, erect, annual herbs, 5-20 cm high. Radical leaves in rosette, 0.5-2.5 × 0.2-0.6 cm, obovate or oblong, obtuse ; cauline ones smaller, linear-oblong. Flowers in dichotomous cymes, with a long pedicelled flowers in each fork, pink. Calyx segments linear-subulate. Corolla lobes elliptic, acute, glabrous. Capsules linear-oblong. Seeds many, faintly reticulate.

Fl. & Fr. : December-March.

Weed in and around cultivated fields, particularly in the east of Aravalli.

Selected specimens : Ajmer : Gravelly raised ground around lake, Sharma 1579 (LWG) ; Bharatpur : Katipura village, Parmar 8650 (BSJO) ; Chittorgarh : Saran 65191 (LWG) ; Jaipur : Baragaon, Sharma 2019 (RUBL) ; Sirohi : Mt. Abu, Kanodia 62228 (BSI).

3. ENICOSTEMA Blume *nom. cons.*

Enicostema axillare (Lam.) Raynal in Adansonia 9 : 75. 1969. *Gentiana verticillata* L. Syst. Nat. ed. 12. 200. 1767, *pro part*, non L. 1760. *G. axillaris* Lam. Ill. Gen. 1(2) : 487. 1793. *Exacum hyssopifolium* Willd. Sp. Pl. 1 : 640. 1798. *Enicostema littorale auct.*, non Blume, 1826 ; Clarke in Hook. f. Fl. Brit. India 4 : 101. 1883 ; Duthie, Fl. Gangetic Plain 2 : 73. 1911. *E. verticillatum* (L.) Engl. Pflanz. Ostafri. C. 313. 1895, non Baill. 1891. *E. hyssopifolium* (Willd.) Verdoorn in Bothalia 7 : 462. 1961 ; Mahesh. Illus. Fl. Delhi f. 129. 1966. 'Navri' (Hindi).

Perennial herbs, with many quadrangular branches from the base. Leaves sessile, 1-7 × 0.6-1.3 cm, linear to linear-lanceolate, obtuse, amplexicaule. Flowers subsessile, many, in axillary, capitate, opposite fascicles, white. Capsules 3-5 mm long, ellipsoid-oblong, glabrous, septically 2-valved. Seeds many, minute, sub-globose, foveolate, brown.

Fl. & Fr. : June-December.

Common in open plains, forests, grasslands and in cultivated fields.

Selected specimens : Banswara : Dagia-Bowji hills, Singh 2864 (BSJO) ; Barmer : Pachpadra salt basin, Shetty 2244 (BSJO) ; Bhilwara : Badnor, Singh 6487 (BSJO) ; Bundi : Manghi river bed, Verma 1868

(BSA) ; Jalore : Malwara, *Vyas* 6392 (BSJO) ; Tonk : Siras forest, *Shetty* 1022 (BSJO).

4 EXACUM L.

Leaves ovate. Calyx not winged.	...	1. <i>E. lawii</i>
Leaves elliptic - lanceolate. Calyx winged.	...	2. <i>E. pedunculatum</i>

1. *Exacum lawii* Clarke in Hook. f. Fl. Brit. India 4 : 98. 1883.

Erect herbs, 10 - 15 cm high, with quadrangular stem. Leaves sessile, c. 6 × 6 mm, ovate. Flowers in few-flowered, lax, terminal or sub-terminal, pedunculate cymes ; pedicels mostly elongate. Calyx lobes 3 - 5 mm long, ovate, strongly nerved, not winged. Corolla lobes 5 - 10 mm long, elliptic or round, purple blue. Capsules 3 - 5 mm long ovoid.

Fl. & Fr. : September - March.

Rare, in wet and shady localities at high altitude. Closely allied to *E. sessile* L., but flowers are larger and inflorescence altogether different.

Selected specimens : Sirohi : Mt. Abu, *Mehta* 398, 1239, 1240 (JAC).

2. *Exacum pedunculatum* L. Sp. Pl. 112. 1753 ; Wight, Ic. 2(1) : 2. t. 336. 1840, '*pedunculare*' ; Clarke in Hook. f. Fl. Brit. India 4 : 97. 1883 ; Duthie, Fl. Gangetic Plain 2 : 72. 1911. *E. pedunculare* Arn. in Ann. Sci. Nat. ser. 2. 11 : 176. 1836.

Erect, annual, glabrous herbs, 15 - 30 cm high. Leaves sessile to sub sessile, 3 - 5 × 0.3 - 1.0 cm, elliptic or lanceolate, obtuse, tapering at the base, 3 nerved. Flowers in terminal, much branched paniced cymes, bluish purple. Calyx tube cup-shaped ; lobes 4, ovate, acute, with a wedge-shaped wing extending from apex to the base on the outer surface. Anthers sagittate at base, not spirally twisted after anthesis. Capsules globose, membranous, surrounded by persistent, winged calyx. Seeds minute, glabrous, pale brown.

Fl. & Fr. : September - March.

Common in wet places in the forests, particularly east of Aravalli.

Selected specimens : Banswara : Jhola, *Kanodia* 42 (BSI) ; Bhilwara : Meja dam, *Singh* 6044 (BSJO) ; Jhalawar : Shyam ghat, *Majumdar & Mishra* 10086 (BSA) ; Looda, *Majumdar* 10265 (BSA).

5. HOPPEA Willd.

Hoppea dichotoma Heyne ex Willd. in Ges. Naturf. Fr. Berlin Neue Schr. 3 : 435. 1801 ; Clarke in Hook. f. Fl. Brit. India 4 : 100. 1883 ; Duthie, Fl. Gangetic Plain 2 : 76. 1911. '*Ramjetta*' (Hindi).

Small, annual, glabrous herbs ; stem and branches quadrangular, more or less winged. Leaves sessile, 0.2-0.6 cm long, ovate, acute, glabrous. Flowers in terminal, dense, dichotomous cymes, pale yellow. Capsules c. 0.25 cm long, ellipsoid, enclosed in persistent calyx. Seeds numerous, oblong or subglobose, pale to dark-green, muricate.

Fl. & Fr. : September - January.

Common in moist places, particularly in the east of Aravalli.

Selected specimens : Ajmer : Clayey river bed, *Sharma* 1247 (LWG) ; Banswara : Khora forest, *Singh* 3725 (BSJO) ; Bhilwara : Bijolia, *Singh* 5704 (BSJO) ; Jalore : Sunda hills, *Vyas* 6857 (BSJO) ; Jhalawar : Kyasara, *Verma* 6807 (BSA).

6. SWERTIA L.

Swertia minor (Griseb.) Knobl. in Bot. Centralbl. 60 : 321. 1894 ; Cooke, Fl. Bombay 2 : 193. 1904. *Ophelia minor* Griseb. in DC. Prodr. 9 : 126. 1845 ; Wight, Ic. 4(2) : 8. t. 1332. 1848. *Pleurogyne minor* (Griseb.) Clarke in Hook. f. Fl. Brit. India 4 : 120. 1883.

Small, erect, annual herbs, upto 15 cm high. Stem 4-winged. Leaves sessile, 1.2 × 0.5-1.2 cm, ovate, acute, 3-nerved, membranous. Flowers 4-merous, in leafy paniculate cymes, bluish-purple. Calyx enlarged in fruit ; segments ovate. Each corolla-lobe with 2 triangular pocket-shaped nectaries at the base. Capsules 4-6 mm long, ovoid. Seeds suborbicular, compressed.

Fl. & Fr. : November - March.

Rare, on hills in wet, springly grounds ; so far reported only from Mt. Abu.

Selected specimen : Sirohi : Mt. Abu, *Jain* 46607 (BSI).

85. MENYANTHACEAE

(P. J. Parmar)

NYMPHOIDES Seguir

- 1a. Leaves floating only, 3.5 - 22 cm broad. Flowers nearly 15 - 24 in a fascicle. Corolla - lobes 5 - 7, more than 1.5 cm across. Seeds smooth or tuberculate :
- 2a. Corolla - lobes densely fimbriate on inner surface. Style heterostylous. Capsules 15 or more - seeded. Seeds smooth. ... 2. *N. indica*
- 2b. Corolla - lobes with a median longitudinal crest on inner surface, not fimbriated. Style homostylous. Capsules 5 to 10 - seeded. Seeds tuberculate. ... 1. *N. hydrophylla*
- 1b. Leaves both floating and radical ; floating leaves 1 - 3 cm broad. Flowers 4 - 8 in a fascicle. Corolla - lobes 4, not more than 1.2 cm across. Seeds muricate. ... 3. *N. parviflora*

1. *Nymphoides hydrophylla* (Lour.) Kuntze, Rev. Gen. Pl. 2 : 429. 1891. *Menyanthes hydrophylla* Lour. Fl. Cochinch. 1 : 129. 1790. *M. cristata* Roxb. Pl. Cor. 2 : 3, t. 105. 1798. *Nymphoides cristata* (Roxb.) Kuntze, Rev. Gen. Pl. 2 : 429. 1891. *Limnanthemum cristatum* (Roxb.) Griseb. Gen. Sp. Gent. 342. 1839 ; Clarke in Hook. f. Fl. Brit. India 4 : 131. 1883 ; Duthie, Fl. Gangetic Plain 2 : 79. 1911. 'Kumudini' (Hindi).

Attached or floating perennial herbs ; rhizome short, erect or oblique, bearing scaly leaves from the axils of which petiole like branches develop and come above the water surface. Floating leaves 4 - 13 × 3 - 11 cm, elliptic orbicular, deeply cordate hastate at base, with rounded lobes, faintly crenate, greenish above, purplish beneath. Flowers white with yellow centre. Sepals obtuse. Capsules 7 - 10 × 3 - 5 mm, broadly ovoid - oblong. Seeds 2 - 3 mm in diam., yellowish white.

Fl. & Fr. : October - March, sometimes almost throughout the year.

Common in the east of Aravalli in ponds, pools, tanks, lakes and other stagnant water sources.

Selected specimens : Alwar : Baran Viar, Parmar 9748 (BSJO) ; Banswara : Lamarao talao, Singh 3632 (BSJO) ; Bhilwara : Banera Singh 6021 (BSJO) ; Jhalawar : Anawar - Aklera, Wadhwa 7534 (BSA) ; Sirohi : Mt. Abu, Mehta 342 (JAC), Blatter 21491 (BLAT).

2. *Nymphoides indica* (L.) Kuntze, Rev. Gen. Pl. 2 : 429. 1891. *Menyanthes indica* L. Sp. Pl. 145. 1753. *Limnanthemum indicum* (L.) Griseb. Gen. Sp. Gent. 343. 1839 ; *emend.* Thw. Enum. Pl. Zeyl. 205. 1860, *includ.* vars. ; Clarke in Hook. f. Fl. Brit. India 4 : 131. 1883 ; Duthie, Fl. Gangetic Plain 2 : 79. 1911. 'Kumudini' (Hindi).

Attached or floating perennial herbs ; rhizome oblique, thick ; scale like leaves numerous, ovate. Petioloid branches long, simple, flexible. Floating leaves 4.5 - 22.0 × 3.5 - 22.0 cm, nearly orbicular, deeply cordate at base, coarsely crenate. Flowers white, throat yellow. Sepals acute. Capsules obovoid or oblong ovoid. Seeds globose, shining, yellow.

Fl. & Fr. : Most part of the year.

Common in the east of Aravalli in stagnant water in tanks, ponds, lakes, rivers etc.

Selected specimens : Banswara : Verma 218 (BSA) ; Bhilwara : Bijolia. Singh 6100 (BSJO) ; Kota : Lachhamipuria tank, Wadhwa 9483 (BSA) ; Sirohi : Mt. Abu, Mehta 337 (JAC) ; Tonk : Bisalpora, Shetty 544 (BSJO).

3. *Nymphoides parviflora* (Griseb.) Kuntze, Rev. Gen. Pl. 2 : 429. 1891. *Limnanthemum parvifolium* Griseb. in DC. Prodr. 9 : 141. 1845 ; Clarke in Hook. f. Fl. Brit. India 4 : 132. 1883, *incl. var. moonii* ; Cooke, Fl. Bombay 2 : 106. 1904.

Perennial, aquatic or terrestrial, rhizomatous herbs. Leaves radical & floating ; radical leaves 0.7 - 1.1 × 0.6 - 1.1 cm, spatulate or deltoid, cuneate at base, obtuse ; floating leaves 1.0 - 4.2 × 1.0 - 3.0 cm, broadly oval to cordate orbicular or obovate, with deep triangular sinus. Flowers in axillary clusters. Calyx lobes oblong lanceolate, faintly 3 nerved. Corolla white ; lobes 4, subacute. Capsules 4 × 2 mm, oblong, 15 or more - seeded. Seeds lenticulate, muriculate, white.

Fl. & Fr. : May - December.

This species is included on the authority of Blatt. & Hallb. (1918 21), who collected it from Badaka, W. Rajasthan.

CULTIVATED SPECIES

Nymphoides peltatum Kuntze (*Limnanthemum nymphoides* Link)
Perennial, aquatic herbs with creeping rhizomes. Stem long, floating, rooting at nodes. Leaves 2.5 - 5.0 cm in diam., deeply cordate. Flowers in

axillary umbels, yellow. Reported to be grown in Jodhpur district (Puri *et al.*, 1964).

86. HYDROPHYLLACEAE

(P. J. Parmar)

HYDROLEA L. *nom. cons.*

Hydrolea zeylanica (L.) Vahl, *Symb. Bot.* 2 : 46. 1791 ; Wight, *lc.* 2(3) : 8. t. 601. 1842 ; Clarke in *Hook. f. Fl. Brit. India* 4 : 133. 1883 ; Duthie, *Fl. Gangetic Plain* 2 : 80. 1911. *Nama zeylanica* L. *Sp. Pl.* 226. 1753.

Erect or procumbent, annual, glandular hairy herbs at least younger parts, rooting at the lower nodes. Leaves 2 - 5 × 0.5 - 1.5 cm, oblong to narrowly lanceolate. Flowers solitary or in condensed, glandular hairy racemes, lilac blue. Bracts and sepals lanceolate, acute, glandular. Capsules 4 - 6 mm long, ovoid-oblong or ellipsoid, enclosed in persistent calyx. Seeds many, minute, oblong, glabrous.

Fl. & Fr. : September - February.

Common in moist low lying areas, rice fields, ponds etc., particularly in south & south-eastern parts of the state.

Selected specimens : Banswara : Kushalgarh, *Singh* 3751 (BSJO) ; Bhilwara : Bijolia, *Singh* 6052 (BSJO) ; Jhalawar : *Singh* 83721 (LWG).

87. BORAGINACEAE

(P. J. Parmar)

1a. Style arising from between the carpels :

2a. Anthers connivent into a cone ; connectives
much produced, twisted together at the apex. ... 8. *Trichodesma*

2b. Anthers not connivent into a cone ; connectives
obtuse or apiculate, not twisted together :

3a. Faucal appendages (scales) present :

4a. Corolla 2 - 5 mm long, limb divided
nearly to the base, pale - purple to
blue :

- 5a. Corolla infundibuliform. Nutlets glochidiate - appendiculate all round. ... 3. *Cynoglossum*
- 5b. Corolla sub - tubular. Nutlets minutely tuberculate. ... 4. *Gastrocotyle*
- 4b. Corolla 1 - 2 cm long, limb half the length of corolla - tube, dark brown to dark purple. ... 6. *Nonneu*
- 3b. Faucal appendages (scales) absent, sometimes hairs are present within the throat :
- 6a. Roots with red stain. Flowers yellow. Corolla - tube c. 6 mm long ; throat naked inside. Style bifid ; stigmas 2. ... 1. *Arnebia*
- 6b. Roots without stain. Flowers white. Corolla - tube c. 2 mm long, throat densely filled with hairs. Style simple ; stigma 1. ... 7. *Sericostoma*
- 1b. Style terminal on the ovary, not inserted between the carpels :
- 7a. Flowers solitary, axillary. Corolla - lobes 4. Style 2. ... 2. *Coldenia*
- 7b. Flowers in terminal, scorpioid cymes. Corolla - lobes 5. Styles one, simple or bifid. ... 5. *Heliotropium*

I. ARNEBIA Forsk.

Arnebia hispidissima (Lehm.) DC. Prodr. 10 : 94. 1846 ; Wight, Ic. 4(2) : 17. t. 1393. 1848 ; Clarke in Hook. f. Fl. Brit. India 4 : 176. 1883 ; Duthie, Fl. Gangetic Plain 2 : 27. 1911. *Lithospermum hispidissimum* Lehm. Ic. Nov. Strip. t. 39. 1821. 'Rambui, Ratanjot' (Hindi).

Annual or perennial, erect or decumbent herbs ; branches diffuse from woody base, clothed with long, whitish, spreading, bulbous based hairs. Leaves sessile, alternate, 1.5 - 5.0 × 0.25 - 0.8 cm, linear - lanceolate. Flowers subsessile, in simple, dense, secund spikes or racemes, yellow. Bracts leaf - like. Calyx - lobes lanceolate. Corolla without purple spots at the base of the lobes. Nutlets 4; 1.5 - 2.0 mm long, ovoid or pyramidal - ovoid, broadest at the base, smooth to tuberculate, pink to brown.

Fl. & Fr. : March - August.

Common along roads, in cultivated and fallow fields, preferably in dry sandy soils.

Selected specimens : Ajmer : Somalpur plantation, *Raizada* Acc. No. 130419 (DD); Bharatpur : Pahartal forest, *Parmar* 8524 (BSJO); Jaisalmer : Near Miajlar, *Shetty* 6144 (BSJO); Jodhpur : Chaba, *Singh* 3141 (BSJO); Tonk : Benthali village, *Shetty* 465 (BSJO).

2. COLDENIA L.

Coldenia procumbens L. Sp. Pl. 125. 1753; Clarke in Hook. f. Fl. Brit. India 4: 144. 1883; Duthie, Fl. Gangetic Plain 2 : 88. 1911; Mahesh. Ill. Fl. Delhi f. 131. 1966.

Deep-rooted, procumbent herbs, usually lying quite flat on the ground; younger parts clothed with white silky hairs. Leaves 1.2 - 4.0 × 0.6 - 2.0 cm, obovate-oblong, crisped, rounded at the apex, margins coarsely serrate to subpinnatifid, densely hairy. Flowers nearly sessile, solitary, axillary, yellow. Calyx divided nearly to the base; lobes ovate, acute, ciliate. Drupes 3 mm long, 4-lobed, pyramidal; pyrenes 1-seeded.

Fl. & Fr. : September - May.

Common weed in moist grounds, on the edges of tanks and in cultivated fields.

Selected specimens : Banswara : Talwara village, *Singh* 4601 (BSJO); Bhilwara : Noharsagar, *Singh* 5743 (BSJO); Jodhpur : Kailana, *Singh* 3101 (BSJO); Pali : Khairlao tank, *Shetty* 1339 (BSJO); Tonk : Near Tordi Sagar dam, *Shetty* 579 (BSJO).

3. CYNOGLOSSUM L.

1a. Style filiform, long, cylindric. Nutlets dorsally concave, variously appendiculate, marginal appendages usually confluent at their base and forming a narrow wing.

... 2. *C. walliichi* var. *glochidiatum*

1b. Style fleshy, thick, short, sub-quadrangular. Nutlets dorsally convex, uniformly appendiculate, usually not confluent at their base :

2a. Leaves covered dorsally with trichomes of unequal length, obviously arising from tuberculate bases. Corolla-scales patent, sub-orbicular, much broader than long. Nutlets not or obscurely margined.

... 1. *C. lanceolatum*

- 2b. Leaves covered dorsally with trichomes of equal length, not arising from tuberculate bases. Corolla - scales erect, sub - quadrate, slightly longer than broad. Nutlets strongly margined.

... 3. *C. zeylanicum*

1. *Cynoglossum lanceolatum* Forsk. Fl. Aegypt. - Arab. 41. 1775 ; Clarke in Hook. f. Fl. Brit. India 4 : 156. 1883 ; Duthie, Fl. Gangetic Plain 2 : 96. 1911.

Erect - ascending, annual herbs ; branches densely covered with stout, white, tubercle - based trichomes. Leaves c. 5.75 cm long ; lower petiolate, ovate ; upper ones nearly sessile, elliptic - oblong to lanceolate, acute at both ends. Flowers in lax, paniced cincinni, light blue. Corolla c. 3 mm long. Nutlets 4, 1 - 2 mm long, ovate, glochidiate at the apex.

Fl. & Fr. : August - December.

Rare, in scrub forests, preferably in pastures. Included on the authority of Ramdeo (1969) from Udaipur and Sankhala (1951) from N.W. Rajasthan.

2. *Cynoglossum wallichii* G. Don var. *glochidiatum* (Wall. ex Benth.) Kazmi in Journ. Arnold Arbor. 52 : 347. 1971. *C. glochidiatum* Wall. ex Benth. in Royle, Illus. Bot. Himal. 1 : 306. 1839.

Erect, biennial herbs ; stem and branches densely covered with white, spreading trichomes in the lower parts. Lower leaves petiolate, 0.6 - 1.0 × 0.3 cm, lanceolate to ovate, obtuse to acute, gradually narrowed at base ; upper leaves acute, longer and broader than lower ones, with shorter petioles. Flowers usually in pairs, axillary or terminal. Nutlets ovate, obtuse to acute at apex, covered with few vertical appendages along the more or less prominent longitudinal keels.

Fl. & Fr. : August - December.

Rare, in moist localities among grasses.

Selected specimens : Sirohi : Near Kakhi lake - Mt. Abu, Tataka 46462 (BSI), Mehta 418 (JAC).

3. *Cynoglossum zeylanicum* (Vahl ex Hornem.) Thunb. ex Lehm. in Neue Schriften Naturf. Ges. Pl. Hort. Halle 3(2) : 20. 1817. *Anchusa zeylanica* Vahl ex Hornem. Enum. Hafn. 3. 1807. *Cynoglossum furcatum* Wall. ex Roxb. Fl. Ind. 2 : 6. 1824 ; Wight, Ic. 4(2) : 17. t. 1395. 1848 ; Clarke in Hook. f. Fl. Brit. India 4 : 155. 1883. *C. denticulatum* A. DC. var. *zeylanicum* (Vahl ex Hornem.) Clarke in Hook. f. l.c. 4 : 157. 1883 ; Duthie, Fl. Gangetic Plain 2 : 96. 1911.

Erect, annual herbs, clothed with spreading or appressed hairs. Leaves radical and cauline; radical ones c. 20×9 cm, broadly ovate-oblong; cauline ones $2.5 - 8.0 \times 1 - 4$ cm, ovate-lanceolate, ovate-oblong or elliptic-oblong. Flowers in long, axillary or terminal forked cymes, pale-blue. Nutlets 3-4 mm long, uniformly appendiculate all around, emarginate, appendages glochidiate at apex, free at base.

Fl. & Fr. : August - December.

Rare, in moist localities in the forests & roadsides, chiefly among grasses.

Selected specimens : Nagaur : Merta Road Stn. & Rupasar, *H. Lal* 34887, 34960 (LWG); Jaisalmer : Shergarh Phalsund Rd, *Wadhwa* 4733 (BSA); Sirohi : Kodra water works, *Kanodia* 66558 (BSA); Mt. Abu, *Puri* 56750, *Kanodia* 62200, *Jain* 45182, 5318 (BSI).

4. GASTROCOTYLE Bunge

Gastrocotyle hispida (Forsk.) Bunge, Del. Sem. Hort. Dorpat 1849 : 2. 1849 et in Mem. Sav. Etrang. Petersb. 7 : 405. 1851; Clarke in Hook. f. Fl. Brit. India 4 : 168. 1883; Dhillon & Bajwa in Bull. Bot. Surv. India 11 : 239. 1972. *Anchusa hispida* Forsk. Fl. Aegypt. - Arab. 40. 1775.

Annual, suberect to prostrate herbs; stems many from the base, fleshy, covered densely with spreading trichomes. Basal leaves variable, petiolate, oblong; upper leaves shortly petiolate to sessile, with undulate margins. Flowers in small axillary racemes or axillary-solitary, pale-purple to bright blue. Nutlets ovate, dorsally strongly convex, minutely tuberculate, brown.

Fl. & Fr. : February - April.

Rare, weed in cultivated fields and other moist waste places.

Selected specimen : Ganganagar : College farm, *Bajwa* 176 (Khalsa college, Ganganagar).

5. HELIOTROPIMUM L.

1a. Flowers pale to bright rose or purple. Fruits
mitriform, 4-beaked.

...

6. *H. indicum*

1b. Flowers usually white, seldom yellow. Fruits of
2-4 nutlets, not beaked;

- 2a. Calyx divided upto 1/4 of its length ; lobes short. Fruits enclosed by the calyx. ... 14. *H. supinum*
- 2b. Calyx divided nearly to the base ; lobes free, long. Fruits not enclosed by the calyx :
- 3a. Plants glabrous. ... 4. *H. curassavicum*
- 3b. Plants hairy :
- 4a. Inflorescence bracteate, sometimes bracts much reduced :
- 5a. Corolla 1.5 - 2.5 mm long, sparsely hairy within just above the corolla base. Stigma subcapitate ; stigmatic ring fleshy, thick. ... 10. *H. rariflorum*
- 5b. Corolla 2.5 - 4.0 mm long, slightly or densely hairy within only at the throat. Stigma elongate, conic ; stigmatic ring not fleshy, thin :
- 6a. Plants decumbent or prostrate. Leaves lanceolate or elliptic. Flowers sessile, closely set on the inflorescence :
- 7a. Leaves 1.8 - 2.0 cm long, thinly covered with sharp, tubercle - based trichomes. Bracts 3 - 4 mm long. Fruits hairy at the top or glabrous. ... 7. *H. marifolium* var. *marifolium*
- 7b. Leaves 0.4 - 1.0 cm long, densely covered with trichomes not arising from tubercles. Bracts 1 - 2 mm long. Fruits densely covered with short stout trichomes throughout. ... 8. *H. marifolium* var. *walllichii*
- 6b. Plants usually erect. Leaves linear to linear - lanceolate. Flowers sub - sessile to pedicellate, distantly set on inflorescence :
- 8a. Leaves linear. Inflorescence bracteate throughout. Style short, c. 0.1 mm long ; stigmatic ring conspicuous. ... 15. *H. zeylanicum*

- 8b. Leaves linear - lanceolate. Lower flowers of inflorescence bracteate, in the upper region bracts much reduced or absent. Style distinct, c. 0.4 mm long. Stigma with a distinct stigmatic ring :
- 9a. Leaves 1.5 - 2.5 cm long. Fruits 4 - lobed, depressed at the top towards the style. ... 11. *H. strigosum* var. *strigosum*
- 9b. Leaves upto 1.5 cm long. Fruits not or slightly lobed, not depressed at the top but plain or slightly produced towards the style. ... 12. *H. strigosum* var. *brevifolium*
- 4b. Inflorescence ebracteate :
- 10a. Leaves elliptic - oblong or obovate :
- 11a. Plants green. Calyx - segments equal. Corolla glabrous within. ... 5. *H. europaeum* var. *lasiocarpum*
- 11b. Plants grey. Calyx - segments very unequal. Corolla with a few club - shaped hairs in the throat. ... 9. *H. ovalifolium*
- 10b. Leaves lanceolata, linear - lanceolata or elliptic - lanceolata :
- 12a. Corolla - lobes broad, oblong, ovate or roundish, subvalvate or imbricate :
- 13a. Nutlets margined :
- 14a. Fruits divided into 2, 2 - seeded nutlets, verrucose on back. ... 1. *H. bacciferum* var. *bacciferum*
- 14b. Fruits with 4 nutlets, having simple or bilobed, corky cells on their back. ... 2. *H. bacciferum* var. *suberosum*

- 13b. Nutlets not margined. ... 3. *H. crispum*
- 12b. Corolla - lobes narrow,
caudate - acuminate, inflexed
in corolla - tube when
young, later patent. ... 13. *H. subulatum*

1. *Heliotropium bacciferum* Forsk. Fl. Aegypt. - Arab. 38. 1775 ; Bhandari, Fl. Ind. Desert 233. 1978 ; Shah, Fl. Gujarat 1 : 451. 1978. '*Kali - but*' (Hindi).

var. *bacciferum*

Perennial herbs or shrubs, usually with woody base. Leaves variable, 0.8 - 3.5 × 0.4 - 0.8 cm, sessile or subsessile or tapering at both ends. Flowers sessile, ebracteate, in cymes, upto 2.5 cm long, white. Fruits globose, 2 mm long and broad ; nutlets 4, in 2 pairs, somewhat winged, smooth, rugose or warty, glabrous or sometimes with few hairs.

Fl. & Fr. : August - May.

Frequently met in moist open wastelands in western desertic parts of the state.

Selected specimens : Barmer : *Bhandari* 1574 (JAC). ; Bikaner : Shivbari, *Roy* 1701 (BSJO) ; Ganganagar : Raisinghnagar, *Roy* 4920 (BSJO) ; Jaisalmer : Devikot, *Shetty* 3356 (BSJO) ; Jalore : Ranodar, *Vyas* 5300 (BSJO) ; Jodhpur : Mokeri, *Singh* 3215 (BSJO).

2. var. *suberosum* (Clarke) Bhandari, Fl. Ind. Desert 234. 1978. *Heliotropium undulatum* Vahl, var. *suberosa* Clarke in Hook. f. Fl. Brit. India 4 : 151. 1883 ; Blatter & Hallberg in Journ. Bombay Nat. Hist. Soc. 26 : 542. 1919.

Distinguishable from type variety by its depressed globose fruits which are c. 3 mm in diam. and 2, 2 - seeded nutlets having corky cells on their back.

Fl. & Fr. : August - May.

Rare, in moist open wastelands.

Selected specimen : Jaisalmer : *Bhandari* 1042 (JAC). Also reported from Jodhpur & Sikar by Blatter & Hallberg (1919) and Ratnam (1951) respectively.

3. *Heliotropium crispum* Desf. Fl. Atlant. 1 : 151. t. 41. 1798. *Lithospermum hispidum* Forsk. Fl. Aegypt. - Arab. 39. 1775, non *Heliotropium hispidum* Kunth, 1819. *Heliotropium undulatum* auct. non Vahl,

1790 ; Clarke in Hook. f. Fl. Brit. India 4 : 150. 1883. *H. undulatum* Vahl, var. *ramosissimum* Lehm. Asperif. 24. t. 40. 1831. *H. ramosissimum* (Lehm.) DC. Prodr. 9 : 536. 1845.

Perennial, erect herbs or shrubs ; stem and branches greyish green, covered with short stiff trichomes. Leaves 3 - 4 × 0.5 - 0.7 cm, lanceolate to linear - lanceolate, margins crenulate, undulate or sub - entire. Flowers in terminal or axillary scorpioid cymes. Corolla exceeding the calyx, tubular, hairy out side, glabrous within. Fruits covered with hairs, surface rugulose ; nutlets 4, not margined, when young in pairs, later free.

Fl. & Fr. : August - March.

Rare, in dry sandy desertic soils.

Selected specimens : Jaisalmer : Devikot, *Wadhwa* 5289 (BSA) ; Kuchhdi ki - Dhani, *Stower* B - 229, B - 809 (BSI) ; Pokaran - Lavan, *Jain* 49444 (BSI) ; Jodhpur : Beriganga, *Jain* 40236 (BSI). Also reported from Sikar (Ratnam, 1951 ; Nair & Nathawat, 1957 ; Nair & Malhotra, 1961).

4. *Heliotropium curassavicum* L. Sp. Pl. 130. 1753 ; Mahesh. & Sharma in Bull. Bot. Surv. India 11 : 455. 1972 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 158. 1976 ; Pandey *et al.* in Bull. Bot. Surv. India 24 : 134. 1982.

Decumbent, glabrous, halophytic herbs ; stem and branches hollow. Leaves fleshy, 2 - 4 × 0.8 - 1.2 cm, linear - lanceolate, oblong - lanceolate or narrowly spatulate, subobtuse, glabrous. Flowers usually in terminal, simple or geminate, upto 6 cm long, scorpioid cymes, white. Calyx divided nearly to the base. Fruits c. 2 mm long, slightly broader in diam., globose, lobed, not enclosed by the calyx ; nutlets 4, glabrous, brown or pale - brown, rugulose.

Fl. & Fr. : September - February.

Common in moist sandy - saline soils, particularly on dry river - beds.

Selected specimens : Barmer : Gandhav, *Tiwari* 1199 (BSJO) ; Bharatpur : Rasia village, *Parmar* 8537 (BSJO) ; Jaipur : Sambher lake, *Williamson* Acc. No. 12026 (RUBL) ; Jalore : Ranodar, *Vyas* 5286 (BSJO) ; Jodhpur : Bilara, *Singh* 3567 (BSJO) ; Tonk : Mavasi river, *Pandey* 4796 (BSJO).

5. *Heliotropium europaeum* L. var. *lasiocarpum* (Fish. & Mey.) Kazmi in Journ. Arnold Arbor. 51 : 176. 1970. *H. lasiocarpum* Fish. & Mey. Index Sem. Hort. Petrop. 4 : 38. 1837. *H. etchwaljit* Steud. var.

lasiocarpum (Fish. & Mey.) Clarke in Hook. f. Fl. Brit. India 4 : 150. 1883 *H. eichwaldii* auct. non Steud. ex DC. 1845 ; Duthie, Fl. Gangetic Plain 2 : 92. 1911. *H. ellipticum* auct. plur. non Ledeb. 1831, non R. Br. 1810.

Green to greyish green, erect, annual herbs ; branches densely covered with white subpatent tubercle based hairs. Leaves petiolate, 1.6 × 1.0-3.5 cm, elliptic ovate to obovate, truncate or slightly attenuate towards the base and acute or rounded at the apex. Flowers in terminal or axillary, 2-5 cm long spikes. Calyx lobes 0.5-0.8 mm broad, acutish. Corolla-tube narrowed at the throat. Stigmatic appendages more or less bifid. Nutlets usually densely pilose, minutely verrucose.

Fl. & Fr. : August - March.

Weed in moist places, fellow fields and road-sides.

Selected specimens : Alwar : Talvaraksh, *Parmar* 9762 (BSJO) ; Ganganagar : Raisingh nagar, *Roy* 3872 (BSJO) ; Jaipur : Tonk road, *Sharma* 332 (RUBL) ; Jodhpur : Near Chopasni, *Pandey* 8074 (BSJO) ; Tonk : Haji - ki kothi, *Shetty* 505 (BSJO).

6. *Heliotropium indicum* L. Sp. Pl. 130. 1753 ; Clarke in Hook. f. Fl. Brit. India 4 : 152. 1883 ; Duthie, Fl. Gangetic Plain 2 : 90. 1911. *Tiaridium indicum* Lehm. Pl. As. Nucif. 14. 1818 ; Wight, Illus. t. 171. 1850.

Perennial, hairy herbs. Leaves 2.7-9.0 × 2-6 cm, broadly ovate, serrulate, impressed between nerves above. Flowers in extra-axillary, upto 22 cm long, ebracteate spikes, pale-violet. Fruits ovoid or conical, deeply 2-lobed, separating into pyrenes ; each pyrene with a bidentate beak, compressed, 4-ribbed, 2-seeded.

Fl. & Fr. : Almost throughout the year.

Native of America ; imperfectly naturalized along the roads, particularly in the east of Aravalli.

Selected specimens : Dungarpur : *Jain* 47063 (BSI) ; Kota : Chhabra, *Singh* 90408 (LWG). Also reported from Jhunjhunu (Nair, 1956), Jodhpur (Sarup, 1954), Sikar (Nair & Nathawat, 1957) and Udaipur (Ramdeo, 1969).

7. *Heliotropium marifolium* Retz. Obs. Bot. 2 : 8. 1781 ; Clarke in Hook. f. Fl. Brit. India 4 : 152. 1883. *H. scabrum* Retz. l. c. 2 : 8. 1781 ; Wight, Ic. 4(2) : 17. t. 1389. 1848 ; Clarke in Hook. f. l. c. 4 : 152. 1883 ; Duthie, Fl. Gangetic Plain 2 : 93. 1911.

var. marifolium

Perennial, much - branched, decumbent or prostrate herbs ; branches usually spreading from the base. Leaves 1.8 - 2.0 × 0.2 - 0.5 cm, broadly lanceolate to elliptic, acute, scabrous with tubercle - based, sharp trichomes. Flowers in short, axillary and terminal, bracteate, 2.5 - 5.0 cm long, compact spikes, white. Corolla throat densely hairy. Stigma elongate - conic. Fruits depressed, rounded or 4 - lobed, pubescent on the top or glabrous ; nutlets 4, with a much rounded back.

Fl. & Fr. : September - March.

Common in sandy soils.

Selected specimens : Ajmer : *Lourie* 4760 a (DD) ; Banswara : Nathela tank, *Kanodia* 75345 (BSA) ; Jaisalmer : Kalyan Ghat, *Wadhwa* 5213 A (BSA) ; Jaipur : Amer, *Sharma* 125 (RUBL) ; Pali : Rajpura dam, *Pandey* 4195 (BSJO).

8. var. *wallichii* Clarke in Hook. f. *Fl. Brit. India* 4 : 152. 1883. *Heliotropium scabrum* var. *wallichii* (Clarke) Gamble, *Fl. Madras* 897. 1923. *H. marifolium* Retz. subsp. *wallichii* (Clarke) Kazmi in *J. Arnold Arbor.* 51 : 155. 1970.

Small, decumbent or prostrate, much branched herbs. Leaves subsessile, 0.4 - 1.0 × 0.15 - 0.25 cm, lanceolate, subacute, densely covered with white trichomes usually not arising from tubercles. Spikes upto 4 cm long. Bracts lanceolate, 1 - 2 × 1 mm. Corolla - throat less hairy. Fruits densely covered with short trichomes.

Fl. & Fr. : September - March.

Rare, in sandy and rocky terrain.

Selected specimens : Banswara : Nathela tank, *Kanodia* 75345 (BSI) ; Bharatpur : Near Weir, *Parmar* 8726 (BSJO) ; Bhilwara : Badnor, *Singh* 7071 (BSJO).

9. *Heliotropium ovalifolium* Forsk. *Fl. Aegypt. - Arab.* 38. 1775 ; Clarke in Hook. f. *Fl. Brit. India* 4 : 150. 1883 ; Duthie, *Fl. Gangetic Plain* 2 : 92. 1911. *H. coromandelianum* Raddi ex DC. *Prodr.* 9 : 533. 1845 ; non Retz. 1781 ; Wight, *Ic.* 4(2) : 17. t. 1388. 1848.

Erect or decumbent herbs ; stem and branches densely clothed with long silky appressed hairs. Leaves 0.6 - 4.0 × 0.4 - 1.5 cm, elliptic or obovate - oblanceolate, mucronate, upper leaves usually shorter. Flowers in terminal, 3 - 12 cm long, forked, unilateral spikes, white. Bracts absent or in upper part only. Nutlets 1.5 mm long, ovate, sub-acute, hairy, when

falling leaving the calyx attached to the rachis. Fruits rounded, slightly pointed, with appressed short hairs, breaking up into 4 - equal nutlets.

Fl. & Fr. : August - June.

Gregarious in drying ponds, ditches, fellow fields etc.

Selected specimens : Ajmer : Beer, *Sharma* 449 (DD) ; Banswara : Talwara village, *Singh* 4604 (BSJO) ; Barmer : Sindari (Luni river bed), *Tiwari* 1209 (BSJO) ; Jodhpur : Pichiyak (Luni river bed), *Singh* 3530 (BSJO) ; Kota : *Wadhwa* 9480 (BSA) ; Pali : Bandi river bed, *Shetty* 1347 (BSJO).

10. *Heliotropium rariflorum* Stocks in Hook. Kew Journ. Bot. 4 : 174. 1852 ; Clarke in Hook. f. Fl. Brit. India 4 : 152. 1883 ; Cooke, Fl. Bombay 2 : 209. 1904 ; Bhandari, Fl. Ind. Desert 236. 1978. 'Kharsani, Kharchan' (Hindi).

Erect, stiff undershrubs ; branches hoary with appressed hairs. Leaves 2.0 - 3.5 × 0.3 - 0.5 cm, linear lanceolate, subacute, more or less revolute margined. Flowers distant, in terminal or extra axillary, slender, bracteate, 2.5 - 7.5 cm long spikes, white. Calyx divided to the base. Stamens inserted above the middle of corolla - tube. Stigma subcapitate. Fruits 4 - lobed, c. 2.5 mm across ; nutlets 4, covered with short, appressed hairs.

Fl. & Fr. : September - April.

Frequent, in the wastelands in arid parts of the state.

Selected specimens : Barmer : Near Bandra village, *Pandey* 7914 (BSJO) ; Bikaner : Gajner sanctuary, *Roy* 2087 (BSJO) ; Jaisalmer : Along Miajlar road, *Shetty* 3394 (BSJO) ; Jodhpur : Shergarh - Phalodi crossing, *Singh* 3202 (BSJO).

11. *Heliotropium strigosum* Willd. Sp. Pl. 1 : 743. 1798 ; Clarke in Hook. f. Fl. Brit. India 4 : 151. 1883 ; Duthie, Fl. Gangetic Plain 2 : 93. 1911. 'Arkali' (Hindi).

subsp. *strigosum*

Erect or decumbent, scabridly appressed hairy, much branched herbs. Leaves sessile, 1.5 - 2.5 cm long, not exceeding 5 mm in width, linear lanceolate, acute. Flowers in 2.5 - 7.5 cm long, lax spikes, white, lower ones pedicelled and bracteate, upper sessile. Calyx falling with the fruit. Fruits 1.5 mm long, ovoid, 4 - lobed, depressed at the top, dark brown to blackish ; nutlets 4 ; conical, rounded on the back, glabrous or sparsely grey hairy.

Fl. & Fr. : August - December.

Common in open wastelands, fellow fields and open forests.

Selected specimens : Alwar : Naldeshwar forest block, *Parmar* 9529 (BSJO) ; Banswara : Shergarh village, *Singh* 3062 (BSJO) ; Barmer : Sheo, *Tiwari* 902 (BSJO) ; Ganganagar : Kalibunga, *Roy* 6412 (BSJO) ; Jaipur : Gujar ki Ghati, *Sharma* 552 (BSJO) ; Kota : *Verma* 410 (BSA).

12. subsp. *brevifolium* (Wall.) Kazmi in Journ. Arnold Arbor. 51 : 153. 1970. *Heliotropium brevifolium* Wall. in Roxb. Fl. Ind. 2 : 2. 1824 ; Duthie, Fl. Gangetic Plain 2 : 93. 1911. *H. strigosum* Willd. var. *brevifolium* (Wall.) Clarke in Hook. f. Fl. Brit. India 4 : 151. 1883.

Decumbent, intricately branched herbs ; stem, branches and leaves covered with loosely set trichomes giving the whole plant a greenish white appearance. Leaves upto 1.5 cm long. Fruits not or slightly lobed, not depressed at the top, plain or slightly produced towards the style.

Fl. & Fr. : September - March.

Rare, in open, moist waste places.

Selected specimens : Ajmer : Puch kund, *Sharma* 269 (DD) ; Jaipur : Univ. Res. Forest, *Sharma* 2731 (RUBL) ; Moti Dongri, *Tandon* 47049 (BSI) ; Jaisalmer : Bundha, *Rao* 67153 (BSI).

13. *Heliotropium subulatum* (Hochst. ex DC.) Vatke, Oesterr. Bot. Zeitschr. 25 : 166. 1875 ; Duthie, Fl. Gangetic Plain 2 : 91. 1911. *Tournefortia subulata* Hochst. ex DC. Prodr. 9 : 528. 1845. *Heliotropium zeylanicum* auct. plur. non Lam. 1789 ; Wight, Ic. 3(2) : 8. t. 892. 1843 - 45 ; Clarke in Hook. f. Fl. Brit. India 4 : 148. 1883.

Annual or perennial, scabridly hairy herbs. Leaves 1.0 - 6.0 × 0.3 - 1.5 cm, lanceolate, densely covered on both surfaces with sub-appressed trichomes. Flowers sessile, uniseriate, in 5 - 15 (- 20) cm long, terminal or axillary, scabrid, simple or branched spikes, white or dirty yellow. Corolla - lobes inflexed when young, later patent, caudate acuminate. Fruits 2 mm in diam. ; nutlets 4, brown, minutely tuberculate, separating first in pairs, later free.

Fl. & Fr. : Almost throughout the year.

Common weed in arid and semiarid regions ; rarely found in the dry deciduous forests.

Selected specimens : Ajmer : Puch kund, *Jain* 49660 (BSI) ; Barmer : Sheo fields, *Tiwari* 886 (BSJO) ; Bikaner : Vallabh - garden, *Roy* 1746

(BSJO); Jaipur: Golimar, *Sharma* 1087 (RUBL); Jodhpur: Kharda Randhir village, *Shetty* 203 (BSJO); Pali: Samji - ka - Guda, *Shetty* 1577 (BSJO).

14. *Heliotropium supinum* L. Sp. Pl. 130, 1753; Wight, Ic. 4(2): 17. t. 1387, 1848; Clarke in Hook. f. Fl. Brit. India 4: 149, 1883; Duthie, Fl. Gangetic Plain 2: 91, 1911. *H. malabarica* Retz. Obs. Bot. 4: 24, 1786. *H. supinum* L. var. *malabarica* (Retz.) Clarke in Hook. f. l.c. 4: 149, 1883.

Prostrate, annual herbs; branches pale - greyish, densely softly villous. Leaves petiolate, 1.2 - 3.0 × 0.5 - 1.5 cm, ovate, ovate - elliptic or obovate, plicate, appressed - hairy. Flowers sub - sessile, in uniseriate, 2 - 5 (- 8) cm long, simple or forked spikes, white. Calyx divided upto 1/4 of its length; lobes short, subvalvate. Fruits of usually one developed nutlet, sometimes with 1 - 2 or rarely 3 abortive ones; nutlets rounded and obscurely tuberculate on the back, dark - brown, enclosed within the calyx.

Fl. & Fr.: August - March.

Common on drying banks of ponds and tanks, low lying cultivated fields etc.

Selected specimens: Ajmer: Kishangarh - Menjella tank, *Sharma* 861 (DD); Banswara: Dhanpur village, *Singh* 4267 (BSJO); Churu: Near Jaswantgarh, *Roy* 2467 (BSJO); Jaisalmer: Barabagh, *Shetty* 3500 (BSJO); Kota: Daosa road, *Wadhwa* 8177 (BSA); Pali: Kharda dam, *Moorthy* 358 (BSJO).

15. *Heliotropium zeylanicum* (Burm. f.) Lam. Encycl. Meth. Bot. 3: 94, 1789; Duthie, Fl. Gangetic Plain 2: 93, 1911. *H. curassavicum* L. var. *zeylanicum* Burm. f. Fl. Ind. 41. t. 16. f. 2, 1768. *H. paniculatum* R. Br. Prodr. 494, 1810; Clarke in Hook. f. Fl. Brit. India 4: 151, 1883; Bhandari, Fl. Ind. Desert 236, 1978. *H. zeylanicum* (Burm. f.) Lam. subsp. *paniculatum* (R. Br.) Kazmi in Journ. Arnold Arbor 51: 156, 1970.

Annual or perennial, erect herbs; stem and branches pale brown on maturity, loosely covered with short appressed trichomes. Leaves subsessile, c. 7 × 3 cm, linear - lanceolate, acute, entire, usually revolute - margined. Flowers in terminal or axillary, 5 - 10 cm long, bracteate, simple or forked, lax spikes. Corolla white with yellow throat. Fruits c. 3 mm in diam., compressed, lobed, covered with loose trichomes.

Fl. & Fr.: August - March.

Common in waste places.

Selected specimens : Ajmer : *Lourie* 4763 (BSJO) ; Parmer : *Sinadari, Rao* 66944 (BSI) ; Ganganagar : *Suratgarh, Puri* 44416 (BSI) ; Jodhpur : *Beriganga, Shetty* 126 (BSJO) ; Kota : *Shahabad, Verma* 810 (BSA) ; Pali : *Near Beawar, Shetty* 1781 (BSJO).

6. NONEA Medik.

Nonea pulla (L.) DC. subsp. *rudbarensis* Rech. f. in *Ann. Naturh. Mus. Wien.* 55 : 17. 1947 ; *Kazmi* in *Journ. Arnold Arbor.* 52 : 676. 1971 ; *Clarke* in *Hook. f. Fl. Brit. India* 4 : 169. 1883, under *N. pulla* ; *Sharma & Tiagi, Fl. North East Rajasthan* 255. 1979, under *N. pulla*.

Perennial, rhizomatous herbs ; densely covered with spreading, stiff trichomes. Lower leaves shortly petiolate, 1.7 × 0.8 - 1.5 cm, lanceolate ; cauline leaves sessile, dilated to sub-amplexicaule at base, gradually tapering towards the apex, densely clothed with rigid trichomes. Flowers in few-flowered, dense racemes, blackish-purple. Fruits sub-globose. Nutlets 3 - 4 mm long transversely ovate, puberulous, dark brown ; areole of nutlet prominently hollowed out by a thickened girdle.

Fl. & Fr. : January - March.

Frequent, weed in cultivated fields, particularly in the east and north-eastern parts of the state.

Selected specimens : Ajmer : *Tiagi* Acc. No. 104326 (DD) ; Jaipur : *Raniji ka Bundha, Sharma* 2250 (RUBL, with white to cream-yellow flowers) ; *Durgapura, Singh* Acc. No. 8212 (RUBL) ; *Raj College, Singh* Acc. No. 10218 (RUBL).

Note : According to *Kazmi (l. c.)* subsp. *pulla* is confined to Europe and species found in western India is actually subsp. *rudbarensis* Rech. f. We have followed *Kazmi (1971)*.

7. SERICOSTOMA Stocks ex Wight

Sericostoma pauciflorum Stocks ex Wight, *lc.* 4 (2) : 15. t. 1377. 1848 ; *Clarke* in *Hook. f. Fl. Brit. India* 4 : 175. 1883 ; *Raizada, Suppl. Duthie, Fl. Gangetic Plain* 159. 1976 ; *Bhandari, Fl. Ind. Desert* 238. 1978.

Deep-rooted, erect, perennial undershrubs. Stem and branches covered with loose, short trichomes. Leaves 0.5 - 3.5 × 0.2 - 0.5 (-1.0) cm, variable, from short linear to broadly ovate or oblong, uni-

formly covered with short appressed trichomes on both surfaces. Flowers in terminal, short, 2 to 6 - flowered racemes. Corolla white ; throat densely filled with hairs. Style undivided ; stigma 1. Nutlets $c. 0.25 \times 0.15$ mm, ovoid - oblong, tuberculate, brownish.

Fl. & Fr. : August - September ; sometimes March - April.

Common in sandy habitats, particularly in the desertic zones.

Selected specimens : Bharatpur : Gajipura, *Parmar* 8754 (BSJO) ; Barmer : Leela dhora, *Tiwari* 960 (BSJO) ; Jaipur : Ramgarh, *Jain* 49644 (BSI) ; Jaisalmer : East of Sam, *Pandey* 7505 (BSJO) ; Jalore : Sunda hills, *Vyas* 5193 (BSJO) ; Tonk : Near Siras forest, *Pandey* 4761 (BSJO).

8. TRICHODESMA R. Br. *nom. cons.*

- | | | |
|--|-----|--|
| 1a. Flowers usually in terminal paniculate cymes. Calyx - lobes ovate or rounded at base in fruits. | ... | 4. <i>T. zeylanica</i> |
| 1b. Flowers solitary, leaf - opposed and in terminal few - flowered cymes. Calyx - lobes cordate or hastate at base in fruits : | | |
| 2a. Staminal cone exserted ; back of the connectives densely tomentose with crisped hairs ; tip of connectives spirally twisted : | | |
| 3a. Leaves crowded, coriaceous, villous beneath, margins more or less revolute, | ... | 1. <i>T. indica</i> var. <i>indica</i> |
| 3b. Leaves distant, chartaceous, glabrous beneath except on nerves, margins flat, not revolute. | ... | 2. <i>T. indica</i> var. <i>amplexicaule</i> |
| 2b. Staminal cone included ; back of the connectives densely penicillate with straight erect hairs ; tip of connectives not twisted. | ... | 3. <i>T. sedgwickianum</i> |

1. *Trichodesma indica* (L.) R. Br. Prodr. Fl. Nov. Holl. 496. 1810 ; Clarke in Hook. f. Fl. Brit. India 4 : 153. 1883 ; Duthie, Fl. Gangetic Plain 2 : 94. 1911, *pro parte*. *Borago indica* L. Sp. Pl. 137. 1753. 'Chhota kulpha' (Hindi).

var. *indica*

Much branched, erect or diffuse, annual, hispid herbs. Leaves opposite, sessile, crowded, $2.5 - 6.0 \times 1.0 - 1.5$ cm, lanceolate or linear - lanceolate to ovate - oblong, obtuse at apex, sub-cordate and

amplexicaule at base. Flowers white, changing pale blue to violet with age. Fruits pyramidal, sub - 4 - ridged ; nutlets 4 - 5 × 3 mm, oblong, with smooth shining back and scabrous, more or less margined inner face.

Fl. & Fr. : August - January.

Common weed of open wastelands and in forest undergrowth

Selected specimens : Alwar : Sariska Tiger Reserve, *Parmar* 10201 (BSJO) ; Banswara : Bhongra, *Kanodia* 75425 (BSA) ; Jaipur : Durgapura, *Sharma* 491 (RUBL) ; Jaisalmer : Amarsagar, *Wadhwa* 5201 A (BSA) ; Sirohi : Mt. Abu, *Duthie* 6669 (DD).

2. var. *amplexicaule* (Roth) Cooke, *Fl. Bombay* 2 : 215. 1905. *Trichodesma amplexicaule* Roth, *Nov. Sp. Pl.* 104. 1821, non DC. 1846 ; Clarke in *Hook. f. Fl. Brit. India* 4 : 153. 1883, *pro parte*. *T. indicum sensu* Duthie, *Fl. Gangetic Plain* 2 : 94. 1911, *pro parte*, non (L.) R. Br. 1810.

Very similar to var. *indica*, but can be distinguished by stem being sparsely covered with trichomes, upper surface of leaves uniformly covered with large tubercle based trichomes, lower surface with similar type of trichomes but confined to midrib and veins only, cauline leaves broad at base, sub - cordate to sub - amplexicaule.

Fl. & Fr. : July - November.

Common weed in open wastelands and forests.

Selected specimens : Bharatpur : Near Weir, *Parmar* 8727 (BSJO) ; Banswara : Derivali Dungri, *Kanodia* 75146 (BSI) ; Barmer : Siwana, *Shetty* 2227 (BSJO) ; Jaipur : Ramgarh, *Sharma* 171 (RUBL) ; Jodhpur : Chhittar Palace area, *Vaswani* Acc. No 118953 (DD) ; Sirohi : Dhobighat, *Blatter* 21619 (BLAT).

3. *Trichodesma sedgwickianum* Banerjee in *Bull. Bot. Soc. Bengal* 16 : 10. 1964 ; Banerjee & Pramanik in *Bull. Bot. Surv. India* 17 : 116. f. A - D. 1978. *T. amplexicaule auct.* non Roth, 1821 ; A. DC. in DC. *Prodr.* 10 : 172. 1846 ; Clarke in *Hook. f. Fl. Brit. India* 4 : 158. 1883, *pro parte* ; Sedgwick in *Rec. Bot. Surv. India* 6 : 347. 1913.

Erect, annual herbs, branched above. Leaves sessile, opposite, 2.5 - 8.0 × 1.2 - 2.5 cm, ovate oblong, entire, obtuse at apex, cordate at base, sub - amplexicaule, scabrid with distinct stiff hairs arising from bulbous bases. Flowers violet. Calyx sagittate at the base, 5 - angled ; lobes ovate - acuminate. Corolla without scales in the throat. Nutlets 4, ovoid, smooth.

Fl. & Fr. : July - October.

Common weed in open wastelands and forests, particularly in the east of Aravalli.

Selected specimens : Ajmer : Jodhpur Rd., Wadhwa 4884 (BSA) ; Banswara : Danpur, Singh 2990 (BSJO) ; Jaisalmer : Phalsund, Wadhwa 4770 (BSA) ; Kota : Baran, Majumdar 10809 (BSA) ; Sirohi : Mt. Abu, Raizada 20581 (DD), Blatter 21095 (BLAT).

4. *Trichodesma zeylanica* (Burm. f.) R. Br. Prodr. Fl. Nov. Holl. 496. 1810 ; Clarke in Hook. f. Fl. Brit. India 4 : 154. 1883 ; Duthie, Fl. Gangetic Plain 2 : 95. 1911. *Borago zeylanica* Burm. f. Fl. Ind. 41. t. 14. f. 2. 1768. 'Hetemuria' (Hindi).

Large, erect, annual herbs ; stem often purplish, clothed with long soft hairs. Leaves 2.5 - 12.0 × 1.0 - 3.5 cm, opposite, oblong or oblong lanceolate, sub-acute or obtuse, densely clothed above with soft, stiff, bulbous based hairs. Flowers solitary, axillary, gradually passing on to lax, terminal racemes by the reduction of leaves. Nutlets broadly ovoid, sub-obtuse, finely margined.

Fl. & Fr. : August - February.

Rare, in open wastelands, particularly in south eastern parts of the state.

Selected specimen : Kota : Atru, Singh 90550 (LWG.)

88. EHRETIACEAE

(P.J. Parmar)

- | | | |
|---|-----|-------------------|
| 1a. Trees or large shrubs. Flowers in terminal and axillary dichotomous or paniculate cymes. Style two to 4 - fid : | | |
| 2a. Calyx accrescent in fruit. Style 4 - fid. Stigma simple. Drupes pulpy. | ... | 1. <i>Cordia</i> |
| 2b. Calyx not accrescent in fruit. Style 2 - fid. Stigma capitellate. Drupes dry. | ... | 2. <i>Ehretia</i> |
| 1b. Virgate shrubs. Flowers in 2 to 3 - flowered cymes. Style one, simple. | ... | 3. <i>Rotula</i> |

1. *Cordia* L.

- 1a. Leaves distinctly 3 to 5 - nerved from the base :
- 2a. Leaves deeply dentate towards the apex. ... 1. *C. crenata*
- 2b. Leaves entire throughout :
- 3a. Calyx ribbed, pubescent or tomentose externally :
- 4a. Leaves cordate or rounded at base. Corolla - tube glabrous within. ... 4. *C. macleodii*
- 4b. Leaves cuneate or rounded at base. Corolla - tube hairy within. ... 7. *C. vestita*
- 3b. Calyx not ribbed, glabrous externally :
- 5a. Leaves as long as broad or nearly so. Corolla - lobes as long as the tube :
- 6a. Adult leaves glabrous beneath. Sepals scarcely villous on the margins. ... 5. *C. obliqua* var. *obliqua*
- 6b. Adult leaves densely stellate - fulvous or white tomentose beneath. Sepals glabrous on the margins. ... 6. *C. obliqua* var. *wullichii*
- 5b. Leaves much longer than broad. Corolla - lobes longer than the tube. ... 2. *C. dichotoma*
- 1b. Leaves feather - nerved. ... 3. *C. gharaf*

1. *Cordia crenata* Delile, Fl. Egypt. 195. t. 20. 1813 ; Duthie, Fl. Gangetic Plain 2 : 83. 1911. *C. lowriana* Brandis, Indian Trees 479. 1906. 'Gundi' (Hindi).

Large shrubs or small trees, wholly glabrous except minutely hairy inflorescence. Leaves alternate or subopposite, 2.5 - 7.5 cm long, elliptic or elliptic - lanceolate, rounded, sub acute or shortly acuminate at the apex, obliquely rounded or cuneate at the base, margins crenate dentate or deeply dentate at least towards the apex. Flowers in small, compact, pedunculate cymes from the axils of the uppermost leaves. Drupes c. 8 mm long, ovoid, acute.

Fl. & Fr. : January - April.

Very rare, confined to the forests of old state of Merwara in Rajasthan.

Selected specimen : Ajmer : Bar, Duthie 4754 A (DD). Also reported from Ajmer by Sharma (1958).

Notes : According to Duthie (*l.c.*), this species is indigenous in Rajputana. Outside India, *i.e.* Egypt, it is known under cultivation. Sharma (1958) reported this species from Ajmer without any voucher specimen, probably on the authority of Duthie (*l.c.*). The only authentic specimen of this species is Duthie's 4754 A (DD) collection of January 1886. Probably this taxon is on the verge of extinction in its native home and needs conservation.

2. *Cordia dichotoma* Forst. f. Prodr. 18. 1786. *C. myxa* auct. plur. non L. 1753 ; Duthie, Fl. Gangetic Plain 2 : 82. 1911, *pro parte*, 'Lasora, Gunda' (Hindi).

Moderate sized, deciduous trees, usually with crooked trunk. Leaves $8-12 \times 4-8$ cm, elliptic to ovate or obovate, obtuse at apex and rounded to acute at base. Flowers in ebracteate, loosely branched dichotomous cymes, white. Drupes with viscous mesocarp, 1.0-1.5 cm in diam., globose, yellow, pink or orange to reddish when ripe, apiculate, supported by accrescent indurate saucer-shaped calyx.

Fl. & Fr. : February - June.

Common in dry deciduous forests. Often cultivated.

Selected specimens : Ajmer : Lowrie 56 (DD) ; Banswara : Danpur forest, Singh 4261 (BSJO) ; Jhalawar : Bakni, Wadhwa 9524 (BSJO) ; Jodhpur : Near Barle temple, Pandey 6180 (BSJO) ; Sirohi : Mt. Abu, Jain 46753 (BSI).

3. *Cordia gharaf* (Forsk.) Ehrenb. ex Asch. Sitzungber Ges. Naturf. Freunde Berlin 1879 (4) : 46. 1879. *Cornus gharaf* Forsk. Fl. Aegypt. — Arab. 95. 1775. *Cordia rothii* Roem. & Schult. Syst. Veg. 4 : 798. 1819 ; Wight. Ic. 4 (2) : 15. t. 1379. 1848 ; Clarke in Hook. f. Fl. Brit. India 4 : 138. 1883 ; Duthie, Fl. Gangetic Plain 2 : 85. 1911. 'Gundi' (Hindi).

Medium sized trees, with greyish, deeply furrowed bark. Leaves nearly or quite - opposite, $6-10 \times 2.0-2.5$ cm, oblanceolate - oblong, entire, rounded at apex, rough and glabrous above when mature, more or less pubescent beneath. Flowers small, in short, axillary or terminal corymbose cymes, white. Calyx pubescent outside, silky within. Drupes c. 1.2 cm long, ovoid, mucronate, striate, yellow when ripe, usually one-seeded.

Fl. & Fr. : April - December.

Common in the forests and wastelands ; often cultivated for its edible fruits.

Selected specimens : Ajmer : Lowrie 57 (DD) ; Barmer : Balotra, Tiwari 983 (BSJO) ; Bikaner : Kolayat, Roy 2405 (BSJO) ; Jhalawar : Manoharthana, Verma 3456 (BSA) ; Sirohi : Abeshwar, Jain 60469 (BSI).

4. *Cordia macleodii* (Griff.) Hook. f. & Thoms. in Journ. Linn. Soc. Bot. 2 : 128. 1858 ; Brandis, Forest Fl. North West & C. India 337. t. 41. 1874 ; Clarke in Hook. f. Fl. Brit. India 4 : 139. 1883 ; Duthie, Fl. Gangetic Plain 2 : 84. 1911. *Hemigymnia macleodii* Griff. in Calcutta Journ. Nat. Hist. 3 : 363. 1843. 'Bara-lasora, Padul, Gunda' (Hindi).

Small, deciduous trees, with smooth grey bark ; young branches covered with dense white pubescence. Leaves 7-18 × 5-18 cm, orbicular or broadly ovate cordate, obtuse at apex, sinuate-margined, glabrous above, densely grey tomentose beneath. Flowers in terminal and axillary, paniculate, tomentose cymes, white. Calyx accrescent, obconic, tomentose. Filaments hairy at base. Drupes 1.2-2.0 cm long, ovoid, acute, supported by cup-shaped, slightly ribbed calyx.

Fl. & Fr. : May - September.

Rare, in the forests, particularly in the east of Aravalli.

Selected specimens : Banswara : Anand Sagar, Singh 4612 (BSJO) ; Jaipur : Ramgarh, Jain 49629 (BSI) ; Kota : Shahabad, Jain 28828 (BSI) ; Pali : Paras Ram Mahadev R.F., Pandey 4183 (BSJO) ; Sirohi : Mt. Abu, Mehta 782 (JAC). Also reported from Ajmer (Sharma, 1958).

5. *Cordia obliqua* Willd. Phytogr. 1 (4) : t. 4. f. 1. 1794 et Sp. Pl. 1 : 1072. 1798 ; Clarke in Hook. f. Fl. Brit. India 4 : 137. 1883. *C. myxa* auct. plur. non L. 1753 ; Duthie, Fl. Gangetic Plain 2 : 82. 1911. *pro parte*.

var. *obliqua*

Medium sized deciduous trees, with shallow longitudinally fissured bark. Leaves 7-13 × 6-12 cm, orbicular, broadly ovate, elliptic or obovate, obtuse or more or less abruptly acuminate, rounded at base, rarely cuneate, glabrous beneath. Flowers in large, lax, terminal or axillary pedunculate cymes, white. Drupes 1.2-2.5 cm, ovoid, apiculate, yellowish-brown when ripe.

Fl. & Fr. : October - February.

Rather common, in the forests, particularly on the fringes.

Selected specimens : Alwar : Minak forest block, *Parmar* 9807 (BSJO) ; Bikaner : Bichwal, *Roy* 2427 (BSJO) ; Jaipur : *Sitaram* Acc. No. 2709 (RUBL) ; Jalore : Sunda hills, *Vyas* 5806 (BSJO) ; Jhalawar : *Sharma* 476, 488, 489, (RUBL).

6. var. *wallichii* (G. Don) Clarke in Hook. f. Fl. Brit. India 4 : 137. 1883. *Cordia wallichii* G. Don, Gen. Hist. 4 : 379. 1837. *C. tomentosa* Wall. in Roxb. Fl. Ind. 2 : 339. 1824, non Roem. & Schult. 1819. *C. obliqua* Willd. var. *tomentosa* (Wall.) Kazmi in Journ. Arnold Arbor. 51 : 143. 1970.

Very similar to var. *obliqua*, but can be distinguished by the leaves being densely stellate fulvous or white tomentose beneath and calyx glabrous externally.

Fl. & Fr. : September - February.

Rare, in the forests.

Selected specimen : Pali : 5 km from Sadri, *Pandey* 4131 (BSJO).

7. *Cordia vestita* (DC.) Hook. f. & Thoms. in Journ. Linn. Soc. Bot. 2 : 128. 1858 ; Clarke in Hook. f. Fl. Brit. India 4 : 139. 1883 ; Duthie, Fl. Gangetic Plain 2 : 84. 1911. *Gynaion vestitum* DC. Prodr. 9 : 468. 1845. 'Godela' (Hindi).

Small, deciduous trees, with a low rounded crown and greenish-grey bark exfoliating in large woody flakes ; branches densely grey tomentose when young. Leaves coriaceous, 7.5 - 15.0 × 6 - 13 cm, orbicular, broadly ovate or obovate, rounded or acuminate at apex and rounded or cuneate at the base. Flowers in dense compound cymes ; male flowers usually in unilateral racemes, yellowish - white. Drupes 1.2 - 1.7 cm long, ellipsoid, acute, supported by the saucer - shaped or campanulate, strongly ribbed accrescent calyx.

Fl. & Fr. : March - October.

Included on the authority of Sharma (1958) from Ajmer. Duthie (*l.c.*) also gives its local name 'Godela' (Ajmere), showing its distribution in Ajmer district.

2. EHRETIA P. BROWN

The genus *Ehretia* L. is highly polymorphic in respect of shape, size, texture and pubescent nature of leaves. Mostly these characters have been used to distinguish different taxa under this genus. Present study

revealed that sometimes these characters do not hold good. Since the material is limited in the hands of authors, it is hard to comment with certainty. The genus, however needs critical study.

- | | | |
|--|-----|---|
| 1a. Leaves serrate. | ... | 5. <i>E. serrata</i> |
| 1b. Leaves entire : | | |
| 2a. Trees. Leaves exceeding 8 cm in length, usually upto 13 cm long, glabrous beneath when mature. | ... | 3. <i>E. laevis</i> |
| 2b. Large shrubs or small trees. Leaves not exceeding 8 cm in length, slightly hairy to pubescent beneath : | | |
| 3a. Leaves usually ovate, scabrous above and pubescent below. Corymbs few - flowered. | ... | 4. <i>E. pubescens</i> |
| 3b. Leaves elliptic, elliptic - oblong to obovate - spathulate, slightly persistently hairy beneath. Corymbs many - flowered : | | |
| 4a. Leaves broadly elliptic to elliptic - oblong, usually shortly acuminate at the apex. | ... | 1. <i>E. aspera</i> var. <i>aspera</i> |
| 4b. Leaves obovate - spathulate, rounded or retuse at the apex. | ... | 2. <i>E. aspera</i> var. <i>obtusifolia</i> |

1. *Ehretia aspera* Willd. Phytogr. 1 (4) : t. 2. f. 1. 1794 ; Roxb. Pl. Cor. 1 : 41. t. 55. 1796 ; Duthie, Fl. Gangetic Plain 2 : 87. 1911, excl. syn. *E. obtusifolia* Hochst. ex DC. *E. laevis* Roxb. var. *aspera* (Willd.) Clarke in Hook. f. Fl. Brit. India 4 : 142. 1883. 'Tambolan' (Hindi).

var. aspera

Large deciduous shrubs or small trees, with short, terete, glabrous branches, downy when young. Leaves variable, 4 - 8 × 2.3 - 4.2 cm, coriaceous, sometimes slightly hairy on the upper surface. Flowers in dense, apparently terminal corymbose cymes, afterwards becoming paniculate, lax and lateral, white to bluish - white. Drupe c. 5 mm across, depressed globose, smooth ; pyrenes 4, black.

Fl. & Fr. : March - May.

Common in the dry deciduous forests along Aravalli range.

Selected specimens : Ajmer : Bonwar forest, *Lourie* 84, 112/6 (DD) ; Alwar : Near Malarwa, *Parmar* 9664 (BSJO) ; Banswara : Kotharia forest block, *Singh* 4229 (BSJO) ; Pali : Ghanero R. F., *Pandey* 4647 (BSJO) ; Sirohi : Mt. Abu, *Jain* 62136, *Puri* 37750 (BSI) ; Tonk : Amli R. F., *Pandey* 4707 (BSJO).

2. var. *obtusifolia* (Hochst. ex DC.) Parmar *comb. nov.* *Ehretia obtusifolia* Hochst. ex DC. Prodr. 9 : 507. 1845 ; Clarke in Hook. f. Fl. Brit. India 4 : 142. 1883 ; Duthie, Fl. Gangetic Plain 2 : 86. 1911, under synonymy of *E. aspera* Willd. ; Kazmi in Journ. Arnold Arbor. 51 : 146. 1970.

Very similar to var. *aspera*, but can be distinguished by its obovate spatulate leaves with rounded apices, more lax corymbs and comparatively larger flowers.

Fl. & Fr. : November April.

Common in the forests along the western edges of Aravalli.

Selected specimens : Barmer : Haldeshwar Mahadev forest, Pandey 7923 (BSJO) ; Pali : Manpura forest block, Pandey 4148 (BSJO).

3. *Ehretia laevis* Roxb. Pl. Cor. 1 : 42. t. 56. 1796 ; Clarke in Hook. f. Fl. Brit. India 4 : 141. 1883, includ. var. *floribunda* (Benth.) Brandis ; Duthie, Fl. Gangetic Plain 2 : 86. 1911. '*Chamar, Tamboli*' (Hindi).

Medium-sized, deciduous trees, with smooth grey bark. Leaves variable, 7 - 13 × 5 - 11 cm, elliptic, ovate - elliptic or elliptic - oblong or even suborbicular, rounded or angled at bases and apices. Flowers in terminal and axillary, loosely dichotomous corymbose cymes, white. Drupes yellow or reddish - orange, becoming black with age, wrinkled when dry, endocarp rugose, breaking up at maturity into 4, single-seeded pyrenes.

Fl. & Fr. : March May.

Common in the dry deciduous forests, particularly in the east of Aravalli.

Selected specimens : Ajmer : Udaipur Rd., Kaul 8502 (LWG) ; Alwar : Sariska (Kankwari block), Parmar 9687 (BSJO) ; Jaipur : Gujar-ki - Ghati, Sharma 468 (RUBL) ; Jhalawar : Sharma 300 (RUBL) ; Pali : Sadari, Jain 48419 (BSI) ; Sirohi : Mt. Abu, Puri 56703 (BSI).

4. *Ehretia pubescens* Benth. in Royle, Illus. Bot. Himalaya 1 : 306. 1836. *Ehretia laevis* Roxb. var. *pubescens* (Benth.) Clarke in Hook. f. Fl. Brit. India 4 : 142. 1883 ; Sharma & Tiagi, Fl. North - East Rajasthan 249. 1979.

Medium sized trees, 6 - 8 m high. Leaves 4 - 6 × 2 - 4 cm, chartaceous, elliptic - oblong, hirsute above, sericeous below, obtuse to sub-acute at apex and acute to attenuate at base. Flowers in lateral, lax;

hirsute - pubescent cymes, white. Calyx lobes 5, lanceolate, acute. Drupes globose c. 5 mm across.

Fl. & Fr. : February - May.

Rare, in dry deciduous forests in the North - Eastern hilly tracts.

Selected specimens : Jaipur : Athuni ka Kund, *Sharma* 1122 (RUBL); U.R.F., *Sharma* Acc. No. 2723 (RUBL).

5. *Ehretia serrata* Roxb. Fl. Ind. 2 : 340. 1824 ; Wight, Illus. 2 : t. 170. 1841. *E. acuminata* *cuct plur.* non R. Br. 1810 ; Clarke in Hook. f. Fl. Brit. India 4 : 141. 1883 ; Duthie, Fl. Gangetic Plain 2 : 86. 1911. *E. acuminata* R. Br. var. *serrata* (Roxb.) Johnston in Journ. Arnold Arbor. 32 : 23. 1951.

Medium sized, deciduous trees. Leaves 8 - 15 × 4 - 7 cm, usually lanceolate, sometimes elliptic - oblong, acuminate, margins finely and regularly serrate. Flowers in large, terminal, puberulous panicles, white. Drupes globose, c. 3.5 mm in diam., nearly black when ripe ; pyrenes 2, each 2 - celled ; cells 1 - seeded.

Fl. & Fr. : February - May.

Rare, in the forests on Aravalli at high altitude.

Selected specimen : Sirohi : Mt. Abu, *Jain* 62087 (BSI).

3. ROTULA Lour.

Rotula aquatica Lour. Fl. Cochinch. 121. 1790. *Rhabdta lycioides* Mart. & Zucc. Nov. Gen. & Sp. Pl. 2 : 137. t. 195. 1827 ; Clarke in Hook. f. Fl. Brit. India 4 : 145. 1883 ; Duthie, Fl. Gangetic Plain 2 : 88. 1911. *Ehretia cuneata* Wight, Ic. 4 (2) : 16. t. 1385. 1848.

Small shrubs, upto 1 m high ; branches often creeping and rooting. Leaves subsessile, alternate or clustered, 0.6 - 2.5 cm long, spatulate or linear - oblong, entire, rounded at apex. Flowers in subterminal racemes on short lateral branchlets, reddish lilac. Sepals acuminate. Drupes subglobose, c. 3 mm in diam., nearly dry, red or orange when ripe, with 4, crustaceous 1 - seeded pyrenes. Seeds oblong.

Fl. & Fr. : October - February.

Rare, in sandy and rocky beds of rivers and streams, particularly in the south - eastern parts of the state.

Selected specimens : Jhalawar : Bakani - Kali - Sindh river, Verma 6997 (BSA) ; Kota : Shahabad, Majumdar 13263 (BSA).

89. CONVULVACEAE

(V. Singh)

- 1a. Capsules indehiscent :
 - 2a. Pollen echinate :
 - 3a. Fruits with thin fragile wall. ... 5. *Ipomoea*
 - 3b. Fruits with thick, woody or fleshy wall :
 - 4a. Corolla white, hypocrateriform. Stigmas elliptic - oblong. Fruits woody. ... 10. *Rivea*
 - 4b. Corolla rose, purple or violet, not hypocrateriform. Stigmas globose. Fruits mealy or fleshy. ... 1. *Argyreia*
 - 2b. Pollen not echinate. ... 9. *Porana*
- 1b. Capsules dehiscent :
 - 5a. Capsules operculate. ... 8. *Operculina*
 - 5b. Capsules valvate or dehiscing irregularly :
 - 6a. Styles 2, free or very slightly united at base :
 - 7a. Flowers axillary, solitary. Corolla - lobes imbricate. Stamens exerted. ... 3. *Cressa*
 - 7b. Flowers in cymes. Corolla - lobes in duplicate - contorted. Stamens not exerted :
 - 8a. Each style 2 - fid ; stigmas lateral. Capsules 2 to 4 - valved. ... 4. *Evolvulus*
 - 8b. Both styles unbranched. Stigmas capitate. Capsules irregularly dehiscent. ... 11. *Seddera*
 - 6b. Style 1, entire or slightly 2 - lobed at the apex :
 - 9a. Capsules 1 - seeded. ... 9. *Porana*
 - 9b. Capsules 4 or more - seeded ;
 - 10a. Stigmas elliptic - oblong ;
 - 11a. Capsules 4 - valved or irregularly dehiscent. ... 2. *Convolvulus*

- | | | |
|---------------------------|-----|------------------------|
| 11b. Capsules 8 - valved. | ... | 6. <i>Jacquemontia</i> |
| 10b. Stigmas globose : | | |
| 12a. Pollen spinulose. | ... | 5. <i>Ipomoea</i> |
| 12b. Pollen smooth. | ... | 7. <i>Merremia</i> |

1. ARGYREIA LOUR.

- | | | |
|-------------------|-----|-----------------------|
| Ovary 2 - celled. | ... | 2. <i>A. strigosa</i> |
| Ovary 4 - celled. | ... | 1. <i>A. sericea</i> |

1. *Argyreia sericea* Dalz. in Dalz. & Gibs. Bombay Fl. 169. 1861 ; Clarke in Hook. f. Fl. Brit. India 4 : 188. 1883 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 160. 1976.

Silky twiners. Leaves 7 - 15 × 5 - 13 cm, broadly ovate - cordate, acuminate, hispid or strigose above, densely silvery - white beneath, main nerves 8 - 10 pairs. Petioles 2.5 - 5.0 cm long. Flowers in 6 to 8 - flowered, capitata or subcapitata cymes ; peduncles 2.5 - 10.0 cm long. Bracts ovate - oblong, foliaceous, with subparallel nerves. Sepals densely hairy and ciliate, outer 2 linear - oblong, inner 3 elliptic - oblong. Filaments hairy at the base ; anthers sagittate. Berries orange - coloured.

Fl. & Fr. : August - December.

Rare, climbing on trees and shrubs in wastelands and along the roads.

Selected specimens : Banswara : Kushalgarh Rd., Singh 3023 (BSJO) ; Bundi : Kota Dam, Singh 74445 (LWG). Also reported from Ajmer (Sharma, 1958), Alwar (Vyas, 1967) and Jhunjhunu (Nair, 1961).

2. *Argyreia strigosa* (Roth) Roberty in Candollea 14 : 44. 1952. *Ipomoea strigosa* Roth. Nov. Pl. Sp. 113. 1821. *Lettsomia setosa* Roxb. Fl. Ind. 1 : 450. 1832 ; Wight, Ic. 4(2) : 12, t. 1360. 1848 ; Clarke in Hook. f. Fl. Brit. India 4 : 194. 1883 ; Duthie, Fl. Gangetic Plain 2 : 122. 1911. *Argyreia setosa* (Roxb.) Choisy in Mem. Soc. Phys. Hist. Nat. Geneve 6 : 425. 1833.

Twining shrubs, with terete branches and rough bark. Leaves 7 - 15 × 5 - 13 cm, ovate, acute or acuminate, sparsely hairy on both sides, cordate at the base. Flowers in dense, hairy, corymbose cymes ; peduncles 5 - 20 cm long, strigose with appressed hairs. Bracts broadly ovate, obtuse, strigose. Sepals orbicular, subfleshy, appressedly strigose, the 2 inner membranous margins. Corolla - tube swollen beyond the

calyx and densely strigose. Filaments dilated and hairy at the base. Fruits ovoid, red.

Fl. & Fr. : August - March.

Rare, in the wastelands and outskirts of forests in the hilly tracts.

Selected specimens : Chittorgarh : Kalakhct, *Verma* 1737 (BSA) ; Jhalawar : Dug Kyasra, *Wadhwa* 6771 (BSA) ; Sacred Block, *Wadhwa* 7694 (BSA) ; Sirohi : Mt. Abu, *Rao* 66618 (BSI).

2. CONVULVULUS L.

- | | | |
|--|-----|---|
| 1a. Corolla 4 - 5 times as long as the calyx. | ... | 1. <i>C. arvensis</i> |
| 1b. Corolla smaller, equal or at most twice as long as calyx : | | |
| 2a. Erect undershrubs : | | |
| 3a. Plants densely hirsute with brown - grey ferruginous hairs. Leaves obovate or spatulate. | ... | 10. <i>C. seindicus</i> |
| 3b. Plants silky pilose or villous. Leaves linear : | | |
| 4a. Calyx hirsute. | ... | 9. <i>C. rotlerianus</i> |
| 4b. Calyx glabrous. | ... | 11. <i>C. stocksii</i> |
| 2b. Prostrate or twinning herbs, often woody at base : | | |
| 5a. Flowers in densely hairy, involucrate heads : | | |
| 6a. Heads sessile or subsessile : | | |
| 7a. Corolla twice the length of calyx. | ... | 8. <i>C. rhynchospermus</i> |
| 7b. Corolla smaller or equal to the length of calyx. | ... | 5. <i>C. blatterl</i> |
| 6b. Heads distinctly stalked, subtended by a pairs of leafy bracts : | | |
| 8a. Twining or climbing herbs : | | |
| 9a. Plants white hairy. | ... | 4. <i>C. verticillatus</i> var. <i>volabilis</i> |
| 9b. Plants ferruginously silky hairy. | ... | 3. <i>C. verticillatus</i> var. <i>ferruginosus</i> |

- 8b. Prostrate herbs. ... 2. *C. auricomus* var. *auricomus*
- 5b. Flowers not in heads :
- 10a. Flowers clustered directly in leaf axils. ... 7. *C. prostratus*
- 10b. Flowers condensed at the end of axillary peduncles. ... 6. *C. deserti*

1. *Convolvulus arvensis* L. Sp. Pl. 153. 1753 ; Clarke in Hook. f. Fl. Brit. India 4 : 219. 1883 ; Duthie, Fl. Gangetic Plain 2 : 106. 1911 ; Mahesh. Illus. Fl. Delhi f. 146. 1966. 'Hiranpagl' (Hindi).

Prostrate, creeping or twining, perennial herbs. Leaves 1.5 - 8.0 × 0.5 - 5.0 cm, ovate lanceolate to oblong, obtuse, mucronate, subentire - repand, hastate or sagittate at base. Petioles 1 - 3 cm long. Flowers in axillary, 1 to 3 - flowered cymes ; peduncles 1.5 - 10.0 cm long ; pedicels 0.8 - 2.0 cm long. Bracteoles linear. Calyx - segments elliptic - oblong, retuse, mucronate. Corolla 1.5 - 2.0 cm long, glabrous, with hairy mid - petaline bands outside. Capsules 5 - 6 mm in diam., ovoid globose. Seeds tuberculate, brown.

Fl. & Fr. : December - April.

Common weed in cultivated fields, road-sides and gardens.

Selected specimens : Bharatpur : Dig. Parmar 8550 (BSJO) ; Bikaner : Bichwal, Roy 1669 (BSJO) ; Jaipur : Forest Nursery, Nautiyal & Raizada 2546 (DD) ; Kota : Singh 9095 (LWG) ; Sirohi : Mt. Abu, Jain 62145 (BSI).

2. *Convolvulus auricomus* (A. Rich.) Bhandari in Bull. Bot. Surv. India 6 (2 - 4) : 327. 1964. *Ipomoea auricoma* A. Rich. Tent. Fl. Abyss. 2 : 67. 1851. *Convolvulus glomeratus* Choisy in DC. Prodr. 9 : 401. 1845, non Thunb. 1792 ; Wight, Ic. 4 (2) : 13. t. 1366. 1848 ; Clarke in Hook. f. Fl. Brit. India 4 : 219. 1883. 'Rata - bel' (Hindi).

var. *auricomus*

Prostrate, biennial or perennial herbs. Leaves 1.5 - 3.5 × 0.4 - 0.8 cm, oblong, acute, mucronate, rounded or subcordate at the base ; petioles 3 - 5 mm long. Flowers in dense, axillary, silky white hairy heads ; peduncles 1 - 2 cm long, slender, solitary. Outer bracts foliaceous, ovate - lanceolate, densely clothed with white hairs, ciliate ; inner ones smaller but little larger than calyx. Calyx 1.0 - 1.5 cm long ; 2 outer sepals broader than 3 inner, ovate - lanceolate ones. Corolla tube 0.8 - 1.0 cm long, pinkish brown, scabrid.

Fl. & Fr. : September - November.

Rare, in wastelands, particularly in desertic zones. Large number of branches arise from the perennial root - stock and develop on all sides.

Selected specimens : Barmer : Tapara, Shetty 2270 (BSJO) ; Jaisalmer : Shetty 3411 (BSJO) ; Jodhpur : Kailana : Singh 3117 (BSJO) ; Pali : Mandela, Shetty 1850 (BSJO).

3. var. *ferruginosus* Bhandari, Fl. Ind. Desert 245. 1978.

Plants twinning, ferruginously silky hairy. Leaves 7×3.5 cm.

Fl. & Fr. : October - November.

Rare, in dry sandy soils. Endemic to Rajasthan desert.

Selected specimens : Barmer : Bhandari 465, 516 (JAC) ; Jaisalmer : Bhandari 974, 1018 (JAC) ; Jodhpur : Bhandari 137, 1260 (JAC).

4. var. *volubilis* (Clarke) Bhandari in Bull. Bot. Surv. India 6 (2-4) : 327. 1964 & Fl. Ind. Desert 244. f. 83. 1978. *Convolvulus glomeratus* Choisy var. *volubilis* Clarke in Hook. f. Fl. Brit. India 4 : 219. 1883.

Twining, white hairy herbs. Leaves $3 - 5 \times 0.8 - 2.0$ cm. Petioles upto 6 mm long. Flowers more numerous ; heads larger, borne on upto 6 cm long peduncles. Bracts, sepals and petals all larger.

Fl. & Fr. : October - November.

Common twiner on bushes in wastelands in the desert or on the fences of fields. This variety is more common than rest two and also flowers more profusely.

Selected specimens : Barmer : Bhandari 1596 (JAC) ; Jaisalmer : Blatter 3550, 3552 (BLAT) ; Jodhpur : Bhandari 1410, 1747 (JAC), Blatter 3553 (BLAT).

5. *Convolvulus blatteri* Bhandari in Bull. Bot. Surv. India 6 (2-4) : 327. 1964 & Fl. Ind. Desert 245. 1978. *C. densiflorus* Blatt. & Hallb. in Journ. Bombay Nat. Hist. Soc. 26 (2) : 545. 1919, non Hook. & Arn. 1867.

Prostrate or ascending, perennial herbs, with terete, hirsute and fistular branches. Leaves $3.0 - 3.5 \times 0.8 - 1.3$ cm, elliptic or oblanceolate, subacute, entire, hirsute when young, attenuated at base. Flowers condensed on axillary, 1.0 - 2.5 cm long peduncles. Bracts ovate-lanceolate or elliptic, acute, hirsute when young. Sepals 7 - 8 mm long, narrowly lanceolate, densely villous outside. Corolla rather shorter than calyx ;

lobes minutely penicillate at the apex. Filaments glabrous. Capsules globose, 4 valved, scarious, glabrous. Seeds 4, tuberculate.

Fl. & Fr. : September - December.

Rare, in dry sandy habitats in the desert. It is endemic to N.W. India.

Selected specimen : Jaisalmer : *Blatter* 3515 (BLAT).

6. *Convolvulus deserti* Hochst. & Steud. ex Baker & Rendle in Dyer, *Fl. Trop. Afr.* 4 (2) : 164. 1905 ; Bhandari, *Fl. Ind. Desert* 246. f. 84. 1978. *C. microphyllus sensu* Choisy in DC. *Prodr.* 9 : 402. 1845, non Sieb. ex Spreng. 1824. 'Santari' (Hindi).

Suffruticose, with terete slender stems, sparsely clothed with spreading hairs. Leaves sessile, usually 3-4 cm long, few lower ones upto 7 cm long, linear-oblong to spatulate, obtuse, hairy. Peduncles upto 3 cm long, axillary, bearing 1-3 flowers. Bracts c. 1 cm long, linear, clothed with ferruginous hairs. Sepals upto 7.5 mm long, subequal, ovate, long acuminate. Corolla 9-12 mm long, funnel-shaped. Capsules c. 3 mm long. Seeds 2-4, dark brown, pubescent.

Fl. & Fr. : August - December.

Rare, in dry sandy habitats in the desert.

Selected specimens : Barmer : *Bhandari* 406, 476 (JAC) ; Ganganagar : Hindumal Kot, *Roy* 3956 (BSJO) ; Jaisalmer : *Bhandari* 1003 (JAC) ; Jodhpur : *Bhandari* 411, 261 (JAC).

7. *Convolvulus prostratus* Forsk. *Fl. Aegypt. Arab.* 203. 1775. *C. microphyllus* Sieb. ex Spreng. *Syst. Veg.* 1 : 611. 1825 ; Wight, *lc.* 4 (2) : 13. t. 1367. 1848 ; Clarke in Hook. f. *Fl. Brit. India* 4 : 218. 1883, incl. var. *boissieri*. *C. pluricaulis* Choisy in *Mem. Soc. Phys. Hist. Nat. Geneve* 6 : 477. 1834 ; Clarke in Hook. f. *lc.* 4 : 218. 1883, incl. var. *macra* ; Duthie, *Fl. Gangetic Plain* 2 : 105. 1911. 'Santari, Santar' (Hindi).

Prostrate or procumbent, perennial herbs, 10-50 cm high, hairy or ferruginously pilose. Leaves sessile, 1.5-7.0 × 0.3-0.8 cm, linear to oblong or oblanceolate to lanceolate, subacute to obtuse, villous, lower leaves usually larger and spatulate. Flowers sessile or subsessile, in pedunculate axillary heads ; peduncles upto 2 cm long, decreasing in length upwards, finally becoming subsessile. Bracts linear-oblanceolate or lanceolate, acuminate, outer longer than inner ones. Corolla 10-12 mm long, funnel-shaped, pinkish white. Capsules c. 3 mm in diam, subglobose, somewhat scarious, glabrous. Seeds 2-4, brown or black, pubescent.

Fl. & Fr. : August - December.

Common throughout the state in sandy habitats. In open grounds the habit is prostrate, while in thick associations procumbent to suberect.

Selected specimens : Alwar : Minak Forest, *Parmar* 9610 (BSJO) ; Banswara : Ghatol, *Majumdar* 10218 (BSA) ; Barmer : Balotra, *Khisti* 40314 (BSA) ; Jaipur : Durgapura, *Sharma* 752, 2218 (RUBL) ; Forest Nursery, *Nautiyal & Raizada* 25405 (DD) ; Kota : Darah, *Singh* 83840 (LWG) ; Sirahi : Abu Rd., *Kaul* 9382 (LWG).

8. *Convolvulus rhyniospermus* Hochst. ex Choisy in DC. Prodr. 9 : 405 : 1845 ; Wight, Ic. 4 (2) : 13. t. 1368. 1848 ; Clarke in Hook. f. Fl. Brit. India 4 : 218. 1883 ; Bhandari, Fl. Ind. Desert 247. 1978. 'Santari' (Hindi).

Annual herbs, with many stems from a woody root-stock clothed with long spreading hairs. Leaves 2 - 5 cm long, oblong or oblanceolate, obtuse, mucronulate. Petioles 2 - 3 mm long, dilated. Flowers in axillary, few flowered, villous clusters ; peduncles 4 - 6 mm long, throughout the length of stem. Bracts oblong lanceolate, villous. Corolla pale-pink, hairy at the tip of lobes. Ovary glabrous. Capsules 4 - 6 mm in diam., globose, papery, glabrous. Seeds 4, minutely papillose, brown.

Fl. & Fr. : August - November.

Rare, in dry sandy habitats in the desert. Very close to *C. blatteri* Bhandari.

Selected specimens : Barmer : Way to Uterlai, *Shetty* 2289 (BSJO) ; Jaisalmer : Bada Bag, *Tiwari* 805 B (BSJO).

9. *Convolvulus rottlerianus* Choisy in Mem. Soc. Phys. Geneve 6 : 477. 1834 ; Clarke in Hook. f. Fl. Brit. India 4 : 219. 1883 ; Bhandari, Fl. Ind. Desert. 248. 1978. 'Kaland'. (Hindi).

var. *rottlerianus*

Erect, perennial herbs, 20 - 50 cm high ; stems silky villous. Leaves sessile or subsessile, 2.5 - 5.0 × 0.3 - 0.6 cm, linear, acute, silky hairy. Flowers in 1 to 3 flowered, axillary, lax racemes. Bracts 2, beneath each pedicel, linear - lanceolate, silky. Outer sepals - ovate, acute, hirsute outside ; inner ones membranous, acuminate. Corolla c. 1 cm long, tubular, hairy outside at apex. Stamens unequal. Ovary glabrous. Seeds puberulous.

Fl. & Fr. : September - November.

Rare, in dry sandy habitats in the desert. Included on the authority of Blatter and Hallberg (1919) from Jaisalmer and Jodhpur.

10. *Convolvulus scindicus* Stocks in Kew Journ. Bot. 4 : 173. 1852 ; Clarke in Hook. f. Fl. Brit. India 4 : 217. 1883 ; Bhandari, Fl. Ind. Desert 248. 1978. '*Kaland*' (Hindi).

Erect, much branched, rigid undershrubs, about 50 cm high, clothed with grey tomentum ; branchlets ending abruptly or sometimes spinescent. Leaves sessile, 8-15 × 4-6 mm, obovate to spatulate, entire, hirsute. Flowers sessile, in congested, rufous hirsute heads. Bracts ovate-lanceolate, hairy. Sepals c. 7 mm long, lanceolate, hirsute. Corolla c. 9 mm long, funnel-shaped, white with pinkish bands ; lobes with a tuft of hairs at the tip. Ovary glabrous.

Fl. & Fr. : November - March.

Rare, in wastelands in the desert.

Selected specimen : Barmer : Bhandari 614 (JAC).

11. *Convolvulus stocksii* Boiss. Fl. Orient. 4 : 110. 1879 ; Bhandari, Fl. Ind. Desert 249. 1978. *C. tenellus* Stocks in Kew Journ. Bot. 4 : 172. 1852. non Desr. 1813. *C. gracilis* Blatt. & Hallb. in Journ. Bombay Nat. Hist. Soc. 26 : 545. 1919, non Salisb. 1806. *C. rottlerianus* Choisy var. *tenella* (Stocks) Clarke in Hook. f. Fl. Brit. India 4 : 219. 1883.

Erect, annual herbs, 20-50 cm high, clothed with adpressed silky white hairs. Leaves attenuated into short petioles in basal region, sessile upwards, 2.0-5.5 × 0.3-0.6 cm, linear, acute in upper region and spatulate below. Cymes axillary ; peduncles 1-7 cm long. Bracts foliaceous ; bracteoles 2, 3-6 mm long, linear-subulate. Calyx glabrous. Corolla c. 8 mm long, tubular, pink-rose, hairy outside at the apex. Filaments glabrous. Capsules 3-4 mm in diam., subglobose, glabrous. Seeds grey pubescent.

Fl. & Fr. : August - November.

Rare, in rocky habitats. It is a slender, graceful plant resembling closely *C. rottlerianus* Choisy.

Selected specimens : Barmer : Tiwari 978 (BSJO) ; Bhandari 444 (JAC) ; Udaipur : Nahar marga area, Kanodia 82361 (BSI) ; Bagdara forest, Kanodia 82340 (BSI).

3. CRESSA L.

Cressa cretica L. Sp. Pl. 223. 1753 ; Clarke in Hook. f. Fl. Brit. India 4 : 225. 1883 ; Duthie, Fl. Gangetic Plain 2 : 103. 1911.

Erect, hairy, dwarf undershrubs or herbs, 15 - 20 cm high. Leaves numerous, alternate, apparently crowded, 3 - 7 × 1.5 - 3.5 mm, ovate, acute, densely silky hairy. Flowers in small clusters in the axils of upper leaves ; pedicels short. Bracts 2, linear, hairy, appressed to the calyx. Calyx c. 2.6 mm long, elliptic, concave, obtuse, densely silky. Corolla c. 4 mm long, campanulate, divided half way down ; lobes oblong, deflexed, hairy outside near the apex. Stamens 5, exserted. Capsules 4 - 5 mm long, ovoid, crowned by style-base. Seeds chest nut brown, glabrous, usually one in a capsule.

Fl. & Fr. : November - May.

Common in wastelands, particularly along the railway lines. Plants prefer saline soils and are abundant near salt lakes in the state.

Selected specimens : Barmer : Gypsum halt, *Tiwari* 965 (BSJO) ; Jaipur : Ram Niwas garden, *Sharma* Acc. No. 4047 (RUBL) ; Jaisalmer : Ramgarh, *Wadhwa* 5149 (BSA) ; Jomara Tank, *Pandey* 7851 (BSJO) ; Jodhpur : Kapurda, *Shetty* 1768 (BSJO) ; Pali : Kharda, *Moorthy* 332 (BSJO).

4. EVOLVULUS L.

Leaves lanceolate - oblong, acute or rounded at base.

Peduncles upto 2 cm long. Flowers pale - blue.

Calyx - segments acute.

... 1. *E. alsinoides*

Leaves broadly oblong - rounded, cordate or

truncate at base. Peduncles absent i.e. cymes

sessile. Flowers white. Calyx - segments

obtuse.

... 2. *E. nummularius*

1. *Evolvulus alsinoides* (L.) L. Sp. Pl. ed. 2. 392. 1762 ; Clarke in Hook. f. Fl. Brit. India 4 : 220. 1883 ; Duthie, Fl. Gangetic Plain 2 : 104. 1911 ; Mahesh. Illus. Fl. Delhi f. 136. 1966. *Convolvulus alsinoides* L. Sp. Pl. 157. 1753.

Prostrate or ascending, slender herbs, clothed with adpressed or spreading hairs. Leaves 1.0 - 3.5 × 0.3 - 1.0 cm, oblong or lanceolate, obtuse, emarginate or acute to acuminate, adpressedly pilose on both surfaces, sometimes glabrous above. Peduncles filiform, shorter or exceed-

ing the leaves, 1 to few flowered. Bracteoles linear lanceolate. Pedicels longer than calyx, pilose. Calyx segments acute or acuminate, villous. Corolla 7-11 mm long, rotate, pale blue or white. Capsules globular, glabrous, 4-valved, usually 4-seeded. Seeds black, smooth.

Fl. & Fr. : July - November.

Fairly common in wastelands in dry sandy and rocky habitats.

Selected specimens : Banswara : Paloda, Singh 2822 (BSJO) ; Barmar : Dhorimanna hills, Shetty 2336 (BSJO) ; Bharatpur : Pahartal, Parmar 8506 (BSJO) ; Jaipur : Amer, Sharma 286, 840 (RUBL) ; Kota : Shahabad, Majumdar 13114 (BSA) ; Sirohi : Mt. Abu, Jain 60136 (BSI).

Notes : It is highly polymorphic species. Van Ooststroom (Med. Bot. Mus. Herb. Utrecht 14 : 26-58, 1934) has recognised 17 varieties under this species, of which five vars. *alsinoides*, *hirsutus* (Lam.) Ooststr., *decumbens* (R. Br.) Ooststr., *linifolius* (L.) Bak. and *wallichii* Ooststr. are recorded from Rajasthan. The specimens from Rajasthan cited under these species merge together so much that the author could not adopt the present status of these taxa. A detailed study is required to comment upon.

2. *Evolvulus nummularius* (L.) L. Sp. Pl. ed. 2. 391. 1762 ; Shah, Fl. Gujarat 1 : 464. 1978. *Convolvulus nummularius* L. Sp. Pl. 157. 1753. *Volvulopsis nummularius* (L.) Roberty in Candollea 14 : 28. 1952.

Creeping, perennial herbs, rooting from the nodes. Leaves 0.5-2.0 × 0.5-2.0 cm, ovate-elliptic or rounded-suborbicular, cordate-based, hairy on the nerves beneath. Flowers axillary, solitary or paired on a common peduncle, pedicels decurved after anthesis. Calyx segments lanceolate, apiculate, ciliate. Corolla white. Capsules 3-5 mm in diam., globose, 1-locular, 2-valved, 4-seeded. Seeds subglobose, brown to black.

Fl. & Fr. : March - November.

Native of America ; naturalized in wet habitats in the gardens.

Selected specimen : Kota : Chhabra, Singh 74021 (LWG).

5. IPOMOEA L.

1a. Ovary 4-celled :

2a. Sepals oblong, obtuse, awned, not enclosing the fruit. Corolla red.

... 10. *I. hederifolia*

- 2b. Sepals orbicular - oblong, subobtusely, concave, enclosing fruit. Corolla purple. ... 12. *I. mauritiana*
- 1b. Ovary 2 to 3 - celled :
- 3a. Ovary 3 - celled :
- 4a. Leaves stipulate, digitately deeply 3 to 7 - lobed. ... 7. *I. coptica*
- 4b. Leaves exstipulate, entire, angled or shallowly 3 - lobed but not digitately :
- 5a. Peduncles usually 1 to 3 - flowered. Bracts linear. Corolla purple. Capsules globose :
- 6a. Seeds glabrous. ... 13. *I. nil* var. *nil*
- 6b. Seeds pubescent. ... 14. *I. nil* var. *himalaica*
- 5b. Peduncles 5 to many - flowered. Bracts setose. Corolla bright blue turning to rose with age. Capsules ovoid. ... 11. *I. indica*
- 3b. Ovary 2 - celled :
- 6a. Flowers sessile or subsessile, in heads or clusters :
- 7a. Leaves rotundate in outline, deeply palmately 5 to 9 - lobed. ... 18. *I. pes - tigridis*
- 7b. Leaves ovate - cordate or oblong - hastate or elliptic - rhomboid, entire or repand or obscurely 3 - lobed :
- 8a. Corolla more than 2.5 cm long. ... 28. *I. wightii*
- 8b. Corolla upto 2 cm long :
- 9a. Capsules glabrous. Seeds villous :
- 10a. Leaves elliptic or rhomboid, subacute. Seeds furred, villous on the margins. ... 23. *I. stocksii*
- 10b. Leaves oblong - hastate, acute. Seeds velvety. ... 21. *I. sindica*
- 9b. Capsules pubescent. Seeds glabrous. ... 9. *I. eriocarpa*
- 6b. Flowers pedicelled, arranged variously but not in heads :
- 11a. Creeping aquatic or marshland herbs. ... 2. *I. aquatica*

- 11b. Erect or twining, terrestrial herbs or shrubs ; if creeper, always terrestrial :
- 12a. Leaves stipulate, deeply digitately or pedately 5 to 9 - partite or foliolate :
- 13a. Corolla upto 2 cm long. 19. *I. pulchella*
- 13b. Corolla more than 2 cm long :
- 14a. Seeds pubescent. ... 3. *I. cairica* var. *cairica*
- 14b. Seeds glabrous. ... 4. *I. cairica* var. *semine - glabra*
- 12b. Leaves exstipulate, entire, angular or somewhat lobed but never digitately :
- 15a. Leaves emarginate or deeply 2 - lobed from the apex midway down - wards. ... 17. *I. pes - caprae*
- 15b. Leaves otherwise :
- 16a. Outer sepals sagittate or cordate at the base. ... 22. *I. sinensis* subsp. *sinensis*
- 16b. Outer sepals truncate or rounded at the base :
- 17a. Stem muricated or prickly :
- 18a. Flowers purple. Stamens included. ... 26. *I. turbinata*
- 18b. Flowers white. Stamens exerted. ... 1. *I. alba*
- 17b. Stem glabrous to hairy, not muricate :
- 19a. Calyx - segments with a distinct awn at or below the tip. ... 14. *I. tricolor*
- 19b. Calyx - segments acute or obtuse, not awned :

- 20a. Flowers in pedunculate umbels :
- 21a. Corolla upto 1.5 cm long. Capsules pubescent. ... 25. *I. triloba*
- 21b. Corolla more than 2.5 cm long. Capsules glabrous :
- 22a. Sepals 10 - 12 mm long. Petioles with stipule like leaves in their axils. ... 16. *I. pallida*
- 22b. Sepals c. 7 mm long. Petioles without axillary leaves. ... 20. *I. sepiaria*
- 20b. Flowers in pedunculate cymes or panicles :
- 21a. Corolla upto 3 cm long. Capsules crowned by calyx - base :
- 23a. Sepals glabrous. ... 15. *I. obscura*
- 23b. Sepals clothed with long hairs :
- 24a. Hairs on sepals bulbous - based. Corolla upto 12 mm long. ... 27. *I. verticillata*
- 24b. Hairs on sepals not bulbous - based. Corolla more than 15 mm long. ... 8. *I. dichroa*
- 21b. Corolla more than 6 cm long. Capsules obtuse :
- 25a. Twining shrubs. Leaves acute or apiculate. ... 5. *I. carnea* var. *carnea*
- 25b. Erect, stout shrubs. Leaves acuminate. ... 6. *I. carnea* var. *fistulosa*

1. *Ipomoea alba* L. Sp. Pl. 161. 1753. *I. bona-nox* L. Sp. Pl. ed. 2. 228. 1762 ; Clarke in Hook. f. Fl. Brit. India 4 : 197. 1883. *Calonyction speciosum* Choisy in Mem. Soc. Phys. Geneve 6 : 441. t. 1. f. 4. 1833 ; Wight, Ic. 4 (2) : 13. t. 1361. 1848. *C. bona-nox* (L.) Bojer, Hort. Maurit. 227. 1837 ; Duthie, Fl. Gangetic Plain 2 : 118. 1911. 'Moon Flower' (English).

Extensive twiners, with mucronate or almost prickly stems. Leaves 7 - 12 cm long, broadly ovate, acuminate, entire, glabrous, deeply cordate at the base ; petioles about as long as the leaves. Peduncles 5 - 15 cm long, glabrous, 1 to 5 flowered. Bracts caducous. Sepals subequal, ovate, mucronate. Corolla white ; tube 7 - 9 cm long. Anthers shortly exerted. Capsules c. 2.5 cm long, ovoid oblong, narrowed upwards. Seeds irregularly 3 - gonous, glabrous, yellow.

Fl. & Fr. : October - December.

Often found in the thickets of *Euphorbia* in wastelands. Flowers fragrant, open at night and fading in the morning.

Selected specimen : Banswara : Kushalgarh, Kanodia 75669, 54438 (BSI).

2. *Ipomoea aquatica* Forsk. Fl. Aegypt.-Arab. 44. 1775 ; Clarke in Hook. f. Fl. Brit. India 4 : 210. 1883 ; Mahesh. Illus. Fl. Delhi f. 139. 1966. *Convolvulus repens* Vahl, Symb. Bot. 1 : 17. 1790, non L. 1753. *Ipomoea reptans* Poir. in Lam. Encycl. Meth. Bot. Suppl. 3 : 460. 1814, non *Convolvulus reptans* L. ; Duthie, Fl. Gangetic Plain 2 : 114. 1911. *Ipomoea repens* (Vahl) Roth, Nov. Pl. Sp. 110. 1821, non *Convolvulus repens* L. 1753. 'Nali' (Hindi).

Floating or creeping, aquatic, or marshy herbs, rooting on the nodes; stem fistular, glabrous. Leaves variable, 4-8 × 1-5 cm, ovate to oblong, lanceolate-linear, cordate, hastate or sagittate at the base, acute or shortly acuminate at the tip. Flowers in axillary, 1 to 5 flowered, pedunculate cymes. Sepals subequal, oblong-lanceolate, membranous. Corolla 3-6 cm long, infundibuliform, pale rosy or purple or white ; lobes 5, obscure. Filaments very unequal, hairy at base. Capsules ovoid-globose, glabrous, 2 to 4 seeded. Seeds minutely pubescent.

Fl. & Fr. : Most part of the year.

Common in aquatic and semi-aquatic habitats around tanks, ditches, rice fields etc.

Selected specimens : Banswara : Chandan Singh ki Bassi, Singh 3631 (BSJO) ; Ganganagar : Khanuwali 7 Candy, Roy 4897 (BSJO) ; Jaipur : Daosa, Sharma Acc. No. 12539 (RUBL) ; Kota : Singh 90266 (LWG) ; Udaipur : Parla ka Pul, Majumdar 10309 (BSA).

3. *Ipomoea cairica* (L.) Sweet, Hort. Brit. 287. 1827 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 162. 1976. *Convolvulus cairicus* L. Syst. Nat. ed. 10. 922. 1759. *Ipomoea palmata* Forsk. Fl. Aegypt.-Arab. 43. 1775 ; Clarke in Hook. f. Fl. Brit. India 4 : 214. 1883, excl. some syns. *I. pulchella* Wight. Ic. 1 (8) : 8. t. 156. 1839, non Roth 1821 ; Duthie, Fl. Gangetic Plain 2 : 117. 1911. 'Railway creeper' (English).

var. *cairica*

Perennial twiners, with tuberous root stock. Leaves palmately 5 to 7-partite ; segments elliptic-obovate or lanceolate, narrowed at both ends, retuse, mucronate at apex, glabrous or punctate. Flowers in 1 to 3-flowered cymes, Calyx-segments unequal, ovate, mucronulate, tuberculate on the back of outer ones. Corolla 6-7 cm long, white or purple. Capsules 2-celled, 4-valved. Seeds pubescent.

Fl. & Fr. : Throughout the year.

Common among bushes, shrubs and hedges of gardens, waste places and outskirts of forests. Also cultivated in the gardens, parks, railway platforms etc. Easily propagated by stem cuttings.

Selected specimens : Bharatpur : Wair, *Parmar* 8715 (BSJO) ; Bikaner : Shivabari, *Roy* 2132 (BSJO) ; Jodhpur : Bilara, *Singh* 3514 (BSJO) ; Jhalawar : Bhawanimandi, *Verma* 3490 (BSJ). Also reported from Udaipur (Ramdeo, 1969).

4. var. *semine glabra* (Blatt. & Hallb.) Bhandari, *Fl. Ind. Desert* 253. 1978. *I. palmata* Forsk. var. *semine-glabra* Blatt. & Hallb. in *Journ. Bomb Nat. Hist. Soc.* 26 (1) : 546. 1919.

Differs from the proper species by having glabrous seeds.

Fl. & Fr. : August - November.

Rare, in wastelands near habitations. Not collected again after the type.

Selected specimen : Jaisalmer : Vinjorai, *Blatter & Hallberg* 6675 (Lectotype, BLAT).

5. *Ipomoea carnea* Jacq. *Enum. Pl. Carib.* 13. 1760 ; *Johriin J. Econ. Tax. Bot.* 5 : 1120. 1984.

subsp. *carnea*

Twining shrubs, upto 3 m high. Leaves 10-25 × 6.0-7.5 cm, broadly ovate or ovate-oblong, acute or apiculate, entire. Anatomically diffuse porous in root, radial-row porous in stem, ray cells broad, sheath cells present, phelloderm originates from deeper layer of cortical cells. Flowers in 1 to many-flowered cymes. Corolla purple. Capsules ovoid, c. 2 cm in diam., glabrous. Seeds densely villous, brown.

Fl. & Fr. : Throughout the year.

Native of America ; rarely found in wastelands in and around the gardens. Usually cultivated in the gardens. Plants prefer dry habitats.

Selected specimens : Churu : Sardarshahar, *Roy* 6074 (BSJO) ; Jodhpur : *Johri s.n.* 17265 (RUBL) ; Kota : *Singh* 90870 (LWG).

6. subsp. *fistulosa* (Mart. ex Choisy) Austin in *Taxon* 26 : 237. f. 2. 1977. *Ipomoea fistulosa* Mart. ex Choisy in *DC. Prodr.* 9 : 349. 1845 ; Mahesh, *Illus. Fl. Delhi* f. 138. 1966 ; Raizada, *Suppl. Duthie, Fl. Gangetic Plain* 163. 1976. 'Nagar pan' (Hindi).

Erect, stout shrubs. Leaves ovate lanceolate, undulate, acuminate. Anatomically radial row porous in root, diffuse porous in stem, ray cells narrow, sheath cells absent, phelloderm just after the epidermal layer.

Fl. & Fr. : Throughout the year.

Native of South America ; common in wastelands and along the roads, particularly near water resources it forms dense community. Easily propagated by stem cuttings and its growth is very fast.

Selected specimens : Alwar : Siriska Tiger Reserve, Parmar 9707 (BSJO) ; Banswara : Saina vasi village, Singh 2955 (BSJO) ; Bikaner : Chattargarh, Roy 2115 (BSJO) ; Jaipur : Bapunagar, Bharu Lal Acc. No. 12647 (RUBL) ; Jodhpur : Pipad, Singh 3562 (BSJO) ; Kota Nahargarh, Wadhwa 9398 (BSA) ; Tonk : Niwai Temple, Pandey 4748 (BSJO).

Notes : Verma and Srivastava [J. Econ. Tax. Bot. 4 (3) : 903-907, 1983] have made an attempt to prove that *I. carnea* Jacq. and *I. fistulosa* Mart. ex Choisy are conspecific ignoring differences pointed out in the habit, leaf - shape character, wood anatomy and pollen morphology by earlier workers. The author does not agree with them. However, he considers *I. fistulosa* Mart. ex Choisy as a subsp. under *I. carnea* Jacq. due to inadequate differentiating morphological characters which can be observed and assessed easily in the field as well as laboratory.

7. *Ipomoea coptica* (L.) Roth ex Roem. & Schult. Syst. Veg. 4 : 208, 1819 ; Mahesh. Illus. Fl. Delhi f. 142, 1966. *Convolvulus copticus* L. Mant. Pl. 2, App. 559, 1771. *Ipomoea dissecta* Willd. Phytogr. 5, t. 2, f. 3, 1794, non Pers. 1797 ; Clarke in Hook. f. Fl. Brit. India 4 : 200, 1883 ; Duthie, Fl. Gangetic Plain 2 : 115, 1911. 'Amarti' (Hindi).

Prostrate or twining annuals. Leaves digitately or pedately 3 to 7 lobed ; lobes linear lanceolate or ovate elliptic, serrate dentate ; petioles with axillary, stipule - like leaves at their base. Flowers axillary, solitary, pedunculate. Bracts near the flowers, minute, lanceolate, acute or flowers sessile among leaf - like pectinate bracts. Sepals oblong, shortly cuspidate, mucronate on the back. Corolla tubular, white, acutely 5 lobed. Capsules 5-7 mm in diam., subglobose, glabrous, 3 to 6-valved. Seeds densely pubescent.

Fl. & Fr. : July - March.

Native of America ; naturalized among bushes in wastelands and on the edges of fields and garden.

Selected specimens : Banswara : Loharia forest, Singh 4239 (BSJO) ; Bharatpur : Raizada 64497 (DD) ; Jaipur : Chaksu, Sharma 1918 (RUBL) ;

Jodhpur : Bilara, *Singh* 4453 (BSJO) ; Kota : Atru, *Singh* 91034 (LWG) ; Pali : Manda village, *Shetty* 1828 (BSJO) ; Sirohi : Mt. Abu, *Mehta* 842 (JAC).

8. *Ipomoea dichroa* (Roem. & Schult.) Choisy in DC. Prodr. 9 : 364. 1845. *Convolvulus bicolor* Desr. in Lam. Encycl. 3 : 564. 1791, non *Ipomoea bicolor* Lam. 1791. *Convolvulus dichrous* Roem. & Schult. Syst. Veg. 4 : 263. 1819. *C. pilosus* Roxb. Fl. Ind. 2 : 55. 1824, non Rottl. 1803. *Ipomoea pilosa* Sweet, Hort. Brit. ed. 2. 289. 1827, non Houtt. 1777 ; Wight, Ic. 3 (2) : 3. t. 837. 1844 - 45 ; Clarke in Hook. f. Fl. Brit. India 4 : 213. 1883 ; Duthie, Fl. Gangetic Plain 2 : 114. 1911. *I. arachnosperma* Welw. Apont. Phytogeogr. 588. 1857.

Twining, annual herbs, clothed with long, spreading, glandular-based brownish hairs. Leaves 4.5 - 15.0 × 4 - 15 cm, ovate cordate, entire, angled or 3 lobed, acute or acuminate, appressed white tomentose beneath. Flowers in lax, axillary, racemose cymes. Bracts ovate lanceolate, 1.0 - 1.5 cm long. Calyx lobes ovate lanceolate, acuminate. Corolla 1.5 - 3.5 cm long, tube suddenly widened at mouth, bright pink. Capsules c. 1 cm in diam., subglobose, glabrous. Seeds cotton hairy.

Fl. & Fr. : August - December.

Common in open forests in hilly areas and along the boundaries of gardens among hedges. Flowers open in the morning hours. In moist habitats, the leaves are usually infected by *Albugo* species.

Selected specimens : Banswara : Kushalgarh, *Kanodia* 75728 (BSI) ; Barmer : Balotra, *Shetty* 2257 (BSJO) ; Jaipur : Ramgarh, *Sharma* 680, 2170 (RUBL) ; Jodhpur : *Bhandari* 193, 1748 (JAC) ; Kota : Gabernath Mahadeo, *Singh* 74652 (LWG) ; Sirohi : Mt. Abu, *Mehta* 563 (JAC).

9. *Ipomoea eriocarpa* R. Br. Prodr. 484. 1810 ; Clarke in Hook. f. Fl. Brit. India 4 : 204. 1883. *Convolvulus hispidus* Vahl, Symb. Bot. 3 : 29. 1794. *Ipomoea hispida* (Vahl) Roem. & Schult. Syst. Veg. 4 : 238. 1819, non Zucc. 1809 ; Duthie, Fl. Gangetic Plain 2 : 113. 1911. '*Boota, Ghlabata, Nakhri*' (Hindi).

Twining or creeping, annual, hispid herbs. Leaves 3 - 12 × 0.8 - 5.0 cm, ovate lanceolate or oblong, cordate or hastate at the base, acuminate or acute at the tip, pilose. Flowers sessile, in sessile or subsessile, 1 to 7 flowered clusters. Bracts upto 1 cm long, linear. Calyx lobes subequal, ovate, acuminate, pilose. Corolla campanulate, pubescent in upper part and with small tuft of hairs at the apices of small acute lobes. Capsules 6 - 8 mm in diam., ovoid or globose, 2 celled, 4 - valved, hairy. Seeds glabrous.

Fl. & Fr. : August - January, rarely most part of the year.

Rare, in open forests among bushes, waysides and on the boundaries of fields.

Selected specimens : Alwar : Bala Fort Forest, *Hira Lal* 34469 (LWG) ; Banswara : Kotharia Forest, *Singh* 3756 (BSJO) ; Ganganagar : Dabli, *Roy* 5054 (BSJO) ; Jaipur : Ramgarh, *Sharma* 817, 1302 (RUBL) ; Jodhpur : *Bhandari* 49 (JAC) ; Kota : Sitabari, *Wadhwa* 9296 (BSA) ; Sirohi : Mt. Abu, *Mehta* 220 (JAC).

10. *Ipomoea hederifolia* L. Syst. Nat. ed. 10. 925. 1759. *I. angulata* Lam. Encycl. Meth. Bot. 1 : 464. 1793. *I. phoenicea* Roxb. Fl. Ind. 2 : 92. 1824. *Quamoelit phoenicea* (Roxb). Choisy in Mem. Soc. Phys. Geneve 6 : 433. 1834 ; Duthie, Fl. Gangetic Plain 2 : 122. 1911. *Ipomoea cocctnea* auct. non L. 1753 ; Clarke in Hook. f. Fl. Brit. India 4 : 199. 1883, *pro parte*.

Annual, herbaceous twiners, with 3 angular, glabrous or shortly hairy stems. Leaves 4 15 × 2.5 12.0 cm, ovate cordate, entire or 3 to 5 angular or lobed, glabrous. Flowers in 1 to many-flowered, scorpioid cymes. Calyx lobes oblong, obtuse, each with a 3 - 5 mm long awn. Corolla 3 4 cm long, red. Stamens exserted. Capsules 6 8 mm long, globose, 4 celled. Seeds pubescent.

Fl. & Fr. : July - November.

Rare, in scrub forests, road-sides, along railway lines etc.

Selected specimens : Jodhpur : *Bhandari* 1531, 1678 (JAC) ; Kota : Chhabra, *Singh* 83807, 90692 (LWG).

11. *Ipomoea indica* (Burm. f.) Merr. Int. Rumph. Herb. Amb. 445. 1917. *Convolvulus indicus* Burm. f. in Rumph. Herb. Amb. 7 : 6. 1755. *Ipomoea leari* Paxt. in Paxton, Bot. Mag. 6 : t 267. 1839 ; Duthie, Fl. Gangetic Plain 2 : 117. 1911. 'Morning Glory' (English).

Twining perennials, upto 6 m high. Leaves 4 11 × 3 9 cm, ovate-cordate, palmately 3 lobed. Flowers bright blue, in capitata clusters of 5 to many. Bracts setose to foliaceous. Sepals linear - lanceolate, hairy - pubescent. Seeds glabrous.

Fl. & Fr. : August - March.

Native of America ; cultivated in the gardens, parks etc. ; commonly runs wild in wastelands, apparently forming part of indigenous flora. Flower - colour changes to pink or red in the afternoon while closing. Often mistaken for *I. nil* (L.) Roth or *I. purpurea* (L.) Roth.

Selected specimens : Barmer : Haldeshwar Mahadeo, Pandey 7949, 7961 (BSJO) ; Jodhpur : Bhandari 732 (JAC) ; Sirohi : Mt. Abu, Mehta 219 (JAC).

12. *Ipomoea mauritiana* Jacq. Collect. 4 : 216. 1791 & in Hort. Schoenbr. 2 : 39. t. 200. 1797 ; Shah, Fl. Gujarat 1 : 471. 1978. *Convolvulus paniculatus* L. Sp. Pl. 156. 1753. *Ipomoea digitata* auct. non L. 1759 ; Clarke in Hook. f. Fl. Brit. India 4 : 202. 1883. *I. paniculata* (L.) R. Br. Prodr. 486. 1810, non Burm. f. 1768.

Large, glabrous twiners, with tuberous roots. Leaves 5 - 24 × 6 - 18 cm, orbicular in outline, entire or palmately 3 to 9 - lobed, cordate or truncate at base ; lobes lanceolate to ovate, acuminate, entire. Petioles 3 - 11 cm long. Flowers in few to many flowered, pedunculate cymes ; peduncles 2.5 - 20.0 cm long ; pedicels 0.9 - 2.5 cm long. Sepals 6 - 12 mm long, orbicular or elliptic, clasping the corolla tube. Corolla funnel-shaped, reddish purple. Capsules 1.2 - 1.5 cm long, ovoid, obtuse. Seeds 6 - 7 mm long, clothed with silky hairs.

Fl. & Fr. : July - November.

Rare, in moist habitats in the forests.

Selected specimen : Udaipur : Chhapti, Kanodia 82480 (BSI).

13. *Ipomoea nil* (L.) Roth, Cat. Bot. 1 : 36. 1797 ; Mahesh. Illus. Fl. Delhi f. 145. 1966. *Convolvulus nil* L. Sp. Pl. ed. 2. 1 : 219. 1762. *Ipomoea hederacea* auct. plur. non (L.) Jacq. 1760 ; Clarke in Hook. f. Fl. Brit. India 4 : 199. 1883 ; Duthie, Fl. Gangetic Plain 2 : 116. 1911. *I. hederacea* (L.) Jacq. var. *integrifolia* Clarke in Hook. f. l.c. 4 : 200. 1883. 'Gheta, Kala Danah, Mirchai, Nil Kalmi' (Hindi).

var. *nil*

Twining, perennial herbs, with watery sap and retrorsely grey brown hairy stems. Leaves 3 - 15 × 2.5 - 12.0 cm, ovate cordate, entire or 3 lobed, acuminate, appressed hairy. Flowers in axillary, 1 to 5 - flowered, peduncled cymes. Bracts linear. Sepals 1.5 - 2.5 cm long, ovate - lanceolate, acuminate, hirsute, ciliate, accrescent. Corolla 4 - 6 cm long, purple. Capsules 1.0 - 1.5 cm in diam., 3 - valved, 3 - celled.

Fl. & Fr. : August - November.

Common in wastelands, forests, boundaries of fields and gardens. Flowers usually close up before noon.

Selected specimens : Alwar : Siriska Tiger Reserve, Parmar 9544 (BSJO) ; Banswara : Shergarh, Singh 3074 (BSJO) ; Barmer : Dhori -

manna hills, *Shetty* 2338 (BSJO); Kota : *Singh* 74071 (LWG); Sirohi : Mt. Abu, *Rao* 66662 (BSI). Also reported from Udaipur (Ramdeo, 1969).

14. var. *himalaica* (Clarke) Johri in Journ. Econ. Tax. Bot. 5 : 432. 1984. *Ipomoea hederacea* auct. plur. non (L.) Jacq. 1760 var. *himalaica* Clarke in Hook. f. Fl. Brit. India 4 : 200. 1883. 'Kirpan Bel' (Hindi).

Closely resembles the proper species except that it bears pubescent seeds, comparatively large leaves, flowers and accrescent calyx.

Fl. & Fr. : August - October.

It is a denizen of high altitude. Rarely found on the Aravalli hills.

Selected specimens : Sawaimadhopur : Ranthambhore, *Sharma* 3134 (RUBL); Sirohi : Mt. Abu, *Sharma* 5552 (RUBL).

15. *Ipomoea obscura* (L.) Ker - Gawl. Bot. Reg. 3 : t. 239. 1817; Clarke in Hook. f. Fl. Brit. India 4 : 207. 1883; Duthie, Fl. Gangetic Plain 2 : 215. 1911. *Convolvulus obscurus* L. Sp. Pl. ed. 2. 200. 1762. *Ipomoea obscura* (L.) Ker - Gawl. var. *gemella* Clarke in Hook. f. l.c. 4 : 207. 1883.

Twining herbs, glabrous or with few spreading hairs. Leaves 2 - 7 × 2 - 8 cm, ovate to orbicular or reniform, entire, acute or acuminate, cordate based. Flowers axillary, solitary or 2 to 3 together on peduncles. Bracts minute, linear - lanceolate. Sepals subequal, c. 5 mm long, oblong, shortly apiculate. Corolla 2 - 3 cm long, infundibuliform, white with yellow bands and with a small purple eye; lobes apiculate. Capsules ovoid or globose, 2 celled, 4 valved. Seeds brown, velvety.

Fl. & Fr. : July - April.

Common among bushes in wastelands, hedges of fields and gardens and open forests.

Selected specimens : Bharatpur : Naharpura, *Parmar* 8761 (BSJO); Banswara : Chandu ji ka Garha, *Singh* 3001 (BSJO); Barmer : Silly Pasture, *Tiwari* 996 (BSJO); Jodhpur : *Bhandari* 1775 (JAC); Kota : *Singh* 90225 (LWG); Sirohi : Mt. Abu, *Jain* 60194 (BSI).

16. *Ipomoea pallida* Sant. & Patel in Trans. Bosc Res. Inst. 22 : 38. 1958. *Convolvulus stipulaceus* Roxb. Fl. Ind. 1 : 484. 1824. *Ipomoea stipulacea* (Roxb.) Sweet, Hort. Brit. 372. 1827, non Jacq. 1760. *I. sepriaria* Koen. ex Roxb. var. *stipulacea* (Roxb.) Clarke in Hook. f. Fl. Brit. India 4 : 209. 1883.

Glabrous or pubescent, twining herbs. Leaves 3.0 - 7.5 × 3 - 5 cm, triangular - ovate, cordate at base with rounded lobes or angular or

sagittate to hastate at the base, acute or acuminate at the apex. Petioles with stipule like small leaves in their axils. Flowers white. Sepals 10 - 12 mm long. Capsules apiculate. Seeds densely tomentose.

Fl. & Fr. : August - November.

Rare, among bushes along the roads and wastelands. Very close to *I. sepiaria* Koen. ex Roxb.

Selected specimen : Kota : Atru, Singh 83775 (LWG).

17. *Ipomoea pes caprae* (L.) R. Br. in Turkey, Narr. Exped. Congo, App. 477. 1818 ; Sweet, Hort. Suburb. Londin. 35. 1818 ; Bhandari, Fl. Ind. Desert 258. 1978 ; Sharma & Tiagi, Fl. N.E. Raj. 270. 1979. *Convolvulus pes-caprae* L. Sp. Pl. 159. 1753. *I. biloba* Forsk. Fl. Aegypt. Arab. 44. 1775 ; Cooke, Fl. Bombay 2 : 248. 1905. 'Do Patti Lata' (Hindi).

Glabrous, perennial, prostrate or twining herbs, with long roots having thick brown bark. Leaves 4 - 6 × 5.0 - 7.5 cm, broader than long, deeply 2 lobed or rarely emarginate, fleshy, conspicuously parallel veined, cuneate or truncate at the base. Flowers solitary or 2 to 3 together ; peduncles 2.5 - 12.0 cm long. Bracts lanceolate, caducous. Two outer sepals oblong, obtuse, apiculate, smaller than inner ; 3 inner ones elliptic-oblong, obtuse or emarginate, apiculate. Corolla tubular, infundibuliform, pink-purple. Filaments dilated and hairy at the base. Capsules ovoid, glabrous. Seeds villous.

Fl. & Fr. : August - March.

Common in the desert area in sandy soils. It is a fast growing plant which may be propagated by vegetative means. It is a good soil binder.

Selected specimens : Barmer : Leela dhora, Tiwari 961 (BSJO) ; Bikaner : Baman-wadi, Roy 2161 (BSJO) ; Churu : Sardar Shahar, Roy 3985 (BSJO) ; Jaipur : Ramgarh, Sharma 378 (RUBL) ; Jodhpur : Bhandari 1228 (JAC).

18. *Ipomoea pes-tigridis* L. Sp. Pl. 162. 1753 ; Clarke in Hook. f. Fl. Brit. India 4 : 204. 1883 ; Duthie, Fl. Gangetic Plain 2 : 116. 1911 ; Mahesh, Illus. Fl. Delhi f. 143. 1966. *I. hepaticaeifolia* L. Sp. Pl. 161. 1753. *I. capitellata* Choisy in Mem. Soc. Phys. Geneve 6 : 446. 1884 & in DC. Prodr. 9 : 365. 1845. *I. pes-tigridis* L. var. *hepaticaeifolia* (L.) Clarke in Hook. f. l. c. 4 : 204. 1883. *I. pes-tigridis* L. var. *capitellata* (Choisy) Clarke in Hook. f. l. c. 4 : 204. 1883. 'Gheta, Ghiabati, Panchpatia' (Hindi).

Twining herbs, clothed with long spreading hairs. Leaves 3-10 cm in diam., rotundate in outline, palmately 5 to 9-lobed; lobes elliptic-oblong, hirsute. Flowers sessile, 3 or more in a head; peduncles as long or longer than petioles. Bracts 1.5-3.0 cm long, ovate-lanceolate, forming an involucre. Two outer sepals ovate-lanceolate, broader than 3 inner linear-oblong ones. Corolla tubular-companulate, white or pale pink. Capsules ovoid, glabrous, enclosed in the calyx. Seeds 4, triangular, silky.

Fl. & Fr. : August-December.

Common weed in cultivated fields, grasslands and open jungles. Flowers open in the afternoon. It is a polymorphic species showing qualitative and quantitative variations in leaf character.

Selected specimens : Alwar : Siriska Tiger Reserve, Parmar 9409 (BSJO); Banswara : Kotharia Forest, Singh 3042 (BSJO); Jaipur : Ramgarh, Sharma 803 (RUBL); Jaisalmer : Amar Sagar, Wadhwa 5192 (BSA); Kota : Shahabad, Verma 494 (BSA); Sirohi : Mt. Abu, Mehta 578 (JAC).

19. *Ipomoea pulchella* Roth. Nov. Pl. Sp. 115. 1821; Shah, Fl. Gujarat 1 : 473. 1978; Parmar & Singh in Journ. Econ. Tax. Bot. 3 : 505. 1982; Johri in Journ. Econ. Tax. Bot. 5(5) : 1132. 1984.

Slender, herbaceous twiners. Leaves deeply 5-lobed; lobes obovate-oblanccolate, glabrous, basal lobes bilobed once again. Flowers 1-3, in axillary cymes. Corolla 1.2-1.5 cm long. Capsules 0.8-1.0 cm in diam., globose, glabrous. Seeds silky-hairy.

Fl. & Fr. : September - November, rarely upto March.

Rare, among bushes along the roads in wastelands.

Selected specimen : Bhilwara : Ganthila village, Singh 7112 (BSJO).

20. *Ipomoea sepiaria* Koen. ex Roxb. Fl. Ind. 2 : 90. 1824; Wight, Ic. 3(2) : 3. t. 838. 1844-45; Clarke in Hook. f. Fl. Brit. India 4 : 209. 1883; Duthie, Fl. Gangetic Plain 2 : 115. 1911. *I. maxima* auct. plur. non (L. f.) D. Don ex Sweet. 1830; Ooststr. in Blumea 3 : 525. 1940. 'Phang' (Hindi).

Twining, perennial or annual herbs. Leaves 3-8 × 3.0-5.5 cm, ovate, cordate to hastate or sagittate at the base, entire, acute or acuminate. Flowers in pedunculate subumbellate cymes; peduncles 2.5-15 cm long, thick. Bracts lanceolate, caducous. Pedicels clavate in fruit. Sepals c. 7 mm long, elliptic, apiculate, membranous-margined, 2 outer

shorter than 3 inner ones. Corolla tubular infundibuliform, pale purple or white; lobes acute or shortly apiculate. Filaments hairy at the base. Capsules 5-7 mm in diam., globose, glabrous, 2-celled, 4-valved, 2 or 4-seeded. Seeds thinly pubescent.

Fl. & Fr. : August - December.

Occasional, among bushes along the roads and in wastelands.

Selected specimens : Alwar : Siriska Tiger Reserve, *Parmar* 9546 (BSJO); Banswara : Ghatol Rd., *Singh* 2944 (BSJO); Kota : Baran, *Majumdar* 10814 (BSA). Also reported from Udaipur (Ramdeo, 1969).

21. *Ipomoea sindica* Stapf in Kew Bull. 93 : 346. 1894; Duthie, *Fl. Gangetic Plain* 2 : 113. 1911; Mahesh. *Illus. Fl. Delhi* f. 140. 1966; Bhandari, *Fl. Ind. Desert* 260, f. 93. 1978. '*Rota Bel*' (Hindi).

Trailing or creeping, hirsute herbs. Leaves 2-8 × 1-6 cm, oblong or ovate cordate to triangular hastate or sagittate, entire. Flowers in axillary, 1 to few flowered cymes. Bracts linear, hairy. Sepals lanceolate, dilated at the base, slightly enlarged in fruit, hispid. Corolla infundibuliform, with a tuft of hairs at the tip of each lobe. Capsules 5-8 mm in diam., globose or ovoid, glabrous. Seeds black, grey velvety.

Fl. & Fr. : August - November.

Common in wastelands and open forests among grasses and bushes. Closely resembles *I. eriocarpa* R. Br.

Selected specimens : Ajmer : *Lowrie* 138 (DD); Alwar : Siriska Tiger Reserve, *Parmar* 9404 (BSJO); Banswara : Ghatol, *Kanodia* 75483 (BSI); Barmer : Haldeshwar Mahadeo, *Pandey* 7952 (BSJO); Jodhpur : Mandore, *Singh* 626 (BSJO); Udaipur : Dabok, *Ramchandra* 188/Bot (RUBL).

22. *Ipomoea sinensis* (Desr.) Choisy in Mem. Phys. Soc. Geneve 6 : 459. 1834. *Convolvulus sinensis* Desr. in Lam. *Encycl.* 3 : 557. 1792. *C. calycina* Roxb. *Fl. Ind.* 2 : 51. 1824. *Ipomoea calycina* (Roxb.) Benth. ex Clarke in Hook. f. *Fl. Brit. India* 4 : 201. 1883; Duthie, *Fl. Gangetic Plain* 2 : 112. 1911.

subsp. *sinensis*

Twining herbs, clothed with long spreading hairs. Leaves 3-7 × 2.5-6.0 cm, ovate-cordate, acuminate. Flowers 1-3, on short axillary peduncles; pedicels about as long as peduncles. Bracts ovate-lanceolate or linear-lanceolate, acute. Sepals unequal, outer lanceolate-sagittate in fruit with obtuse auricles, the inner linear-lanceolate. Corolla upto

2.5 cm long, tubular, white, pilose outside. Capsules 0.8 - 1.2 × 0.7 - 1.0 cm, ovoid or globose, glabrous. Seeds 5 - 6 mm long, villous, fringed on the margins with soft, white hairs.

Fl. & Fr. : August - December.

Common among bushes in wastelands, open forests and edges of fields and gardens.

Selected specimens : Banswara : Loda village, *Kanodia* 75315 (BSI) ; Danpur, *Singh* 3713 (BSJO) ; Jhalawar : Eklera, *Singh* 83700 (LWG) ; Pali : Ghencrao, *Shetty* 1884 (BSJO) ; Udaipur : Bagdora forest, *Kanodia* 82339 (BSI).

23. *Ipomoea stocksii* Clarke in Hook. f. *Fl. Brit. India* 4 : 204. 1883 ; Cooke, *Fl. Bombay* 2 : 244. 1905 ; Johri in *Journ. Econ. Tax. Bot.* 5(5) : 1139. 1984.

Prostrate or twining, patently hairy herbs. Leaves c. 9 cm long, elliptic or rhomboid, subacute, obtuse or subcordate at the base. Petioles 0.8 - 3.5 cm long. Flowers in sessile heads. Bracts elliptic - lanceolate, hispid. Sepals 8 - 15 mm long, elliptic lanceolate, patently hispidulous. Capsules 6 - 10 mm long, ovoid, glabrous, 2 - celled, 4 - seeded. Seeds furred, margins villous.

Fl. & Fr. : August - December.

Rare, in the forests. Very close to *I. eriocarpa* R. Br. and *I. sindica* Stapf.

Selected specimens : Sirohi : Vada Khoda, *Jain* 60439, Acc. No. 81461 (BSI).

Notes : Closely allied to *I. clarkei* Hook. f. ; the latter, however, does not occur in Rajasthan.

24. *Ipomoea tricolor* Cav. *Icon. Descr. Pl.* 3 : 5. t. 208. 1784 ; Duthie, *Fl. Gangetic Plain* 2 : 117. 1911. *I. violacea* auct. non L. 1753. *I. rubro-caerulea* Hook. *Bot. Mag.* t. 3297. 1834 ; Cooke, *Fl. Bombay* 2 : 252. 1905.

Twining, glabrous, annual shrubs. Leaves 3 - 8 × 2 - 6 cm, broadly ovate - cordate, entire, acuminate. Flowers on axillary, dichotomously branched, 3 to 9 - flowered peduncles. Sepals 4 - 6 mm long, ovate - lanceolate, hyaline - margined, obtuse. Corolla 4 - 6 cm long, blue, fading to purplish red with white tube. Capsules globose, glabrous. Seeds black, glabrous or minutely pubescent.

Fl. & Fr. : October - January.

Native of Mexico ; naturalized in wastelands in Jhalawar district. Flowers open in the early morning and fade in the evening. Often confused for *Jacquemontia pentantha* (Jacq.) G. Don.

Selected specimen : Jhalawar : Eklera, Singh 83699 (LWG).

25. *Ipomoea triloba* L. Sp. Pl. 161. 1753 ; Shah, Fl. Gujarat 1 : 475. 1978 ; Johri in Journ. Econ. Tax. Bot. 5 (5) : 1136. 1984.

Twining annuals, upto 3 m long. Leaves 2.5 - 8.5 × 2.4 - 7.0 cm, broadly ovate cordate, 3 lobed, entire to coarsely dentate margined ; petioles 3 - 8 cm long. Flowers umbelled at the end of axillary peduncles about as long as petioles. Sepals lanceolate, acute. Corolla 0.8 - 2.0 cm long, pale to bright purple. Capsules ovate or subglobose, glabrous.

Fl. & Fr. : August - November.

Native of Tropical America ; rare, naturalized along the boundaries of gardens.

Selected specimen : Bundi : Ishwari Fruit Garden, Singh 74071 (LWG).

26. *Ipomoea turbinata* Lag. Gen. Sp. Pl. 10. 1816 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 164. 1976. *Convolvulus muricatus* L. Mant. Pl. 44. 1767. *Ipomoea muricata* (L.) Jacq. Pl. Hort. Schoenbr. 3 : 40. t. 323. 1798 (1803), non Cav. 1799 ; Clarke in Hook. f. Fl. Brit. India 4 : 197. 1883. *Calonyction muricatum* (L.) G. Don, Gen. Hist. 4 : 264. 1838 ; Duthie, Fl. Gangetic Plain 2 : 188. 1911. 'Pherwana' (Hindi).

Twining herbs, with white latex and muricated stem. Leaves 4 - 10 × 4 - 8 cm, ovate to suborbicular, cordate, acuminate. Flowers axillary, solitary or 2 - 5 on short muricated peduncles ; pedicels thickened. Bracts caducous. Sepals elliptic oblong, aristate, 3 outer much broader than 2 inner. Corolla tube upto 6 cm long, rose purple or white, hairy within. Anthers not twisted. Capsules 1.5 × 1.5 - 2.0 cm, globose, glabrous, 4 seeded. Seeds black, glabrous.

Fl. & Fr. : August - November.

Common on the edges of fields and in wastelands among bushes. Flowers open in the early night hours and fade away next morning.

Selected specimens : Alwar : Siriska Tiger Reserve, Parmar 9570 (BSJO) ; Banswara : Danpur, Singh 3714 (BSJO) ; Jaipur : Ramgarh, Sharma Acc. No. 2891 (RUBL) ; Jodhpur : Bhandari 228, 1274 (JAC) ; Kota : Darab, Singh 74887 (LWG) ; Sirohi : Mt. Abu, Mehta 383 (JAC).

Notes : Some authors follow the name *Ipomoea muricata* (L.) Jacq. (1798) for this taxon, being the early homonym of Cav. 1799. A perusal of literature (Staffeu & Cowan 1979 Taxonomic literature 2 : 412) revealed that dates (1798) given on the title page of Jacq. Pl. Hort. Schoenbr. vol. 3. Part 2. is incorrect. Probably correct date is 1803. On this ground, the name has been rejected.

27. *Ipomoea verticillata* Forsk. Fl. Aegypt. Arab. 44. 1775. *I. rumicifolia* Choisy in Mem. Soc. Phys. Geneve 6 : 447. 1834 & in DC. Prodr. 9 : 351. 1845 ; Clarke in Hook. f. Fl. Brit. India 4 : 207. 1883 ; Duthie, Fl. Gangetic Plain 2 : 114. 1911.

Sparsely hirsute, annual, prostrate herbs. Leaves 2.5 × 2 - 5 cm, broadly ovate or subreniform, obtuse and apiculate at the tip, entire, cordate or hastate at base ; petioles upto 10 cm long. Peduncles axillary, 10 - 15 mm long, 1 to 3 flowered, slightly thickened towards apex in fruit, deflexed. Bracts linear, hairy. Calyx 6 - 7 mm long ; lobes subequal, acute, clothed with bulbous based spreading hairs. Corolla 9 - 10 mm long, tubular - campanulate, creamy white. Capsules c. 9 mm long, ovoid, glabrous, crowned by style base. Seeds 3 - 4, densely velvety.

Fl. & Fr. : July - August.

Rare, in salty areas in the desert.

Selected specimens : Barmer : Sheo Road, Tiwari 912 (BSJO) ; Jaipur : Banda, Wadhwa 5105 (BSA) ; Jaisalmer : Sudasari, Pandey 7846 (BSJO) ; Jodhpur : Tolesar, Singh 4352 (BSJO) ; Pali : Guru Pratap Singh ka Guda, Shetty 1985 (BSJO) ; Sirohi : Mt. Abu, Blatter 22276 (BLAT).

28. *Ipomoea wightii* (Wall.) Choisy in Mem. Soc. Phys. Geneve 6 : 470. 1834 ; Wight, Ic. 4(2) : 13. t. 1364. 1848 ; Clarke in Hook. f. Fl. Brit. India 4 : 203. 1883. *Convolvulus wightii* Wall. Pl. As. Rar. 2 : 55. t. 171. 1831.

Twining, fulvous villous herbs. Leaves 6 - 10 cm in diam., broadly ovate - cordate, entire or sinuate dentate or rarely obscurely 3 lobed, acute, softly villous above, white woolly beneath. Peduncles 5 - 12 cm long ; heads 2.5 - 5.0 cm in diam., dense, fulvous villous. Outer bracts c. 2.5 cm long, lanceolate, acuminate ; inner ones shorter, linear. Sepals linear - lanceolate, fulvous hirsute. Corolla 2.5 - 3.5 cm long, sparsely hairy outside, pink purple. Capsules 7 - 10 mm in diam., subglobose, papery, minutely pubescent. Seeds puberulous.

Fl. & Fr. : August - October.

Rare, in the forests.

Selected specimen : Sirohi : Mt. Abu, Mehta 253 (JAC). Also reported by Jain (1962).

6. JACQUEMONTIA Choisy

Jacquemontia paniculata (Burm. f.) Hall. f. in Engl. Bot. Jahrb. Syst. 16 : 541. 1893 ; Duthie, Fl. Gangetic Plain 2 : 107. 1911. *Ipomoea paniculata* Burm. f. Fl. Ind. 50. t. 21. f. 3. 1768. *Convolvulus parviflorus* Vahl, Symb. Bot. 3 : 29. 1794, non Desr. 1791 ; Clarke in Hook. f. Fl. Brit. India 4 : 220. 1883.

Twining shrubs, with young parts pubescent. Leaves 3.5 - 8.0 × 2.5 - 2.0 cm, ovate cordate, acuminate or acute, glabrous. Flowers in pedunculate, many flowered, umbellate cymes ; peduncles 2.5 - 4.0 cm long. Bracts narrowly linear. Sepals ovate lanceolate, acuminate. Corolla tubular, white. Stigmas 2, flattened, elliptic oblong, revolute. Capsules globose, glabrous, 8 valved. Seeds 3 gonous, slightly tuberculate.

Fl. & Fr. : October - February.

Rare, among fences of gardens and fields and in wastelands among bushes and shrubs.

Selected specimens : Jhalawar : Khanpur, Verma 6916 (BSA) ; Dug. Verma 6745 (BSA) ; Sarhod, Wadhwa 7685 (BSA) ; Sirohi : Mt. Abu, Mehta 1785 (JAC). Also reported from Jodhpur (Blatter and Hallberg, 1919 ; Sarup, 1954) and Udaipur (Ramdeo, 1969).

7. MERREMIA Dennst. ex Endl. *nom. cons.*

1a. Leaves simple, entire or crenate - serrate :

2a. Leaves ovate or reniform, base cordate :

3a. Creeping herbs, rooting on the nodes.
Flowers axillary, solitary or in 2 to 5 -
flowered sessile cymose clusters. ... 3. *M. emarginata*

3b. Twining herbs, not rooting on the nodes.
Flowers in axillary racemose cymes. ... 4. *M. hederacea*

2b. Leaves spatulate or oblanceolate, base auricled
or hastate :

4a. Leaves obtuse, truncate or emarginate at the
apex. Outer sepals obtuse or emarginate. ... 6. *M. tridentata*
subsp. *tridentata*

- 4b. Leaves acute at the apex. All sepals acuminate. ... 7. *M. tridentata*
subsp. *hastata*
- 1b. Leaves palmately 3 to 9 - lobed or foliolate :
- 5a. Leaves palmately compound, 5 - foliolate :
- 6a. Leaflets and outer sepals hairy. Peduncles
glandular. ... 1. *M. aegyptia*
- 6b. Leaflets and outer sepals glabrous. Peduncles
glandular at tip. ... 5. *M. quinquefolia*
- 5b. Leaves palmately lobed, not compound :
- 7a. Corolla yellow :
- 8a. Leaves 3 - lobed. Corolla 6 - 12 mm long. ... 4. *M. hederacea*
- 8b. Leaves 5 to 9 - lobed. Corolla 2.5 -
6.0 cm long. ... 8. *M. vitifolia*
- 7b. Corolla white. ... 2. *M. dissecta*

1. *Merremia aegyptia* (L.) Urban, Symb. Antill 4 : 505. 1910. *Ipomoea aegyptia* L. Sp. Pl. 162. 1753. *Convolvulus pentaphylla* L. Sp. Pl. ed. 2. 223. 1762. *Ipomoea pentaphylla* (L.) Jacq. Collect. 2 : 297. 1789 ; Clarke in Hook. f. Fl. Brit. India 4 : 202. 1883. *Batatas pentaphylla* (L.) Wight, Ic. 3 (2) : 3. t. 834. 1844 - 45. *Merremia pentaphylla* (L.) Hall. f. in Engl. Bot. Jahrb. Syst. 16 : 552. 1893 ; Duthie, Fl. Gangetic Plain 2 : 110. 1911. 'Rota bel' (Hindi).

Twining, annual herbs, clothed with glandular based, long, scattered hairs. Leaves digitately 5 foliolate ; leaflets subsessile, 5 10 × 2 5 cm, broadly lanceolate, entire to dentate, acuminate. Petioles 2.5 - 10.0 cm long, hairy. Flowers in few flowered, lax, fulvous hairy racemose cymes. Bracts linear. Sepals oblong, enlarged in fruit, 3 outer densely fulvous hairy, 2 inner ones glabrous or with few scattered hairs. Corolla 2 3 cm long, infundibuliform, white. Capsules 1 2 cm in diam., subglobose, papery, glabrous. Seeds brown, glabrous.

Fl. & Fr. : August - December.

Common in wastelands among bushes and shrubs, on the edges of fields and gardens along fences.

Selected specimens : Barmer : Sela forest, Pandey 8049 (BSJO) ; Jaipur : Sambhar, Sharma 1774 (RUBL) ; Kota : Shababad, Singh 90430 (LWG) ; Sirohi : Sanwada, Jain 60456, 60499 (BSI) ; Tonk : Kacha Bundha, Shetty 1055 (BSJO).

2. *Merremia dissecta* (Jacq.) Hall. f. in Engl. Bot. Jahrb. Syst. 16 : 552. 1893 ; Duthie, Fl. Gangetic Plain 2 : 110. 1911. *Convolvulus dissectus* Jacq. Obs. Bot. 2 : 4. t. 28. 1767. *Ipomoea sinuata* Ortega, Hort. Matr. Dec. 7 : 84. 1798 ; Clarke in Hook. f. Fl. Brit. India 4 : 214. 1883.

Twining herbs, with sparsely hirsute or glabrous stems. Leaves palmately divided almost to the base into 7-9 lobes ; lobes sinuate to sinuate-dentate, glabrous. Flowers solitary, axillary, rarely in cymes. Sepals 1.5-3.0 cm long, mucronate, glabrous. Corolla 3-5 cm long, white with purple centre. Capsules 1-2 cm in diam., depressed globose, subtended and partially surrounded by calyx. Seeds black, glabrous.

Fl. & Fr. : May-December.

Occasional, in wastelands among clumps of trees and shrubs.

Selected specimens : Bhilwara : Near Rly. station, Singh 6012 (BSJO) ; Churu : Sujangarh, Roy 2530 (BSJO) ; Jaisalmer : *Bhandari* 240, 1532 (JAC) ; Jodhpur : Bilara, Singh 3586 (BSJO) ; Sirohi : Mt. Abu, Mehta 254 (JAC).

3. *Merremia emarginata* (Burm. f.) Hall. f. in Engl. Bot. Jahrb. Syst. 16 : 552. 1893 ; Duthie, Fl. Gangetic Plain 2 : 109. 1911. *Evolvulus emarginatus* Burm. f. Fl. Ind. 77. t. 30. f. 1. 1768. *Convolvulus reniformis* Roxb. Fl. Ind. 2 : 67. 1824 & 1 : 481. 1832. *Ipomoea reniformis* (Roxb.) Choisy in Mem. Soc. Phys. Geneve 6 : 446. 1834 ; Clarke in Hook. f. Fl. Brit. India 4 : 206. 1883. 'Popli' (Hindi).

Prostrate herbs, rooting on the nodes and sparsely clothed with white spreading hairs. Leaves 1.2-2.5 × 1.5-3.0 cm, reniform-ovate, cordate, crenate, pale green beneath. Flowers axillary, solitary or in 2 to 5 flowered sessile cymose clusters. Sepals ciliate, outer 2 apiculate, inner 3 larger and emarginate. Corolla c. 7 mm long, campanulate, yellow. Capsules subglobose, glabrous, 4-valved, enclosed in the calyx. Seeds glabrous, dark chestnut brown.

Common in wastelands and forests in dry habitats, particularly in the east of Aravalli.

Selected specimens : Banswara : Punapathar forest, Singh 3672 (BSJO) ; Barmer : Gandhar, Shetty 2341 (BSJO) ; Bharatpur : Ashanagra, Parmar 8675 (BSJO) ; Jaipur : Chaksu, Sharma 1713 (RUBL) ; Kota : Baran, Majumdar 10867 (BSA).

Notes : Some authors, following Cufodontis (Bull. Jard. Bot. Brux. 31, Suppl. 1961), call this plant *M. gangetica* (L.) Cuf. based on *Convolvulus gangeticus* L. ; the latter is, however, *Cocculus hirsutus* (L.) Diels (syn. *C. villosus* DC).

4. *Merremia hederacea* (Burm. f.) Hall. f. in Engl. Jahrb. Syst. 18 : 118. 1894. *Evolvulus hederaceus* Burm. f. Fl. Ind. 77. t. 30. f. 2. 1768. *Convolvulus flavus* Willd. Sp. Pl. 1 : 852. 1798. *Ipomoea chryseides* Ker Gawl. Bot. Reg. 4 : t. 270. 1818 ; Clarke in Hook. f. Fl. Brit. India 4 : 206. 1883 *Merremia chryseides* (Ker Gawl.) Hall. f. Engl. Bot. Jahrb. Syst. 16 : 552. 1893 ; Duthie, Fl. Gangetic Plain 2 : 109. 1911.

Twining or prostrate herbs, with glabrous or sparsely pubescent and tuberculate stems. Leaves 2.5–8.0 × 1.5–7.5 cm. ovate, acute or obtuse, entire or crenate, cordate based, rarely 3 lobed. Flowers in dense, axillary racemose cymes. Sepals oblong to obovate, truncate or notched at the apex. Corolla 6–12 mm long, yellow. Capsules conical to depressed globose, somewhat 4 angled. Seeds 3 gonous, pubescent.

Fl. & Fr. : September–December.

Rare, found climbing on the fences of fields and gardens. Included on the authority of Ramdeo (1969) from Udaipur.

Notes : Clarke (Fl. Brit. India 4 : 219. 1883) has described Wight collections from Deccan peninsula under *C. flavus* Willd. *Evolvulus hederaceus* Burm. f. and *Convolvulus rufescens* Choisy have been considered synonymous to *C. flavus* Willd. An examination of the type (microfische) of *C. flavus* Willd. No. 3648 (Botanical Museum Berlin–Dahlem) revealed that it does not match with the description of Clarke (*l.c.*), but closely allied to the *Evolvulus hederaceus* Burm. f. (Fl. Ind. 77. t. 30. 1768) which has been transferred to the genus *Merremia* Dennst. ex Endl. by Hallier f. (in Engl. Bot. Jahrb. Syst. 18 : 118. 1894). Hallier has also examined the type 3648 of *C. flavus* Willd. and identified it as *Merremia hederacea* (Burm. f.) Hall. f. Now it is to consider *C. flavus* Willd. conspecific to *Merremia hederacea* (Burm. f.) Hall. f. While Clarke's description of Fl. Brit. India, based on Wight collections, is very well applicable to Wight *l.c.* t. 1365 and to the protologue of *Convolvulus rufescens* Choisy. Hence, *C. flavus sensu* Clarke may be called *C. rufescens* Choisy—the next valid name for the material.

Further, Rheede's figure (Hort. Mal. 7 : t. 27.) cited by Clarke under *C. flavus* Willd. bears tendril and it is certainly some other taxon, neither *C. flavus* Willd. nor *C. rufescens* Choisy.

5. *Merremia quinquefolia* (L.) Hall. f. in Engl. Bot. Jahrb. Syst. 16 : 552. 1893 ; Bhandari, Fl. Ind. Desert 263. 1978 ; Shah, Fl. Gujarat 479. 1978. *Ipomoea quinquefolia* L. Sp. Pl. 162. 1753. *Convolvulus quinquefolia* (L.) L. Syst. Nat. cd. 10. 923. 1759.

Twining, perennial herbs, glabrous or with sparsely hairy stems. Leaves palmately 5 foliolate ; leaflets narrowly oblong to lanceolate,

2 6 × 1.0 1.5 cm, dentate or serrate, acute or obtuse. Flowers in 1 to 3 flowered, axillary racemose cymes; peduncles 4 7 cm long, glandular with patent hairs. Bracts triangular, acute or acuminate. Calyx tubular, outer 2 sepals shorter than inner ones, glabrous. Capsules 1 cm in diam., globose, glabrous, 4 - seeded. Seeds ovoid oblong, trigonous, clothed with adpressed curled hairs.

Fl. & Fr. : August December.

Rare, in wastelands among bushes.

Selected specimens : Banswara : Ghantala, *Majumdar* 10241 (BSA); Jaipur : Ramgarh, *Sharma* 2262 (RUBL); Jodhpur : *Bhandari* 248, 548 (JAC); Pali : Sadri, *Pandey* 4163 (BSJO); Sirohi : Abu Rd., *Blatter* 22133 (BLAT).

6. *Merrenia tridentata* (L.) Hall. f. in Engl. Bot. Jahrb. Syst. 16 : 552. 1893; Duthie, Fl. Gangetic Plain 2 : 108. 1911. *Convolvulus tridentatus* L. Sp. Pl. 157. 1753. *Ipomoea tridentata* (L.) Roth in Roem. & Schult. Arch. Bot. 1 (2) : 38. 1798; Clarke in Hook. f. Fl. Brit. India 4 : 205. 1883.

subsp. *tridentata*

Prostrate or twining, perennial herbs, with angular, glabrous stems. Leaves subsessile 1 5 × 0.5 1.5 cm, spatulate or oblanceolate, obtuse or emarginate to 3 toothed at the apex and dilated at the base into toothed auricles. Flowers axillary, solitary or in 2 to 3 - flowered cymes. Bracts lanceolate, beneath the pedicels. Sepals elliptic, apiculate, eciliate. Corolla pale yellow. Capsules ovoid - globose, 4 - valved. Seeds 3 - gonous.

Fl. & Fr. : September December.

Rare, in wastelands, usually under the shade of shrubs.

Selected specimens : Banswara : Ripal Khunt, *Singh* 3699 (BSJO); Jaipur : Lalsot, *Sharma* 1877 (RUBL); Jhalawar : *Singh* 83730 (LWG); Kota : Devari, *Singh* 90552 (LWG); Sirohi : Mt. Abu, *Mehta* 932 (JAC).

7. subsp. *hastata* Ooststr. in Blumea 3 : 317. f. 2. 1939. *Convolvulus hastatus* Desr. in Lam. Encycl. Meth. 3 : 542. 1792, non Forsk. 1775. *Ipomoea angustifolia* Jacq. Ic. Pl. Rar. 2 : 10. t. 317. 1786 93; Clarke in Hook. f. Fl. Brit. India 4 : 209. 1883.

Peduncles more than 2.5 cm long. Sepals lanceolate, acuminate with recurved points.

Fl. & Fr. : September - December.

Rare, in wastelands, climbing on the shrubs and bushes. Included on the authority of Bakshi (1954) from Jhunjhunu, Nair and Nathawat (1957) from Sikar and Bhandari & Mehta (1978) from Sirohi based on *Blatter* 22391, 22394 (BLAT).

8. *Merremia vitifolia* (Burm. f.) Hall. f. in Engl. Bot. Jahrb. Syst. 16 : 552. 1893. *Convolvulus vitifolius* Burm. f. Fl. Ind. 45. t. 18. f. 1. 1768. *Ipomoea vitifolia* (Burm. f.) Blume, Bijdr. 709. 1826 ; Clarke in Hook. f. Fl. Brit. India 4 : 213. 1883.

Perennial climbers ; young branches clothed with spreading deciduous hairs. Leaves 5 - 15 cm in diam., palmately 5 to 7 lobed ; lobes 3 angular, acuminate, hairy above and on the nerves beneath, serrate dentate. Flowers 1 - 7, in pedunculate cymes ; peduncles patently hairy. Bracts linear, caducous. Calyx hairy ; lobes broadly elliptic, obtuse, apiculate, enlarged in fruit. Corolla subcampanulate, yellow. Capsules 1.0 - 1.5 cm in diam., subglobose. Seeds glabrous.

Fl. & Fr. : August - December.

Rare, in wastelands among bushes and shrubs. Included on the authority of Nair and Nathawat (1957) from Sikar district.

8. OPERCULINA Silva Manso

Operculina turpethum (L.) Manso, Enum. Subst. Bras. 16. 1836 ; Duthie, Fl. Gangetic Plain 2 : 110. 1911. *Convolvulus turpethum* L. Sp. Pl. 155. 1753. *Ipomoea turpethum* (L.) R. Br. Prodr. 485. 1810 ; Clarke in Hook. f. Fl. Brit. India 4 : 212. 1883.

Perennial, twining shrubs, with 3 to 5 winged or angular branches. Leaves 5 - 15 × 2 - 14 cm, broadly ovate to orbicular, ovate - lanceolate or oblong, subacute, mucronate, pubescent on both sides, truncate or cordate based. Flowers in racemose cymes ; peduncles 2.5 - 5.0 cm. long. Bracts lanceolate, often pinkish. Pedicels slightly thickened upwards. Outer 2 sepals much enlarged in fruit, broadly ovate - suborbicular, concave, mucronate ; three inner sepals oblong - ovate, membranous. Corolla white, subcampanulate. Capsules 8 - 15 mm in diam., globose, enclosed in the enlarged, very imbricate sepals. Seeds black, pitted on the sides.

Fl. & Fr. : April - October.

Rare, among fences of gardens and fields and among clumps of trees and shrubs in the wastelands.

Selected specimens : Jhalawar : Eklera, Singh 83698 (LWG) ; Kota : Singh 91085 (LWG). Also reported from Sikar (Nair & Nathawat, 1957).

9. PORANA Burm. f.

Porana paniculata Roxb. Pl. Cor. 3 : t. 235. 1815 ; Clarke in Hook. f. Fl. Brit. India 4 : 222. 1883 ; Duthie, Fl. Gangetic Plain 2 : 102. 1911.

Perennial, woody twiners densely white hairy on young parts. Leaves 3 15 × 2.5 10.0 cm, ovate cordate, acuminate, hairy, palmately 5 to 7 nerved. Flowers in axillary and terminal, white - pubescent, cymose panicles. Calyx segments densely hairy, enlarged in fruit. Corolla white, densely hairy outside ; lobes obcordate. Stamens included. Capsules 4 6 mm in diam., ovoid globular, membranous, brittle, hairy, 1 - seeded.

Fl. & Fr. : October - March.

Rare, in scrub forests and wastelands. Occasionally cultivated in the gardens for its dense masses of flowers.

Selected specimens : Ajmer : Puch-Kund, Sharma 113 (DD) ; Kota : Kathoon, Singh 90604 (LWG) ; Sirohi : Mt. Abu, Blatter 23371 (DD)

10. RIVEA Choisy

Leaves broader than long. Peduncle as long as the petiole, many - flowered. Sepals lanceolate, acute. ... 2. *R. ornata*

Leaves not broader than long. Peduncle short, usually with single flower. Sepals ovate, obtuse. ... 1. *R. hypocrateriformis*

1. *Rivea hypocrateriformis* (Desr.) Choisy in Mem. Soc. Phys. Geneve 6 : 408. 1834 ; Clarke in Hook. f. Fl. Brit. India 4 : 184. 1883 ; Duthie, Fl. Gangetic Plain 2 : 119. 1911 ; Mahesh. Illus. Fl. Delhi f. 137. 1966. *Convolvulus hypocrateriformis* Desr. in Lam. Encycl. 3 : 561. 1792. 'Gawal-kakri, Phang' (Hindi).

Large, woody climbing shrubs. Leaves 2 8 cm in diam., broadly ovate to orbicular, cordate based, shortly acuminate, with a pair of purplish glands at the base of lamina. Flowers axillary, 1 to 3 together at the end of 1 6 cm long peduncles ; pedicels 8 15 mm long. Bracts 2, spatulate. Calyx c. 10 mm long ; lobes ovate elliptic, obtuse. Corolla

upto 8 cm long, hypocrateriformis, slightly hairy outside, white. Stamens 5 ; filaments woolly at the base. Capsules 1.3 - 1.8 cm in diam., globose or ovoid, mucronate, glabrous.

Fl. & Fr. : August - December.

Fairly common along roads and boundaries of fields among the clumps of trees and shrubs ; often found in the forests.

Selected specimens : Alwar : Siriska Tiger Reserve, *Parmar* 9647 (BSJO) ; Banswara : Paloda, *Singh* 2814 (BSJO) ; Barmer : Haldeshwar Mahadco, *Pandey* 7977 (BSJO) ; Jaipur : *Wadhwa & Srivastava* 8113 (BSI) ; Kota : *Vernia* 426 (BSA) ; Sirohi : Vada Khoda, *Jain* 60460 (BSI).

2. *Rivea ornata* Choisy in Mem. Soc. Phys. Geneve 6 : 409. 1834 ; Wight, *lc.* 4 (2) : 12. t. 1356. 1848 ; Clarke in Hook. f. Fl. Brit. India 4 : 183. 1883 ; Duthie, Fl. Gangetic Plain 2 : 120. 1911. *R. ornata* Choisy var. *griffithii* Clarke in Hook. f. *lc.* 4 : 183. 1883.

Twining shrubs, clothed with white appressed hairs. Leaves 3.5 - 10.0 × 4 - 12 cm, orbicular or reniform, obtuse or shortly acuminate, apiculate, white silky beneath. Flowers in pedunculate, 1 to 10 flowered, axillary cymes ; peduncles white pubescent. Bracteoles 18 - 20 mm long. Sepals ovate - oblong or oblong - lanceolate, involute - margined, clothed with dense short tomentum outside ; the inner ones ovate to elliptic - oblong. Corolla white or fading to creamy yellow with age. Stamens inserted above the middle of corolla tube. Capsules globose, glabrous, brown.

Fl. & Fr. : July - October.

Rare, in wastelands among clumps of trees and shrubs.

Selected specimens : Alwar : Algal, *Sharma* 3857 (RUBL) ; Jaipur : Amer, *Sharma* 310 (RUBL).

11. SEDDERA Hochst.

Seddera latifolia Hochst. & Steud. in Flora 27. Beil. 8. t. 5. f. B & C. 1844. *Breweria latifolia* (Hochst. ex Steud.) Benth. Gen. Pl. 2 : 877. 1873 ; Clarke in Hook. f. Fl. Brit. India 4 : 224. 1883 ; *Bonamia latifolia* (Hochst. & Steud.). Sant. in Journ. Bombay Nat. Hist. Soc. 47 (2) : 342. 1947.

Erect undershrubs, with many stems from a woody base, clothed with grey pubescence. Leaves 4 - 27 × 3 - 8 mm, elliptic - oblong, obtuse, silky, narrowed at the base. Flowers 1 to 3 - together in upper axils,

sessile. Bracteoles 2, linear lanceolate, borne beneath the calyx. Calyx silky; sepals ovate, acuminate. Corolla slightly exceeding the calyx; lobes 5, with hairy bands between the folds. Styles free nearly to the base. Capsules 3-6 mm in diam., ovoid, acute, splitting into 4 valves. Seeds 2, ovoid, dark brown, glabrous.

Fl. & Fr. : October - February.

Rare, in dry sandy and rocky habitats.

Selected specimens : Barmer : Puri 22995 (BSI) ; Temple hills, Rao 66985 (BSI) , Jaisalmer : Gamera, Pandey 7849 (BSJO) ; Jodhpur : Massuria hills, Parmar 2442 (BSJO) ; Shergarh, Singh 3201 (BSJO).

CULTIVATED SPECIES

Argyreia nervosa (Burm. f.) Bojer (*Convolvulus nervosa* Burm. f.) - White tomentose, large twiners with ovate cordate leaves which are glabrous above and tomentose beneath. Flowers rose purple and white, in subcapitate cymes. Cultivated in the gardens for large handsome foliage and beautiful flowers.

Ipomoea batatas (L.) Lam. (*Convolvulus batatas* L.) 'Shakrkand' (Hindi) — Prostrate herbs, with tuberous roots, ovate - cordate to deeply lobed leaves and lavender to purple flowers. Native of America ; cultivated for edible tuberous roots.

Ipomoea horsfalliae Hook. - Woody twiners, with palmately 5 to 7-foliolate leaves, rose or purple flowers in forking clusters. Native of tropical America ; cultivated in the gardens for ornamental purposes.

Ipomoea purpurea (L.) Roth (*Convolvulus purpureus* L.) 'Morning Glory' (English) - Twining, pilose, annual herbs, with entire or 3 lobed broadly ovate cordate leaves and pink or purple flowers in 1 to 5 flowered cymes. Native of America ; cultivated in the gardens and parks for ornamental purposes.

Ipomoea quamoclit L. - Delicate, annual climbers, with deeply pinnatisect leaves and red, salver-form flowers. Native of Mexico ; cultivated for ornamental purposes.

Jacquemontia pentantha (Jacq.) G. Don (*Convolvulus pentanthus* Jacq.) — Glabrous or pubescent twiners, with ovate leaves, blue or white flowers in dense cymes and globose capsules. Native of America ; cultivated in the gardens for ornamental purposes.

90. CUSCUTACEAE

(V. Singh)

- 1a. Style 1, short, stout ; stigma thick and ovoid. ... 5. *C. reflexa*
- 1b. Styles 2, slender, distinct :
- 2a. Calyx and corolla 5 - partite. Stigma capitate or globose :
- 3a. Scales on the corolla - tube absent. ... 4. *C. hyalina*
- 3b. Scales on the corolla - tube present :
- 4a. Scales oblong, fimbriate at tip. ... 1. *C. chinensis*
var. *chinensis*
- 4b. Scales spatulate, 2 - fid ; each lobe deeply fimbriate. ... 2. *C. chinensis*
var. *ciliaris*
- 2b. Calyx and corolla 4 - partite. Stigma elongated. ... 3. *C. europaea*

1. *Cuscuta chinensis* Lam. Encycl. Meth. Bot. 2 : 229. 1786 ; Wight, Ic. 4 (2) : 14. t. 1373. 1848 ; Clarke in Hook. f. Fl. Brit. India 4 : 226. 1883 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 160. 1976. 'Amarbel, Akash-bel' (Hindi).

var. *chinensis*

Leafless stem parasites, with filiform, twining, much branched stems forming tangled mass. Flowers solitary on in shortly pedunculate cymes. Bracts ovate. Calyx divided less than half way down ; lobes deltoid ovate, often with a tubercular keel on the back. Corolla - lobes as long as tube, ovate - oblong, subobtuse, white, scales at the base of corolla tube, fimbriate. Styles 2, distinct. Capsules globose, hyaline, divided into 2 lobes by a deep furrow on top. Seeds 4.

Fl. & Fr. : Most part of year, especially during October - November.

Rather uncommon, parasitising herbs and shrubs.

Selected specimens : Ajmer : Beawar, Sharma 1075 (DD) ; Jodhpur : Bhandari 81, 90, 1162 (JAC) ; Kota : Chhabra, Singh 90400 (LWG). Also reported from Alwar (Raizada & Sharma, 1962) and Jaipur (Sharma, 1974).

2. var. *ciliaris* (Hohen. ex Boiss.) Engl. in Trans. Acad. Sci. St. Louis 1 : 480. 1859. *Cuscuta ciliaris* Hohen. ex Boiss. Diagn. Pl. Or.

Nov. ser. 2. 3 : 129. 1856 ; Bhattacharyya & Mukerjee in Journ. Ind. Forestry 1 : 160. 1978.

Similar to var. *chinensis*, but can be distinguished by the characters used in the key.

Fl. & Fr. : August - October.

Rare, found as a stem parasite on the species of *Ocimum* L. and other herbaceous plants.

Selected specimen : Udaipur : On hill - slopes, *Kanodia* 82231 (BSI).

3. *Cuscuta hyalina* Heyne ex Roth, Nov. Pl. Sp. 100. 1821 ; Clarke in Hook. f. Fl. Brit. India 4 : 226. 1883 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 161. 1976. *C. arabica* Wight, Ic. 4(2) : 14. t. 1371. 1848. 'Amar - bel, Akash bel' (Hindi).

Leafless, filiform stem - parasites, with slender, closely twining, much - branched stems forming a tangled mass. Flowers in dense clusters or in pedunculate cymes or racemes. Bracts lanceolate, acute. Calyx divided more than half - way down ; lobes 4 or 5, ovate - lanceolate, acute or acuminate. Corolla 4 or 5 lobed, pale yellow ; lobes ovate - lanceolate, acute or acuminate. Scales at the base of corolla tube absent. Styles 2, slender, distinct. Capsules subglobose, membranous, 2 to 4 - seeded. Seeds ovoid or suborbicular, brownish.

Fl. & Fr. : July - October.

Common throughout the state, usually parasitising *Cassia obtusifolia* L., *Dipteracanthus patulus* (Jacq.) Nees, *Trianthema portulacastrum* L., *Tribulus terrestris* L., *Anaranthus* species etc.

Selected specimens : Ajmer : Tiagi Acc. No. 100981, 100978 (DD) ; Banswara : Ghatol, *Kanodia* 75467 (BSI) ; Barmer : Haldeshwar Mahadeo, Pandey 7975 (BSJO) ; Jaisalmer : Ujlan, Shetty 3314 (BSJO) ; Udaipur : Parshad, *Kanodia* 82231 (BSI).

4. *Cuscuta reflexa* Roxb. Pl. Cor. 2 : 3. t. 104. 1799 ; Clarke in Hook. f. Fl. Brit. India 4 : 225. 1883 ; Duthie, Fl. Gangetic Plain 2 : 100. 1911. *C. santapau* Banerji & Das in Journ. Arn. Arb. 46 : 87. 1965. 'Amar - bel', 'Akash-bel' (Hindi).

Leafless stem - parasites, with much branched, twining greenish - yellow or brown stems. Flowers solitary or in clusters arranged in racemes. Bracts ovate - suborbicular, fleshy. Calyx divided almost to the base ; lobes ovate - oblong, obtuse, verrucose on the back. Corolla whitish ; tube cylindrical ; lobes deltoid, obtuse, reflexed. Scales at the base of

corolla - tube, fimbriate. Ovary ovoid, fleshy ; style simple, very short and thick ; stigmas 2, thick and fleshy. Capsule depressed globose, glabrous, circumscissile near the base. Seeds 2 - 4, glabrous, black.

Fl. & Fr. : September - February.

Common throughout the state, usually parasitising *Adhatoda zeylanica* Medic., *Acacia nilotica* (L.) Del., *Ziziphus nummularia* (Burm. f.) Wt. & Arn., *Z. mauritiana* Lam. etc.

Selected specimens : Bharatpur : Keoladeo National Park, *Parmar* 8627 (BSJO) ; Bhilwara : Khari Dam, *Singh* 7001 (BSJO) ; Ganganagar : Raisingh nagar, *Roy* 3901 (BSJO) ; Jaipur : Ramgarh, *Sharma* 1971 (RUBL) ; Jhalawar : *Sharma* 560 (RUBL) ; Sirohi : Abu Road, *Kaul* 9387 (LWG) ; Mt. Abu, *Jain* 62154 (BSI).

5. *Cuscuta europaea* L. Sp. Pl. 124. 1753 ; Clarke in Hook. f. Fl. Brit. India 4 : 227. 1833. *C. aggregata* Roxb. Fl. Ind. 1 : 447. 1832.

Leafless, stem - parasites. Flowers in sessile, globose heads. Calyx - tube shortly obconic ; lobes 4, ovate - triangular. Corolla ovoid ; lobes 4, ovate or triangular ; scales near the base of filaments, obtuse or emarginate, crenulate or subentire. Styles shorter than linear stigmas. Capsules circumsciss at the base along a thickened rim. Seeds 4, ellipsoid, brown.

Fl. & Fr. : July - December.

Rare, in the forests at Mt. Abu. It is a temperate Himalayan element distributed from Kashmir to Sikkim (5000 - 12,000 ft.). Occurrence of this taxon at Mt. Abu is quite possible as per reports of Jain (1962) and Raizada (1954).

91. SOLANACEAE

(V. Singh)

1a. Fruit a dehiscent or subindehiscent capsule :

2a. Flowers solitary, axillary. Capsules spiny. ... 1. *Datura*

2b. Flowers in cymose panicles or corymbs. Capsules not spiny. ... 4. *Nicotiana*

1b. Fruit a berry :

3a. Calyx inflated into a membranous bladder enclosing the fruit :

- 4a. Flowers in fascicles. Corolla rotate ; lobes valvate in bud. ... 7. *Withania*
- 4b. Flowers solitary. Corolla campanulate ; lobes contorted in bud :
- 5a. Corolla blue. Filaments hairy at the base. Ovary 3 to 5 - celled. ... 3. *Nicandra*
- 5b. Corolla yellow. Filaments glabrous. Ovary 2 - celled. ... 5. *Physalis*
- 3b. Calyx persistent, but never inflated into bladder and not enclosing the fruit :
- 6a. Corolla - lobes valvate. Anthers dehiscing by apical pores. ... 6. *Solanum*
- 6b. Corolla - lobes imbricate. Anthers dehiscing longitudinally. ... 2. *Lycium*

1. *DATURA* L.

- 1a. Plants clothed with erect, glandular hairs. ... 3. *D. innoxia*
- 1b. Plants glabrous or pubescent, eglandular : --
- 2a. Branches tinged with purple. Corolla more than 15 cm long. Capsules clothed with numerous short blunt tubercles, irregularly breaking up. ... 1. *D. fastuosa*
- 2b. Branches green. Corolla less than 15 cm long. Capsules clothed with numerous long spines, 4 - valved :
- 3a. Corolla more than 7 cm long. Spines on the fruits numerous (100 or more). Leaves 1.5 to 2.5 times as long as broad. Seed black. ... 4. *D. stramonium*
- 3b. Corolla upto 6 cm long. Spines on the capsules limited (40 - 60). Leaves 1 - 1.4 times as long as broad. Seed pale - brown. ... 2. *D. ferox*

1. *Datura fastuosa* L. Syst. Nat. ed. 10. 2 : 932. 1759 ; Wight, Ic. 4(2) : 18. t. 1396. 1848 ; Clarke in Hook. f. Fl. Brit. India 4 : 242. 1883 ; Duthie, Fl. Gangetic Plain 2 : 132. 1911. *D. metel* L. Sp. Pl. 179. 1753, nom. conf. *D. alba* Nees in Trans. Linn. Soc. 17 : 73. 1834 ; Duthie, l. c. 2 : 132. 1911. *D. fastuosa* L. var. *alba* (Nees) Clarke in Hook. f. l.c. 4 : 243. 1883. 'Kata Dhatura' (Hindi).

Herbs or undershrubs, upto 1 m high, clothed with fine purple dust. Leaves 6 - 20 × 4 - 15 cm, triangular - ovate, entire or sinuate - toothed,

grey pubescent. Flowers axillary, solitary. Calyx 6-9 cm long, reflexed in fruit. Corolla 12-15 cm or more long, with 5 rotating nerves and 5 deltoid-acuminate lobes, purple outside, whitish within. Filaments hairy at the base. Capsules 2.5-4.0 cm in diam., subglobose, deflexed, clothed with blunt tubercles, dehiscing irregularly. Seeds 3-gonous or compressed, pale brown, closely packed.

Fl. & Fr. : Most part of the year.

Native of America ; naturalised in wastelands and open forests throughout the state.

Selected specimens : Alwar : Lal 34498 (LWG) ; Banswara : Ghatol, Singh 2938 (BSJO) ; Churu : Sardar Shahr, Roy 2601 (BSJO) ; Jaipur : Sambhar, Sharma 1770 (RUBL) ; Kota : Shahabad, Singh 90460 (LWG) ; Sirohi : Mt. Abu, Mehta 633 (JAC).

2. *Datura ferox* L. Amoen. Acad. 3 : 403. 1756 ; Haegi in Aust. Journ. Bot. 24 : 427. 1976 ; Bhandari, Fl. Ind. Desert 268. 1978. '*Dhatura*' (Hindi).

Stout, bushy, annual herbs. Leaves 10-13 × 7-10 cm, ovate to rounded triangular, coarsely lobed, oblique at the base, often slightly decurrent on the petiole, acute or acuminate at the apex. Peduncles 7-14 mm long. Calyx 2.5-3.0 cm long, angular, narrowed towards the summit, 5-ribbed, 5-lobed ; lobes tomentose inside. Corolla 4.5-6.0 cm long, white, 5-lobed. Stamens 5, adnate to the corolla tube. Stigma included in the corolla throat. Capsules 3.0-3.5 × 2-3 cm, ellipsoid, clothed with sharp conical spines, 4-valved. Seeds D-shaped, minutely reticulate-foveolate.

Fl. & Fr. : September-December.

Native of China ; naturalized in wastelands near habitations.

Selected specimen : Bhilwara : Bijolia, Singh 6093 (BSJO).

3. *Datura innoxia* Mill. Gard. Dict. ed. 8. No. 5. 1768 ; Safford in Ann. Rep. Board. Reg. Smithsonian Inst. 1920 : 549. t. 3. f. 4. 1920 & in J. Wash. Acad. Sci. 11 (8) : 179. f. 1. 1921 ; Sant. in Journ. Bombay Nat. Hist. Soc. 47 (4) : 659. 1948 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 168. 1976. *D. metel auct non L.* 1753 ; Sim. in Curtis, Bot. Mag. t. 1440. 1812 ; Clarke in Hook. f. Fl. Brit. India 4 : 243. 1883 ; Duthie, Fl. Gangetic Plain 2 : 131. 1911. '*Dhatura*' (Hindi).

Stout shrubs, upto 1 m high, clothed with grey pubescence. Leaves 10-15 × 6-10 cm, ovate, sinuate-toothed, Flowers axillary, solitary ;

pedicels 2-3 cm long, recurved in fruit. Calyx accrescent, reflexed in fruit; tube in flowering stage 6-9 cm long, 10 nerved. Corolla white, tube 9-13 cm long; teeth 10, linear. Capsules 3.5-5.5 cm in diam., globose, densely pubescent and armed with weak, 1.0-1.8 cm long spines.

Fl. & Fr. : Most part of the year.

Native of America; naturalized in wastelands, along roads and railway lines. Seeds are poisonous.

Selected specimens : Alwar : Kaul 18653 (LWG); Churu : Khanpur, Roy 2511 (BSJO); Dungarpur : Verma 176 (BSA); Kota : Shahabad, Singh 90466 (LWG), Wadhwa 9469 (BSA); Udaipur : Dabok, Ramchandra 145/Bot. (LWG).

4. *Datura stramonium* L. Sp. Pl. 179. 1753; Clarke in Hook. f. Fl. Brit. India 4 : 242. 1883; Bhandari, Fl. Ind. Desert 269. 1978; Deb in Journ. Econ. Tax. Bot. 1 (1-2) : 38. 1980.

Erect, annual-perennial herbs. Leaves 6-20 × 3-10 cm, ovate-oblong or triangular, acute or acuminate, glabrous or pubescent, unequal-sided and subcordate or cuneate at the base. Pedicels 3-5 mm long, not deflexed in fruit. Calyx 3.0-4.5 cm long, 5-angled. Corolla 8-12 cm long; teeth 5, linear. Capsules 4-7 cm long, oblong-ovoid, erect, clothed with 0.3-1.0 cm long prickles.

Fl. & Fr. : December - May.

Rare, in the wastelands and road-sides.

Selected specimens : Jaipur : Sagar, Sharma 1958 (RUBL); Jodhpur : Bhandari 2136 (JAC); Sirohi : Mt. Abu, Jain 46598 (BSI), Kaul 9554 (LWG). Also reported from N.W. Rajasthan by Sankhala (1951).

2. LYCIUM L.

Corolla-lobes more than half as long as the corolla-tube.

... 1. *L. barbarum*

Corolla-lobes less than half the length of corolla-tube.

... 2. *L. edgeworthii*

1. *Lycium barbarum* L. Sp. Pl. 192. 1753; Clarke in Hook. f. Fl. Brit. India 4 : 241. 1883; Mahesh Illus. Fl. Delhi f. 152. 1966; Bhandari, Fl. Ind. Desert 270. 1978. 'Morali' (Hindi).

Much branched, spinous shrubs, upto 2.5 m high. Stem and branches armed with sharp, conical spines which often elongate and bear leaves and flowers. Leaves solitary or fascicled, 1.5 × 0.6-2.0 cm, oblong-lanceolate or oblong-spathulate or linear, broadest in the middle, obtuse, attenuated at base, glabrescent. Flowers solitary or in fascicles of 2-5. Calyx cup-shaped, irregularly lobed or 2-lipped; teeth oblong, obtuse, membranous-margined. Corolla 12-15 mm long, funnel-shaped. Stamens little exerted; filaments flat, glabrous at the base; anthers orbicular. Ovary seated on a cup-shaped disc; stigma mushroom-head like, 2-lamellate. Berries c. 6 mm in diam., bright red, with slightly enlarged, persistent calyx. Seeds discoid or subreniform, minutely pitted.

Fl. & Fr. : October - January.

Common in the desert area in sandy soils forming open scrub forests and on rocky plateau in the east of Aravalli.

Selected specimens : Barmer : Sheo, Tiwari 924 (BSI) ; Jaipur : Deosa, Wadhwa 8237 (BSA) ; Jaisalmer : Miajlar, Pandey 7886 (BSJO) ; Sawaimadhopur : Jain 18690 (BSI) ; Tonk : Tordi Forest, Shetty 1114 (BSJO).

2. *Lycium edgeworthii* Dun. in DC. Prodr. 13 (1) : 525. 1852 ; Schonbeck in Reehinger, Fl. Iranica 100 : 38. 1972. *L. indicum* Wight, Ic. 4 (2) : 19. t. 1403. 1848, non Retz. 1781. *L. europaeum* auct. non L. 1753 ; Clarke in Hook. f. Fl. Brit. India 4 : 240. 1883. 'Moralii' (Hindi).

Woody shrubs, upto 1 m high, with sharp spines. Leaves 6-22 × 1.5-9.0 mm, lanceolate to obovate or obovate-elliptic, attenuated at base into a short petiole. Flowers solitary or paired; pedicels 1-6 mm long, sparsely hairy or glabrous. Calyx 2.5-3.0 × 1.5-2.5 mm, campanulate or tubular; lobes 5, acute. Corolla 7-17 mm long, infundibuliform, white. Filaments subequal, 3 longer ones exerted, 2 smaller ones included, glabrous at the base. Berries 3-4 mm in diam., globose. Seeds 5-6, reniform, reticulately muricate.

Fl. & Fr. : October - January.

Rare, in wastelands and scrub forests.

Selected specimens : Alwar : Siliserh, Lal 34594 (LWG) ; Jaipur : Delhi Rd., Kaul 8351, 18673 (LWG) ; Jaisalmer : Devikot, Wadhwa 5297 (BSA) ; Jhunjhunu : Pilani, Prasad 20429 (LWG) ; Pali : Bar, Duthle 4669 (DD).

3. NICANDRA Adans. *nom cons.*

Nicandra physalodes (L.) Gaertn. *Fruet.* 2 : 237. t. 141. f. 2. 1791. '*physaloides*'; Clarke in Hook. f. *Fl. Brit. India* 4 : 240. 1883 ; Raizada, *Suppl. Duthie, Fl. Gangetic Plain* 169. 1976. *Atropa physalodes* L. *Sp. Pl.* 181. 1753.

Erect, annual, glabrous herbs, upto 90 cm high. Leaves 10 - 20 × 6 - 8 cm, ovate lanceolate, sinuately lobed or toothed, membranous. Flowers axillary, solitary ; pedicels c. 3 cm long. Calyx lobed nearly to the base, scarious in fruit ; lobes ovate, acute, winged at base. Corolla 2 - 3 cm long, bell shaped, 5 lobed ; tube white ; limb blue. Filaments hairy, base dilated. Berries c. 1.5 cm in diam., globose, loosely enclosed by the enlarged, membranous, net veined, 5 angled calyx.

Fl. & Fr. : August - March.

Native of Peru ; occasionally found as a naturalized weed on the hills.

Selected specimens : Sirohi : Mt. Abu, *Rao* 66714 (BSI), *Jain* 46596 (BSI). Also reported from N.W. Rajasthan (Sankhala, 1951).

4. NICOTIANA L.

Leaves decurrent into wings on the stem. Corolla - tube narrow below, ventricose above. ... 1. *N. alata*

Leaves not decurrent on the stem. Corolla - tube narrow throughout, not ventricose. ... 2. *N. plumbaginifolia*

1. *Nicotiana alata* Link & Otto, *lc. Pl. Rar.* 1 : 63. t. 32. 1841 ; Bailey in *Manual Cult. Pl.* 876. 1951. '*Tambakhu*' (Hindi).

Annual, glandular hairy herbs, 30 - 60 cm high. Leaves 6 - 10 × 3 - 4 cm, lanceolate or oblong, decurrent into wings on the stem. Flowers dull white, fragrant, in terminal, loose racemes. Corolla tube 3.5 - 5.0 cm long. Capsules oblong, enclosed in the inflated calyx.

Fl. & Fr. : December - March.

Rare, in wastelands in and around gardens. Very common in Kcola Deo National Park, Bharatpur ; probably introduced by migratory birds. Native of Brazil. Flowers open during night.

Selected specimens : Bharatpur : Keoladeo National Park, Parmar 8621 (BSJO) ; Bundi : Singh 74010 (LWG).

2. *Nicotiana plumbaginifolia* Viv. Elench. Pl. Hort. Bot. 26. t. 5. 1802 ; Clarke in Hook. f. Fl. Brit. India 4 : 246. 1883 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 170. 1976. 'Jangli Tambakhu' (Hindi).

Erect, viscid, annual or biennial herbs, upto 1 m high. Stems simple or branched from the base, glandular hairy. Basal leaves in rosette, 6 - 30 × 8 - 12 cm, obovate, narrowed into a subulate petiole ; cauline ones sessile, 5 - 12 × 3 - 6 cm, elliptic - obovate, obtuse or acute, with a semi amplexicaul base ; upper most smaller, passing into bracts. Flowers in leafy, cymose panicles. Calyx 1.0 - 1.5 cm long, 10 ribbed, glandular hairy ; lobes unequal, lanceolate - subulate. Corolla 2 - 3 cm long, greenish white, glandular outside. Fruits c. 1 cm in diam., ovate, glabrous, enclosed within the calyx. Seeds rugose.

Fl. & Fr. : Most part of the year ; usually during winters.

Native of Mexico and W. Indies ; completely naturalized in moist shady places. Often confused for *Rumex dentatus* L. in vegetative state.

Selected specimens : Alwar : Siriska Tiger Reserve, Parmar 9758 (BSJO) ; Bhilwara : Badnor, Singh 6465 (BSJO) ; Ganganagar : Loyalpuria, Roy 5001 (BSJO) ; Jhalawar : Shyamgarh, Majumdar 10116 (BSA) ; Jodhpur : Balsamand, Singh 4497 (BSJO) ; Sirohi : Mt. Abu, Kaul 9538 (LWG).

5. PHYSALIS L.

1a. Anthers yellow :

2a. Leaves entire or subentire. Corolla 4 - 5 mm long. Fruiting calyx not 5 - angled. ... 2. *P. micrantha*

2b. Leaves sinuate - dentate. Corolla 8 - 10 mm long. Fruiting calyx 5 - angled. ... 3. *P. minima*

1b. Anthers blue or violet :

3a. Stem, petiole, lamina and pedicels nearly glabrous. Leaves coarsely incised - serrate. Corolla with 5, small, obscure brown spots inside. ... 1. *P. angulata*

3b. Stem, petiole, lamina and pedicels densely glandular pubescent. Leaves subentire to sinuate - dentate. Corolla with 5, large, brown spots inside. ... 4. *P. peruviana*

1. *Physalis angulata* L. Sp. Pl. 183. 1753 ; Waterfall in Rhodora 60 : 162. 1958 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 170. 1976. *P. longifolia auct.* non Nutt. 1837 ; Sant. *et al.* in Journ. Bombay Nat. Hist. Soc. 58 : 551. 1961.

Erect or decumbent, much - branched annual herbs, 20 - 100 cm tall, rarely rooting at the base. Stems angular ribbed, glabrous, except crispy short hairs when young. Leaves 3 - 10 × 3 - 6 cm, ovate elliptic, long acuminate, irregularly sinuate - dentate, cuneate or rounded at the base. Flowers solitary, terminal, seemingly axillary, nodding. Calyx - 4 - 5 mm long, divided half way down ; segments ovate triangular, acuminate or acute, ciliate. Corolla yellow, with 5, small, brown spots insides. Filaments not dilated upwards ; anthers violet or pale blue. Berries 1.0 - 1.5 cm in diam., globose, greenish - yellow, enclosed in c. 4 cm long, 5 - angled, bladder - like inflated calyx.

Fl. & Fr. : August - November.

Native of America ; naturalized in the fields, gardens, road - sides etc. Often confused with *P. longifolia* Nutt. an American element, which is, however, characterized by perennial habit, upwardly dilated filaments, longer corolla and hairy stem, leaves and pedicels. This taxon is included here on the authority of Ramdeo (1969) from Udaipur.

2. *Physalis micrantha* Link, Enum. Pl. Hort. Berol. 1 : 181. 1821 ; Heine in Hutch. & Dalz. Fl. W. Trop. Africa ed. 2. 2 : 329. 1963 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 172. 1975 ; Parmar in Bull. Bot. Surv. India 26 : 168. 1986.

Erect or prostrate, simple or branched, glabrous, annual herbs, 15 - 50 cm high. Stem angular, ribbed, nearly glabrous. Leaves 1.5 - 6.0 × 1.5 - 4.0 cm, ovate, acute or acuminate, entire or sinuate - dentate, glabrous, rounded or cuneate at the base ; petioles 0.5 - 5.0 cm long. Flowers solitary, terminal, seemingly axillary, nodding ; pedicels 5 - 10 mm long, puberulous. Calyx c 4 mm long, hairy ; lobes triangular, acute. Corolla 4 - 5 mm long, pale yellow. Filaments hairy at the base ; anthers yellow. Berries globose, enclosed in an inflated, bladder - like, 1.5 - 3.5 × 1.2 - 2.5 cm calyx.

Fl. & Fr. : August - November.

Rare, in fields, waste places and road - sides.

Selected specimen : Bhilwara : Amarpura, Singh 6219 (BSJO).

Notes : Very close to *P. minima* L., but this can be recognised by glabrous stems, leaves, shorter pedicels and smaller flowers and fruiting calyx being not prominently 5 - angled.

3. *Physalis minima* L. Sp. Pl. 183. 1753 ; Clarke in Hook. f. Fl. Brit India 4 : 238. 1883 ; Duthie, Fl. Gangetic Plain 2 : 127. 1911. *P. indica* Lam. Encycl. Meth. Bot. 2 : 102. 1786. *P. minima* L. var. *indica* (Lam.) Clarke in Hook. f. l.c. 4 : 238. 1883 ; Duthie, l.c. 2 : 128. 1911. 'Papotan' (Hindi).

Erect, simple or branched herbs, upto 75 cm high. Stem angular-ribbed, often purple tinged, hairy. Leaves 2-6 × 1.0-3.5 cm, ovate, entire or sinuate-toothed, acute or obtuse, cuncate to subcordate at the base ; petioles 1-5 cm long. Flowers c. 1 cm long, axillary, solitary, nodding, yellow. Pedicels 5-10 mm long, hairy, 1-2 cm long in fruit. Calyx campanulate at flowering time, not angular, truncate at base ; teeth equalling the tube, pubescent, ciliate. Corolla 8-10 mm long. Anthers yellow. Berries globose, yellow when ripe, enclosed in globose or ovoid, 5 to 10-ribbed, reticulately veined, membranous bladder of calyx.

Fl. & Fr. : August - December.

Native of S. America ; naturalized in wastelands and forests in shady habitats, rarely found as a weed in cultivated fields.

Selected specimens : Alwar : Siriska Tiger Reserve, *Parmar* 9614 (BSJO) ; Banswara : Wadita hillage forest, *Singh* 2876 (BSJO) ; Churu : Bhutia Jodi, *Roy* 2778 (BSJO) ; Jaisalmer : Ramgarh, *Sharma* 2085 (RUBL) ; Kota : Atru, *Singh* 90331 (LWG) ; Sirohi : Mt. Abu, *Kanodia* 62229 (BSI).

4. *Physalis peruviana* L. Sp. Pl. ed. 2. 1670. 1763 ; Clarke in Hook. f. Fl. Brit. India 4 : 238. 1883 ; Duthie, Fl. Gangetic Plain 2 : 128. 1911 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 172. 1976. 'Bari Papotan' (Hindi).

Erect, pubescent herbs or undershrubs, from a perennial root - stock. Stems sulcate when dry, swollen at lower nodes. Leaves 6-11 × 5-8 cm, ovate, entire or toothed, acute or acuminate, pubescent on both sides. Flowers solitary, axillary. Calyx campanulate ; lobes lanceolate, acute, pubescent outside. Corolla rotate - campanulate, pubescent outside, hairy inside, pale - yellow with 5 purple blue spots at the base. Berries 10-15 mm in diam., subglobose, glabrous, enclosed in inflated calyx 3-4 cm in diam. Seeds compressed, rounded.

Fl. & Fr. : August - November.

Native of tropical America ; naturalized in wastelands in and around the gardens ; often cultivated for its edible fruits.

Selected specimens : Jodhpur : *Bhandari* 241 (JAC) ; Kota : Kathoon, *Singh* 90544 (LWG) ; Sirohi : Mt. Abu, *Blatter* s. n. (BLAT). Also

reported from Jaisalmer (Blatt. & Hallberg, 1919), Jhunjhunu (Nair, 1961) and Sikar (Ratnam, 1951).

6. SOLANUM L.

- 1a. Leaves hastately 3 - lobed. ... 8. *S. triquetrum*
- 1b. Leaves entire, angled, toothed or pinnately lobed ;
 - 2a. Plants armed with prickles :
 - 3a. Flowers pale - purple or violet purple :
 - 4a. Berries more than 1 cm in diameter :
 - 5a. Prickles straight. Peduncles solitary, bearing bisexual flowers only :
 - 6a. Berries clothed with long fulvous hairs. ... 3. *S. ferox*
 - 6b. Berries glabrous. ... 9. *S. virginianum*
 - 5b. Prickles recurved. Peduncles paired, one with solitary bisexual flower and other with many male flowers in racemose cymes. ... 4. *S. incanum*
 - 4b. Berries less than 1 cm in diameter :
 - 7a. Much - branched, erect shrubs or undershrubs. Berries yellow when ripe :
 - 8a. Petiole and pedicels prickly. Leaves more than 5 cm long. Seeds pitted. ... 2. *S. anguivi*
 - 8b. Petiole and pedicels not prickly. Leaves maximum upto 5 cm long. Seeds minutely tuberculate. ... 1. *S. albicaule*
 - 7b. Trailing or subscandent undershrubs. Berries scarlet when ripe. ... 7. *S. trilobatum*
 - 3b. Flowers white :
 - 9a. Berries clothed with long fulvous hairs. ... 3. *S. ferox*
 - 9b. Berries glabrous. ... 6. *S. torvum*
 - 2b. Plants unarmed :
 - 10a. Stellately tomentose undershrubs. Berries 1.0 - 1.5 cm in diameter. ... 6. *S. torvum*
 - 10b. Glabrous or pubescent herbs. Berries 5 - 7 mm in diameter. ... 5. *S. nigrum*

1. *Solanum albicaule* Kotschy ex Dunal in DC. Prodr. 13 (1) : 204. 1852 ; Bhandari, Fl. Ind. Desert 273. 1978. *S. drafurens* Delile ex Dunal in DC. Prodr. 13 (1) : 204. 1852. *S. scindicum* Prain in Journ. Asiat. Soc. Bengal 65 : 542. 1896. 'Nar - kanta' (Hindi).

Perennial, prickly undershrubs. Stem terete, slender, covered with white stellate tomentum. Prickles numerous, compressed, recurved at the apex. Leaves 2-4 × 1.5-2.5 cm, ovate or ovate-oblong, acute, obtuse, entire or slightly lobed, stellate hairy on both sides. Flowers in extra-axillary, racemose cymes. Calyx campanulate, stellate tomentose outside ; lobes triangular, acute. Corolla purple ; lobes lanceolate-oblong, acute. Berries 4-10 mm in diam., globose, glabrous. Seeds subreniform, slightly pitted, black.

Fl. & Fr. : August - December.

Rather common in the desert area growing amongst the bushes and rarely rambling on *Euphorbia caducifolia* Haines.

Selected specimens : Barmer : Kharedu hillock, Tiwari 941 (BSJO) ; Jaisalmer : Bhandari 1074 (JAC) ; Jodhpur : Kailana, Moorthy 71 (BSJO). Also reported from Sikar (Ratnam, 1951 ; Nair & Malhotra, 1961).

2. *Solanum anguivi* Lam. Encycl. Meth. Bot. 2 : 23. 1774 ; Hepper in Hawkes in J. Linn. Soc. 76 (4) : 290. 1978. *S. indicum* auct. non L. 1753 ; Clarke in Hook. f. Fl. Brit. India 4 : 234. 1883 ; Duthie, Fl. Gangetic Plain 2 : 126. 1911.

Erect, perennial, armed, stellate tomentose undershrubs. Stem armed with hooked prickles. Leaves 6-15 × 3.5-10 cm, ovate-oblong, sinuate pinnatifid, subacute or obtuse, subcordate or truncate at the base, stellate pubescent. Flowers in lateral cymose corymbs. Calyx prickly, stellate pubescent outside ; lobes ovate, acute. Corolla 2.0-2.5 cm across, stellate-pubescent ; lobes elliptic-oblong, obtuse. Fruits 5-8 mm in diam., globose, smooth, orange-yellow. Seeds smooth.

Fl. & Fr. : August - December.

Occasional, in wastelands along the roads and outskirts of forests.

Selected specimens : Alwar : Pandupole, Sharma 3882 (RUBL) ; Churu : Puri 39929 (BSI) ; Jaipur : Digotha, Sharma 3732 (RUBL) ; Jhalawar : Sharma 145, 299 (RUBL) ; Sirohi : Mt. Abu, Raizada 20665 (DD). Also reported from N.W. Rajasthan (Sankhala, 1951).

3. *Solanum ferox* L. Sp. Pl. ed. 2. 267. 1762 ; Clarke in Hook. f. Fl. Brit. India 4 : 233. 1883 ; Deb in J. Econ. Tax. Bot. 1 : 46. 1980. *S.*

Iasiocarpum Dun. Sol. 222. 1813. *S. stramonifolium* Dun. Sol. 222. 1813.
S. hirsutum Roxb. Fl. Ind. 2 : 253. 1824.

Suberect, prickly, stellate tomentose undershrubs, 60-120 cm high. Leaves 15-20 × 10-15 cm, ovate, sinuately lobed, prickly on the veins, densely tomentose on both sides. Racemes lateral; peduncles stellate tomentose and with needle like hairs, not prickly. Calyx funnel shaped; lobes ovate triangular, not acuminate. Corolla densely woolly outside; lobes oblong, acute. Ovary hirsute. Berries globose, yellow, clothed with needle like hairs.

Fl. & Fr. : Most part of the year.

Rare, in wastelands. Included on the authority of Bajpai & Verma (1964) from Jaipur. Sharma & Tiagi (1979) have, however, not included it in their Flora of N.E. Rajasthan. This taxon finds its distribution in eastern and southern India, hence, occurrence in Rajasthan is quite possible.

4. *Solanum incanum* L. Sp. Pl. 188. 1753; Duthie, Fl. Gangetic Plain 2 : 126. 1911. *S. coagulans* Forsk. Fl. Aegypt. - Arab. 47. 1775; Clarke in Hook. f. Fl. Brit. India 4 : 236. 1883. 'Bhukataliya' (Hindi).

Undershrubs, clothed with stellate tomentum mixed with simple hairs and straight or slightly curved prickles. Leaves 5-12 × 3-8 cm, ovate-elliptic, sinuately toothed, obtuse, stellate hairy on both sides and prickly on the veins. Peduncles extra-axillary, paired, one bearing solitary bisexual flower and other with many male flowers in racemose cymes. Calyx stellate hairy; teeth triangular. Corolla violet-purple, stellate hairy outside. Berries 2.0-2.5 cm in diam., globose, yellow when ripe.

Fl. : August-October; *Fr.* : November-March.

Common in wastelands, open forests and along the roads, particularly in the east of Aravalli.

Selected specimens : Alwar : Siriska Tiger Reserve, Parmar 9403 (BSJO); Banswara : Danpur, Singh 4269 (BSJO); Barmer : Ghandav, Shetty 2342 (BSJO); Jodhpur : Lord Tank, Shetty 314 (BSJO); Kota : Chhabra, Singh 90364 (LWG); Sirohi : Mt. Abu, Jain 5455 (BSI).

5. *Solanum nigrum* L. Sp. Pl. 186. 1753; Clarke in Hook. f. Fl. Brit. India 4 : 229. 1883; Duthie, Fl. Gangetic Plain 2 : 124. 1911. *S. rubrum* Mill. Gard. Dict. ed. 8. no. 2. 1768; Wight, Ic. 2 (1) : 3. t. 344. 1840. 'Kali-papotan, Makao, Mukko, Chirpoti' (Hindi).

Erect or rambling, much-branched, annual-perennial herbs. Leaves 6-10 × 3-5 cm, ovate or ovate-oblong to oblong-lanceolate,

with a cuneate and decurrent base, entire to sinuate - dentate, glabrous except the nerves beneath. Flowers in umbelliform, extra - axillary cymes, white. Calyx lobes ovate - rounded. Style hairy in the lower part. Fruits c. 5 - 8 mm across, globose, yellow, red or blackish purple.

Fl. & Fr. : September - December.

Common weed in cultivated fields, gardens and wet and shady places in wastelands.

Selected specimens : Alwar : Siriska Tiger Reserve, *Parmar* 9573 (BSJO) ; Banswara : Danpur, *Singh* 2988 (BSJO) ; Barmer : Balotra Rd., *Shetty* 2214 (BSJO) ; Jaipur : Ajmer Rd., *Kaul* 8450 (LWG) ; Jaisalmer : Amar Sagar, *Shetty* 6134 (BSJO) ; Sirohi : Mt. Abu, *Duthie* 6676 (DD) ; Udaipur : Nathdwara, *Kaul* 8568 (LWG).

6. *Solanum torvum* Sw. Prodr. 47. 1788 ; Clarke in Hook. f. Fl. Brit. India 4 : 234. 1883 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 176. 1976. 'Bhurat' (Hindi).

Much - branched, tomentose shrubs, upto 4 m high. Stems tinged with dark purple, aculeate with short hooked prickles. Leaves 4 - 15 × 2 - 12 cm, ovate - elliptic to oblong, entire or pinnati - lobed, rounded or cordate at the base, acute or obtuse, sparsely prickly on the midrib. Flowers in many - flowered, sessile or shortly peduncled cymose corymbs. Pedicels glandular hairy with simple and stellate hairs. Calyx glandular hairy ; lobes lanceolate, acuminate. Corolla white, stellate pubescent outside ; lobes lanceolate, subacute. Ovary glandular hairy ; style glabrous. Fruits 1.0 - 1.5 cm across, on a persistent calyx.

Fl. & Fr. : September - February.

Common in wastelands in and around the gardens, along the roads etc. Very close to *S. indicum* L.

Selected specimens : Kota : *Singh* 90294, 90884 (LWG). Also reported from Udaipur (Ramdeo, 1969).

7. *Solanum trilobatum* L. Sp. Pl. 189. 1753 ; Clarke in Hook. f. Fl. Brit. India 4 : 236. 1883 ; Deb in Journ. Econ. Tax. Bot. 1 : 51. 1980. *S. acetosaefolium* Lam. Encycl. 4 : 306. 1797.

Scandent or trailing, suffruticose herbs, 1.5 - 3.5 m high, armed with laterally compressed, recurved, brownish - yellow prickles. Leaves 2.5 - 6.0 × 2 - 4 cm, ovate or oblong, sinuately lobed or wavy, obtuse, sparsely prickly on the nerves. Flowers in 5 - 10 cm long, extra - axillary, racemose cymes ; pedicels thickened upwards and reflexed in fruit. Corolla

purple violet ; lobes as long as tube, lanceolate, reflexed. Berries c. 1 cm in diam., globose, scarlet red when ripe. Seeds slightly pitted, light chocolate.

Fl. & Fr. : October - February.

Rare, in wastelands and open forests.

Selected specimen : Desert afforestation : Puri 22958 (BSI).

8. *Solanum triquetrum* Cav. Syn. Fl. North Am. ed. 2. 2 (1) : 228. 1886 ; Hussian in Bull. Bot Soc. Bengal 22 (2) : 237. 1968 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 177. 1976. 'Dogi' (Hindi).

Erect or climbing herbs, 30 - 75 cm high. Leaves deltoid cordate with a tendency to become hastately 3 lobed ; lateral lobes 0.5 - 2.0 × 0.3 - 1.0 cm ; middle lobe 1.0 - 4.5 × 0.5 - 1.2 cm, lanceolate - linear. Flowers in extra - axillary cymes ; pedicels clavate, nodose - articulated at the base. Calyx 5 lobed. Corolla white, prominently hairy all along the margins and at apex. Berries 0.75 - 0.8 mm in diam., globose, yellowish orange when ripe. Seeds minutely muricate.

Fl. & Fr. : September - February.

Native of America ; few plants were collected from a bare, unploughed field ; probably recently introduced.

Selected specimen : Kota : Devari, Singh 90806 (LWG).

9. *Solanum virginianum* L. Sp. Pl. 187. 1753 ; Hepper & Jaeger in Kew Bull. 41 : 434. 1986. *S. surattense* Burm. f. Fl. Ind. 57. 1768 ; Mahesh. Illus. Fl. Delhi f. 150. 1966. *S. xanthocarpum* Schrad. & Wendl. in Schrad. Sert. Hannov. 1 : S. t. 2. 1795 ; Clarke in Hook. f. Fl. Brit. India 4 : 236. 1883 ; Duthie, Fl. Gangetic Plain 2 : 125. 1911. 'Baigan - Kateli, Bhurangni, Dhaturi' (Hindi).

Diffuse or prostrate, perennial herbs, clothed with stellate hairs and erect, yellow prickles. Stems zigzag, stellate tomentose when young. Leaves 5 - 12 × 2.5 - 6.5 cm, ovate - elliptic or lanceolate, sinuately lobed to subpinnatifid, obtuse or subacute, stellate hairy and armed with long sharp prickles on mid rib and nerves. Flowers extra - axillary, solitary or in few - flowered cymes. Calyx lobes linear, with broad, scarious sinus between the lobes. Corolla violet purple ; lobes deltoid, acute. Berries 1.5 - 2.0 cm in diam., globose, yellow when ripe.

Fl. & Fr. : Most part of the year.

Common throughout the area. White-flowered forms and many intermediates were noted in and around Jodhpur. Cytologically all the forms were found identical.

Selected specimens : Alwar : Siriska Tiger Reserve, *Parmar* 9696 (BSJO) ; Banswara : Chhatripada forest, *Singh* 2978 (BSJO) ; Barmer : Uttarlai, *Shetty* 2291 (BSJO) ; Jaipur : Sambhar, *Lal* 31661 (LWG) ; Jodhpur : *Roy* 2460 (BSJO) ; Kota : *Singh* 90173 (LWG) ; Sirohi : Mt. Abu. *Mehta* 785 (JAC).

7. WITHANIA Pauq. *nom. cons.*

Plants mealy tomentose. Leaves elliptic - lanceolate or oblanceolate. Flowers unisexual. Berries with accrescent calyx, not enclosed. ... 1. *W. coagulans*

Plants hoary tomentose. Leaves ovate, oblong or obovate. Flowers bisexual. Berries enclosed in the persistent calyx. ... 2. *W. somnifera*

1. *Withania coagulans* (Stocks) Dunal in DC. Prodr. 13 (1) : 685. 1852 ; Clarke in Hook. f. Fl. Brit. India 4 : 240. 1883 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 178. 1976. *Puneeria coagulans* Stocks in Journ. Asiat. Soc. Bengal 3 : 56. 1849 ; Wight, Ic. 4 (4) : 17. t. 1616. 1850. 'Panceer - bandh' (Hindi).

Rigid, ashy - grey undershrubs, upto 1 m high. Stem woody, terete, densely clothed with mealy, stellate tomentum, sulcate when dry. Leaves 2.7 × 1.0 - 2.5 cm, elliptic lanceolate or oblanceolate, coriaceous, obtuse at apex, attenuated at base into an obscure, flat petiole, grey tomentose on both surfaces. Male flowers : Stamens reaching upto top of corolla tube ; filaments glabrous. Female flowers : Ovary ovoid ; style glabrous ; stigma mushroom shaped, 2 lamellate. Berries globose, surrounded by scurby pubescent, membranous calyx. Seeds ear - shaped, glabrous.

Fl. & Fr. : November - March.

Rare, in wastelands. Fruits of this plant are used in coagulating milk.

Selected specimens : Ajmer : Lohargal, *Sharma* 206 (DD) ; Jaisalmer : *Bhandari* 1025 (JAC) ; Jodhpur : *Bhandari* 502 (JAC).

2. *Withania somnifera* (L.) Dunal in DC. Prodr. 13 (1) : 453. 1852 ; Clarke in Hook. f. Fl. Brit. India 4 : 239. 1883 ; Duthie, Fl. Gangetic

Plain 2 : 128. 1911. *Physalis somnifera* L. Sp. Pl. 182. 1753. 'Asgandh, Chirpotan, Rasbhari' (Hindi).

Much branched undershrubs, c. 1 m high, clothed with greenish - white hairs. Roots more or less tuberous. Leaves 7-10 × 3-6 cm. ovate or ovate-oblong or obovate, entire, minutely stellate pubescent beneath, acute or subobtuse at the apex. Flowers clustered in axillary, subsessile, umbellate cymes. Calyx much enlarged in fruit, stellate tomentose ; teeth linear, acute. Corolla divided more or less half way down, greenish - yellow ; lobes oblong, obtuse, ciliate and pubescent outside. Stamens attached near the base of corolla tube. Berries 5-6 mm in diam., globose, orange-red, enclosed in 5-angled, pubescent, apiculate, membranous cover of inflated calyx.

Fl. & Fr. : Most part of year.

Common in dry wastelands, preferably in fertile soils.

Selected specimens : Alwar : Siriska Tiger Reserve, *Parmar* 9590 (BSJO) ; Barmer : Berigam, *Tiwari* 1198 (BSJO) ; Bundi : *Singh* 90666 (LWG) ; Dungarpur : *Verma* 179 (BSA) ; Kalinsar, *Stower* 5494 A (DD) ; Jaipur : Ajmer Rd., *Kaul* 8436 (LWG) ; Sirohi : Sanwada, *Jain* 6096 (BSI).

CULTIVATED SPECIES

Capsicum annum L. 'Mirchi' (Hindi) Perennial herbs, with lanceolate leaves, white flowers and slender, green, red or orange berries. Calyx not enclosing the base of berry. Native of South America ; cultivated throughout the area for its edible berries.

var. *acuminata* Fingerh. is also cultivated throughout the area.

Capsicum frutescens L. 'Mirchi' (Hindi) Much-branched undershrubs, with white or yellowish white flowers, blue to purple anthers. Native of Tropical America ; widely cultivated for the fruits used as spice and condiment.

Cestrum diurnum L. 'Din ka Raja' (Hindi) Erect shrubs. Leaves exstipulate, ovate-lanceolate. Flowers white, sweet-scented, in axillary pedunculate cymes. Berries globose, black. Native of West Indies ; cultivated in the gardens for sweet-scented flowers.

Cestrum nocturnum L. 'Rat ki Rani' (Hindi) Shrubs, with ovate-oblong, exstipulate leaves. Flowers greenish-white or creamy white, in many flowered axillary or terminal panicles.

Cestrum parqui L. Herit. 'Rat ki Rani' (Hindi) Glabrous shrubs, with lanceolate leaves tapering at apex. Flowers greenish white or greenish yellow, in profuse axillary and terminal, umbelliform cymes. Native of S. America ; cultivated in the gardens for fragrant flowers.

Lycopersicon esculentum Mill. (*Solanum lycopersicum* L., *Lycopersicon lycopersicum* (L.) Karst. 'Tamatar' (Hindi) Perennial herbs, with yellow flowers and globose berries with accrescent calyx. Native of South America ; cultivated throughout the area ; often found as an escape near the habitations.

Nicotiana rustica L. 'Tambakhu' (Hindi) Glandular pubescent, annual perennial herbs, upto 1 m high, with ovate oblong to rounded leaves, narrowed at the base into a winged petiole. Flowers in dense, cymose panicles. Natives of Central and S. America ; cultivated for the leaves which are smoked or taken within.

Nicotiana tabacum L. 'Tambakhu' (Hindi) Glandular pubescent herbs, with pinkish flowers and ovate capsules. Native of South America ; cultivated throughout the area for the leaves which are smoked or taken within.

Petunia nyctaginiflora Juss. Erect, stout herbs, 30 - 60 cm high, with ovate - oblong leaves, dull white flowers fragrant at evening. Native of Argentina ; cultivated in the gardens ; rarely escape.

Solanum jasminoides Paxt. - Slender, twining shrubs, with ovate - lanceolate leaves and white flowers in corymbose panicles. Native of South America ; rarely grown in the gardens.

Solanum melongena L. var. *melongena* 'Bhintak, Bhatta, Baingun' (Hindi) Erect, prickly herbs or undershrubs, with violet or purple flowers and obovoid, or slender berries. Cultivated for its fruits cooked as vegetable.

Solanum melongena L. var. *insana* Prain 'Baingun' (Hindi) - Similar to var. *melongena*, but bears globose fruits.

Solanum scabrothianum Andrews - Climbing shrubs. Upper leaves simple, lower ones 3 - foliolate or pinnatisect. Flowers blue or rose - coloured, in axillary and terminal corymbose panicles. Berries globose, scarlet.

Solanum tuberosum L. 'Aalu' (Hindi) - Annual herbs, with underground stem tubers, odd - pinnate leaves and blue or white flowers. Native of Chile, Peru and Granada ; introduced in India in 16th century. Cultivated for stem - tubers cooked as vegetable.

Solanum wrightii Benth. '*Bara Baigan*' (Hindi) Large shrubs or small trees, armed with prickles. Leaves ovate - oblong, sinuately lobed. Flowers violet, in tomentose, extra axillary cymes. Native of S. America ; rarely planted in the gardens.

92. SCROPHULARIACEAE

(V. Singh)

- 1a. All leaves alternate :
 - 2a. Stamens 2. ... 1. *Anticharis*
 - 2b. Stamens 4 or 5 ;
 - 3a. Corolla rotate, actinomorphic. Anthers transverse or oblique ; cells confluent throughout the length. ... 24. *Verbascum*
 - 3b. Corolla bilabiate, zygomorphic. Anthers vertical ; cells confluent at apex, divergent below. ... 17. *Schweinfurthia*
- 1b. Lower leaves opposite or whorled, upper may be opposite, whorled or alternate :
 - 4a. Corolla saccate, gibbose or spurred at the base or throat :
 - 5a. Capsules loculicidal :
 - 6a. Calyx 5 - angled ; lobes small. ... 15. *Mimulus*
 - 6b. Calyx not angled :
 - 7a. Anther - cells stipitate. ... 11. *Lindenbergia*
 - 7b. Anther - cells not stipitate. ... 13. *Mazus*
 - 5b. Capsules porous or same capsule porous and loculicidal both :
 - 8a. Leaves ovate - lanceolate to triangular, sagittate or hastate at base. Corolla yellow or purple. Capsule opening by valve on one side and other by subapical pore. ... 9. *Kickxia*
 - 8b. Leaves linear, obtuse or rounded at the base. Corolla white. Capsule dehiscing by apical pores. ... 2. *Antirrhinum*
 - 4b. Corolla neither saccate, nor gibbose, nor spurred. It may be rotate, slightly zygomorphic with subequal lobes or distinctly bilabiate :

- 9a. Fertile stamens 2 ; staminodes 2 or absent :
- 10a. Anthers 2 - celled ; cells parallel :
- 11a. Corolla with upper lobes outside in buds. Capsule - valves placentiferous, 2 - partite. ... 7. *Dopatrium*
- 11b. Corolla with lateral or lower lobes outside in bud. Capsule - valves not placentiferous, entire. ... 25. *Veronica*
- 10b. Anthers 1 - celled or if 2 - celled, the cells divergent at least at the base :
- 12a. Corolla with lateral or lower lobes outside in bud. ... 25. *Veronica*
- 12b. Corolla with upper lobes outside in bud :
- 13a. Calyx 3 - lobed. ... 8. *Glossostigma*
- 13b. Calyx 5 - lobed :
- 14a. Anthers 1 - celled :
- 15a. Small tufted herbs. Capsules loculicidal. ... 14. *Microcarpaea*
- 15b. Prostrate or creeping herbs. Capsules bursting irregularly. ... 16. *Peplidium*
- 14b. Anthers 2 - celled. ... 12. *Lindernia*
- 9b. Fertile stamens 4 :
- 16a. Anthers 1 - celled, if 2 - celled then one cell empty :
- 17a. Corolla with upper lobes outside in bud :
- 18a. Calyx angled. Corolla 2 - lipped. ... 15. *Mimulus*
- 18b. Calyx not angled. Corolla not 2 - lipped ; lobes subequal. ... 22. *Sutera*
- 17b. Corolla with lower lobes outside in bud :
- 19a. Calyx spathaceous, split down the front. ... 5. *Centranthera*

- 19b. Calyx campanulate or tubular :
- 20a. Leaves always pinnatisect. Empty anther - cells stipitate. ... 19. *Sesubia*
- 20b. Leaves entire or toothed, not pinnatisect. Anther - cells not stipitate :
- 21a. Calyx distinctly ribbed. Corolla - tube incurved at or above the middle ; two upper lobes smaller than others. ... 21. *Striga*
- 21b. Calyx not ribbed. Corolla - tube straight ; lobes subequal. ... 4. *Buchnera*
- 16b. Anthers 2 - celled, both cells fertile :
- 22a. Acaulescent herbs. Flowering scapes arising from the centre of the leaf rosette. ... 6. *Craterostigma*
- 22b. Plants with well developed stems. Flowers borne on the stem in various inflorescences :
- 23a. Corolla with lower lobes outside in bud :
- 24a. Calyx spathaceous, split down the front. ... 5. *Centranthera*
- 24b. Calyx campanulate or tubular :
- 25a. Corolla 2 - lipped, 5 - lobed. ... 11. *Lindenbergia*
- 25b. Corolla rotate, 4 - lobed. ... 18. *Scoparia*
- 23b. Corolla with upper lobes outside in bud :
- 26a. Corolla 4 - lobed. ... 18. *Scoparia*
- 26b. Corolla 5 - lobed :
- 27a. Calyx angled or winged :

- 28a. Calyx 5 - angled. Filaments not appendaged.
Seeds smooth. ... 15. *Mimulus*
- 28b. Calyx 3 to 5 - winged. Filaments appendaged
at base. Seeds rugose or cancellate. ... 23. *Torenia*
- 27b. Calyx neither angled nor winged :
- 29a. Lower pair of stamens inserted in the
corolla - throat ; upper pair inserted in the
corolla - tube :
- 30a. Calyx not winged. ... 12. *Lindernia*
- 30b. Calyx 3 to 5 - winged. ... 23. *Torenia*
- 29b. All the four stamens inserted within the
corolla - tube :
- 31a. Corolla campanulate ; lobes rounded,
subequal. ... 3. *Bacopa*
- 31b. Corolla distinctly bilabiate :
- 32a. Anther - cells stipitate :
- 33a. Placentae either separating in
fruit or, if conjoined in a
column, the column not
winged. Seeds terete. ... 20. *Stemodia*
- 33b. Placentae always conjoined
in a column which is winged
by the remains of the septa.
Seeds angular ... 10. *Limnophila*
- 32b. Anther - cells not stipitate. ... 13. *Mazus*

I. ANTICHARIS Endl.

- Leaves upto 2.5 cm long, ovate. Pedicels less than twice
as long as the calyx. ... 1. *A. glandulosa*
var. *caerulea*
- Leaves exceeding 2.5 cm in length. Pedicels more than
twice the length of calyx. ... 2. *A. senegalensis*

1. *Anticharis glandulosa* Aschers. var. *caerulea* Blatt. & Hallb. ex
Sant. in Journ. Bombay Nat. Hist. Soc. 56 (2) : 280. 1959 ; Bhandari, Fl.
Ind. Desert 279. 1978.

Erect, branched herbs, upto 30 cm high, clothed with viscid
glandular hairs. Leaves 1.0 - 2.5 × 0.4 - 1.2 cm, ovate oblong or
oblong - lanceolate, subobtusate, glandular hairy, narrowed at the base into
a short flattened petiole. Flowers axillary, solitary or 2 - together ;

pedicels glandular hairy. Bracts 2, about the middle of the pedicel, linear-spathulate, glandular hairy. Calyx divided to the base; lobes oblanceolate. Corolla 10-15 mm long, pink, rosy or blue. Filaments glabrous; anthers versatile. Ovary seated on a cup-shaped disk. Capsules ovoid, acuminate, pubescent. Seeds oblong, truncate.

Fl. & Fr. : September - November.

Rare, in rocky habitats. Perhaps the plants produce a sort of oily secretion to such a great extent that the ground below the plant appears more or less greasy. It resembles closely to the typical form except in flower colour.

Selected specimens : Jaisalmer : Ramgarh, *Wadhwa* 5159 (BSA) ; Harchandari, *Shetty* 3492 (BSJO) ; Barabagh, *Tiwari* 801 (BSJO).

2. *Anticharis senegalensis* (Walp.) Bhandari in Bull. Bot. Surv. India 6 (2-4) : 327. 1964 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 180. 1976 ; Bhandari, Fl. Ind. Desert 279. 1978. *Doratanthera senegalensis* Walp. Repert. Bot. Syst. 3 : 305. 1844-45. *D. linearis* Benth. in DC. Prodr. 10 : 347. 1846. *Anticharis linearis* (Benth.) Hochst. ex Aschers. in Monatsb. Akad. Wiss. Berl. 882. 1866 ; Hook. f. Fl. Brit. India 2 : 250. 1883. 'Dhunnya' (Hindi).

Erect, annual, much branched, glandular pubescent herbs, upto 40 cm high. Leaves 3-5 × 0.2-0.4 cm, linear to narrowly lanceolate, hairy. Flowers axillary, solitary, filiform; pedicels glabrous below, glandular towards apex. Bracts 2, inserted little above the middle of pedicels, linear. Calyx divided to the base; lobes linear-lanceolate, glandular hairy. Corolla c. 1 cm long, pale purple. Anthers versatile, curved. Capsules ovoid, acuminate. Seeds oblong, truncate, longitudinally ribbed.

Fl. & Fr. : August - October.

Common in open sandy and gravelly areas and on the hill tops, particularly in the desert area. On drying, plants become blue-black.

Selected specimens : Ajmer : Government College, *Sharma* 1626 (DD) ; Barmer : Munabao, *Pandey* 7912 (BSJO) ; Jaisalmer : Sudasari Forest, *Pandey* 7835 (BSJO) ; Jodhpur : Beriganga, *Shetty* 150 (BSJO) ; Pali : Kharia village, *Shetty* 1854 (BSJO).

2. ANTIRRHINUM L.

Antirrhinum orontium L. Sp. Pl. 617. 1753 ; Hook. f. Fl. Brit. India 4 : 253. 1883 ; Duthie, Fl. Gangetic Plain 2 : 140. 1911.

Erect, glandular - pubescent or hairy herbs, 30 - 70 cm high. Leaves sessile or subsessile, lower opposite, upper alternate, 2.5 - 5.0 × 0.2 - 0.8 cm, linear, acute or obtuse, glabrous or hairy. Flowers sessile or shortly pedicellate, axillary, passing into spiciform racemes. Sepals 5, longer than corolla, linear. Corolla bilabiate, personate, saccate or spurred at base. Anther - cells distinct, parallel. Capsules 1.0 - 1.5 cm long, obliquely ovoid, hairy. Seeds compressed, concave on one face, dorsally keeled, thickened on the margins.

Fl. & Fr. : January - March.

Rare, weed in cultivated fields and gardens.

Selected specimens : Bhilwara : Kharia Dam, *Singh* 7016 (BSJO) ; Chittorgarh : Pratapgarh, *Majumdar* 10195 (BSA) ; Ganganagar : 26 p. s., *Roy* 4093 (BSJO) ; Kota : Chhipabaraut, *Singh* 90616 (LWG) ; Sirohi : Mt. Abu, *Mehta* 434 (JAC).

3. BACOPA Aublet *nom. cons.*

- | | | |
|--|-----|---------------------------|
| 1a. Flowers sessile. | ... | 2. <i>B. hamiltoniana</i> |
| 1b. Flowers pedicellate : | | |
| 2a. Leaves crenate. Bracteoles inserted at the base of pedicel. Corolla yellow. | ... | 4. <i>B. procumbens</i> |
| 2b. Leaves entire. Bracteoles inserted at the top of pedicel. Corolla white : | | |
| 3a. Creeping herbs, rooting on the nodes. Leaves obovate - oblong or spatulate. Capsules ovoid, acute. | ... | 3. <i>B. monnieri</i> |
| 3b. Erect herbs, not rooting on the nodes. Leaves linear - lanceolate. Capsules globose. | ... | 1. <i>B. floribunda</i> |

1. *Bacopa floribunda* (R. Br.) Wettst. in Engl. & Prantl. Pflanz. 4 (3 B) : 77. 1891. *Herpestis floribunda* R. Br. Prodr. 442. 1810 ; Hook. f. Fl. Brit. India 4 : 273. 1884. *Moniera floribunda* (R. Br.) T. Cooke, Fl. Bombay 2 : 286. 1905.

Erect herbs, 7 - 20 cm high, with sub - quadrangular, glabrous stem. Leaves sessile, 1 - 3 × 0.15 - 0.4 cm, linear or linear - lanceolate, acute, entire, punctate. Flowers axillary, solitary or paired. Pedicels 3 - 5 mm long. Bracteoles subulate, inserted little below the calyx. Upper sepal 4 - 6 mm long, ovate, subacute, reticulately veined ; two lateral sepals

linear - lanceolate, acute. Corolla white. Capsules 2 - 3 mm in diam., subglobose. Seeds oblong, truncate at both ends, brown.

Fl. & Fr. : September - December.

Rare, in open wet lands. Very close to *B. hamiltoniana* (Benth.) Wettst.

Selected specimen : Kota : Atru, Singh 83707 A (LWG).

2. *Bacopa hamiltoniana* (Benth.) Wettst. in Engl. & Prantl. Pflanz. 4 (3 B) : 77. 1891. *Herpestis hamiltoniana* Benth. Scroph. Ind. 30. 1835 ; Hook. f. Fl. Brit. India 4 : 272. 1884. *Moniera hamiltoniana* (Benth.) Cooke, Fl. Bombay 2 : 286. 1905 ; Duthie, Fl. Gangetic Plain 2 : 142. 1911.

Erect or decumbent, annual herbs, upto 30 cm high, with quadrangular branches. Leaves 2.5 - 3.5 cm long, linear - lanceolate, acute, entire or serrulate, semi amplexicaule or tapering at the base into a short petiole. Flowers sessile, axillary, solitary. Bracteoles setaceous. Upper sepals broadly ovate, acute, larger ; lateral one ovate lanceolate and 2 inner linear oblong. Corolla as long as calyx, pink with bluish tinge, bilabiate ; upper lip emarginate, lower 3 lobed. Anther cells contiguous. Capsules c. 4 mm in diam., globose, 4 - valved, glabrous. Seeds truncate at both ends.

Fl. & Fr. : August - November.

Rare, in open wet places ; confined to south - east Rajasthan.

Selected specimens : Kota : Atru, Singh 83707 B (LWG) ; Shahabad, Majumdar 13198 (BSA).

3. *Bacopa monnieri* (L.) Wettst. in Engl. & Prantl. Pflanz. 4 (3B) : 77. 1891 ; Pennell in Proc. Acad. Nat. Sci. Phil. 98 : 94. 1946. *Lysinachia monnieri* L. Cent. Pl. 2 : 9. 1756. *Moniera cuneifolia* Michx. Fl. Bor. Amer. 2 : 22. 1803 ; Duthie, Fl. Gangetic Plain 2 : 142. 1911. *Herpestis monnieri* (L.) Kunth, Nov. Gen. Sp. Pl. 2 : 366. 1818, *nom. illeg.* ; Hook. f. Fl. Brit. India 4 : 272. 1884. '*Jalbuti, Brahami, Nirbrahmi*' (Hindi).

Suberect or creeping, glandular punctate herbs, rooting at the nodes. Leaves opposite, decussate, sessile, 0.4 - 3.0 cm long, obovate - oblong or spatulate, entire or crenulate, obtuse or emarginate, fleshy. Flowers axillary, solitary ; pedicels 0.5 - 1.5 cm long in flower and upto 2.5 cm long in fruit. Bracteoles 2, linear. Three larger sepals broadly ovate - oblong, acute ; 2 inner ones narrowly lanceolate. Corolla c. 1 cm long,

actinomorphic, purplish or pink with purple veins. Anther cells parallel. Capsules c. 5 mm long, ovoid, acute.

Fl. & Fr. : Throughout the year.

Abundant throughout the area in swampy and semi-aquatic habitats.

Selected specimens : Alwar : Siliserh, *Hiralal* 34591 (LWG) ; Banswara : Wadita hillage, *Singh* 3686 (BSJO) ; Jaipur : *Wadhwa* 8372 (BSA) ; Jodhpur : Chopasni, *Pandey* 1760 (BSJO) ; Kota : Baran, *Singh* 30495 (LWG) ; Sirohi : Mt. Abu, *Kanodia* 62191 (BSI).

4. *Bacopa procumbens* (Mill.) Greenm. Field Columb. Mus. Bot. ser. 2. 261. 1907 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 180. 1976. *Erinus procumbens* Mill. Gard. Dict. ed. 8. no. 6. 1768. *Lindernia dianthera* Sw. Prodr. 92. 1788. *Pagesia dianthera* (Sw.) Penn. in Proc. Acad. Nat. Sci. Philad. Monogr. 1 : 69. 1935. *Mecradonia dianthera* (Sw.) Penn. in Proc. Acad. Nat. Sci. Philad. 98 : 87. 1946.

Prostrate, annual herbs, rooting on the lower nodes, with quadrangular stems. Leaves opposite, decussate, sessile, 8 - 16 × 6 - 12 mm, ovate rounded, crenate serrate, glandular beneath. Flowers axillary, solitary ; pedicels 2 - 4 cm long. Bracteoles 2, linear. Calyx equalling the corolla ; lateral segments rarely bear basal appendage bent towards pedicel. Corolla 2 lipped, lemon yellow, with hairy throat. Stamens 4, didynamous, included ; anther cells stipitate. Stigma lamellate. Capsules c. 6 mm long, cylindrical, 2 - valved, septifragal. Seeds reticulate.

Fl. & Fr. : August - October.

Native of T. America ; rare, in wet and shady habitats in the forests, particularly along water streams.

Selected specimen : Pali : Parashram Mahadeo, *Pandey* 19400 (BSJO).

4. BUCHNERA L.

Buchnera hispida Buch. Ham. ex D. Don, Prodr. Fl. Nep. 91. 1825 ; Wight, Ic. 4 (3) : 2. t. 1413. 1849 ; Hook. f. Fl. Brit. India 4 : 298. 1884 ; Duthie, Fl. Gangetic Plain 2 : 155. 1911.

Erect, annual, hispid herbs, 15 - 60 cm high. Lower leaves in rosette, middle ones opposite and alternate upwards passing into obovate or oblanceolate bracts which are slightly toothed, hispid and contracted

at base. Flowers in terminal, leafy or bracteate spikes. Bracteoles subulate to linear lanceolate. Calyx tubular, 10 ribbed, 5 toothed, hispid; teeth subulate. Corolla 1.0 - 1.5 cm long, purple or purplish blue or white; lobes 5, subequal, obovate cuneate or oblong obovate, hairy near the throat. Anthers 1 celled. Capsules oblong ovoid, enclosed by the calyx.

Fl. & Fr. : September - November.

Rare, in grassy beds of rivers and tanks.

Selected specimens : Banswara : Kushalgarh, *Kanodia* 75686 (BSI); Sirohi : Mt. Abu, *Duthie* 6685 (DD), *Jain* 60152 (BSI).

5. CENTRANTHERA R. Br.

Centranthera nepalensis D. Don, *Prodr. Fl. Nep.* 88. 1825. *C. hispida* *auct. plur.* non R. Br. 1810; Hook. f. *Fl. Brit. India* 4 : 301. 1884; *Duthie*, *Fl. Gangetic Plain* 2 : 158. 1911.

Erect, annual, hispid herbs, 15 - 60 cm high. Leaves sessile, lower opposite, upper alternate and passing into bracts, 1.5 × 0.2 - 0.5 cm, linear oblong, shallowly crenate or subentire. Flowers in terminal, long interrupted subspicate racemes. Calyx c. 8 mm long, spathaceous, hairy. Corolla 1.3 - 2.0 cm long, infundibuliform, slightly curved, white or purple. Anthers coherent in pairs; cells spurred, one imperfect; filaments of anterior pair are comparative densely villous. Capsules 5 - 6 mm long, ovoid oblong, grooved. Seeds reticulate.

Fl. & Fr. : September - November.

Rare, in damp grassy habitats.

Selected specimen : Kota : Shahabad, *Majumdar* 13195 (BSA).

6. CRATEROSTIGMA Hochst.

Craterostigma plantagineum Hochst. in *Flora* 24 : 669. 1841; Maheshwari & Singh in *Bull. Bot. Surv. India* 13 (1 - 2) : 11. f. 1 - 9. 1973. *Torenia plantaginea* Benth. in *DC. Prodr.* 10 : 411. 1846. '*Balsurai*' (Hindi).

Densely pilose, acaulescent, perennial herbs. Leaves rosulate, 3 - 8 in a whorl, 2.5 - 4.0 × 1.5 - 2.5 cm, ovate to ovate - lanceolate or subspathulate, entire, ciliate, 5 - nerved, obtuse, narrowed at the base into

a short winged petiole. Scapes 2.5-10.0 cm long, unbranched, quadrangular. Flowers paired or more, borne in racemes. Bracts 8-15 × 4-8 mm, leaf-like, concave, sessile. Pedicels 2-4 mm long, sometimes upto 1.5 cm long forming corymbose racemes. Calyx 5-angled or 5-ribbed; teeth 5, subequal. Corolla 1.2-2.0 cm long, 2-lipped, violet-purple. Stamens 4, didynamous, anterior pair exserted; anthers dimorphic. Capsules 8-10 × 3 mm, oval or oblong, narrowed at the ends, 5-angled, many-seeded.

Fl. & Fr. : August - April.

Native of T. Africa, imperfectly naturalized in gravelly and shallow soils, particularly between the crevices of rocks.

Selected specimen : Sawaimadhopur : Karauli, Das 9130 (BSJO).

7. DOPATRIUM Buch.-Ham. ex Benth.

Dopatrium junceum (Roxb.) Buch. - Ham. ex Benth. Scroph. Ind. 31. 1835; Hook. f. Fl. Brit. India 4 : 274. 1884; Duthie, Fl. Gangetic Plain 2 : 147. 1911. *Gratiola juncea* Roxb. Pl. Cor. 2 : 16. t. 129. 1800.

Erect, slender, fleshy, glabrous herbs, 15-30 cm high. Leaves opposite, distant, sessile, 0.5-1.5 × 0.3-0.5 cm, elliptic-oblong, parallel-nerved, upper ones reduced to bracts. Flowers arranged in slender racemes of distant opposite pairs; lower one sessile, cleistogamous; upper ones perfect, pedicelled. Calyx lobes oblong-lanceolate, obtuse. Corolla c. 5 mm long, glandular-puberulous, bilabiate; upper lip bilobed; lower one 3-lobed. Stamens 2; anther-cells parallel. Capsules globular, apiculate. Seeds ellipsoid, tubercled.

Fl. & Fr. : September - November.

Rare, in marshy habitats, particularly in rice fields.

Selected specimens : Bhilwara : Bijolia, Singh 6053 (BSJO); Jodhpur : Bhandari 2172 (JAC); Kota : Shahabad, Majumdar 13210, 13159 (BSA); Sirohi : Mt. Abu, Jain 46686 (BSI); Tonk : Rampura, Shetty 1041 (BSJO).

8. GLOSSOSTIGMA Wt. & Arn. ex Arn. nom. cons.

Glossostigma diandra (L.) Kuntze, Rev. Gen. Pl. 2 : 461. 1891. *Limosella diandra* L. Mant. Pl. 252. 1771. *Microcarpaea spathulatum*

Hook. Bot. Misc. 2 : 101. Suppl. t. 4. 1831. *Glossostigma spathulatum* (Hooker) Wt. & Arn. ex Arn. Nov. Act. Acad. Caes. Leop. Carol. Nat. Cur. 18 : 355. 1836.

Tufted, creeping, weak, flaccid herbs, rooting on the nodes. Leaves opposite, 5 - 8 mm long, linear - spathulate, entire, lower ones tapering at the base into a petiole upto 1.5 cm long. Flowers axillary, solitary, ebracteate ; pedicels shorter than leaves. Calyx 3 - lobed. Corolla bluish or pinkish white, 5 lobed. Stamens 2 ; anthers unilocular. Capsules subglobose, equalling the calyx, loculicidal. Seeds ovoid.

Rare, on the banks of rivers, tanks and in road side ponds in swampy habitats.

Selected specimens : Bharatpur : *Raizada* 64495 (DD) ; Bhilwara : Parvatipur, *Singh* 6574 (BSJO) ; Jodhpur : Akhraj ka tank, *Singh* 4484 (BSJO) ; Kota : Airport area, *Singh* 90186 (BSJO) ; Sirohi : Mt. Abu, *Duthie* 6683 (DD) ; Tonk : Rampura, *Shetty* 1039 (BSJO).

9. KICKXIA Dumort.

Plants hirsute. Corolla purplish, pubescent outside ; spur straight or only slightly curved forward. Pedicels as long as sepals. ...

1. *K. incana*

Plants glabrous. Corolla yellow, glabrous outside ; spur strongly curved forward. Pedicels longer than sepals. ...

2. *K. ramosissima*

1. *Kickxia incana* (Wall.) Pennell in Acad. Nat. Sci. Phil. Monogr. 5 : 59. 1943. *Linaria incana* Wall. Pl. As. Rar. 2 : 43. 1831 ; Hook. f. Fl. Brit. India 4 : 252. 1883. *L. cabulica* Benth. in DC. Prodr. 10 : 270. 1846 ; Hook. f. l.c. 4 : 251. 1883. *L. ramosissima* (Wall.) Janchen var. *pubescens* Stocks ex Hook. f. l.c. 4 : 251. 1883.

Prostrate or twining, perennial, hirsute herbs. Leaves alternate, petiole late, lower ovate subhastate and lobed, upper ones lanceolate - sagittate, hirsute. Flowers axillary. Pedicels rigid, longer than leaves. Sepals narrowly lanceolate. Corolla c. 7 mm long, with upper lip purplish and palate purple spotted ; spur deflexed, straight or curved forward, much shorter than corolla - tube. Capsules rupturing irregularly. Seeds pitted.

Fl. & Fr. : Rainy season.

Selected specimens : Jaipur : Amer, *Sharma* 316 (RUBL) ; Sirohi : Ambleshwar Ghat, *Jain* 60467 (BSI) ; Udaipur : *Kanodia* 82483 (BSI). Also reported from Jhunjhunu (Nair *et al.*, 1957) and Sikar (Nair & Nathawat, 1957).

2. *Kickxia ramosissima* (Wall.) Janchen in Oest. Zeit. 82 : 152. 1933 ; Mahesh. Illus. Fl. Delhi f. 153. 1966. *Linaria ramosissima*. Wall. Pl. Asiat. Rar. 2 : 43. t. 153. 1831 ; Hook. f. Fl. Brit. India 4 : 251. 1883 ; Duthie, Fl. Gangetic Plain 2 : 140. 1911.

Much branched, glabrous, twining or trailing, perennial herbs, 15-30 cm high. Leaves alternate, petiolate, variable in shape, the lower 5 to 7-lobed, triangular hastate, the upper lanceolate-sagittate. Flowers axillary, solitary ; pedicels 1.0-3.5 cm long, terete. Calyx-lobes linear-lanceolate, membranous towards the base. Corolla 5-10 mm long, yellow ; upper lip 2-lobed ; lower one 3-lobed. Anther cells parallel. Capsules globose-ovoid, opening on one side by a valve and other side by a subapical pore. Seeds spinulose.

Fl. & Fr. : Throughout the year, chiefly during rainy season.

Common on old walls and in ravines. Plants prefer dry localities.

Selected specimens : Alwar : Siriska Tiger Reserve, Parmar 9651 (BSJO) ; Barmer : Bhandari 514 (JAC) ; Jaipur : Doasa, Wadhwa 8101 (BSA) ; Kota : Chhabra, Singh 90925 (LWG) ; Sirohi : Ambleshwar, Jain 60467 (BSA) ; Tonk : Kacha Bunda, Shetty 1049 (BSJO).

10. LIMNOPHILA R. Br. *nom. cons.*

- | | | |
|--|-----|---------------------------|
| 1a. Leaves pinnately nerved, all alike <i>i.e.</i> no whorls of pinnatifid or multifid leaves. | ... | 3. <i>L. rugosa</i> |
| 1b. Leaves with 3-5 parallel nerves : lower ones pinnatifid or multifid : | | |
| 2a. Flowers sessile. | ... | 1. <i>L. heterophylla</i> |
| 2b. Flowers pedicellate. | ... | 2. <i>L. indica</i> |

1. *Limnophila heterophylla* (Roxb.) Benth. Scroph. Ind. 25. 1835 ; Hook. f. Fl. Brit. India 4 : 270. 1884. *Columnnea heterophylla* Roxb. Fl. Ind. 3 : 97. 1832. *Limnophila reflexa* Benth. Scroph. Ind. 25. 1835. *L. heterophylla* (Roxb.) Benth. var. *reflexa* (Benth). Hook. f. *l.c.* 4 : 270. 1884.

Aquatic perennial herbs, upto 50 cm high. Leaves sessile, on aerial stems opposite or verticillate, upto 20 × 3.5 mm, oblong-lanceolate, subcrenate, semi-amplexicaul, 3 to 5 parallel nerved, glabrous ; submerged leaves upto 5.5 cm long, multifid with capillary segments. Flowers sessile or subsessile, axillary, solitary, forming a lax terminal spike ; cleistogamous flowers frequently present on submerged stems. Bracteoles

absent. Calyx glandular; lobes ovate acuminate. Corolla pale-pink, glabrous, Capsules spheroidal, compressed.

Fl. & Fr. : August - February.

Rare, in marshy or semi aquatic habitats.

Selected specimen : Sirohi : Abu Road, *McCann* 141 (BLAT). Also reported from Alwar (Vyas, 1964, 67), Kota (Gupta, 1966) and Sikar (Nair & Malhotra, 1961).

2. *Limnophila indica* (L.) Druce in Rep. Bot. Exch. Club. Brit. Isles 3 : 420. 1914. *Hottonia indica* L. Syst. Nat. ed. 10. 919. 1759. *Limnophila gratioloides* R. Br. Prodr. 442. 1810; Hook. f. Fl. Brit. India 4 : 271. 1884, incl. vars.; Duthie, Fl. Gangetic Plain 2 : 146. 1911, incl. vars. *L. racemosa* Benth. Scroph. Ind. 26. 1835; Wight, Ic. 3 (2) : 5. t. 861. 1843 45; Hook. f. *I. c.* 4 : 271. 1884; Duthie, *I. c.* 2 : 146. 1911. 'Gulabi' (Hindi).

Amphibious perennial herbs, 2.5 - 14.0 cm high, glandular in the upper region, rooting on the lower nodes. Aerial leaves verticillate, variously dissected or sometimes lower 2 to 3 pairs of opposite, undissected, crenate serrate to lacerate, 1 to 3 nerved leaves towards the apex; submerged leaves verticillate in whorls of 6 - 12, pinnatisect, lobes linear and flattened or capillary. Flowers pedicelled, axillary, solitary; pedicels glandular. Calyx glandular; lobes ovate lanceolate, shortly acuminate. Corolla white or pale yellow at base and mauve pink above. Capsules ellipsoid - subglobose, compressed.

Fl. & Fr. : August - December.

Common in marshy and semi aquatic habitats, particularly in rice - fields.

Selected specimens : Alwar : Siliserh, *H. Lal* 34528 (LWG); Banswara : Loda tank, *Kanodia* 75326 (BSI); Rowal Hindwala forest, *Singh* 3691 (BSJO); Jaipur : Digotha Rd., *Sharma* 3702 (RUBL); Kota : Shahabad, *Verma* 693, *Wadhwa & Prasad* 9348 (BSA); Sirohi : Mt. Abu, *Jain* 48185 (BSA).

3. *Limnophila rugosa* (Roth) Merr. Interpr. Rumph. Herb. Amb. 466. 1917; Raizada, Suppl. Duthie, Fl. Gangetic Plain 184. 1976. *Herpestis rugosa* Roth, Nov. Pl. Sp. 290. 1821. *Limnophila roxburghii* auct. pl. non G. Don, 1838; Hook. f. Fl. Brit. India 4 : 265. 1884.

Erect, aromatic herbs, upto 30 cm high, with many stems from the base. Leaves opposite, 4 - 12 × 1.5 - 4.0 cm, elliptic to ovate, crenate - serrate, punctate beneath. Flowers sessile, in head - like, axillary,

pedunculate spikes. Calyx - lobes acuminate. Corolla blue purplish with a yellow mouth, pubescent outside. Stamens 4, didynamous, included. Capsules c. 6 mm long, oblong, compressed, grooved. Seeds oblong, angular, truncate, minutely dotted.

Fl. & Fr. : August - November.

Rare, in swampy localities.

Selected specimen : Alwar : Siriska Tiger Reserve, *Parmar* 9564 (BSJO).

11. LINDENBERGIA Lehm.

Annual herbs. Flowers axillary, solitary or in clusters, passing into terminal leafy racemes. Calyx - lobes obtuse or rounded. ...

1. *L. indica*

Perennial herbs. Flowers in 1 - sided, interrupted spikes. Calyx - lobes acute. ...

2. *L. macrostachya*

1. *Lindenbergia indica* (L.) Vatke, *Osterr. Bot. Zeitschr.* 25 : 10. 1875. *Dodartia indica* L. *Sp. Pl.* 883. 1753. *Lindenbergia urticaefolia* Lehm. in *Link & Otto, Ind. Sem. Hort. Berol.* 5. 1829 ; *Hook. f. Fl. Brit. India* 4 : 262. 1884 ; *Duthie, Fl. Gangetic Plain* 2 : 160. 1911. *L. polyantha* Royle ex Benth. *Scroph. Ind.* 22. 1835 ; *Hook. f. l. c.* 4 : 262. 1884 ; *Duthie, l. c.* 2 : 160. 1911. *L. abyssinica* Hochst. ex Benth. in *DC. Prodr.* 10 : 377. 1846 ; *Hook. f. l. c.* 4 : 262. 1884.

Erect or decumbent, annual herbs, 10 - 30 cm high. Stems glandular hairy, often purple tinged. Leaves 1.5 - 10.0 × 1 - 6 cm, ovate - elliptic, obtuse or subacute, crenate - serrate, glandular hairy, upper leaves passing into bracts. Flowers axillary, 1 to many - together, passing into axillary and terminal leafy racemes. Calyx campanulate, glandular hairy ; lobes 5, ciliate. Corolla glandular hairy, 2 lipped. One anther cell higher than other. Ovary glabrous or pubescent. Capsules ovoid, laterally compressed, beaked, hairy or pubescent. Seeds ellipsoid.

Fl. & Fr. : July - March.

Commonest species of the genus inhabiting the state in wastelands, cultivated fields, old walls and ravines.

Selected specimens : Ajmer : *Duthie*, 6681 (DD) ; Alwar : Siriska Tiger Reserve, *Parmar* 9479 (BSJO) ; Banswara : Shergarh, *Singh* 3064 (BSJO) ; Barmer : Haldeshwar Mahadco, *Pandey* 8012 (BSJO) ; Jaipur : Doasa, *Wadhwa* 8102 (BSA) ; Sirohi : Mt. Abu, *Rao* 66508 (BSI).

2. *Lindenbergia macrostachya* (Benth.) Benth. Scroph. Ind. 22. 1835 ; Hook. f. Fl. Brit India 4 : 262. 1884 ; Duthie, Fl. Gangetic Plain 2 : 160. 1911. *Stemodia macrostachya* Benth. in Bot. Reg. 17 : t. 1470. 1832.

Erect or ascending, perennial herbs, 30-75 cm high, with woody base. Leaves 2.5-8.0 × 1.5-2.0 cm, elliptic-ovate to oblanceolate, subacute, dentate-serrate, narrowed at the base into a short petiole, glabrous except the nerves beneath. Flowers axillary, forming elongate, interrupted spikes. Calyx shorter than bracts, glandular patent hairy, ribbed. Corolla glandular hairy, bright yellow ; lobes as long as tube. Fruits glandular pubescent at the top.

Fl. & Fr. : March-May.

Rare, on old walls, in wastelands and ravines.

Selected specimen : Alwar : Bala Fort, *Hira Lal* 34468 (LWG). Also reported from Jhunjhunu (Nair & Kanodia, 1959).

12. LINDERNIA All.

1a. Fertile stamens 2 ; staminodes 2 :

2a. Leaves palmately or parallel nerved :

3a. Leaves entire. Flowers pedicelled, solitary, axillary or passing into racemes :

4a. Lower leaves ovate, rounded at base. Fruiting pedicels 1.5 cm long. Corolla 5 mm long. ... 10. *L. parviflora*

4b. Lower leaves lanceolate, acute at base. Fruiting pedicels 2-4 cm long. Corolla more than 1 cm long. ... 6. *L. hyssopoides*

3b. Leaves serrate-dentate. Flowers sessile or rarely pedicelled, clustered in leaf-axils. ... 7. *L. micrantha*

2b. Leaves pinnately nerved :

5a. Leaf-serrations acute or aristate. Flowers white with red streaks :

6a. Seeds truncate at both ends, not tailed. ... 4. *L. ciliata*

6b. Seeds globose or pear-shaped, minutely tailed. ... 3. *L. bracteoides*

5b. Leaf-serrations obtuse. Flowers blue, violet or purple. ... 2. *L. antipoda*

1b. Fertile stamens 4 ; staminodes absent :

- 7a. Capsules not exceeding the length of calyx :
- 8a. Leaves parallel - nerved. ... 11. *L. procumbens*
- 8b. Leaves pinni - nerved :
- 9a. Calyx divided half way down. ... 5. *L. crustacea*
- 9b. Calyx divided nearly to the base. ... 8. *L. multiflora*
- 7b. Capsules much exceeding the length of calyx :
- 10a. Flowers sessile. ... 12. *L. sessiliflora*
- 10b. Flowers pedicelled :
- 11a. Calyx divided half way down. ... 9. *L. nummularifolia*
- 11b. Calyx divided nearly to the base. ... 1. *L. anagallis*

1. *Lindernia anagallis* (Burm. f.) Pennell in Journ. Arn. Arb. 24 : 252. 1943. *Ruellia anagallis* Burm. f. Fl. Ind. 135. 1768. *Vandellia pedunculata* Benth. Scroph. Ind. 37. 1835 ; Hook. f. Fl. Brit. India 4 : 282. 1884 ; Duthie, Fl. Gangetic Plain 2 : 149. 1911. *V. angustifolia* Benth. *J. c.* 37. 1835 ; Hook. f. *J. c.* 4 : 282. 1884.

Erect or decumbent, annual herbs, rooting on the lower nodes. Petiole 0.15 - 0.5 cm long ; leaves 1 - 3 × 0.9 - 2.5 cm, ovate - oblong, obscurely serrate, rounded cordate at base. Flowers axillary, solitary ; pedicels 2 - 3 cm long. Calyx segments lanceolate, acute. Corolla 1.0 - 1.5 cm long, pink or purple ; upper lip entire ; lower lip 3 - lobed. Anterior filaments appendiculate ; anthers basally tailed. Capsules linear - subulate, septicidal.

Fl. & Fr. : August - March.

Rare, in moist habitats, confined to south - eastern plateau of the state.

Selected specimen : Kota : Atru, Singh 83742 (LWG).

2. *Lindernia antipoda* (L.) Alston in Trim. Handb. Fl. Ceylon 6 : 214. 1931. *Ruellia antipoda* L. Sp. Pl. 635. 1753. *Gratiola veronicifolia* Retz. Obs. Bot. 4 : 8. 1786. *G. verbenifolia* Colsm. Prodr. Desc. Grant. 8. 1793. *Bonnaya veronicifolia* (Retz.) Spreng. Syst. Veg. 1 : 41. 1824. *B. verbenifolia* (Colsm.) Spreng. *J. c.* 1 : 41. 1824. *Lindernia veronicifolia* (Retz.) F. Muell. Fragm. 6 : 101. 1867. *L. verbenifolia* (Colsm.) Pennell in Acad. Nat. Sci. Phil. Monogr. 5 : 131. 1943. *Bonnaya veronicifolia* (Retz.) Spreng. var. *verbenifolia* (Colsm.) Hook. f. Fl. Brit. India 4 : 285. 1884.

Prostrate or decumbent, annual herbs, with 4 - angled stems rooting on the lower nodes. Leaves 1 - 5 × 0.3 - 0.6 cm, elliptic - lanceolate or

obovate, shallowly serrate, narrowed towards base. Flowers axillary, solitary or in leafy racemes. Calyx segments linear - lanceolate, serrate in the upper part. Corolla bluish purple. Fertile stamens 2; staminodes clavate, yellow. Capsules cylindric, more than twice the length of calyx.

Fl. & Fr. : July - January.

Rare, in moist habitats, particularly in rice - fields ; confined to south eastern plateau of Rajasthan.

Selected specimen : Bundi : Shikarburj, Singh 74477 (LWG). Also reported from Kota (Majumdar, 1979).

3. *Lindernia bracteoides* (Blatt. & Hallb.) Mukerjee in Journ. Ind. Bot. Soc. 24 : 130. 1945. *Bonnaya bracteoides* Blatter & Hallb. in Journ. Bombay Nat. Hist. Soc. 25 (3) : 416. 1918.

Erect herbs, upto 8 cm high. Leaves sessile, 22 × 11 mm, ovate elliptic, spinous serrate. Racemes axillary and terminal ; pedicels c. 5 mm long in fruit, opposite or whorled towards top. Bracts foliaceous, gradually smaller and narrower upwards. Calyx 4 - 5 mm long, divided nearly to the base ; lobes 5, linear - lanceolate, acute, ciliate. Corolla c. 7 mm long, white, spotted with pink. Stamens 2, inserted near the junction of lips ; filaments glabrous ; pollens globose ; staminodes 2. Style glabrous ; stigma bilamellate, bent on one side. Capsules c. 10 mm long, terete, glabrous. Seeds globose or pear - shaped, with a minute tail, obscurely rugose.

Fl. & Fr. : August - March.

Rare, in wet ground among grasses ; endemic to Mt. Abu.

Selected specimens : Sirohi : Mt. Abu, Blatter & Hallberg 1514, 1515, 1516 (BLAT), Mehta 1779, 1781, 1388, 1516, 1916 (JAC).

4. *Lindernia ciliata* (Colsm.) Pennell in Brittonia 2 : 182. 1936. *Gratiola ciliata* Colsm. Prodr. Desc. Grat. 14. 1793. *Bonnaya brachiata* Link & Otto, Ic. Pl. Select. 25. t. 11. 1820 ; Hook. f. Fl. Brit. India 4 : 284. 1884 ; Duthie, Fl. Gangetic Plain 2 : 151. 1911.

Erect or decumbent, annual herbs, 5 - 10 cm high, with 4 - angular stems. Leaves 1.0 - 3.5 × 0.6 - 1.3 cm, sessile, oblong or obovate, pinnately - nerved, serrate with aristate teeth. Flowers in terminal racemes. Bracts linear. Calyx deeply divided ; segments linear - lanceolate, ciliate, aristate. Corolla white or pink. Fertile stamens 2. Capsules more than twice the length of calyx, cylindric, linear. Seeds truncate at both ends.

Fl. & Fr. : August - February.

Common in wet and shady localities from plains to the hills, particularly in the east of Aravalli.

Selected specimens : Alwar : Siriska Tiger Reserve, *Parmar* 9503 (BSJO) ; Banswara : Wadita hillage forest, *Singh* 2867 (BSJO) ; Jaipur : Ramgarh, *Sharma* 181 (RUBL) ; Kota : Kishanganj, *Verma* 710 (BSA) ; Pali : Kanpohar, *Shetty* 1959 (BSJO).

5. *Lindernia crustacea* (L.) F. Muell. Syst. Census Austr. Pl. 97. 1882. *Capraria crustacea* L. Mant. Pl. 87. 1767. *Vandellia crustacea* (L.) Benth. Scroph. Ind. 35. 1835 ; Wight, Ic. 3 (2) : 5. t. 863. 1843 - 45 ; Hook. f. Fl. Brit. India 4 : 279. 1884 ; Duthie, Fl. Gangetic Plain 2 : 149. 1911.

Diffusely branched, annual herbs, with 4 angled stems hairy on the angles. Leaves 0.8 - 2.0 × 0.5 - 1.5 cm, ovate, entire or crenate, rounded or cordate at base, pinnately nerved ; petioles 0.2 - 0.8 cm long. Flowers axillary, solitary and subracemose ; pedicels 0.5 - 2.0 cm long. Calyx 5 ribbed, 5 - angled, not divided below the middle before anthesis; afterwards divided near to the base. Corolla white, violet or purple. Stamens 4 ; anterior filaments appendiculate. Capsules 2 - 8 mm long, obovate or ovoid to elliptic - oblong, apiculate.

Fl. & Fr. : August - February.

Common from plains to the hills in wet habitats, particularly in the east of Aravalli.

Selected specimens : Alwar : Siriska Tiger Reserve, *Parmar* 9539 (BSJO) ; Banswara : Lasara, *Singh* 3611 (BSJO) ; Jaipur : Maota, *Sharma* 1923 (RUBL) ; Kota : Shahabad, *Majumdar* 10852 (BSA) ; Sirohi : Mt. Abu, *Rao* 66690 (BSI).

6. *Lindernia hyssopioides* (L.) Haines, Bot. Bihar & Orissa 2 : 635. 1922 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 185. 1976. *Gratiola hyssopioides* L. Mant. Alt. 174. 1771. *Ilysanthes hyssopioides* (L.) Benth. in DC. Prodr. 10 : 419. 1846 ; Hook. f. Fl. Brit. India 4 : 283. 1884.

Straggling, slender herbs, 20 - 50 cm high. Leaves sessile, 0.6 - 2.0 × 0.3 - 1.0 cm, oblong - lanceolate or upper ones smaller and linear - lanceolate, entire, palmately nerved. Flowers axillary, solitary ; pedicels 1 - 4 cm long, filiform. Corolla more than 1 cm long, white, tinged with bluish purple. Stamens 2 ; staminodes clavate, glandular. Capsules oblong, deflexed, glabrous.

Fl. & Fr. : August - March.

Rare, in rice fields ; confined to south eastern part of the state.

Selected specimens : Jhalwar : Raipur, *Wadhwa* 5478 (BSA) ; Kota : Shahabad, *Majumdar* 13215, 10853 (BSA).

7. *Lindernia micrantha* (Blatt. & Hallb.) Singh *comb. nov.* *Bonnaya micrantha* Blatt. & Hallb. in Journ. Bombay Nat. Hist. Soc. 25 (3) : 417. 1918.

Small herbs, upto 10 cm high, with few pairs of decussate branches. Leaves subsessile, c. 25×19 mm, broadly ovate to suborbicular, serrate-dentate, 3 to 7 nerved from the base, glabrous or hispid on the margins. Flowers usually sessile or rarely pedicelled, crowded in the axils of leaves. Sometimes the stem is terminated by a 4 flowered umbel. Bracteoles minute, triangular, acuminate, spinous serrulate, subtending the flower or pedicel. Calyx enlarged in fruit ; lobes sparsely hispid, 1 nerved, nerves running down the tube as ribs, split down to the base on one side in fruiting. Corolla white, persistent as a small cap on the beak of growing capsule. Stamens 2 ; filaments shorter than anthers. Style conical ; stigmatic branches longer than style, reflexed. Capsules 7×2.5 mm long, elongate ovoid, 2 valved, valves remaining united at apex after dehiscence. Seeds ovoid, longitudinally ribbed, rugose or echinulate.

Fl. & Fr : September - December.

Rare, on walls at Mt. Abu.

Selected specimens : Sirohi : Mt. Abu, *Blatter & Hallberg* 1734, *Blatter* 6106, 6109, 6110 (BLAT).

8. *Lindernia multiflora* (Roxb.) Mukerjee in Journ. Ind. Bot. Soc. 24 : 131. 1945. *Torenia multiflora* Roxb. Fl. Ind. 3 : 96. 1832. *Vandellia multiflora* (Roxb.) G. Don, Gen. Hist. 4 : 549. 1838 ; Hook. f. Fl. Brit. India 4 : 280. 1884 ; Duthie, Fl. Gangetic Plain 2 : 149. 1911.

Erect, branched, flaccid, annual herbs, 5-20 cm high, with 4-angular stems rooting on the nodes. Leaves subsessile or shortly petioled, $1.5 - 3.0 \times 1.0 - 1.5$ cm, ovate, subentire-serrate, gland-ciliate, glabrous, upper ones smaller and oblanceolate-oblong. Flowers in glandular hairy terminal racemes ; pedicels 0.5 - 1.5 cm long. Bracts subulate. Calyx - segments lanceolate, glandular - hairy. Calyx divided nearly to the base. Corolla white or pale purple. Stamens 4 ; filaments of anterior pair appendaged at base. Capsules ovoid-elliptic to suborbicular. Seeds rugose.

Fl. & Fr. : August - November.

Rare, in wet and shady habitats, particularly in the gardens, in water channels etc. in the east of Aravalli.

Selected specimens : Alwar : Pandupole, *Sharma* 3879 (RUBL) ; Jaipur : Jaigarh, *Sharma* Acc. No. 13019 (RUBL) ; Jhalawar : *Singh* 83726 (LWG) ; Kota : Bhonra, *Singh* 74774 (LWG).

9. *Lindernia nummularifolia* (D. Don) Wettst. in Engl. & Prantl, Pflanz. 4 (3B) : 79. 1891. *Vandellia nummularifolia* D. Don, Prodr. Fl. Nep. 86. 1825 ; Hook. f. Fl. Brit. India 4 : 282. 1884 ; Duthie, Fl. Gangetic Plain 2 : 149. 1911.

Erect or decumbent - ascending, annual herbs, with 4 angular stems hairy on the angles and sometimes rooting on the lower nodes. Leaves sessile or subsessile, 0.5 - 1.5 × 0.2 - 2.5 cm, ovate-rounded to suborbicular, crenate-serrate, rounded or subcordate at base, palmately 5 nerved. Flowers axillary, solitary or in few-flowered subumbellate racemes ; pedicels 0.3 - 1.5 cm long. Calyx divided to the middle ; lobes lanceolate, acute. Corolla white, tinged with purple. Stamens 4 ; anterior pair of filaments appendiculate or dilated at base. Capsules ovoid - oblong, apiculate or beaked.

Fl. & Fr. : August - November.

Rare, in wet and shady localities ; confined to Mt. Abu in Rajasthan. Closely allied to *L. sessiliflora* (Benth.) Wettst. which bears sessile flowers.

Selected specimen : Sirohi : Mt. Abu, *Rao* 66603 (BSI).

10. *Lindernia parviflora* (Roxb.) Haines, Bot. Bihar & Orissa 2 : 635. 1922. *Gratiola parviflora* Roxb. Pl. Cor. 3 : 3. t. 203. 1811. *Bonnaya hyssopioides* Wight, Ic. 3(2) : 5. t. 857. 1844 45, non Benth. 1846. *Illysanthes parviflora* (Roxb.) Benth. in DC. Prodr. 10 : 419. 1846 ; Hook. f. Fl. Brit. India 4 : 283. 1884 ; Duthie, Fl. Gangetic Plain 2 : 151. 1911.

Erect or decumbent ascending, annual herbs, with 4 - angular stems, branched from the base and rooting in the lower region. Leaves sessile, 0.5 - 1.5 × 0.2 - 0.8 cm, ovate-lanceolate, entire, palmately 3 to 5 - nerved, upper ones smaller and passing into bracts. Flowers axillary, solitary, passing into racemes ; pedicels 1.0 - 1.5 cm long. Corolla white. Fertile stamens 2 ; staminodes 2 lobed or dentate. Capsules ellipsoid, apiculate.

Fl. & Fr. : August - March.

Rare, in wet and shady habitats, particularly in hilly tracts.

Selected specimens : Barmer : Haldeshwar, *Pandey* 7951 (BSJO) ; Chittorgarh : *Majumdar* 10397 (BSA) ; Jhalawar : *Singh* 83734 (LWG) ;

Sirohi : Mt. Abu, Rao 66658, Puri 56703 (BSI).

11. *Lindernia procumbens* (Krock.) Philcox in Taxon 14 : 30. 1965. *Anagalloides procumbens* Krock. Fl. Siles. 2 : 398. t. 26. 1790. *Lindernia pyxidaria* L. Mant. Pl. 2 : 252. 1771, *pro parte* (*quoad. spec. excl. syn.*), *nom. illeg.* *Vandellia erecta* Benth. Scroph. Ind. 36. 1835, *pro maj. parte* ; Hook. f. Fl. Brit. India 4 : 281. 1884. *V. pyxidaria* (L.) Maxim. in Bull. Acad. Sci. St. Petersb. 20 : 449. 1875 ; Duthie, Fl. Gangetic Plain 2 : 150. 1911.

Erect, glabrous herbs, branched from the base, but not rooting on nodes. Leaves sessile, elliptic or oblong, obtuse, entire or obscurely crenate. 3 to 5-nerved. Flowers axillary, solitary ; pedicels twice the length of leaves. Sepals lanceolate or linear. Corolla white. Stamens 4 ; staminodes absent. Capsules ovoid-orbicular, exserted from calyx.

Fl. & Fr. : October - March.

Occasional, in wet and shady places, rice fields, river beds etc

Selected specimens : Jaipur : Maota, Sharma 1920 (RUBL) ; Kota : Atru, Singh 90638 (LWG). Also reported from Udaipur (Ramdeo, 1965) and Bundi (Maheswari & Singh, 1974).

12. *Lindernia sessiliflora* (Benth.) Wettst. in Engl. & Prantl, Pflanz. 4(3B) : 79. 1891. *Vandellia sessiliflora* Benth. Scroph. Ind. 37. 1835 ; Hook. f. Fl. Brit. India 4 : 282. 1884.

Erect or decumbent ascending, annual herbs, with 4-angled stems hairy on the angles, often rooting below. Leaves sessile, 0.4-1.0 x 0.4-1.0 cm, suborbicular or broadly ovate, crenate-serrate, cordate or rounded at the base, glabrous except the nerves beneath. Flowers subsessile, in 1 to 4-flowered terminal clusters. Calyx-segments linear-lanceolate. Corolla white, upper lip brown, lower one with a purplish centre. Capsules 8-10 mm long, ellipsoid, acute-acuminate, exceeding the calyx.

Fl. & Fr. : October - March.

Rare, in the forests, particularly among the rocks where some moisture accumulates.

Selected specimen : Sirohi : Mt. Abu, Mehta 530 (JAC).

13. MAZUS Lour.

Mazus pumilus (Burm. f.) Steenis in Nova Guinea (n.s.) 9 : 31. 1958. *Lobelia pumila* Burm. f. Fl. Ind. 186. t. 60. f. 3. 1768. *Lindernia japonica*

Thunb. Fl. Jap. 253. 1784. *Majus rugosus* Lour. Fl. Cochinch. 385. 1790 ; Hook. f. Fl. Brit. India 4 : 259. 1884 ; Duthie, Fl. Gangetic Plain 2 : 144. 1911.

Erect or ascending, often multicauline, non stoloniferous, annual herbs. Leaves mostly radical, petiolate, oblanceolate or obovate-spathulate, crenate-dentate, cuneate at base. Flowers in lax, glandular hairy, 2.5-2.0 cm long, flexuous racemes. Bracts linear-subulate. Calyx campanulate, enlarging in fruit ; segments ovate-lanceolate, subulate. Corolla c. 1 cm long, pale-blue, lilac or whitish-purple, glandular hairy outside. Style filiform ; stigma 2-lamellate. Capsules subglobose, included in the calyx. Seeds minute, pale yellow.

Fl. & Fr. : Most part of the year.

Rare, in moist and shady habitats, particularly in the forests, gardens and irrigation channels. Closely allied to *M. delavayi* Bonati, but differs in having glabrous stem and pedicels and pedicels much longer than calyx.

Selected specimen : Kota : Chhipabaraut, Singh 90654 (LWG).

14. MICROCARPAEA R. Br.

Microcarpaea minima (Koen.) Merrill. in Philipp. Journ. Sci. Bot. 7 : 100. 1912 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 189. 1976. *Paederota minima* Koen. in Retz. Obs. Bot. 5 : 10. 1789. *Microcarpaea muscosa* R. Br. Prodr. 436. 1810 ; Hook. f. Fl. Brit. India 4 : 287. 1884.

Diffuse or creeping, glabrous, annual herbs, 5-10 cm high, rooting at the nodes. Leaves opposite, sessile, oblong, obtuse, entire. Flowers in one axil of each pair of leaves, sessile, ebracteate. Calyx 2.5-3.0 mm long, tubular, 5-angled, 5-fid ; lobes acute, recurved, ciliate. Corolla very short, pale-purple ; tube broad. Fertile stamens 2 ; anthers 1-celled. Style filiform ; stigma capitate, recurved. Capsules ovoid, 2-grooved, loculicidal ; valves entire, separating from the placentiferous septum. Seeds ovoid.

Fl. & Fr. : July - October.

Very rare, in moist sandy habitats, particularly river-beds. Included on the authority of Majumdar (1976) from Kota division.

15. MIMULUS L.

Mimulus strictus Benth. Scroph. Ind. 28. 1835. *M. gracilis* auct. plur. non R. Br. 1810 ; Hook. f. Fl. Brit. India 4 : 259. 1884 ; Duthie, Fl. Gangetic Plain 2 : 143. 1911.

Erect, perennial herbs, 15 - 50 cm high, with 4 angular and striated stems. Leaves radical and cauline, sessile, 3.5 - 8.0 × 0.7 - 2.0 cm, linear-oblong or oblong-lanceolate, obtuse, entire, semi-amplexicaul at the base. Flowers axillary, solitary; pedicels 1.0 - 4.0 cm long. Calyx 5-angled; teeth deltoid, acute. Corolla-tube slightly dilated above; lobes rounded. Anthers subreniform. Ovary glabrous; stigma 2 lamellate. Capsules obovoid, included in the calyx. Seeds oblong-elliptic, smooth.

Fl. & Fr. : March - May.

Rare, in slow running water streams and rice fields.

Selected specimens : Alwar : Pandupole, *Parmar* 9726, 9473 (BSJO); Jhalawar : *Verma* 3339 (BSA); Kota : Shahabad, *Singh* 90434 (LWG); Sirohi : Mt. Abu, *Kanodia* 62217, *Jain* 60168 (BSI).

16. PEPLIDIUM Delile

Peplidium maritimum (L. f.) Asch. in Schweinf. Beitr. Fl. Aethiop. 1306. 1867; Wettst. in Engl. & Prantl, Pflanz. 4 (3B) : 78. 1891; Raizada, Suppl. Duthie, Fl. Gangetic Plain 190. 1976. *Hedyotis maritima* L. f. Suppl. 119. 1781. *Peplidium humifusum* Del. Descr. Egypt. Hist. Nat. 148. t. 4. f. 1. 1812; Hook. f. Fl. Brit. India 4 : 287. 1884.

Prostrate, much branched, succulent herbs, rooting on the nodes, sometimes submerged or floating. Leaves 0.5 - 2.0 × 0.3 - 0.8 cm, obovate or spatulate, tapering at the base into a short petiole which is connected by a membrane with the petiole of the opposite leaf. Flowers axillary, solitary or 1 to 3 together; pedicels very short, sometimes absent. Calyx thinly membranous, reticulately veined, 5-ribbed. Corolla pale pink or white. Capsules globose, enclosed in the calyx, irregularly bursting. Seeds oblong, angular.

Fl. & Fr. : December - April.

Common in rice fields, river banks and other similar marshy habitats. The plants bear long floating stems when growing under water.

Selected specimens : Ajmer : Kishangarh, *Sharma* 875 (DD); Banswara : Loharia, *Singh* 4252 (BSJO); Barmer : Utarlai, *Shetty* 2293 (BSJO); Jodhpur : Luni river, *Tiwari* 651 (BSJO); Tonk : Tordi Sagar, *Shetty* 1095 (BSJO).

17. SCHWEINFURTHIA A. Br.

Schweinfurthia papilionacea (L.) Merrill in Philipp. Journ. Sci. Bot. 19 : 380. 1821 ; Bhandari, Fl. Ind. Desert 284, 1978. *Antirrhinum papilionaceum* L. Mant. Pl. 1 : 86. 1767 ; Burm. f. Fl. Ind. 121. t. 39. f. 2. 1768. *Linaria sphaerocarpa* Benth. in DC. Prodr. 10 : 287. 1846. *Antirrhinum glaucum* Stocks ex Wight, Ic. 4 (3) : 10, t. 1459. 1849. *Schweinfurthia sphaerocarpa* (Benth.) A. Braun. in Monatsb. Akad. Wiss. Berl. 875. 1866 ; Hook. f. Fl. Brit. India 4 : 252. 1883. 'Sanipat' (Hindi).

Glabrous or hairy, much branched, perennial herbs, 15-30 cm high. Leaves 1.2-2.5 × 0.6-1.8 cm, orbicular-ovate to spatulate or elliptic to ovate, subacute, entire, pubescent, attenuated at the base into a short petiole. Flowers axillary ; pedicels as long as petioles, deflexed in fruit. Calyx 5-partite ; upper segments broadly ovate-subcordate, acute ; rest lanceolate. Corolla c. 12 mm long, white with purple veins. Capsules obliquely globose, 2-celled. Seeds obconic, truncate at both ends, acutely winged.

Fl. & Fr. : October-December.

Rare, in rocky habitats ; confined to the desert area in the west of Aravalli.

Selected specimens : Jaisalmer : Ramgarh, Wadhwa 5160 (BSA) ; Harchandari, Shetty 3489 (BSJO).

18. SCOPARIA L.

Scoparia dulcis L. Sp. Pl. 116. 1753 ; Hook. f. Fl. Brit. India 4 : 289. 1884 ; Duthie, Fl. Gangetic Plain 2 : 153. 1911.

Herbs or undershrubs, upto 1 m high, with 4 to 6-angled branches. Leaves opposite and 3-nately whorled, 1.0-7.5 × 1.0-4.5 cm, elliptic or rhomboid, entire or serrate, glandular. Flowers almost actinomorphic, 3 to 6 in each axillary whorl, often forming whorled racemes. Calyx lobes 4, oblong. Corolla white, throat hairy. Anthers sagittate. Capsules 2-3 mm in diam., subglobose, septicidal ; valves 2-fid. Seeds ovoid or obovoid, angled, scrobiculate.

Fl. & Fr. : Almost throughout the year, chiefly during August-October.

Native of Tropical America ; imperfectly naturalized in wastelands and in and around gardens.

Selected specimens : Banswara : Verma 250 (BSA) ; Bundi : Talera, Singh 83916 (LWG) ; Jodhpur : Bhandari 9187 (JAC). Also reported from Sikar (Nair & Nathawat, 1957).

19. SOPUBIA Buch.-Ham. ex D. Don

Sopubia delphiniifolia (L.) G. Don, Gen. Hist. 4 : 560. 1837 ; Hook. f. Fl. Brit. India 4 : 302. 1884 ; Duthie, Fl. Gangetic Plain 2 : 159. 1911. *Gerardia delphiniifolia* L. in Juslenius, Cent. Pl. 21. 1756.

Erect, annual herbs, with 4-angled stem and branches often spotted with purple. Leaves 2.5 - 5.0 cm long, pinnatisect ; segments filiform, distant, often again divided. Flowers 2.5 - 3.5 cm long, axillary, solitary, passing into terminal racemes. Bracteoles filiform. Calyx campanulate, 10 nerved, strongly ribbed below. Corolla tube ventricose in upper region, purple or rose coloured. Capsules 5 - 8 mm long, oblong. Seeds oblong - cuneate.

Fl. & Fr. : October - February.

Rare, in neglected, low lying corners of fields and gardens.

Selected specimens : Banswara : Senawasa village, Singh 3708 (BSJO) ; Kushalgarh, Kanodia 75781 (BSI) ; Kota : Atru, Singh 83776 (LWG) ; Shahabad, Majumdar 13272, 13280 (BSA).

20. STEMODIA L. *nom. cons.*

Stemodia viscosa Roxb. Pl. Cor. 2 : 33. t. 163. 1802. & Fl. Ind. 3 : 94. 1832 ; Wright, Ic. 4(3) : 1. t. 408. 1849 ; Hook. f. Fl. Brit. India 4 : 265. 1884 ; Duthie, Fl. Gangetic Plain 2 : 144. 1911.

Diffusely branched, viscidly pubescent herbs. Leaves sessile, 1.5 - 3.0 × 0.5 - 1.0 cm, obovate-oblong, serrate or dentate. Flowers axillary, solitary or in few-flowered racemes. Calyx-segments lanceolate, acute, glandular. Corolla violet. Anther-cells stipitate, suborbicular. Capsules ovoid-oblong, glabrous, 4 valved, enclosed in the calyx. Seeds ellipsoid, faintly reticulate.

Fl. & Fr. : August - October.

Rare, a low land and marshland ruderal, particularly in the east of Aravalli.

Selected specimens : Banswara : Bhimsar, *Majumdar* 10285 (BSA) ; Jaipur : Sardarpur, *Kaul* 18519 (LWG) ; Kota : Baran, *Majumdar* 10873 (BSA) ; Sirohi : Abu Road, *Kaul* 9374 (LWG).

21. STRIGA Lour.

1a. Calyx-tube 5-ribbed :

2a. Leaves reduced to scales, purple :

3a. Stem much branched, reddish purple, ... 4. *S. gesnerioides* var. *gesnerioides*
scabrous. Corolla lilac.

3b. Stem unbranched, green, glabrous. ... 5. *S. gesnerioides* var. *minor*
Corolla white or pinkish.

2b. Leaves normal, linear, green. ... 3. *S. densiflora*

1b. Calyx-tube 10 to 15-ribbed :

4a. One calyx-rib terminating the tip of each ... 2. *S. asiatica*
lobe and others in the sinus.

4b. Three calyx-ribs terminating the tip of each ... 1. *S. angustifolia*
lobe.

1. *Striga angustifolia* (D. Don) Saldhana in Bull. Bot. Surv. India 5 : 70. 1963. *Buchnera angustifolia* D. Don, Prodr. Fl. Nep. 91. 1825. *B. euphrasioides* auct. non Vahl, 1794 ; Benth. Scroph. Ind. 41. 1835. *Striga euphrasioides* sensu Benth. in Hook. Comp. Bot. Mag. 1 : 364. 1836, excl. basionym *Buchnera euphrasioides* Vahl ; Wight, Ic. 3(2) : 5. t. 855. 1843-45 ; Hook. f. Fl. Brit. India 4 : 299. 1884 ; Duthie, Fl. Gangetic Plain 2 : 157. 1911.

Erect, annual, scabrid herbs, 15 - 60 cm high. Leaves sessile, 1 - 5 × 0.1 - 0.4 cm, linear to lanceolate, subacute, hispid. Flowers subsessile, axillary, solitary, passing into terminal spikes. Calyx - tube 15 - ribbed ; lobes 5, each with 3 - ribs terminating at its apex. Corolla - tube abruptly incurved at or above the middle ; lower lobes outside in bud. Capsules ovoid, 2 - valved, apiculate, enclosed in the calyx.

Fl. & Fr. : August - October.

Common throughout the state in open grassy wastelands and cultivated fields.

Selected specimens : Banswara : Lasara village, *Singh* 3620 (BSJO) ; Barmer : Siwana, *Shetty* 2233 (BSJO) ; Ganganagar : Bhaduwalla, *Roy* 4951 (BSJO) ; Jaipur : Moti Dungri, *Sharma* Acc. No. 10891 (RUBL) ;

Kota : Barha, *Majumdar* 10875 (BSA) ; Sirohi : Mt. Abu, *Blatter* 1711 (BLAT).

2. *Striga asiatica* (L.) Ktze. Rev. Gen. Pl. 1 : 466, 1891. *Buchnera asiatica* L. Sp. Pl. 630. 1753. *Striga lutea* Lour. Fl. Cochin. 22. 1790 ; Hook. f. Fl. Brit. India 4 : 299. 1884 ; Duthie, Fl. Gangetic Plain 2 : 157. 1911.

Erect, annual herbs, 5 - 50 cm high ; stems ribbed, hispidly hairy. Leaves sessile, 1 - 2 × 0.1 - 0.2 cm, linear, subacute, hispidly pilose, upper ones passing into bracts. Flowers in lax, leafy, terminal spikes. Bracteoles linear. Calyx 5 - 6 mm long, hispid with tubercle based hairs. Corolla 1.0 - 1.5 cm long, yellow ; tube hispid hairy. Capsules oblong, grooved, dark brown.

Fl. & Fr. : August - November.

Common root - parasite in the east of Aravalli on sugarcane and sorghum.

Selected specimens : Jaipur : Nairna, *Sharma* 1526 (RUBL) ; Jhalawar : Aklera, *Wadhwa* 7678 (BSA). Also reported from Alwar (Vyas, 1967), Jodhpur (Sarup, 1954), Sikar (Nair and Nathawat, 1957), Sirohi (Ahluwalia, 1965).

3. *Striga densiflora* (Benth.) Benth. Comp. Bot. Mag. 1 : 363. 1836 ; Hook. f. Fl. Brit. India : 299. 1884 ; Duthie, Fl. Gangetic Plain 2 : 156. 1911. *Buchnera densiflora* Benth. Scroph. Ind. 41. 1835.

Erect, green, scabrid or hispid herbs. Leaves sessile, 1 - 4 × 0.3 - 0.8 cm, linear, acute, scabrid, upwards passing into bracts. Flowers in terminal spikes. Bracteoles 2, linear, acute, ciliate. Calyx 5 - 6 mm long, 5 - ribbed, scabrid ; teeth lanceolate, subulate, ciliate. Corolla 1.0 - 1.5 cm long, white, hairy in the throat. Anthers 1 - celled, dorsifixed. Capsules oblong - obovoid, included in the calyx.

Fl. & Fr. : August - October.

Rare, in open grasslands across the plains.

Selected specimen : Chittorgarh : *Jain* 55979 (BSA). Also reported from Kota division (*Majumdar*, 1979).

4. *Striga gesnerioides* (Willd.) Vatke, Oesterr. Bot. Zeits. 25 : 11. 1875. *Buchnera gesnerioides* Willd. Sp. Pl. 3 : 338. 1800. *B. orobanchoides* R. Br. ex Endl. Flora 15 : 388. t. 2. 1832. *Striga orobanchoides* (R. Br. ex Endl.) Benth. Comp. Bot. Mag. 1 : 361. t. 19. 1836 ; Wight, Ic. 4 (3) : 2. t. 1414. 1849 ; Hook. f. Fl. Brit. India 4 : 299. 1884 ; Duthie, Fl. Gangetic Plain 2 : 156. 1911, '*Missi, Gwal - mehndi*' (Hindi).

var. gesnerioides

Erect, rigid, glabrous or pubescent, purple, root parasitic herbs, 10-50 cm high, with prominent haustoria and woody root-stock. Leaves opposite or alternate, 5-10 × 2.0-3.5 mm, scaly, ovate-lanceolate, acute, purple, upper ones passing into bracts. Flowers 1 to 3-nate, in dense terminal spikes. Bracteoles shorter than calyx. Calyx tubular, 4 to 5-ribbed, hispid, somewhat scarious, splitting between the teeth. Corolla-tube incurved above the middle, hairy outside and in the throat. Capsules c. 5 mm in diam., ovoid-globose.

Fl. & Fr. : August-October.

Common root parasite on *Lepidagathis* Willd. in the east and on *Euphorbia caducifolia* Haines in the west of Aravalli.

Selected specimens : Ajmer : Wadhwa 4871 (BSA) ; Jaipur : Ramgarh, Sharma 811, 2086 (RUBL) ; Jodhpur : Kailana, Moorthy 38 (BSJO) ; Sirohi : Mt. Abu, Rao 66683 (BSI), Duthie 6680 (DD) ; Udaipur : Kelwara, U. L. Mahatma 55 (DD).

5. var. *minor* Sant. in Kew Bull. 1948 : 491. 1949 & in Journ. Bombay Nat. Hist. Soc. 49 : 42. 1950 & in Rec. Bot. Surv. India 16 : 206. 1953 ; Bhandari, Fl. Ind. Desert 287. 1978.

Glabrous, green, unbranched herbs, 4-12 cm high. Flowers white or pinkish white. Bracts, bracteoles and teeth of calyx with few hairs only at the apex.

Fl. & Fr. : October-January.

Rare, parasitising the roots of *Lepidagathis bandraensis* Blatt. in the desert and *Hygrophila serpyllum* Anders. in the semi-arid habitats.

Selected specimens : Banswara : Kanodia 75569 (BSI) ; Jodhpur : Bhandari 1135, 1900 (JAC), Blatter 10313, 10316 (BLAT).

22. SUTERA Roth

Sutera dissecta (Del.) Walp. Rep. 3 : 271. 1884. *Capararia dissecta* Del. Fl. Egypt. 95. t. 32. f. 2. 1812. *Sutera glandulosa* Roth, Nov. Pl. Sp. 291. 1821 ; Hook. f. Fl. Brit. India 4 : 258. 1884 ; Duthie, Fl. Gangetic Plain 2 : 141. 1911.

Erect or spreading, glandular-pubescent herbs, having many branches from the base. Leaves 2.0-2.5 × 0.4-1.0 cm, ovate in outline,

closely multi - pinnatifid. Flowers sessile or subsessile, axillary, solitary, passing into racemes. Calyx lobes 5, linear oblong, gland dotted, imbricate in bud. Corolla tubular, 5 lobed, white or purplish yellow. Anthers 1 celled. Capsules c. 4 mm long, ellipsoid oblong. Seeds pitted.

Fl. & Fr. : August - November.

Rare, in the forests and wastelands.

Selected specimen : Bhilwara : Bijolia, Singh 7138 (BSJO).

23. TORENIA L.

Torenia aerinea Alston in Trimen, Handb. Fl. Ceylon 6 : 213. 1931. *T. hirtella* Hook. f. Fl. Brit. India 4 : 277. 1884, *pro parte*, excl. syn. *T. rubens* Thw.

Prostrate or ascending, pubescent herbs. Leaves 1.6 - 3.5 × 1.0 - 1.8 cm, ovate to ovate - lanceolate, acute, crenate serrate, scabrid above, punctate beneath. Flowers axillary, solitary. Pedicels 1.5 - 3.0 cm long. Bracts linear, ciliate. Calyx keeled, strigose on angles. Corolla bilabiate, violet - purple ; upper lip erect, broadly orbicular. Style glabrous. Capsules 10 - 12 mm long, glabrous. Seeds ovoid, globose, pitted.

Fl. & Fr. : Most part of year.

Rare, in damp shady habitats. Included on the authority of Sarup (1954) from Jodhpur.

24. VERBASCUM L.

Pubescent herbs, with gland - tipped hairs. Flowers in racemes. Stamens 4. ... 1. *V. chinense*

Tomentose herbs, with non glandular hairs. Flowers in dense spike - like racemes. Stamens 5. ... 2. *V. thapsus*

1. *Verbascum chinense* (L.) Sant. Fl. Purandhar 90. 1958 & in Rec. Bot. Surv. India 16 : 177. 1967. *Scrophularia chinensis* L. Mant. Pl. 2 : 250. 1771. *Celsia coromandeliana* Vahl, Symb. Bot. 3 : 79. 1794 ; Wight, Ic. 4 (3) : 1. t. 1406. 1849 ; Hook. f. Fl. Brit. India 4 : 251. 1883 ; Duthie, Fl. Gangetic Plain 2 : 139. 1911. *Verbascum coromandelianum* (Vahl) Kuntze, Rev. Gen. Pl. 1 : 460. 1891.

Erect, annual, glandular pubescent herbs, 30 - 100 cm high. Radical leaves petiolate, in rosette, oblong obovate, lyrate pinnatifid; cauline ones sessile, ovate, crenate dentate, gradually smaller upwards passing into bracts. Flowers axillary, solitary, passing into lax, glandular hairy racemes. Calyx segments ovate lanceolate. Corolla yellow. Filaments bearded. Capsules 6 - 7 mm in diam., globose, punctate, 2 valved. Seeds oblong, longitudinally grooved.

Fl. & Fr. : Most part of the year.

Common in wet, swampy and shady habitats in the wastelands, forests, gardens and fields.

Selected specimens : Alwar : Siliserh, *H. Lal* 34557 (LWG); Banswara : Bagaycha Forest, *Singh* 4277 (BSJO); Barmer : Bhujawas, *Tiwari* 1132 (BSJO); Jaipur : Sambhar lake, *H. Lal* 34801 (LWG); Kota : Shahabad, *Wadhwa* 9266 (BSA); Sirohi : Mt. Abu, *Puri* 56671 (BSA).

2. *Verbascum thapsus* L. Sp. Pl. 177. 1753; Hook. f. Fl. Brit. India 4 : 250. 1883; Duthie, Fl. Gangetic Plain 2 : 138. 1911.

Erect, simple or branched, densely stellate tomentose herbs, upto 1 m high. Stems winged by decurrent leaf-bases. Radical leaves in rosette, petioled, obovate; cauline ones sessile, alternate, oblanceolate or oblong, acute or acuminate; all leaves subentire-crenulate, densely stellate tomentose. Flowers in terminal, densely stellate tomentose, spicate racemes. Bracts linear lanceolate. Calyx-segments ovate lanceolates, acute. Corolla yellow, pubescent outside. Lower 3 filaments bearded with white hairs. Capsules ovoid, globose, stellate tomentose.

Fl. & Fr. : February - June.

Rare, in sandy habitats in the wastelands. Plants grow very sparsely, never noted in dense community.

Selected specimens : Alwar : Siliserh, *H. Lal* 34517 (LWG); Ganganagar : Abohar Rd., *Roy* 5962 (BSJO); Sirohi : Mt. Abu, *Mehta* 1293 (JAC). Also reported from Sikar (Nair & Malhotra, 1961).

25. VERONICA L.

1a. Flowers axillary, solitary. ... 1. *V. agrestis*

1b. Flowers in distinct racemes :

2a. All leaves petiolate :

- 3a. Herbs, upto 20 cm high ; nodes thickened and rooting in the lower region. Leaves 7 × 2.5 cm. ... 6. *V. beccabunga* var. *attenuata*
- 3b. Herbs, upto 7 cm high ; nodes neither thickened nor rooting. Leaves 13 × 6 mm. ... 5. *V. anagallis-aquatica* var. *punctata*
- 2b. All leaves sessile or lower ones petiolate :
- 4a. Dwarf herbs, upto 6 cm high, not rooting on the nodes :
- 5a. Racemes shorter than leaves, ... 3. *V. anagallis-aquatica* var. *bracteosa*
- 5b. Racemes as long or longer than leaves. ... 4. *V. anagallis-aquatica* var. *montioides*
- 4b. Robust herbs, 15 - 60 cm high, rooting on the lower nodes. ... 2. *V. anagallis-aquatica* var. *anagallis-aquatica*

1. *Veronica agrestis* L. Sp. Pl. 13. 1753 ; Hook. f. Fl. Brit. India 4 : 294. 1884 ; Duthie, Fl. Gangetic Plain 2 : 154. 1911.

Prostrate or decumbent, pubescent, annual herbs, sometimes rooting on the nodes. Leaves subsessile or shortly petioled, 0.5 - 2.0 × 0.5 - 1.8 cm, ovate rounded at the base, gradually smaller upwards passing into bracts. Flowers axillary, solitary ; pedicels 1.5 - 2.0 cm long. Calyx divided to the base ; segments ovate - lanceolate. Corolla white or blue, rotate ; lobes subequal. Stamens 2 ; filaments glabrous. Capsules didymous, deeply emarginate and pubescent at the apex.

Fl. & Fr. : December - May.

Occasional, in damp shady places in the gardens, fields, water channels etc.

Selected specimens : Bhilwara : Khejari village, Singh 7030 (BSJO) ; Jaipur : Amer, Sharma 1056 (RUBL) ; Jodhpur : Bhandari 657 (JAC) ; Sirohi : Mt. Abu, Mehta 499 (JAC). Also reported from Ganganagar (Dhillon & Bajwa, 1969) and Sikar (Nair & Malhotra, 1961).

2. *Veronica anagallis-aquatica* L. Sp. Pl. 12. 1753 ; Hook. f. Fl. Brit. India 4 : 293. 1884 ; Duthie, Fl. Gangetic Plain 2 : 154. 1911.

var. *anagallis aquatica*

Erect or decumbent - ascending, simple or branched, annual, aquatic herbs. Stems glandular hairy towards apex, rooting on the nodes towards base. Leaves sessile, 2.5 - 10.0 × 0.7 - 2.5 cm, oblong - lanceolate, entire or serrulate, amplexicaul at base or shortly petiolate with cuneate base. Flowers in lax, 8 - 15 cm long, axillary, bracteate racemes. Bracts linear. Calyx segments lanceolate - oblong. Corolla white; lower lobes outside in bud. Anther - cells with confluent tips. Capsules 2 - 3 × 3 - 4 mm, orbicular, notched at the apex, ciliate. Seeds oblong, biconvex.

Fl. & Fr. : October - May.

Common in aquatic and marshy habitats.

Selected specimens : Ajmer : *Lawrie* 198, 4791 (DD); Alwar : Siriska Tiger Reserve, *Parmar* 9715 (BSJO); Banswara : Ghatol, *Singh* 4201 (BSJO); Jaipur : *Jain* 4960 (BSI); Jodhpur : *Bhandari* 796 (JAC); Kota : Shahabadi, *Verma* 3304 (BSA); Sirohi : Mt. Abu, *Mehra* 807 (JAC).

3. var. *bracteosa* Blatt. & Hallb. in Journ. Bombay Nat. Hist. Soc. 25 : 427. 1918.

Small herbs, c. 6 cm high, with few spreading branches near the base. Leaves longer than internodes, 3.5 × 1.5 cm, sessile, oblong, subserrate, obtuse. Racemes axillary, many flowered, shorter than leaves; peduncles c. 1.7 cm long. Bracts twice as long as pedicels, elliptic or oblong, subacute, attenuate at the base.

Fl. & Fr. : September - November.

Rare, in wet and shady habitats; endemic to Mt. Abu.

Selected specimen : Sirohi : Mt. Abu, *Blatter & Hallberg* 1633 (BLAT).

4. var. *montioides* Boiss. Fl. Orient. 4 : 637. 1879; Hook. f. Fl. Brit. India 4 : 293. 1884; Blatt. & Hallb. in Journ. Bombay Nat. Hist. Soc. 25 : 427. 1918.

About 3 cm high herbs. Leaves and bracts uniform, c. 2 mm long, elliptic - oblong. Pedicels about twice as long.

Fl. & Fr. : January - May.

Rare, in wet and shady habitats.

Selected specimen : Sirohi : Mt. Abu, *Blatter & Hallberg* 1632 (BLAT).

5. var. *punctata* Hook. f. Fl. Brit. India 4 : 293. 1884 ; Blatt. & Hallb. in Journ. Bombay Nat. Hist. Soc. 25 : 427. 1918.

Herbs, about 7 cm high. Leaves petioled, c. 13 × 6 mm, elliptic - oblong or subspathulate, lower serrate, upper entire. Pedicels 5 - 10 mm long. Bracts c. 2 mm long, linear.

Fl. & Fr. : September - November.

Rare, in wet and shady habitats.

Selected specimen : Sirohi : Mt. Abu, *Blatter & Hallberg* 1631 (BLAT).

6. *Veronica beccabunga* L. var. *attenuata* Blatt. & Hallb. in Journ. Bombay Nat. Hist. Soc. 25 : 428. 1918.

Erect or decumbent, robust, annual herbs, c. 20 cm high, with thickened nodes rooting in the lower region. Leaves 7.0 × 2.5 - 3.5 cm, broadly ovate to ovate elliptic, very coarsely dentate - serrate, 3 nerved, attenuated at the base into a short petiole of about 1 cm length. Racemes axillary, with spreading pedicels. Sepals ovate oblong, subacute. Capsules orbicular. Seeds biconvex.

Fl. & Fr. : October - March.

Rare, on the hills in wet and shady habitats ; confined to Mt. Abu.

Selected specimens : Sirohi : Mt. Abu (Uria), *Blatter & Hallberg* 1635, 1637 (BLAT).

DOUBTFUL TAXON

Lathraea squamaria L. Sp. Pl. 606. 1753 ; Hook. f. Fl. Brit. India 4 : 318. 1884.

This species is a denizen of western Himalayas. Nair & Nathawat (1957) reported its occurrence from Sikar in Rajasthan, but the herbarium specimens are not available in any Indian herbaria. Occurrence of this species in Rajasthan is doubtful.

CULTIVATED SPECIES

Antirrhinum majus L. - Erect herbs, with ovate - elliptic leaves, white, red or variegated flowers in glandular - hairy racemes. Cultivated for ornamental purposes.

Russelia equisetiformis Schlecht. & Chem. (*R. juncea* Zucc.)—Shrubs, 1.0–1.5 m high, with rush-like stems and bright scarlet tubular flowers blooming throughout the year. Native of Mexico; cultivated for ornamental purposes.

Russelia rotundifolia Cav. — Undershrubs, with opposite, sessile, suborbicular cordate leaves and scarlet flowers in axillary and terminal racemes. Native of Mexico; cultivated ornamentally in the gardens and parks.

Scrophularia alpestris J. Gray ex Benth.—Perennial herbs, upto 1 m high. Leaves simply dentate. Cymes 3 to 30 flowered. Cultivated in the gardens for ornamental purposes.

93. LENTIBULARIACEAE

(V. Singh)

UTRICULARIA L.

- | | | |
|---|-----|------------------------|
| 1a. Peduncle with a whorl of floats. | ... | 4. <i>U. stellaris</i> |
| 1b. Peduncles without floats : | | |
| 2a. Turions (winter buds) absent : | | |
| 3a. Leaves divided into filiform segments.
Aquatic herbs : | | |
| 4a. Racemes 1 to 3 - flowered. Pedicels
erect in fruit. | ... | 1. <i>U. aurea</i> |
| 4b. Racemes more than 3 - flowered.
Pedicels reflexed in fruit. | ... | 3. <i>U. exoleta</i> |
| 3b. Leaves entire. Terrestrial herbs. | ... | 5. <i>U. striatula</i> |
| 2b. Turions (winter buds) of tightly clustered
modified foliar segments present at the apex of
some of the stolons. | ... | 2. <i>U. australis</i> |

1. *Utricularia aurea* Lour. Fl. Cochinch. 26. 1790. *U. flexuosa* Vahl, Enum. Pl. 1 : 198. 1804 ; Clarke in Hook. f. Fl. Brit. India 4 : 329. 1884, *pro parte* ; Duthie, Fl. Gangetic Plain 2 : 166. 1911.

Aquatic herbs, with much branched, terete stolons. Leaves dichotomously branched into linear segments. Traps orbicular, lateral or at the point of forking. Racemes 5 to 7 - flowered ; scales and bracteoles absent. Calyx - lobes 2, subequal, ovate. Corolla yellow ; upper lip

suborbicular, folded in the middle, entire to undulate ; lower lip larger than upper, orbicular. Capsules c. 1 mm across, globose. Seeds prismatic, narrowly winged along the angles ; testa reticulate.

Fl. & Fr. : December - March.

Rare, in ponds, tanks and water logged marshlands, particularly in the east of Aravalli.

Selected specimens : Jaipur : Ramgarh, *Sharma* Acc. No. 3209, 1309 (RUBL) ; Digotha road, *Sharma* 3717 (RUBL) ; Jhalawar : *Sharma* 504, 505 (RUBL), *Verma* 3310 (BSA). Also reported from Alwar (*Vyas*, 1964), Bundi (*Maheshwari & Singh*, 1974).

2. *Utricularia australis* R. Br. Prodr. 1 : 430. 1810 ; Taylor in van Steenis, Fl. Males. ser. 1. 8 (2) : 299. f. 25. 1977. *U. flexuosa* (non Vahl) Benth. Fl. Austr. 4 : 525. 1869 ; Clarke in Hook. f. Fl. Brit. India 4 : 329. 1884, *partim et quoad syn. U. australis* R. Br.

Free floating, aquatic herbs ; stolons filiform, 15-30 cm long, branched, glabrous. Leaves 1.0-3.5 cm long ; primary segments 2, filiform, ultimate segments finely setulose. Traps numerous, shortly stalked ; mouth lateral, with simple margined setae ; upper lip with 2, long, branched, setiform appendages. Scapes upto 20 cm long ; scales and bracts basifixed ; bracteoles absent. Flowers 3-10, yellow ; scales 2-3 at the upper half of the peduncle. Calyx lobes subequal, ovate-oblong ; lower lobe emarginate. Corolla glabrous outside ; spur cylindrical or broadly conical, curved under lower lip. Stamens 2. Style distinct. Seeds prismatic, angled, narrowly winged.

Fl. & Fr. : September - November.

Rare, in swampy areas along river-beds. Closely allied to *U. aurea* Lour.

Selected specimen : Jalore : Jaitpura, *Shetty* 6755 (BSJO).

3. *Utricularia exoleta* R. Br. Prodr. 1 : 430. 1810 ; Clarke in Hook. f. Fl. Brit. India 4 : 329. 1884 ; Duthie, Fl. Gangetic Plain 2 : 166. 1911 ; Subram. Aquatic Ang. 32. f. 25. 1962. *U. gibba* L. subsp. *exoleta* (R. Br.) Taylor in Mitt. Bot. Staat. Munch. 4 : 101. 1961 & in Kew Bull. 18 : 204. 1964.

Free-floating aquatic herbs, with terete stolons. Leaves alternate, capillary, forked. Traps obliquely ovoid, replacing one of the leaf-segment at the fork ; upper lip of traps with two branched appendages. Racemes upto 10 cm long, 1 to 3 flowered ; scales and bracts basifixed ;

bracteoles absent. Calyx lobes 1-3 mm long, orbicular to ovate-oblong, many-nerved. Corolla yellow, often with pink striations; upper lip ovate, entire or slightly lobed; lower lip palate, prominently raised; spur 4-6 mm long, straight. Capsules 2-4 mm in diam., globose, 2-valved. Seeds with broad irregular wing.

Fl. & Fr. : December - April.

Rare, in still water ponds, tanks and water-logged marshes in the east of Aravalli.

Selected specimens : Banswara : Verma 214 (BSA) ; Kota : Shahabad, Majumdar 10435, Verma 3305, Wadhwa 9317 (BSA). Also reported from Bundi (Maheshwari & Singh, 1974).

4. *Utricularia stellaris* L. f. Suppl. 86. 1781 ; Wight, Ic. 4 (4) : 9. t. 1567. 1850 ; Clarke in Hook. f. Fl. Brit. India 4 : 328. 1884 ; Duthie, Fl. Gangetic Plain 2 : 165. 1911 ; Subram. Aquatic Ang. 33. f. 23. 1962. *U. inflexa* Forsk. var. *stellaris* (L. f.) Taylor in Mitt. Bot. Staat. Munch. 4 : 96. 1961 & in Kew Bull. 18 : 189. 1964.

Free floating, aquatic herbs, with filiform, terete stolons. Leaves whorled, auricled at the base, deeply divided into linear segments. Traps 1-3 mm long, obliquely ovoid, stalked, mouth lateral, upper lip with 2-branched appendages. Floats 0.5-2.0 cm long, ellipsoid, white, spongy, borne above the middle on scape. Racemes 2 to 16-flowered. Calyx-lobes subequal. Corolla yellow, 2-lipped. Capsules c. 5 mm long, globose, with reflexed calyx at the base. Seeds discoid or 4 to 6-angled, narrowly winged.

Fl. & Fr. : October - December.

Rare, in tanks and ponds in the east of Aravalli.

Selected specimens : Banswara : Verma 215 (BSA) ; Loda, Majumdar 10258 (BSA) ; Bharatpur : Lake, Bachkeli Acc. No. 140598 (DD). Also reported from Alwar (Vyas, 1964).

5. *Utricularia striatula* J.E. Smith in Rees, Cyclop. 37. No. 17. 1817 ; Taylor in Kew Bull. 18 : 91. 1964. *U. orbiculata* Wall. ex DC. Prodr. 8 : 18. 1844 ; Clarke in Hook. f. Fl. Brit. India 4 : 334. 1884. *U. glochidiata* Wight, Ic. 4 (4) : 11. t. 1581. 1850.

Terrestrial herbs, with filiform stolons bearing traps and leaves. Leaves in rosette, 3-4 × 2-3 mm, orbicular or reniform. Traps globose or ovoid, 6-8 mm in diam. Flowers in 2 to 8-flowered, scapose racemes. Bracts medifixed, oblong, obtuse. Calyx-lobes unequal; upper one orbicular-obcordate, emarginate, 7 to 9-nerved; lower one ovate-

oblong, nerveless. Corolla white or pale purple ; upper lip bidentate ; lower lip 5 lobed ; spur subulate. Seeds ovoid, glochidiate.

Fl. & Fr. : September - February.

Rare, in slow running water streams on wet rocks.

Selected specimen : Sirohi : Mt. Abu, *McCann* 5887 (BLAT).

94. OROBANCHACEAE

(V. Singh)

Corolla 2 - lipped.	...	2. <i>Orobanche</i>
Corolla not 2 - lipped ; lobes subequal.	...	1. <i>Cistanche</i>

1. CISTANCHE Hoffm. & Link

Cistanche tubulosa (Schrenk) Wight, *lc.* 4 (3) : 4. t. 1420. 1850 ; *Hook. f. Fl. Brit. India* 4 : 324. 1885 ; *Duthie, Fl. Gangetic Plain* 2 : 163. 1911. *Phelipaea tubulosa* Schrenk, *Pl. Spec. Aegypt. Arab.* 23. 1840. 'Beaphor, Loukimula' (Hindi).

Purplish yellow, leafless root parasites, having solitary or fascicled scapes from the ground, upto 60 cm high. Scapes furrowed, fleshy, pubescent, terminating into 2 - 4 cm long spikes. Bracts 2.0 - 2.5 cm long, oblong lanceolate, scarious margined ; bracteoles 1.5 - 1.7 cm long, linear - lanceolate. Calyx 1.2 - 2.0 cm long, tubular, campanulate ; lobes 5 - 7 mm long, subequal, rounded. Corolla yellow, tubular, hairy at the base inside the lower half, upper half campanulate, bent outwards from the middle ; lobes rounded, reflexed. Filaments pubescent at the base ; anthers woolly. Capsules 20 - 25 × 8 - 10 mm, ovoid oblong, laterally compressed, beaked. Seeds numerous, reticulately pitted.

Fl. & Fr. : October - March.

Usually parasitising the roots of *Calligonum polygonoides* L., *Capparis decidua* (Forsk.) Edgew., *Salvadora persica* L., *Calotropis procera* (Ait.) R. Br. and *Acacia* sp., particularly in the desert area.

Selected specimens : Ajmer : Rampura, *Lourie* 4795 A (DD) ; Barmer : Puri 22978 (BSI) ; Bikaner : Badrasar, *Roy* 1724 (BSJO) ; Jaipur : Pipla, *Bherulal* Acc. No. 8250 (RUBL) ; Jaisalmer : *Jain* 40672 (BSI) ; Badabagh, Puri 23200 (BSI) ; Pokaran, *Wadhwa* 4994 (BSA), *Tiwari* 682 (BSJO) ; Pali : Jowai Dam, *Shetty* 1618 (BSJO).

2. OROBANCHE L.

Bracteoles absent. Stamens inserted about the middle of corolla-tube. Anthers glabrous.	...	2. <i>O. cernua</i> var. <i>nepalensis</i>
Bracteoles 2. Stamens inserted near the base of corolla-tube. Anthers woolly.	...	1. <i>O. aegyptiaca</i>

1. *Orobanche aegyptiaca* Pers. Syn. 2 : 181. 1807 ; Duthie, Fl. Gangetic Plain 2 : 164. 1911. *O. indica* Buch. Ham. ex Roxb. Fl. Ind. 3 : 27. 1832, non Spreng. 1825 ; Hook. f. Fl. Brit India 4 : 326. 1885. *O. ramosa* auct. non L. 1753 ; Hook. f. l. c. 4 : 326. 1885 ; Sharma & Tiagi, Fl. N. E. Rajasthan 305. 1919. 'Lonki mulo' (Hindi).

Root parasites, 10-50 cm high, usually branching from the base. Scales few, lanceolate, slightly hairy. Spikes lax ; bracts half as long as corolla-tube, ovate or lanceolate ; bracteoles filiform, shorter than calyx. Calyx campanulate, 4-toothed, pubescent ; teeth equalling the tube, lanceolate, strongly nerved down the middle. Corolla blue, lilac or whitish ; upper lip 2-lobed ; lower one 3-lobed ; tube slightly curved above, constricted above the insertion of the stamens. Filaments hairy at the base ; anthers woolly along the sutures. Capsules oblong, acuminate, glabrous. Seeds subglobose to broadly ovoid, reticulate.

Fl. & Fr. : January-March.

Common parasite on the roots of the members of Solanaceae and Brassicaceae.

Selected specimens : Jaipur : Sharma 3215, 3216 (RUBL) ; Jodhpur : Kharia - Meetapur, Singh 3575 (BSJO) ; Pali : Haria Mali, Shetty 1575 (BSJO).

2. *Orobanche cernua* Loeffl. var. *nepalensis* Reut. in DC. Prodr. 11 : 33. 1847 ; Sant. & Wagh in Bull. Bot. Surv. India 5 (2) : 107. 1963. *O. nicotiana* Wt. Ill. 5 (2) : 179. t. 158. 1850. *O. cernua* Loeffl. var. *desertorum* G. Beck. in Biblioth. Bot. 19 : 142. f. 33. 1890. 'Lonki-mulo' (Hindi).

Erect, leafless, root parasite, 20-30 cm high, cobwebby pubescent, tinged with dark brown or purplish. Scales 8-11 mm long, ovate-lanceolate, acute or acuminate, entire or denticulate. Spikes terminal, short, dense, cylindric. Bracts 8-15 mm long, ovate-lanceolate, turning brown, prominently nerved. Calyx membranous ; sepals 2-partite from back to front ; segments deeply 2-fid, pale violet, glandular pubescent. Corolla 18-20 mm long, 2-lipped ; tube curved, dilated above ; upper

lip notched, erect ; lower lip spreading, 3 lobed. Stamens 4 ; filaments dilated at base, glabrous. Style glabrous ; stigma white, 2 lobed. Seeds ovoid, reticulate.

Fl. & Fr. : December - April.

Usually parasitising the roots of *Solanum melongena* L., *Lycopersicon esculentum* Mill. and *Nicotiana tabacum* L.

Selected specimens : Ajmer : *Lourie* 4794 (DD) ; Jaipur : Rajasthan College Garden, *Sharma* 409 (RUBL) ; Dug - Lokha, *Verma* 6730 (BSA) ; Jodhpur : Umed Sagar, *Tondon* Acc No. 118961 (DD). Also reported from Udaipur (*Vyas*, 1965).

95. GESNERIACEAE

(R. P. Pandey)

DIDYMOCARPUS Wall. *nom. cons.*

Didymocarpus pygmaea Clarke in Hook. f *Fl. Brit. India* 4 : 345. 1884 ; Duthie, *Fl. Gangetic Plain* 2 : 168. 1911.

Delicate, pubescent, annual herbs, 2 - 5 cm high, with filiform stem. Leaf solitary, sessile, membranous, 3.5 - 5.0 × 2.0 - 5.5 cm, broadly ovate or lanceolate, obtuse or rounded at both ends, margins sinuate crenate, villous on both surfaces. Flowers solitary or in fascicles, pedicellate, axillary, yellow. Calyx 5 lobed ; lobes linear, densely hairy outside. Corolla tubular, shortly 5 lobed. Fertile stamens 2, included. Staminodes 2, linear. Ovary and style densely hairy. Capsules upto 1.5 cm long, linear, 2 valved, pubescent, with persistent accrescent calyx at the base.

Fl. & Fr. : February - April.

Rare, found in moist rock crevices.

Selected specimens : Bundi : Kotah dam, *Singh* 74719 (LWG) ; Sirohi : Mt. Abu, *Mehta* 1172 (JAC).

96. BIGNONIACEAE

(V. Singh)

- 1a. Leaves simple. ... 9. *Tecomella*
 1b. Leaves pinnate :
 2a. Leaves 1 - pinnate :

- | | | |
|--|-----|-------------------------|
| 3a. Fruits indehiscent. | ... | 4. <i>Kigelia</i> |
| 3b. Fruits dehiscent : | | |
| 4a. Calyx spathaceous, clift to the base on one side of flower : | | |
| 5a. Flowers white. | ... | 1. <i>Dolichandrone</i> |
| 5b. Flowers orange or red. | ... | 7. <i>Spathodea</i> |
| 4b. Calyx not spathaceous : | | |
| 6a. Seeds winged on each side. | ... | 2. <i>Fernundoa</i> |
| 6b. Seeds winged on one side and grooved on the other side. | ... | 8. <i>Stereospermum</i> |
| 2b. Leaves 2 to 3-pinnate : | | |
| 7a. Stamens 4 : | | |
| 8a. Corolla white. Capsules linear. | ... | 5. <i>Millingtonia</i> |
| 8b. Corolla blue or mauve. Capsules orbicular. | ... | 3. <i>Jacaranda</i> |
| 7b. Stamens 5. | ... | 6. <i>Oroxylum</i> |

1. DOLICHANDRONE (Fenzl) Seem. *nom. cons.*

Calyx - spathe with a recurved point. Corolla 4 - 6 cm long. Capsules arcuate, with conspicuous speckles, only slightly compressed. ... 1. *D. atrovirens*

Calyx - spathe obtuse or emarginate. Corolla less than 4 cm long. Capsules falcately curved, without speckles, much flattened. ... 2. *D. falcata*

1. *Dolichandrone atrovirens* (Heyne ex Roth) Sprague in Bull. Misc. Inform. 1919 : 304. 1919 ; Gamble. Fl. Madras 2 : 996. 1924. *Bignonia atrovirens* Heyne ex Roth, Nov. Pl. Sp. 284. 1821. *B. crispa* Ham. ex Roxb. Fl. Ind. 3 : 103. 1832. *Dolichandrone crispa* (Ham. ex Roxb) Seem. in J. Bot. 8 : 381. 1870 ; Clarke in Hook. f. Fl. Brit. India 4 : 379. 1884.

Medium sized trees, with rough, brown bark. Leaves 1 pinnate ; leaflets 5 7, 7 9 × 3 - 4 cm, ovate, acuminate, coriaceous, nerves 5 7 pairs. Flowers in corymbs. Calyx spathaceous, with a recurved point at the tip. Corolla 4 6 cm long, white. Anther cells divergent to parallel. Capsules upto 50 cm long, arcuate, with conspicuous speckles, slightly compressed. Seeds with membranous wings.

Fl. & Fr. : April June.

Rare, in wastelands near habitations.

Selected specimen : Kota : Khushiara village, Wadhwa 9274 (BSA).

2. *Dolichandrone falcata* (Wall. ex DC.) Seem. in J. Bot. 8 : 381. 1870 ; Clarke in Hook. f. Fl. Brit. India 4 : 380. 1884, excl. syn. *Bignonia atrovirens* Heyne ex Roth ; Duthie, Fl. Gangetic Plain 2 : 172. 1911. *Spathodea falcata* Wall. ex DC. Prodr. 9 : 206. 1845. *Dolichandrone lawii* Seem. l. c. 8 : 380. 1870 ; Clarke in Hook. f. l. c. 4 : 380. 1884.

Deciduous trees, 4-15 m high ; young parts pubescent or shortly villous. Leaves 1-pinnate, 7-15 cm long ; leaflets 2-5 × 1.5-4.0 cm, ovate, suborbicular or obovate, abruptly acuminate, entire, pubescent or glabrous. Flowers in terminal, few-flowered racemes. Calyx spathaceous, obtuse or emarginate at the apex. Corolla c. 2.5 cm long, white ; tube narrow at the base, gradually enlarging upwards. Anther cells parallel, glabrous. Capsules 15-50 × 1.5-3.5 cm, falcate, 2-valved, glabrous. Seeds broadly 4-angular, winged at the two ends.

Fl. & Fr. : March-June.

Rare, on the fringes of forests and in wastelands. Ripe fruits of previous year remain on the tree when the flowers of next year are in bloom.

Selected specimens : Banswara : Danpur Forest, Singh 4270 (BSJO) ; Kota : Air Port Area, Singh 90179 (LWG) ; Atru, Singh 90983 (LWG).

2. FERNANDOA Welw. ex Seem.

Fernandoa adenophylla (Wall. ex G. Don) Steenis in Blumea 23 (1) : 135. 1976. *Bignonia adenophylla* Wall. ex G. Don, Gen. Hist. 4 : 221. 1838. *Heterophragma adenophylla* (Wall. ex G. Don) Seem. ex Benth. & Hook. f. Gen. Pl. 2 : 1047. 1876 ; Clarke in Hook. f. Fl. Brit. India 4 : 381. 1884. *Haplophragma adenophyllum* (Wall. ex G. Don) P. Dop in Bull. Soc. Bot. France 72 : 890. 1926.

Medium sized trees, 10-15 m high. Leaflets 5-7, 6-18 × 6-15 cm, broadly elliptic, entire, acute, rusty tomentose beneath. Flowers large, in terminal panicles. Calyx 2.0-2.5 cm long, rusty tomentose. Corolla tube 3.0-3.5 cm long, tomentose ; lobes subequal, obtuse. Style 3.5 cm long ; stigma elliptic. Capsules 30-90 × 3 cm, cylindrical, ribbed, mostly curved. Seeds winged.

Fl. & Fr. : March-June.

Rare, planted along the roads as an avenue tree.

Selected specimen : Jhalawar : Jhalarapatan, Singh 83933 (LWG).

3. JACARANDA Juss.

Jacaranda mimosaeifolia D. Don in Bot. Reg. 8 : t. 631. 1822 & Edinb. N. Phil. Journ. 9 : 264. 1823. *J. ovalifolia* R. Br in Curtis, Bot. Mag t. 2327. 1822.

Small or medium - sized trees, with grey white or dull black bark. Leaves bipinnate, 18 - 30 cm long ; rachis grooved ; pinnae opposite, c. 20 pairs ; leaflets 5 - 26 pairs and an odd one, oblong, narrowed at both ends, cuspidate, terminal one linear - lanceolate. Flowers in lax pyramidal panicles. Calyx 5 toothed. Corolla tube curved, 2 lipped ; lobes 5, nearly equal. Stamens 4, included ; staminodes clavately thickened and hairy at top. Capsules 7.5 × 2.5 cm, ovate orbicular, compressed at right angle to the septum. Seeds winged.

Fl. & Fr. : March - May.

Native of N.W. Argentina and Brazil ; commonly planted in the gardens, lawns, squares and along the roads as an avenue tree.

Selected specimens : Kota : Singh 90887 (LWG) ; Udaipur : Majumdar 11628 (BSA). Also reported from Ajmer (Sharma, 1958) and Jhunjhunu (Nair, 1961).

4. KIGELIA DC.

Kigelia africana (Lam.) Benth. in Hook. Niger. Fl. 463. 1849. *Bignonia africana* Lam. Encycl. 1 : 424. 1785. *Crescentia pinnata* Jacq. Collect. 3 : 203. t. 18. 1791. *Kigelia pinnata* (Jacq.) DC. Prodr. 9 : 247. 1845.

Trees, 8 - 15 m high. Leaflets 5 - 9, 7.5 - 18 × 4 - 8 cm, oblong or obovate, entire, acute or retuse, coriaceous. Flowers arranged in whorls of 3, in lax, 30 - 80 cm long hanging racemes. Calyx campanulate, glabrous. Corolla throat wide. Anther cells parallel, versatile or dorsifixed. Fruits 30 - 40 × 10 - 13 cm, woody, gourd like, hanging on cord like peduncles. Seeds wingless.

Fl. & Fr. : May - November.

Native of T. Africa ; commonly planted in the gardens and along the roads as an avenue tree. Rarely found in the forests.

Selected specimens : Alwar : Siriska Tiger Reserve, *Parmar* 9669 (BSJO) ; Dungarpur : *Verma* 185 (BSA) ; Kota : Bara bag, *Singh* 90861 (LWG) ; Tonk : Malpura, *Pandey* (BSJO).

5. MILLINGTONIA L. f.

Millingtonia hortensis L. f. *Suppl. Pl.* 291. 1781 ; *Wight. Ill. Ind. Bot.* t. 161. f. 6. 1850 ; *Clarke in Hook. f. Fl. Brit. India* 4 : 377. 1884 ; *Duthie, Fl. Gangetic Plain* 2 : 174. 1911. '*Neem Chameli*' (Hindi).

Trees, 10-20 m high. Leaves 2 pinnate ; leaflets 3-5 × 2-4 cm, elliptic-ovate, rounded or oblique at the base, entire or coarsely toothed, acuminate. Panicles corymbose. Calyx cupular ; lobes 5, obtuse. Corolla white, tubular ; tube 5-7 cm long ; lobes 5, bilabiate. Stamens 4 ; anthers oblong, with 1 fertile cell, barren cell reduced to an appendage. Capsules c. 30 × 2 cm.

Fl. & Fr. : October-March.

Native of Burma ; commonly planted in the gardens, on railway platforms and along the roads as an avenue tree.

Selected specimen : Kota : *Bhonra, Singh* 90501 (LWG). Also reported from Ajmer (*Sharma*, 1958). *Jhunjhunu* (*Nair et al.*, 1961), *Udaipur* (*Ramdeo*, 1969) and *Jodhpur* (*Sarup*, 1951).

6. OROXYLUM Vent.

Oroxylum indicum (L.) Vent. *Gen. Nov.* 8. 1808 ; *Clarke in Hook. f. Fl. Brit. India* 4 : 378. 1884. *Bignonia indica* L. *Sp. Pl.* 625. 1753.

Trees, upto 15 m high. Leaves 60-180 cm long, ternately bipinnate ; rachis stout, ribbed ; leaflets 7-14 × 5-8 cm, elliptic-ovate, entire, subacuminate, oblique or rounded at the base, pubescent beneath. Racemes 20-30 cm long. Calyx fleshy. Corolla fleshy. Stamens shortly exerted ; filaments woolly at the base, fifth filament rather shorter than others ; anther-cells divergent below. Capsules 30-100 cm long, elongate, compressed, brown ; valves woody ; septum flat. Seeds discoid, winged all round except at the base.

Fl. & Fr. : March-June.

Rare, in the forests ; also planted near temples.

Selected specimens : *Udaipur* : *Cheeka ghat, Gemawat* 1641 Bot., Acc.

No. 53164 (LWG) ; Nagda Mandir, *Gemawat* 179/Bot., Acc. No. 53163 (LWG) ; Dabok, *Gemawat* 164 (BSI).

7. SPATHODEA P. Beauv.

Spathodea campanulata P. Beauv. Fl. Owar. 1 : 17 t. 27 28 1805.

Trees, 4-6 m high. Leaflets 9-13, 5-7 × 2.5-4.0 cm, ovate-oblong, entire, acuminate, tomentose beneath. Flowers in terminal, tomentose racemes. Calyx 6-8 cm long, spathaceous, tomentose. Corolla 10-12 cm long, campanulate, orange-crimson or red. Capsules 15-20 cm long, without false septa. Seeds winged.

Fl. & Fr. : January - June.

Native of Africa ; commonly planted along road-sides and in the gardens.

Selected specimen : Kota : Singh 90888 (LWG).

8. STEREOSPERMUM Cham.

Stereospermum colais (Buch-Ham. ex Dill.) Mabberley in Taxon 27 (5-6) : 553. 1979. *Bignonia colais* Buch-Ham. ex Dill. Rev. Ref. Hort. Mal. 28 1839. *B. suaveolens* Roxb. Fl. Ind. 3 : 104. 1832. *Stereospermum suaveolens* (Roxb.) DC. Prodr. 9 : 211. 1845 ; Clarke in Hook. f. Fl. Brit. India 4 : 382. 1884 ; Duthie, Fl. Gangetic Plain 2 : 173. 1911.

Deciduous trees, 10-20 m high ; young shoots pubescent. Leaf-rachis upto 30 cm long ; leaflets 7-9, 8-20 × 6-10 cm, broadly elliptic, entire or serrulate, acute or acuminate. Flowers in lax, trichotomous, viscid panicles. Calyx c. 1 cm long, campanulate, viscid, 3 to 5-lobed. Corolla dull purple to lilac. Capsules 30-60 × 1.0-2.5 cm, cylindrical, 4-angled, tubercled. Seeds winged at each end.

Fl. : February - May ; *Fr.* : June onwards.

Occasional, found in wastelands. Fruits remain on the tree for a very long time.

Selected specimens : Alwar : Siriska Tiger Reserve, Parmar 9665 (BSJO) ; Kota : Chhabra, Singh 91015 (LWG) ; Pali : Ghanerao Forest, Pandey 4651 (BSJO).

9. TECOMELLA Seem.

Tecomella undulata (Sm.) Seem. in Ann. & Mag. Nat. Hist. ser. 3. 10 : 30. 1862 & in Journ. Bot. 1 : 18. 1863 ; Duthie, Fl. Gangetic Plain 2 : 171. 1911 ; Mahesh. Illus. Fl. Delhi f. 159. 1966. *Bignonia undulata* Sm. Exot. Bot. 1 : 35. t. 19. 1804. *Tecoma undulata* (Sm.) G. Don, Gen. Hist. 4 : 223. 1838 ; Clarke in Hook. f. Fl. Brit. India 4 : 378. 1884.

Shrubs or small trees, with drooping branches, minutely stellate hairy when young. Leaves subopposite, simple, 5-12 × 1.5-2.5 cm, oblong, obtuse or emarginate, entire or undulate margined, cuneate at the base. Cymes few-flowered, arranged in racemose manner, terminating short lateral branches. Calyx 8-9 mm long, campanulate ; lobes ovate, obtuse, mucronate. Corolla 5-7 cm long, yellow or orange-yellow, campanulate ; lobes 5, subequal. Stamens exserted ; filaments glabrous. Ovary on a yellow annular disc ; stigma bilamellate, elliptic. Capsules 15-35 × 8-10 mm, curved, linear-oblong, smooth. Seeds winged at the apex.

Fl. & Fr. : January-April.

Rather common in desert area in comparison to the semi-arid zones. It is the chief source of timber and fuel-wood and has, therefore, been badly threatened due to over-exploitation.

Selected specimens : Ajmer : Bali, Kaul 8490 (LWG) ; Alwar : Siliserh, Hiralal 34547 (LWG) ; Barmer : Puri 21903 (BSI), Tiwari 957 (BSJO) ; Jaipur : Shahpura, Kaul 8380 (LWG) ; Jaisalmer : Shetty 6126 (BSJO) ; Pokran, Jain 49466 (BSI) ; Jodhpur : Balsamand, Jain 40243 (BSI) ; Pali : Bar, Duthie, 4796 (DD) ; Udaipur : Goramghat, Kanodia 82529 (BSI) ; Tonk : Sohela Forest, Shetty 497 (BSJO).

CULTIVATED SPECIES

Campsis grandiflora (Thunb.) K. Schum. (*Bignonia grandiflora* Thunb., *Tecoma grandiflora* Loisel.) Extensive deciduous climbers, with few or no aerial roots. Leaves opposite, odd-pinnate. Flowers scarlet or orange. Stamens 4. Cultivated for ornamental purposes.

Macfadyena uguis-cati (L.) A. Gentry (*Bignonia unguis-cati* L.) Extensive shrubby climbers, with 3-fid, claw-like tendrils and oblong, acuminate leaflets. Flowers yellow, paired in the axils of leaves on slender peduncles. Native of Argentina ; commonly grown in the gardens around trunks of trees and on trellis.

Pyrostegia venusta (Ker Gawl.) Miers (*Bignonia venusta* Ker Gawl.) Evergreen, tendril climbers, with crimson orange flowers in drooping corymbose cymes. Native of Brazil ; cultivated as an ornamental climber along walls, poles and on pergolas.

Tecoma stans (L.) Juss. ex Kunth (*Bignonia stans* L.) Evergreen shrubs, with 1 pinnate leaves and yellow flowers. Native of S America ; often grown in the gardens for ornamental purposes.

97. PEDALIACEAE

(V. Singh)

Ovary cells undivided. Fruits drupaceous, indehiscent, subpyramidal, 4 - angled, with a spine at each basal angle. ...	1. <i>Pedalium</i>
Ovary cells divided by a false septum. Fruits oblong, slightly 4 - lobed, dehiscent, capsular, not spinous. ...	2. <i>Sesamum</i>

1. PEDALIUM L.

Pedalium murex L. Syst. Nat. ed. 10. 1123. 1759 ; Wight, Ic. 4 (4) : 17. t. 1615. 1850 ; Clarke in Hook. f. Fl. Brit. India 4 : 386. 1884 ; Bhandari, Fl. Ind. Desert 293. 1978.

Erect, annual, glandular pubescent herbs, 30 - 50 cm high. Leaves 2 - 8 × 1.5 - 5.5 cm, obovate oblong, repand dentate, with minute glistening glands beneath, base cuneate and 3 - nerved ; petioles with two, axillary, dark violet glands at the base. Flowers 2 - 3 cm long, axillary, solitary, pale yellow. Calyx divided near to base, minutely scaly outside ; lobes triangular lanceolate. Corolla densely scaly glandular outside, zygomorphic ; lobes suborbicular. Stamens 4, included, glandular, hairy at base. Ovary papillose ; stigma obliquely capitate. Seeds 2 in each cell of fruit, elongate elliptic, 3 - angled towards apex.

Fl & Fr. : August - December.

Native of Africa ; naturalized in wastelands throughout the state.

Selected specimens : Banswara : Paloda, Singh 2830 (BSJO) ; Ganganagar : Bhadra, Roy 6448 (BSJO) ; Jaipur : Sambhar, Sharma 1776 (RUBL) ; Jhalawar : Sharma 16 (RUBL) ; Jodhpur : Shastrinagar, Pandey 3480 (BSJO) ; Sirohi : Mt. Abu, Mehta 245 (JAC).

2. SESAMUM L.

Sesamum indicum L. Sp. Pl. 634. 1753 ; Clarke in Hook. f. Fl. Brit. India 4 : 387. 1884 ; Duthie, Fl. Gangetic Plain 2 : 175. 1911 ; Mahesh. Illus. Fl. Delhi f. 161. 1966. *S. orientale* L. Sp. Pl. 634. 1753. *S. mulayanum* Nair in Bull. Bot. Surv. India 5 : 251. 1963. 'Til' (Hindi).

Erect, annual, glandular pubescent herbs, 75-150 cm high. Stem obtusely 4-angled, salcate, glandular-pubescent to glabrescent. Leaves 4-15 × 0.5-4.5 cm, elliptic-lanceolate, upper entire, lower 2 to 3 segmented, serrate. Flowers axillary, solitary, pink or purple or rarely white. Calyx lobes oblong, pubescent. Corolla pubescent outside, bilabiate. Filaments glabrous. Capsules 1.5-3.0 × 0.6-0.8 cm, oblong-quadrangular, deeply 4-grooved, beaked at the apex. Seeds black or white, smooth to rugose.

Fl. & Fr. : August- November.

Black and white seeded varieties are grown in the area. The both have also truly naturalized from plains to the hills. Leaves fall before ripening of fruits.

Selected specimens : Alwar : Siriska Tiger Reserve, Parmar 9500 (BSJO) ; Banswara : Shergarh, Singh 3093 (BSJO) ; Ganganagar : Durahpurkeri, Roy 5017 (BSJO) ; Jaipur : Wadhwa 4814 (BSA) ; Jaisalmer : Kishangarh Road, Shetty 3475 (BSJO) ; Jhalawar : Khanpur, Wadhwa 9576 (BSA).

98. MARTYNIACEAE

(V. Singh)

MARTYNIA L.

Martynia annua L. Sp. Pl. 618. 1753 ; Mahesh. Illus. Fl. Delhi f. 162. 1966. *M. diandra* Glox. Obs. Bot. 14. t. 1. 1785 ; Clarke in Hook. f. Fl. Brit. India 4 : 386. 1884 ; Duthie, Fl. Gangetic Plain 2 : 176. 1911. 'Billi' (Hindi).

Erect, widely branched, glandular pubescent herbs, upto 1.5 m high. Stem subterete, fistular. Leaves 8-20 × 8-17 cm, broadly ovate cordate, sinuately dentate, sticky, long petioled. Racemes 5-10 cm long, lax, in the bifurcation of upper branches. Flowers drooping, pinkish white ; pedicels with semilunar glands at base. Corolla 5-7 cm long, bilabiate, with stalked glands and purple dots on the anterior side within.

Stamens diandrous; filaments white, glabrous. Fruits woody, bottle shaped, hooked at the tip, hairy, deflexed.

Fl. & Fr. : August - October.

Native of Mexico; naturalized in wastelands, along the roads and in open forests, particularly in the east of Aravalli.

Selected specimens : Alwar : Siriska Tiger Reserve, *Parmar* 9592 (BSJO); Banswara : Rovelhindvela forest, *Singh* 2886 (BSJO); Jaipur : Ramgarh, *Sharma* 2088 (RUBL); Kota : *Majumdar* 13273 (BSA); Sirohi : *Jain* 46756 (BSI).

99. ACANTHACEAE (incl. THUNBERGIACEAE)

(R.P. Pandey & V. Singh)

- | | | | |
|--|-----|-----|-------------------|
| 1a. Climbers. | ... | 30 | <i>Thunbergia</i> |
| 1b. Erect or prostrate herbs or shrubs : | | | |
| 2a. Seeds not supported on hard retinaculæ : | | | |
| 3a. Bracts rigid. Peduncles of spikes covered with alternate scales. | ... | 12. | <i>Elytraria</i> |
| 3b. Bracts herbaceous. Spikes sessile or if pedunculate, the peduncle without scales. | ... | 23. | <i>Nelsonia</i> |
| 2b. Seeds supported on hard upcurved retinaculæ : | | | |
| 4a. Corolla without an upper lip; lower lip large, expanded, 3-lobed. Ovules 2 in each cell. | ... | 5. | <i>Blepharis</i> |
| 4b. Corolla 2-lipped or with 5 subequal lobes : | | | |
| 5a. Corolla-lobes twisted to the left in bud : | | | |
| 6a. Ovules more than 2 in each cell i.e. capsules 6 or more seeded : | | | |
| 7a. Corolla distinctly 2-lipped. | | 18. | <i>Hygrophila</i> |
| 7b. Corolla subequally 5-lobed : | | | |
| 8a. Inflorescence a lax, axillary cyme, passing into terminal panicles. | ... | 27. | <i>Ruellia</i> |
| 8b. Inflorescence a simple spike or capituliform of compound spikes or 1-3 flowers in leaf axils : | | | |

- 9a. Inflorescence a capitulum of compound spikes surrounded by 4 large ovate bracts. ... 14. *Gentelbua*
- 9b. Inflorescence a simple spike or flowers in leaf axils :
- 10a. Inflorescence a simple, elongate spike :
- 11a. Stamens. 4. ... 17. *Hemigraphis*
- 11b. Stamens. 2. ... 16. *Hemiadelphis*
- 10b. Inflorescence of single axillary flower or in axillary triads or 2 - 3 flowers superposed. ... 9. *Dipteracanthus*
- 6b. Ovules 2 in each cell i.e. capsules 1 to 4 seeded :
- 12a. Placentae separating elastically from the base of ripe capsule. ... 26. *Petalidium*
- 12b. Placentae not separating elastically from the base of ripe capsule :
- 13a. Anthers mucronate or spurred at base. ... 10. *Dyschoriste*
- 13b. Anthers not spurred :
- 14a. Corolla - tube long, linear, slender. Stamens 2. ... 13. *Eranthemum*
- 14b. Corolla - tube narrow below, usually infundibuliform upwards. Stamens 4 :
- 15a. Seeds hairy :
- 16a. Bracteoles present. ... 22. *Nilgirianthus*
- 16b. Bracteoles absent. ... 6. *Carvia*
- 15b. Seeds glabrous. ... 29. *Strobilanthes*
- 3b. Corolla - lobes imbricate in bud :

- 17a. Ovules 3 to many in each cell i.e. capsules 6 or more - seeded :
- 18a. Flowers in unilateral racemes or in panicles, without cladodes :
- 19a. Flowers in unilateral racemes. ... 19. *Indoneesiella*
- 19b. Flowers in panicles. ... 2. *Andrographis*
- 18b. Flowers clustered in the midst of axillary cladodes. ... 15. *Haplantodes*
- 17b. Ovules 1 to 2 in each cell i.e. capsules 2 to 4 - seeded :
- 20a. Corolla - lobes 5, subequal :
- 21a. Anthers 1 - celled. ... 7. *Crossandra*
- 21b. Anthers 2 - celled :
- 22a. Calyx 4 - partite ; the two opposite outer lobes much longer than inner ones. Stamens 2. ... 4. *Barleria*
- 22b. Calyx 5 - lobed ; lobes subequal or 2 - lipped. Stamens 4 :
- 23a. Calyx 2 - lipped. ... 24. *Neuracanthus*
- 23b. Calyx - lobes subequal. ... 3. *Asystasia*
- 20b. Corolla distinctly 2 - lipped :
- 24a. Stamens 4. ... 21. *Lepidagathis*
- 24b. Stamens 2 :
- 25a. Placentae separating elastically from the valves from the base upwards :
- 26a. Bracts in unilateral spikes. ... 28. *Rungia*
- 26b. Bracts clustered in leaf - axils or laxly cymose. ... 8. *Dicliptera*

- 25b. Placentae not separating elastically from the valves :
- 27a. Anther - cells parallel, subequal. ... 11. *Ecbolium*
- 27b. Anther - cells one higher than other :
- 28a. Anther - cells, at least the lower one, with a basal spur - like appendage. ... 20. *Justicia*
- 28b. Anther - cells not spurred at base :
- 29a. Anther cells apiculate. ... 1. *Adhatoda*
- 29b. Anther cells muticous. ... 25. *Peristrophe*

1. ADHATODA Mill.

Leaves oblong. Flowers in globose, head - like spikes. Corolla - tube not mottled. Ovary glabrous. ... 1. *A. beddomei*

Leaves elliptic. Flowers in elongate spikes. Corolla - tube mottled. Ovary minutely hairy. ... 2. *A. zeylanica*

1. *Adhatoda beddomei* Clarke in Hook. f. Fl. Brit. India 4 : 540. 1885. 'Arllua' (Hindi).

Large shrubs. Leaves 6 - 15 × 1.7 - 3.0 cm, oblong, tapering at both ends, entire, pubescent. Spikes in axillary, peduncled heads made of many spikes. Bracts narrowed at the base. Calyx 5 - partite. Corolla creamish white, hairy ; lower lip 3 lobed, upper one emarginate. Filaments hairy at the base ; lower anther - cells acuminate or shortly tailed at base. Ovary glabrous, 4 - lobed ; stigma bifid.

Fl. : August - October.

Rare, found on the hills.

Selected specimens : Sirohi : Mt. Abu, Blatter 22678 (BLAT), Mehta 260 (JAC).

2. *Adhatoda zeylanica* Medic. Hist. & Commentat. Acad. Elect. Sci. Theod. Palat. 6 : 393. 1790 ; Matthew, Illus. Fl. Tam. Carnatic pl. 519. 1982. *Justicia adhatoda* L. Sp. Pl. 15. 1753 ; Duthie, Fl. Gangetic Plain 2 : 207. 1911. *Adhatoda vasica* Nees in Wall. Pl. Asiat. Rar. 3 : 103. 1832 ; Clarke in Hook. f. Fl. Brit. India 4 : 540. 1885 ; Santapau in Univ. Bombay Bot. Mem. 2 : 92. 1951. 'Adusa' (Hindi).

Erect, glabrous shrubs, upto 1.75 m tall ; young parts densely appressed pubescent, with swollen nodes. Leaves 5-20 × 1.5-8.0 cm, coriaceous, ovate-lanceolate, elliptic-lanceolate or oblanceolate, acuminate or acute, base cuneate or decurrent, margins subentire to crenulate-undulate, glabrous. Flowers white or creamish white. in dense, leafy, 4.5-12.5 cm long spikes. Bracts leafy, ciliate ; bracteoles shorter than the bracts, elliptic-oblong. Corolla 2-lipped ; lower lip 3-lobed, with purple streaks inside ; throat villous. Capsules upto 2.5 × 1.0 cm. 4-seeded, hard, dark brown. Seeds c. 5 mm across, suborbicular, rugose, brown.

Fl. & Fr. : October - March.

Fairly common throughout Rajasthan in scrub forests, by the sides of roads and in other wastelands.

Selected specimens : Alwar : Nilkantha, Parmar 9693 (BSJO) ; Banswara : Loharia tank, Singh 4238 (BSJO) ; Bikaner : Shivbari, Roy 1704 (BSJO) ; Jaipur : Amer, Sharma 357 (RUBL) ; Jodhpur : Bilara, Singh 3519 (BSJO) ; Jhalawar : Sharma 705 (RUBL) ; Sirohi : Mt. Abu, Kaul 9544, 9545 (LWG).

2. ANDROGRAPHIS Wall. ex Nees

Andrographis paniculata (Burm. f.) Wall. ex Nees in Wall. Pl. Asiat. Rar. 3 : 116. 1832 ; Wight, Ic. 2(3) : 1. t. 518. 1842 ; Clarke in Hook. f. Fl. Brit. India 4 : 501. 1884 ; Duthie, Fl. Gangetic Plain 2 : 196. 1911. *Justicia paniculata* Burm. f. Fl. Ind. 9. 1768. *Andrographis subspathulata* Clarke in Hook. f. Ic. 4 : 502. 1884.

Erect, stout, glabrous herbs or undershrubs. Leaves 4.5-8.5 × 1.0-2.5 cm, linear-obovate, tapering at both ends, glabrous. Flowers in long panicles, white or dirty white, often tinged with pink. Bracts lanceolate ; bracteoles 2. Calyx segment 5, glandular-pubescent. Upper-lip of corolla 2-fid. Stamens 2, bearded. Capsules compressed, oblong, sparsely hairy, acute.

Fl. & Fr. : November - March.

Common along the irrigation channels, in wastelands, neglected corner of gardens, forests etc. Sometimes planted in the houses.

Selected specimens : Chittorgarh : *Majumdar* 11606 (BSA) ; Jodhpur : Mandor-garden, *Tiwari* 1122 (BSJO).

3. ASYSTASIA Blume

Asystasia gangetica (L.) T. Anders. in Thw. Enum. Pl. Zeyl. 235. 1860 ; Santapau in Univ Bombay Bot. Mem. 2 : 68. 1951. *Justicia gangetica* L. Cent. Pl 2 : 3. 1756 & Amoen. Acad. 4 : 299. 1759. *Asystasia coromandeliana* Wight ex Nees in Wall. Pl. Asiat. Rar 3 : 89. 1832 ; Clarke in Hook. f. Fl Brit. India 4 : 493. 1884 ; Wight, Ic. 4(4) : 1. t. 1506. 1850.

Suffruticose, straggling herbs or undershrubs, with branches grey and puberulous. Leaves c. 3.5 x 2.5 cm, elliptic-ovate, acute to acuminate, base rounded or truncate. Flowers in terminal secund racemes, white with purplish streaks or sometimes yellow. Bracts 2-4 mm long, lanceolate, shorter than calyx. Calyx 5 - partite, thinly pubescent. Corolla mottled within. Stamens 2. Capsules 1.0 - 1.5 x 0.25 - 0.5 cm, pubescent, acute. Seeds 3 - 4 mm across.

Fl. & Fr. : October - March.

Rare, found near water - logged and in shady habitats.

Selected specimen : Kota : *Singh* 90624 (LWG).

4. BARLERIA L.

1a. Capsules 2-seeded close to the base :

2a. Corolla lilac or white. ... 5. *B. hochstetteri*

2b. Corolla yellow or orange yellow :

3a. Flowers all axillary, not spicate. ... 4. *B. cuspidata*

3b. Flowers axillary and passing into terminal spikes :

4a. Corolla upto 5 cm long. ... 7. *B. prionitis*
subsp. *prionitis*
var. *prionitis*

4b. Corolla 6-8 cm long :

5a. Calyx-lobes glandular outside. ... 9. *B. prionitis*
subsp. *pubiflora*

- 5b. Calyx-lobes eglandular. ... 8. *B. prionitis*
subsp. *prionitis*
var. *dicantha*
- 1b. Capsules 4-seeded, if 2-seeded, then seeds at or near the middle due to the suppression of two lower seeds :
- 6a. Prickly undershrubs ; prickles pinnatifid near the base. ... 1. *B. acanthoides*
- 6b. Plants unarmed :
- 7a. Seeds hairy :
- 8a. Flowers purple-blue. ... 2. *B. cristata* var. *cristata*
- 8b. Flowers white. ... 3. *B. cristata* var. *dichotoma*
- 7b. Seeds glabrous ... 6. *B. prattensis*

1. *Barleria acanthoides* Vahl, *Symb. Bot.* 1 : 47. 1790 ; Clarke in Hook. f. *Fl. Brit. India* 4 : 484. 1884 ; Duthie, *Fl. Gangetic Plain* 2 : 200. 1911 ; Bhandari, *Fl. Ind. Desert* 296. f. 112. 1978.

Prickly, rigid, perennial undershrubs or shrubs, upto 0.75 m high ; branches hoary or velvety-tomentose. Leaves upto 7×3 cm, obovate-oblong or obovate, obtuse or emarginate, mucronate, attenuate at the base, entire, pubescent. Spines upto 0.75 cm long, inter-petiole, simple or branched. Flowers solitary or in 1 to 8-flowered, unilateral racemes. Bracts straw-coloured, spinous-tipped. Outer calyx-lobes distinctly nerved and reticulately veined. Corolla infundibuliform ; tube 7.5 cm long, pubescent outside. Filaments bearded at the base only. Capsules upto 1.5 cm long, ellipsoid, glabrous, brown. Seeds c. 3.5 mm across, broadly-ovoid, compressed, silky-hairy, brownish.

Fl. & Fr. : October - March.

Common on low Aravalli hills and in other rocky habitats. The plant is highly polymorphic with regards to shape and size of leaves, bracts, calyx and also the texture of spines. The flowers open after sunset.

Selected specimens : Ajmer : *Tiagi* 37 (DD), *Duthie* 4802 (DD) ; Barmer : Haldeshwar Mahadev R.F., *Pandey* 7996 (BSJO) ; Jaipur : Ram Niwas garden, *Sharma* 3407 (RUBL) ; Jodhpur : Balsamand, *Singh* 4493 (BSJO) ; Pali : Bisalpura, *Pandey* 19453 (BSJO).

2. *Barleria cristata* L. *Sp. Pl.* 636. 1753 ; Wight, *lc.* 2(2) : 3. t. 453 1840 - 43 ; Clarke in Hook. f. *Fl. Brit. India* 4 : 488. 1884 ; Duthie, *Fl.*

Gangetic Plain 2 : 201. 1911 ; Santapau in Univ. Bombay Bot. Mem. 2 : 59. 1951.

var. cristata

Erect herbs or undershrubs, 0.75 - 1.25 m high. Leaves upto 16 × 7 cm, elliptic or elliptic-oblong, acute-acuminate, base tapering, entire and ciliate-margined. Flowers in lax cymes. Bracteoles membranous, acute, 1-nerved. Outer 2 calyx-lobes membranous, pubescent, whitish, margins bristle-tipped ; inner ones narrower. Corolla infundibuliform, pubescent outside. Capsules c. 1.25 cm long, oblong-ovoid, glabrous, 4-seeded. Seeds c. 4 mm across, suborbicular, compressed, silky-hairy, brown.

Fl. & Fr. : October - February

Common along the streams, in the valleys and on low hills throughout Rajasthan.

Selected specimens Alwar : Kankawasi, *Parmar* 9428 (BSJO) ; Banswara : Puna Pathar forest, *Singh* 3658 (BSJO) ; Kota : Aklera, *Majumdar* 10026 (BSA) ; Pali : Kumbhalgarh R.F., *Pandey* 19422 (BSJO) ; Sirohi : Mt. Abu, *Jain* 46678, 60192 (BSI) ; Udaipur : Sajangarh, *Kanodia* 82296 (BSI).

3. var. *dichotoma* (Roxb.) Prain, Bengal Pl. 812. 1903 ; Wight, Ic. 2(2) : 3. t. 453. 1841 ; Santapau in Univ. Bombay Bot. Mem. 2 : 59. 1951 ; Bhandari, Fl. Ind. Desert 297. 1978. *Barleria dichotoma* Roxb. Fl. Ind. 3 : 39. 1832.

Perennial, erect undershrubs, 75-150 cm high. Leaves 5-15 × 2-5 cm, elliptic-oblong, acuminate, tapering at base, pubescent on both sides. Flowers axillary, solitary or few, forming dense spikes, white. Calyx 4-partite, tip with a bristle, pubescent. Corolla-tube glandular-pubescent outside. Capsules 1.0 - 1.5 cm long, ellipsoid, tapering at the both ends, 4 seeded. Seeds compressed, orbicular.

Fl. & Fr. : October - February.

Occasionally found along ditches and nalas in waste-lands etc. ; often cultivated in the gardens for ornamental purposes.

Selected specimen : Jodhpur : *Bhandari* 737 (JAC). Also reported from Sikar (*Majumdar*, 1969).

4. *Barleria cuspidata* Heyne ex Nees in Wall. Pl. Asiat. Rar. 3 : 93. 1832 ; Wight, Ic. 2(2) : 3. t. 451. 1840 - 43 ; Clarke in Hook. f. Fl. Brit. India 4 : 483. 1884 ; Sharma & Tiagi, Fl. N.E. Rajasthan 312. 1979.

Spiny shrubs ; spines 4, axillary, upto 2.75 cm long, white. Leaves *c.* 3.75 × 0.75 cm, oblong - lanceolate, apex spiny, base cuneate. Flowers solitary, axillary, yellowish-white or pale yellow. Bracts linear, spine-tipped. Calyx 4-partite, spine-tipped. Stamens exerted beyond the corolla-tube ; filaments flattened. Capsules *c.* 1.75 × 0.5 cm, ovoid, 2-seeded. Seeds *c.* 5 mm across, ovoid, appressedly hairy.

Fl. & Fr. : November - March.

Rare, found in wastelands and on the hills.

Selected specimens : Jaipur : Near Jal Mahal, *Sharma* 366 (RUBL) ; Ramgarh hills, *Sharma* 3378 (RUBL) ; Sirohi : Vasa, *Puri* 49922 (BSI). Also reported from N.W. Rajasthan by Sankhala (1951).

5. *Barleria hochstetteri* Nees in DC. Prodr. 11 : 231. 1847 ; Wight, Ic. 4(4) : 4. t. 1528. 1850 ; Clarke in Hook. f. Fl. Brit. India 4 : 483. 1884 ; Bhandari, Fl. Ind. Desert 298. 1978.

Much-branched, rigid shrubs. Leaves *c.* 2.5 × 1.0 cm, oblong, obtuse, base tapering, entire, pubescent on both sides. Flowers in threes, pedicelled, borne at the apex of short peduncle-like branchlets, lilac. Calyx-lobes unequal, hairy outside. Corolla-lobes rounded, emarginate. Capsules 5-9 mm long, ovoid, beaked, pubescent, 2-seeded near the base. Seeds 2.0 - 2.5 mm across, suborbicular, appressedly hairy.

Fl. & Fr. : November - March.

Rare, found in Western Rajasthan desert, particularly in rocky habitats.

Selected specimen : Barmer : *Bhandari* 1270 (JAC). Also reported by Sankhala (1951) from N.W. Rajasthan.

6. *Barleria prattensis* Santapau in Kew Bull. 3 : 487. 1949 & in Univ. Bombay Bot. Mem. 2 : 62, pl. 3. 1951 & in Rec. Bot. Surv. India 16(1) : 179. 1960.

Erect, glabrous herbs or undershrubs, half to one meter high. Leaves 4-12 × 0.75 - 3.75 cm, elliptic-oblong to lanceolate. Flowers in axillary or terminal spikes, white or purple. Bracts lanceolate-elliptic, spinous-toothed. Bracteoles linear. Calyx 4-lobed, bristle-tipped, distinctly nerved. Capsules upto 2 cm long, ellipsoid, 4-seeded. Seeds orbicular, compressed, black, glabrous.

Fl. & Fr. : September - February.

Commonly found as a forest undergrowth, particularly in moist and shady localities in S.E. Rajasthan.

Selected specimens : Banswara : Puna Pathar forest, *Singh* 3656 (BSJO) ; Parla ka Pul, *Majumdar* 10319 (BSA) ; Bundi : Kala Khet, *Verma* 1736, 1753 (BSA) ; Chittorgarh : Pratapgarh, *Majumdar* 12304 (BSA) ; Kota : Shahabad, *Majumdar* 10837 (BSA) ; Udaipur : *Majumdar* 11658 (BSA).

7. *Barleria prionitis* L. Sp. Pl. 636. 1753 ; Wight, Ic 2(2) : 3, t. 452. 1840-1843 ; Clarke in Hook. f. Fl. Brit. India 4 : 482. 1884 ; Duthie, Fl. Gangetic Plain 2 : 200. 1911 ; Santapau in Univ. Bombay Bot. Mem. 2 : 57 1951. 'Kala Bans' (Hindi).

subsp. *prionitis* var. *prionitis*

Glabrous, armed undershrubs, 50-100 cm high. Leaves 3-10 × 2-5 cm, ovate-obovate, obtuse or acute, base attenuate, sparsely hairy below. Flowers solitary or in cymose clusters, orange yellow to golden-yellow. Bracts 2 lanceolate, spine-tipped. Calyx 4-partite. Stamens 4. Capsules 1.0-1.5 cm long, ovoid, beaked. Seeds c. 5 mm across, sub-orbicular, appressedly hairy.

Fl. & Fr. : October - February.

Common throughout Rajasthan in rocky habitats.

Selected specimens : Alwar : Talvaraksh, *Parmar* 9759 (BSJO) ; Banswara : Chandan Singh ki Bassi, *Singh* 3633 (BSJO) ; Jaipur : Ramgarh, *Jain* 49633 (BSI) ; Jodhpur : Mandore, *Tiwari* 1120 (BSJO) ; Kota : Darah, *Jain* 28728 (BSI) ; Sirohi : Mt. Abu, *Jain* 46752 (BSI).

8. subsp. *prionitis* var. *dicantha* Blatt. & Hallb. in Journ. Bombay Nat. Hist. Soc. 26(3) : 811. 1919, non *Barleria dicantha* Nees 1847 ; Bhandari, Fl. Ind. Desert 299. 1978.

Armed, glabrescent, bushy undershrubs, with whitish bark. Leaves 1.5-12.5 × 0.5-6.5 cm, elliptic or ovate-elliptic, acute or acuminate, mucronate, tapering at the base, pubescent. Flowers showy, in terminal dense spikes, yellow. Bracts 2, leafy. Bracteoles 2. Outer 2 calyx lobes ovate-lanceolate, spine-tipped. Corolla-tube upto 2.75 cm long. Filaments pubescent at the base. Capsules upto 2.25 cm long, ovoid, beaked, glabrous. Seeds c. 5.5 mm across, suborbicular or ovoid, compressed, silky-hairy.

Fl. & Fr. : August - March.

Endemic to Rajasthan. Common on low hillocks, particularly in rocky habitats.

Selected specimens : Alwar : Kankwari, *Parmar* 8789 (BSJO) ; Barmer : *Tiwari* 970 (BSJO) ; Bhilwara : Bhilon ki Jopri, *Singh* 6208

(BSJO) ; Jhalawar : Aklera, *Wadhwa* 7600 (BSA) ; Pali : Dujana, *Shetty* 1415 (BSJO) ; Tonk : Tordi R.F., *Shetty* 1290 (BSJO).

9. subsp. *pubiflora* (Benth. ex Hohen.) Brummitt & Wood in Kew Bull. 38 : 436. 1983. *Barleria pubiflora* Benth. ex Hohen. in Fl. 32 : 358. 1849.

Armed undershrubs or shrubs, upto 1.5 m high. Leaves upto 16.5 × 5.5 cm, elliptic. Flowers in terminal heads or condensed spikes, orange yellow, showy. Calyx linear lanceolate, spine tipped, usually with stiff appressed hairs down the middle and stalked glands towards the top. Corolla upto 7.5 cm long. Capsules c. 1.75 cm long, ovoid, beaked. Seeds c. 5 mm across, compressed, silky.

Fl. & Fr. : September - February.

Rare, the only collection from Rajasthan is by Duthie cited below.

Selected specimen : Pali : Merwara, *Duthie* 4800 (K).

5. BLEPHARIS Juss.

1a. Herbs. Flowers 1 - 3, axillary :

2a. Leaves membranous, glabrous beneath. ... 2. *B. maderaspatensis*

2b. Leaves thick, hairy beneath. ... 3. *B. repens*

1b. Small shrubs. Flowers in pendulous strobilate spikes.

... 1. *B. linariaefolia*

1. *Blepharis linariaefolia* Pers. Syn. Pl. 2 : 180. 1806. *Acanthodium grossum* Wight, Ic. 4 (4) : 5. t. 1535 & 1536. 1850, non Nees 1830. *Blepharis sindica* T. Anders. in Journ. Linn. Soc. 9 : 500. 1867 ; Clarke in Hook. f. Fl. Brit. India 4 : 479. 1884 ; Duthie, Fl. Gangetic Plain 2 : 183. 1911 ; Santapau in Univ. Bombay Bot. Mem. 2 : 16. 1951 ; Bhandari, Fl. Ind. Desert 299. f. 113. 1978. '*Oonth - Kantala*' (Hindi).

Dichotomously - branched perennials, with woody root - stock. Leaves upto 12 × 0.75 cm, linear, acute, margins revolute, with few spinous teeth near the base, pubescent beneath. Flowers sessile, in hairy spikes, violet, purple or bluish violet. Bracts 4 farious, upto 2.5 cm long, ovate acuminate, spine - tipped, margins recurved, spinous. Bracteoles upto 1.5 cm long, linear lanceolate. Calyx 4 partite, pubescent. Corolla - tube c. 0.5 cm long, constricted below the limb. Larger anther - cells bearded. Capsules c. 7.5 mm long, ellipsoid, compressed, glabrous, brown. Seeds c. 3.5 mm across, ovoid, compressed, densely covered with long brownish hairs.

Fl. & Fr. : August - January.

Common in rocky to sandy habitats in W. Rajasthan desert.

Selected specimens : Barmer : Samandari, *Shetty* 2189 (BSJO) ; Churu : Payal, *Roy* 2722 (BSJO) ; Jaisalmer : Sudasari, *Pandey* 7837 (BSJO) ; Jodhpur : Kailana, *Singh* 45 (BSJO).

2. *Blepharis maderaspatensis* (L.) Heyne ex Roth, Nov. Pl. Sp. 320. 1821 ; Santapau in Univ. Bombay Bot. Mem. 2 : 15. 1951. *Acanthus maderaspatensis* L. Sp. Pl. 639. 1753. *Blepharis boerhaviaefolia* Pers. Syn. Pl. 2 : 180. 1806 ; Wight, Ic. 2 (2) : 3. t. 458. 1840-43 ; Clarke in Hook. f. Fl. Brit. India 4 : 478. 1884 ; Duthie, Fl. Gangetic Plain 2 : 183. 1911.

Diffuse or prostrate, pubescent herbs, often rooting at the nodes. Leaves 0.75-8.5 × 0.35-3.5 cm, elliptic, ovate lanceolate, ovate elliptic or oblanceolate, acute, cuneate, subentire, glabrescent. Flowers sessile, axillary, white or dirty white with dark purple streaks. Bracts 8, in 4 opposite pairs, spatulate, strongly 3-nerved, upper margins with retrorsely hairy bristles. Calyx lobes 4 ; unequal. Lower lip of corolla with yellow spots within. Larger anther-cells bearded. Capsules c. 7.5 mm long, ellipsoid, brown, 2-seeded. Seeds c. 3.5 mm across, suborbicular or ovoid, compressed, echinate with white spines.

Fl. & Fr. : September - January.

Common in rock crevices and other shaded and moist situations in the hilly areas of Rajasthan.

Selected specimens : Banswara : Khora forest, *Singh* 3722 (SBJO) ; Bharatpur : Rohasar, *Parmar* 8589 (BSJO) ; Pali : Sadari, *Jain* 48430 (BSI) ; Sirohi : Mt. Abu, *Puri* 56715 (BSI), *Jain* 66141 (BSI) ; Udaipur : Kambli ghat, *Kanodia* 82408 (BSI).

3. *Blepharis repens* (Vahl) Roth, Nov. Pl. Sp. 321. 1821. *Acanthus repens* Vahl, Symb. Bot. 2 : 76. 1791. *Blepharis molluginifolia* Pers. Syn. Pl. 2 : 180. 1806 ; Clarke in Hook. f. Fl. Brit. India 4 : 479. 1884 ; Duthie, Fl. Gangetic Plain 2 : 183. 1911 ; Mahesh. Illus. Fl. Delhi f. 164. 1966.

Diffuse, pubescent herbs. Leaves sessile, in whorls of 4, upto 3.5 × 1.0 cm, oblong or obovate, entire, hispid. Flowers sessile, axillary, solitary, blue or white. Bracteoles 8-10, spinous, in opposite pairs. Calyx segments linear lanceolate, acute, membranous margined. Capsules ellipsoid, compressed, glabrous, completely enclosed within the calyx, 2-seeded. Seeds ellipsoid, hairy.

Fl. & Fr. : October - January.

Found in fallow fields and grassy localities.

Selected specimens : Alwar : Kankawari, *Parmar* 9419 (BSJO) ; Banswara : Chhatripura, *Singh* 3738 (BSJO) ; Bhilwara : *Singh* 6005 (BSJO) ; Jaipur : Ramgarh, *Sharma* 176 (RUBL) ; Jhalawar : *Sharma* 26 (RUBL) ; Jodhpur : Bilara, *Singh* 3509 (BSJO) ; Sirohi : Mt. Abu, *Mehta* 57 (JAC).

6. *CARVIA* Bremek.

Carvia callosa (Nees) Bremek. in *Verh. Ned. Akad. Wet.* (II) 40 : 187. 1944 ; Santapau in *Univ. Bombay Bot. Mem.* 2 : 46. 1951. *Ruellia callosa* Wall. *Cat.* 2359. 1830, *nom. nud.* *Strobilanthes callosus* Nees in *Wall Pl. Asiat. Rar.* 3 : 85. 1832 ; Clarke in *Hook. f. Fl. Brit. India* 4 : 451. 1884 ; Cooke, *Fl. Bombay* 2 : 378. 1905. *S. grahamianus* Wight, *Ic.* 4 (4) : 3. t. 1520. 1850.

Erect shrubs, 1.0 - 1.75 m high. Leaves 8 - 20 × 5 - 10 cm, elliptic, crenate, with 8 - 16 pairs of nerves, acuminate at both ends. Flowers in axillary spikes, bright blue. Bracts orbicular or elliptic, obtuse, glabrous. Calyx segments divided nearly to base, softly hairy. Filaments hairy at the base. Ovary glabrous. Capsules c. 2 × 0.5 cm, ovoid, compressed. Seeds obovate, densely appressedly hairy.

Fl. & Fr. : November - March.

Rare, found on the hills.

Selected specimens : Sirohi : Mt. Abu, *Jain* 46603, 5610, 5611, 56997, 5365 (BSI), *Rao* 66657 (BSI), *McCann* 48 (BLAT). Also reported from Jodhpur (*Puri et al.* 1964).

7. *CROSSANDRA* Salisb.

Crossandra infundibuliformis (L.) Nees in *Wall. Pl. Asiat. Rar.* 3 : 98. 1832 ; Santapau in *Univ. Bombay Bot. Mem.* 2 : 55. 1951 ; Raizada, *Suppl. Duthie. Fl. Gangetic Plain* 204. 1976. *Justicia infundibuliformis* L. *Syst. Nat.* ed. 10. 850. 1759. *Crossandra undulaefolia* Salisb. in *W. Hooker, Parad.* Lond. t. 12. 1805 ; Clarke in *Hook. f. Fl. Brit. India* 4 : 492. 1884. *C. axillaris* Nees. *I. c.* 3 : 98. 1832 ; Wight, *Ic.* 2 (2) : 4. t. 460. 1841.

Undershrubs, upto 1 m high. Leaves 5 - 15 × 2 - 5 cm, 4 in a whorl, lanceolate or elliptic, acute, tapering at the base, glabrous. Flowers

in terminal and axillary, dense spikes, orange yellow or orange scarlet. Bracts and bracteoles glandular - pubescent. Calyx 5 - lobed, glandular - pubescent. Corolla lobes 5, subequal. Stamens 4. Capsules c. 1.5 cm long, oblong, acutish, 4 seeded, glabrous. Seeds 2 - 3 mm across.

Fl. & Fr. : August - March.

Rare, in the thickets of forests near streams etc. ; often planted in the gardens, near temples etc.

Selected specimen : Udaipur : Kaul 8585 (LWG).

8 DICLIPTERA Juss. *nom. cons.*

- 1a. Flowers in axillary clusters only. Corolla 4 - 6 mm long :
- | | | |
|---|-----|---------------------------|
| 2a. Bracts glabrous, ciliate - margined. | ... | 5. <i>D. verticillata</i> |
| 2b. Bracts pubescent, ciliate - margined : | | |
| 3a. Tubercles of the seeds glochidiate. | ... | 3. <i>D. leonotis</i> |
| 3b. Tubercles of the seeds not glochidiate. | ... | 1. <i>D. abuensis</i> |
- 1b. Flowers in axillary and terminal clusters. Corolla 1.5 - 2.0 cm long :
- | | | |
|---|-----|---------------------------|
| 4a. Bracts cuneate - elliptic or obovate, apiculate, not acuminate. | ... | 4. <i>D. roxburghiana</i> |
| 4b. Bracts linear or linear - oblong, nearly parallel - sided, acuminate - cuspidate. | ... | 2. <i>D. bupleuroides</i> |

1. *Dicliptera abuensis* Blatter in Journ. & Proc. Asiat. Soc. Bengal (n.s.) 26 : 347. 1930.

Much branched, straggling shrubs. Leaves upto 5.0×2.75 cm, ovate, acute, subentire, sparingly hairy. Flowers in dense axillary cymes, white with deep pink tinge. Bracts 2, ovate lanceolate, unequal, with densely ciliate and scarious margins. Bracteoles subequal, lanceolate - acuminate, with scarious margins. Calyx lobes 5, subulate. Corolla glabrous. Stamens 2. Capsules c. 4.0×1.5 mm, yellowish. Seeds 4, c. 1 mm across, suborbicular, compressed, brown, covered with many capitate hairs.

Fl. & Fr. : November - March.

Endemic to Mt. Abu in Rajasthan, rare.

Selected specimen : Sirohi : Mt. Abu - Dhobi Ghat, Hallberg 22856 (BLAT).

2. *Dicliptera bupleuroides* Nees in Wall. Pl. Asiat. Rar. 3 : 111. 1832. *D. roxburghiana* Nees var. *bupleuroides* (Nees) Clarke in Hook. f. Fl. Brit. India 4 : 554. 1885 ; Duthie. Fl. Gangetic Plain 2 : 213. 1911.

Hairy herbs or undershrubs. Leaves ovate or elliptic, acute or acuminate, glabrous or somewhat pubescent. Flowers sessile, in axillary and terminal, dense clusters. Bracts linear or linear oblong, nearly parallel sided, acuminate - cuspidate.

Fl. & Fr. : October - February.

Rare, found on Aravalli hills. Included on the authority of Majumdar *et al.* (1969) from Dungarpur. Differs from *D. roxburghiana* Nees by being much hairy and in having linear bracts with parallel margins.

3. *Dicliptera leonotis* Dalz. ex Clarke in Hook. f. Fl. Brit. India 4 : 553. 1885. *D. burmanni* Dalz. & Gibs. Bombay Fl. 196. 1861, non Nees, 1832, non T. Anders. 1868.

Erect herbs. Leaves petiolate, 7-8 × 2.5 cm, elliptic, acuminate, glabrous. Flower clusters in axillary whorls. Bracts 10-15 × 5 mm, oblong-lanceolate, acuminate, cuspidate, minutely pubescent. Corolla 1.5-2.0 cm long. Capsules 5-8 mm long, densely hairy. Seeds larger, minutely glandular-papillose, scarcely verrucose.

Fl. & Fr. : October - January.

Rare, weed along roads and in wastelands. Closely allied to *D. verticillata* (Forsk.) Christens., but bracts, flowers, capsules and seeds are much larger.

Selected specimens : Sirohi : Mt. Abu, Mehta 545, 2303 (JAC).

4. *Dicliptera roxburghiana* Nees in Wall. Pl. Asiat. Rar. 3 : 111. 1832 ; Clarke in Hook. f. Fl. Brit. India 4 : 553. 1885 ; Duthie. Fl. Gangetic Plain 2 : 213. 1911.

Glabrous herbs, 50-80 cm high. Leaves 5-10 × 2-3 cm, elliptic, acute, base cuneate. Flowers in terminal and axillary, sessile clusters, purple. Bracts with ciliate margins, 3 nerved, pubescent. Capsules c. 1 cm long, clavate, stalked, glabrescent. Seeds distinctly verrucose.

Fl. & Fr. : October - February.

Rare, in wastelands. Reported from Udaipur by Ramdeo (1969).

5. *Dicliptera verticillata* (Forsk.) C. Christens. in Dansk. Bot. Ark. 4 (3) : 11. 1922 ; Wood *et al.* in Kew Bull. 38 : 450. 1983. *Dianthera*

verticillata Forsk. Fl. Aegypt. Arab. 9. 1775. *Dicliptera micranthes* Nees in Wall. Pl. Asiat. Rar. 3 : 112. 1832 ; Clarke in Hook. f. Fl. Brit. India 4 : 553. 1885 ; Duthie, Fl. Gangetic Plain 2 : 213. 1911 ; Santapau in Univ. Bombay Bot. Mem. 2 : 79. 1951.

Decumbent, branched, glabrous herbs, with long internodes. Leaves unequal, 1.0 - 6.5 × 0.5 - 3.75 cm, ovate, acuminate - acute, entire, glabrous. Flowers in axillary, sessile clusters or in cymes, purple or purplish pink. Bracts 2, leafy, unequal, cuspidate acuminate. Bracteoles upto 5 mm long, linear subulate, pubescent. Calyx lobes 5, pubescent. Corolla throat with dark purple spots. Capsules c. 5 mm long, ellipsoid, compressed, acute and pubescent at the top, stalked, brown. Seeds suborbicular, brown.

Fl. & Fr. : October - January.

Commonly found as a forest undergrowth, particularly near shaded moist situations.

Selected specimens : Ajmer : *Lourie* 4811 (DD) ; Alwar : *Pani Dhal, Parmar* 9797 (BSJO) ; Banswara : *Bagaycha forest, Singh* 4282 (BSJO) ; Barmer : *Haldeshwar Mahadev R.F., Pandey* 8006 (BSJO) ; Sirohi : *Mt. Abu, Jain* 60134 (BSI).

9. DIPTERACANTHUS Nees emend. Bremek.

- | | | |
|---|-----|--|
| 1a. Prostrate or climbing herbs. Leaves acute. Ovary and capsule pubescent. | ... | 3. <i>D. prostratus</i> |
| 1b. Erect or suberect herbs. Leaves obtuse. Ovary and capsule glabrous : | | |
| 2a. Flowers pale - purple. | ... | 1. <i>D. patulus</i> var. <i>patulus</i> |
| 2b. Flowers white. | ... | 2. <i>D. patulus</i> var. <i>alba</i> |

1. *Dipteracanthus patulus* (Jacq.) Nees in Wall. Pl. Asiat. Rar. 3 : 82. 1832 ; Wight, Ic. 4 (4) : 1. t. 1505. 1850 ; Santapau in Univ. Bombay Bot. Mem. 2 : 24. 1951. *Ruellia patula* Jacq. Misc. Bot. 2 : 358. 1781 ; Clarke in Hook. f. Fl. Brit. India 4 : 412. 1884 ; Duthie, Fl. Gangetic Plain 2 : 188. 1911.

var. *patulus*

Hoary - pubescent, much - branched herbs or undershrubs. Leaves upto 5 × 3 cm, ovate or ovate - elliptic, base rounded. Flowers subsessile,

axillary, solitary or in clusters. Bracteoles leafy, densely pubescent. Calyx - lobes 5, ciliate. Corolla infundibuliform, pubescent outside. Capsules c. 1.5 cm long, brown. Seeds c. 2.25 mm across, suborbicular, densely hairy on the margins.

Fl. & Fr. : July - November.

Common in open rocky habitats, particularly on low hillocks throughout Rajasthan. Mostly flowers close up in bright sunlight.

Selected specimens : Banswara : Lalpura forest, *Singh* 3738 (BSJO) ; Barmer : Hatma, *Tiwari* 945 (BSJO) ; Bharatpur : Achnera, *Parmar* 8664 (BSJO) ; Chittorgarh : Thana, *Singh & Pandey* 6925 (BSJO) ; Jaipur : Galta, *Khisti* 58455 (BSI) ; Sirohi : Ambeshwar, *Jain* 60468 (BSI) ; Udaipur : Sujangarh, *Kanodia* 82311 (BSI).

2. var. *alba* (Saxton) Bhandari in Bull. Bot. Surv. India 6 : 327. 1965 & Fl. Ind. Desert 301. 1978. *Ruellia patula* Jacq. var. *alba* Saxton in Rec. Bot. Surv. India 6 : 288. 1918.

This variety can only be distinguished from the proper variety by having white flowers. The flowers are soon caducous and close up during sunlight.

Fl. & Fr. : January - December.

Common in rocky habitats.

Selected specimens : Barmer : Haldeshwar Mahadev R.F, *Pandey* 7962 (BSJO) ; Pali : Near C.A.Z.R.I., *Shetty* 1332, 1392 (BSJO) ; Tonk : Sopari, *Pandey* 4765 (BSJO).

3. *Dipteracanthus prostratus* (Poir.) Nees in Wall. Pl. Asiat. Rar. 3 : 81. 1832 ; Santapau in Univ. Bombay Bot. Mem. 2 : 24. 1951. *Ruellia prostrata* Poir. in Lam. Encycl. 6 : 349. 1804 ; Beddome, Icon. Pl. Ind. Or. 67. t. 282. 1874 ; Clarke in Hook. f. Fl. Brit. India 4 : 411. 1884. *Dipteracanthus dejectus* Nees, l. c. 3 : 82. 1832. *Ruellia prostrata* Poir. var. *dejecta* (Nees) Clarke in Hook. f. l. c. 4 : 412. 1884 ; Duthie, Fl. Gangetic Plain 2 : 187. 1911.

Much - branched, pubescent perennials. Leaves 1.0 - 7.0 × 0.25 - 3.5 cm, ovate to ovate - elliptic, base acute or truncate, margins ciliate, sparsely hairy on both surfaces. Flowers sessile, axillary, usually solitary, blue - violet. Bracteoles leafy. Calyx lobes acute, puberulous, ciliate. Corolla pubescent outside. Capsules c. 2 cm long, acute, brown. Seeds c. 3 mm across, suborbicular, with a dense fringe of hygroscopic hairs on the margins, brown.

Fl. & Fr. : Almost throughout the year.

Common in moist shady places, particularly in the east of Aravalli.

Selected specimens : Banswara : Jolana, *Kanodia* 51172 (BSI) ; Jaipur : Amer, *Sharma* 251 (RUBL) ; Jhalawar : Bijliya Bhodak, *Wadhwa* 7436 (BSA) ; Kota : Shahabad, *Verma* 621 (BSA) ; Pali : Erinpura, *Rao* 66784 (BSI) ; Udaipur : *Kanodia* 82348 (BSI).

10. DYSCHORISTE Nees

Dyschoriste depressa Nees in Wall. Pl. Asiat. Rar. 3 : 81. 1832 ; Duthie, Fl. Gangetic Plain 2 : 192. 1911. *Calophanes nagchana* Nees in DC. Prodr. 11 : 109. 1847 ; Clarke in Hook. f. Fl. Brit. India 4 : 410. 1884. *Dyschoriste erecta* auct. non (Burm. f.) Kuntze 1891 ; Santapau in Univ. Bombay Bot. Mem. 2 : 31. 1951.

Prostrate perennials, often rooting at the nodes. Leaves 2.5 × 0.5 - 1.5 cm, broadly - elliptic or obovate, base attenuate, obtuse or apiculate at apex, entire, glabrous. Flowers in axillary clusters, pinkish purple. Bracts absent ; bracteoles linear. Calyx - lobes 5, lanceolate - subulate, acuminate, pubescent. Corolla - tube uniformly cylindrical. Stamens 4 ; anther - cells shortly mucronate. Capsules c. 1.25 cm long, glabrous, 4 seeded. Seeds c. 2 mm across, orbicular, compressed, hairy.

Fl. & Fr. : November - March.

Rare, found near shaded moist habitats in the forests.

Selected specimens : Sirohi : Mt. Abu, *Mehta* 629, 1242 (JAC). Also reported by Jain (1961) from Mt. Abu.

11. ECBOLIUM Kurz

Ecbolium viride (Forsk.) Alston in Trimen, Handb. Fl. Ceylon 6 (suppl.) : 229. 1931. *Justicia viridis* Forsk. Fl. Aegypt. - Arab. 5. 1775. *Ecbolium linneanum* Kurz in Journ. Asiat. Soc. Bengal 2 : 75. 1871 ; Clarke in Hook. f. Fl. Brit. India 4 : 544. 1885 ; Wight, Ic. 2 (2) : 4. t. 463. 1840 - 43.

Low shrubs or undershrubs, 0.75 - 1.5 m high. Leaves upto 10 × 6 cm, elliptic - ovate or obovate, acute, base attenuate. Flowers in terminal and axillary, leafy spikes, bluish - green. Bracts obtuse or slightly acute ;

bracteoles 2. Calyx lobes 5, subequal, acuminate. Lower - lip of corolla with 2 wing like lateral lobes. Stamens 2; anther - cells unequal, mucicous. Capsules *c.* 1.75 cm long, compressed, ovoid, beaked, 2 - seeded. Seeds orbicular, tuberculate.

Fl. & Fr. : Throughout the year.

Rare, found on the outskirts of Aravalli in scrub forests This plant is included on the authority of Vyas (1967) from Alwar.

12. ELYTRARIA A. Mich. *nom. cons.*

Elytraria acaulis (L. f.) Lindau in Engl. & Prantl. Pflanz. Nacht. 1 : 304. 1897 ; Santapau in Univ. Bombay Bot. Mem. 2 : 11. 1951 ; Bremek. in Reinwardtia 3 : 250. 1955 ; Mahesh. Illus. Fl. Delhi f. 163. 1966. *Justicia acaulis* L. f. Suppl. Pl. 84. 1781. *Elytraria crenata* Vahl. Enum. 1 : 106. 1804 ; Clarke in Hook. f. Fl. Brit. India 4 : 394. 1884. *Tubiflora acaulis* (L. f.) Kuntze, Rev. Gen. Pl. 1 : 500. 1891 ; Duthie, Fl. Gangetic Plain 2 : 180. 1911. 'Pathar - Chatta' (Hindi).

Herbs, upto 20 cm high, with fibrous roots. Leaves upto 22 × 8 cm, obovate to oblanceolate, rounded or obtuse, crenate, base cuneate, glabrous. Scapes up to 22 cm long, many. Flowers in simple or branched spikes, white. Bracts ovate, acuminate; bracteoles linear, villous or pubescent. Calyx - lobes unequal, with scarious and ciliate margins, acute. Corolla bilipped, 5 lobed. Capsules 0.5 - 0.75 × 0.25 - 0.35 cm, ovoid, acute, glabrous, brownish. Seeds many, more or less ovoid, minute, flattened, papillose, brown.

Fl. & Fr. : April - October.

Common throughout the state in moist and shady places viz. rock crevices, along the streams and other rocky gravelly habitats.

Selected specimens : Alwar : Kankwari, Parmar 8771 (BSJO) ; Banswara : Anand Sagar, Singh 3743 (BSJO) ; Bhilwara : Banera, Singh 6013 (BSJO) ; Kota : Shahabad, Jain 28860 (BSI) ; Sawai Madhopur : Rajbagh, Jain 18637 (BSI).

13. ERANTHEMUM L. *emend.* Radlk.

1a. Bracts white, with green nerves :

2a. Bracts elliptic - ovate, cuspidate, glabrous.

Spikes 2.5 - 7.5 cm long, in close panicles.

...

1. *E. nervosum*

- 2b. Bracts obovate, obtuse mucronate or shortly apiculate, gland - strigose. Spikes 7.5 - 15.0 cm long, subinterrupted in elongate panicles, often solitary. ... 3. *E. roseum*
- 1b. Bracts green, with green nerves. ... 2. *E. purpurascens*

1. *Eranthemum nervosum* (Vahl) R. Br. Prodr. 1 : 477. 1810 ; Santapau in Univ. Bombay Bot. Mem. 2 : 35. 1951. *Justicia nervosa* Vahl, Enum. 1 : 164. 1804 ; *Daedalacanthus nervosus* T. Anders. in Journ. Linn. Soc. 9 : 487. 1867 ; Clarke in Hook. f. Fl. Brit. India 4 : 418. 1884 ; Duthie, Fl. Gangetic Plain 2 : 193. 1911.

Herbs or undershrubs, 50 cm to 2 m high. Leaves 15 - 25 cm long, ovate, acuminate, base attenuate, entire or crenulate. Flowers in short, uninterrupted spikes forming a close terminal panicle, blue. Bracts whitish with dark green nerves, ovate or elliptic ; bracteoles lanceolate. Calyx 5 lobed, whitish, densely pubescent. Corolla lobes subequal, rounded. Capsules c. 1.5 cm long, oblong, 4 seeded. Seeds compressed, discoid, hairy.

Fl & Fr. : February - April.

Found in the forests ; often cultivated in the gardens for handsome flowers.

Selected specimen : Kota : *Wadhwa* 9246 (BSA). Also reported from Alwar district by Vyas (1967).

2. *Eranthemum purpurascens* Wight ex Nees in Wall. Pl. Asiat. Rar. 3 : 106. 1832 ; Santapau in Univ. Bombay Bot. Mem. 2 : 35. 1951. *Daedalacanthus purpurascens* (Wight ex Nees) T. Anders. in Journ. Linn. Soc. 9 : 488. 1867 ; Clarke in Hook. f. Fl. Brit. India 4 : 420. 1884 ; Duthie, Fl. Gangetic Plain 2 : 194. 1911.

Erect herbs, upto 1 m high. Leaves 3.5 - 15.0 × 2.5 - 10.5 cm, oblong ovate or ovate elliptic, acuminate, cuneate at the base. Flowers in long, terminal spikes, blue purple. Bracts ovate lanceolate or acuminate, ciliolate, prominently nerved. Bracteoles linear, scarious, glandular pubescent, ciliate. Calyx white pubescent on both sides. Corolla pubescent outside. Filaments glabrous. Capsules clavate - oblong, glabrous. Seeds ellipsoid, hairy.

Fl. & Fr. : October - March.

Commonly found as a forest undergrowth on the hills and in wastelands.

Selected specimens : Alwar : Pandupole, *Parmar* 9732 (BSJO) ; Banswara : Ghatol, *Singh* 4207 (BSJO) ; Bhilwara : Bijolia, *Singh* 6077 (BSJO) ; Jhalawar : Asnawar, *Verma* 6886 (BSA) ; Kota : Shahabad, *Nautiyal & Raizada* 25378 (DD).

3. *Eranthemum roseum* (Vahl) R. Br. Prodr. 1 : 477. 1810 ; Santapau in Univ. Bombay Bot. Mem. 2 : 34. 1951. *Justicia rosea* Vahl, Enum. 1 : 165. 1804. *Daedalacanthus roseus* (Vahl) T. Anders. in Journ. Linn. Soc. 9 : 487. 1867 ; Clarke in Hook. f. Fl. Brit. India 4 : 419. 1884 ; Cooke, Fl. Bombay 2 : 363. 1905.

Herbs or undershrubs, upto 2 m high. Leaves elliptic, acuminate, glabrous. Flowers in 7-15 cm long, linear, axillary and terminal spikes, blue when fresh, turn rose coloured afterwards. Bracts obovate, obtuse, mucronate or shortly apiculate, gland - strigose, strongly nerved. Bracteoles linear, hairy, ciliate. Capsules upto 1.5 cm long, cylindric, glabrous. Seeds 2-4 mm across, compressed, brown.

Fl. & Fr. : November - March.

Rare, found in dry deciduous forests on Aravalli hills.

Selected specimens : Banswara : Bijolia hills, *Kanodia* 75687 (BSI) ; Kota : Darah, *Sharma* 138351 (DD) ; Sirohi : Mt. Abu, *Jain* 62118, 48182 (BSI).

14. GANTELBUA Bremek.

Gantelbua urens (Heyne ex Roth) Bremek. in Verh. Nederl. Akad. Wet. (II). 40 (1) : 148. 1944 ; Santapau in Univ. Bombay Bot. Mem. 2 : 28. 1951. *Ruellia urens* Heyne ex Roth, Nov. Pl. Sp. 302. 1821. *R. dura* Nees in Hook. Comp. Bot. Mag. 2 : 311. 1836. *Hemigraphis dura* (Nees) T. Anders. in Journ. Linn. Soc. 9 : 461. 1867, excl. syn. *R. crispa* Nees, non L. 1753 ; Clarke in Hook. f. Fl. Brit. India 4 : 422. 1884 ; Duthie, Fl. Gangetic Plain 2 : 190. 1911. 'Dubrasoos' (Hindi).

Procumbent or diffuse, strigosely hairy herbs, upto 70 cm high. Leaves 3-6 cm long, spatulate-oblong, obtuse, tapering at base, subrenate. Flowers in involucrate heads, densely clothed with white and yellowish brown hairs, bright rosy purple. Bracts upto 3.5 cm long, spatulate or oblong, subacute, densely hairy. Calyx 5-partite, linear, acute, densely hairy and ciliate with jointed hairs. Stamens 4. Capsules c. 1.5 cm long, linear-oblong, glabrous, 6 to 8 seeded. Seeds discoid, compressed, brown.

Fl. & Fr. : October - March.

Rare, found in scrub forests.

Selected specimens : Bharatpur : Dig, *Parmar* 8554 (BSJO) ; Jhalawar : Aklera Manoharthana road, *Verma* 3452 (BSA) ; Kota : Baran, *Wadhwa* 9459 (BSA).

15. HAPLANTHODES Ktze.

- | | | |
|---|-----|------------------------------|
| Cladodes stout, quadrangular, 20 mm long or more. | ... | 2. <i>H. verticillatus</i> |
| Capsules glabrous, 10 mm long, shining. | | |
| Cladodes slender, subquadrangular, upto 18 mm long. | ... | 1. <i>H. neilgherryensis</i> |
| Capsules pubescent, upto 8 mm long, dull. | | |

1. *Haplantodes neilgherryensis* (Wight) Majumdar in Bull. Bot. Soc. Bengal 25 : 76. 1971. *Haplantus neilgherryensis* Wight, Ic. 4 (4) : 7. t 1556. 1850 ; Santapau in Univ. Bombay. Bot. Mem. 2 : 52. 1951. *H. tentaculatus* (L.) Nees var. *nilgherrensis* (Wight) Clarke in Hook. f. Fl. Brit. India 4 : 507. 1884.

Glandular - pubescent herbs. Leaves 5 - 10 cm long, ovate, acuminate. Cladodes 0.75 - 1.75 cm long, slender, densely hairy, apex with 2 or 3, flattened, villous teeth. Flowers blue - lilac to white, in terminal spikes, amongst cladodes. Bracteoles shorter than the calyx, subulate. Calyx lobes hairy. Capsules c. 1 cm long, oblong, pointed, hairy. Seeds compressed, minute, brown.

Fl. & Fr. : August - February.

Rare, found in rocky habitats. This plant is included on the authority of Puri *et al.* (1964) from Jodhpur.

2. *Haplantodes verticillatus* (Roxb.) Majumdar in Bull. Bot. Soc. Bengal 25 : 76. 1971. *Justicia verticillata* Roxb. Fl. Ind. 1 : 135. 1832. *Haplantus verticillaris* Nees in DC. Prodr. 11 : 513. 1847 ; Clarke in Hook. f. Fl. Brit. India 4 : 506. 1884 ; Duthie, Fl. Gangetic Plain 2 : 198. 1911. *Bremekampia verticillata* (Roxb.) Sreem. in Bull. Bot. Surv. India 6 : 323. 1965.

Erect annuals, 50-70 cm high. Leaves upto 10×6 cm, ovate, acute or acuminate, pubescent. Axillary cladodes (spines) quadrangular, upto 4.25 cm long, 10-18 at each node, with 2 spinous teeth at the apex. Flowers in between the cladodes, blue. Bracteoles longer than the calyx, subulate, pointed. Calyx-lobes glandular-pubescent. Corolla greenish-white inside

the throat. Capsules oblong, acute, grooved. Seeds oblong, compressed, hairy.

Fl. & Fr. : November - March.

Common in shady habitats and on the walls of old buildings, forts etc.

Selected specimens : Ajmer : *Lourie* 122/68 (DD) ; Sirohi : Mt. Abu, *Jain* 5435, 62074 (BSI).

16. HEMIADELPHIS Nees

Hemiadelphis polysperma (Heyne ex Roth) Nees in Wall. Pl. Asiat. Rar. 3 : 75, 80. 1832 ; Wight, Ic. 4(3) : 18. t. 1492. 1849. *Ruellia polysperma* Heyne ex Roth, Nov. Pl. Sp. 305. 1821. *Justicia polysperma* Roxb. Fl. Ind. 1 : 49. 1832. *Hygrophila polysperma* (Roxb.) T. Anders. in Journ. Linn. Soc. 9 : 456. 1867 ; Clarke in Hook. f. Fl. Brit. India 4 : 406. 1884 ; Duthie, Fl. Gangetic Plain 2 : 185. 1911 ; Santapau in Univ. Bombay Bot. Mem. 2 : 19. 1951.

Prostrate to suberect, pubescent herba, often rooting at lower nodes. Leaves 0.5 - 2.75 × 0.25 - 1.5 cm, elliptic to elliptic oblong, obtuse or acute, tapering at base, entire. Flowers in terminal dense spikes, violet, bluish-purple or white. Bracts elliptic-lanceolate, obtuse, hairy. Bracteoles linear, margins ciliate. Calyx-lobes 5, linear lanceolate, margins scarious and ciliate. Corolla 2 lipped. Capsules upto 7.5 mm long, acute, brown. Seeds upto 0.5 mm across, orbicular, pale brown.

Fl. & Fr. : September - March.

Common in marshy habitats.

Selected specimens : Alwar : Nilkanth, *Parmar* 9694 (BSJO) ; Banswara : *Singh* 4236 (BSJO) ; Jaipur : *Kaul* 8361 (LWG) ; Jodhpur : Jalana, *Kanodia* Acc. No. 30848 (BSI) ; Kota : Rampura, *Verma* 1792 (BSA).

17. HEMIGRAPHIS Nees *emend.* T. Anders.

- | | | | |
|--|-----|----|-------------------|
| 1a. Longer filaments glabrous. | ... | 3. | <i>H. hitra</i> |
| 1b. Longer filaments bearded in upper half : | | | |
| 2a. Capsules patently hairy : | ... | 1. | <i>H. crenata</i> |
| 2b. Capsules pubescent : | | | |

- 3a. Capsules 8 to 10-seeded. ... 2. *H. crossandra*
- 3b. Capsules upto 6-seeded :
- 4a. Plants densely viscid-pubescent, aromatic. Heads very dense. ... 6. *H. rupestris*
- 4b. Plants not viscid, but sparsely pubescent or hairy. Heads spicate :
- 5a. Leaves upto 3×2 cm. acute or obtuse ; hairs stiff, bristly. ... 5. *H. latebrosa* var. *ebraectata*
- 5b. Leaves 6×2.5 - 4.0 cm more or acuminate ; hairs soft. ... 4. *H. latebrosa* var. *latebrosa*

1 *Hemigraphis crenata* (Benth. ex Hohenack.) Bremek. in Mat. Mon. Strob. 137. 1944 ; Santapau in Univ. Bombay Bot. Mem. 2 : 27. 1951. *Ruellia crenata* Benth. ex Hohenack. in Flora 32 : 558. 1849. *Hemigraphis elegans* (Hook.) Nees var. *crenata* (Benth. ex Hohenack.) Clarke in Hook. f. Fl. Brit. India 4 : 425. 1884 ; Cooke, Fl. Bombay 2 : 359. 1905.

Diffuse, patently white-glandular hairy herbs. Leaves ovate - elliptic, crenate. Flowers in glandular hairy heads. Bracts of inner flowers longer than the sepals. Corolla-tube whitish ; limb blue. Capsules c. 0.75 cm long, patently hairy, 6 seeded. Seeds compressed, discoid.

Fl & Fr. : October June

Rare, found in moist and shady places in the forests.

Selected specimens : Sirohi : Mt. Abu, Jain 45198 (BSI), Tatake 46443 (BSI).

2. *Hemigraphis crossandra* (Steud.) Bremek. Mat. Mon. Strob. 137. 1944 ; Santapau in Univ. Bombay Bot. Mem. 2 : 27. 1951. *Ruellia diffusa* Wall. ex Nees in Wall. Pl. Asiat. Rar. 3 : 83. 1832. non Vellozo, 1827. *R. elegans* Hook. Bot. Mag. t. 3389. 1835, non Poir. 1817. *R. crossandra* Steud. Nomen. ed. 2. 2 : 481. 1841. *Hemigraphis elegans* (Hook.) Nees in DC. Prodr. 11 : 722. 1847 ; Clarke in Hook. f. Fl. Brit. India 4 : 424. 1884.

Decumbent or diffuse, viscidly pubescent herbs, with woody and woolly root-stock. Leaves upto 4.0×2.5 cm, tapering at the base. Flowers axillary, sessile, 2 to 4 together or in heads, blue with white throat. Bracts upto 1.5 cm long, elliptic or oblong, ciliate. Bracteoles absent. Calyx lobes 5, linear, acute, ciliate. Corolla - throat with red or purplish streaks. Filaments densely bearded in the upper half. Capsules c. 7.5 mm long. pubescent, brown. Seeds c. 1 mm across, suborbicular, densely clothed with whitish hairs.

Fl. & Fr. : November - March.

Very rare ; only one specimen collected from marshy places along the stream.

Selected specimen : Pali : Sarpania ki Nal R.F. Bijapur, Pandey 19441A (BSJO).

3. *Hemigraphis hirta* (Vahl) T. Anders. in Journ. Linn. Soc. Bot. 9 : 462. 1867 ; Clarke in Hook. f. Fl. Brit. India 4 : 422. 1884 ; Duthie, Fl. Gangetic Plain 2 : 191. 1911. *Ruellia hirta* Vahl, Symb. Bot. 3 : 84. t. 67. 1794.

Hirsute-villous, prostrate herbs. Leaves 0.75 - 2.5 × 0.5 - 1.5 cm, broadly ovate or ovate to elliptic, crenate, acute or obtuse at apex. Flowers few, in condensed, terminal heads, pale blue. Bracts upto 1.5 cm long, elliptic, woolly. Sepals linear or subspathulate in fruit. Corolla glabrous, with two hairy lines in the palate. Style hairy. Capsules 0.5 - 1.0 cm long, linear - cylindric, glabrous. Seeds 12, compressed, discoid, brownish.

Fl. & Fr. : April - July.

Occasionally found in moist places and wastelands.

Selected specimens : Kota : Wadhwa 9459 (BSA) ; Sirohi : Mt. Abu, Kanodia 62182 (BSI).

4. *Hemigraphis latebrosa* (Heyne ex Roth) Nees in DC. Prodr. 11 : 723. 1847 ; Wight, Ic. 4(4) : 1. t. 1504. 1850 ; Clarke in Hook. f. Fl. Brit. India 4 : 423. 1884. *Ruellia latebrosa* Heyne ex Roth, Nov. Pl. Sp. 307. 1821. *Hemigraphis latebrosa* (Heyne ex Roth) Nees var. *heyneana* Bremek. in Verh. Nederl. Acad. Wet. (II). 40(1) : 139. 1944 ; Santapau in Univ. Bombay Bot. Mem. 2 : 26. 1951.

var. *latebrosa*

Diffuse, viscidly pubescent herbs, often with woody root - stock. Leaves dimorphic, upto 9.5 × 6.5 cm, sparsely hairy on both sides, base cuneate or truncate ; the leaves on the side branches are smaller, elliptic, acute. Flowers blue. Bracts of the outer flowers much longer, hairy, ciliate - margined. Calyx 5-lobed ; one of the calyx lobe much longer than the others. Corolla throat white with red markings, bearded within. Filaments densely bearded in the upper half. Capsules c. 6 mm long, pubescent, brown. Seeds c. 1 mm across, suborbicular or oblong-ellipsoid, clothed with white hairs, yellowish brown.

Fl. & Fr. : November - March.

Commonly found as a forest undergrowth in moist and shady places along the Aravalli range.

Selected specimens : Banswara : Danta, Singh 5421 (BSJO) ; Bundi : Kholakhet, Verma 1751 (BSA) ; Pali : Paras Ram Mahadev R.F., Pandey 19405, 19415, 19441 (BSJO) ; Sirohi : Mt. Abu, Duthie 6668 (DD), Jain 56987 (BSI) ; Udaipur : Nautiyal & Ratzada 25486 (DD).

5. var. *ebracteata* (Dalz.) Cooke, Fl. Bombay 2 : 358. 1904 ; Bremek. Mat. Mon. Strob. 139. 1944 ; Santapau in Univ. Bombay Bot. Mem. 2 : 26. 1951. *Ruellia ebracteata* Dalz. in Kew Journ. Bot. 2 : 342. 1850. *R. ebracteolata* T. Anders. in Journ. Linn. Soc. 9 : 462. 1867. *Hemigraphis ebracteolata* (T. Anders.) Clarke in Hook. f. Fl. Brit. India 4 : 424. 1884.

Hispid herbs. Leaves ovate, serrate, obtuse or acute, base rounded or cuneate, hairy with bulbous-based hairs. Flowers in axillary and terminal heads, blue. Bracts elliptic, acute, outer ones longer than calyx ; bracteoles absent. One calyx segment longer than other 4, hairy and ciliate. Capsules c. 6 mm long, minutely pubescent, 6 seeded. Seeds suborbicular, clothed with white hairs.

Fl. & Fr. : October - April.

Rare, found in humid and shady places.

Selected specimens : Sirohi : Mt. Abu, Jain 56987 (BSI), Mehta 407, 440 (JAC).

6. *Hemigraphis rupestris* Heyne ex T. Anders. in Journ. Linn. Soc. Bot. 9 : 462. 1867 ; Bremek. in Verh. Kon. Ned. Ak. Wet. A'dam Sect. 2. 41 : 1. 141. 1944 ; Babu, Herb. Fl. Dehra Dun 384. 1977. *H. latebrosa* (Heyne ex Roth) Nees var. *rupestris* (Heyne ex T. Anders.) Clarke in Hook. f. Fl. Brit. India 4 : 424. 1884 ; Duthie, Fl. Gangetic Plain 2 : 191. 1911.

Erect or decumbent - ascending, aromatic, glandular-pubescent or villous perennials, with woody root - stock. Leaves upto 10 × 5 cm, ovate-elliptic, acute or acuminate, with rounded or cuneate base, margins serrate - dentate, ciliate, hairy on both surfaces. Flowers sessile, in axillary or terminal, dense spikes or heads, blue. Bracts upto 1.5 cm long, ovate-lanceolate. Calyx - segments subequal, glandular - pubescent. Corolla-tube yellowish ; limb blue, hairy. Filaments bearded in the upper half. Capsules c. 0.5 cm long, beaked. Seeds compressed, discoid.

Fl. & Fr. : November - April.

Occasionally found in scrub forests. This species is included on the authority of Majumdar (1976) from Kota.

18 HYGROPHILA R. Br. *emend.* Heine

Plants armed with axillary spines.		
Flowers in axillary whorls.	...	1. <i>H. auriculata</i>
Plants unarmed. Flowers in terminal spikes	...	2. <i>H. serpyllum</i>

1. *Hygrophila auriculata* (Schum.) Heine in Kew Bull. 16 : 172. 1962. *Barleria longifolia* L. Cent. Pl. 2 : 22. 1756, non *H. longifolia* Nees, 1847. *B. auriculata* Schum. in Schum. & Thonn. Beskr. Guin. Pl. 285. 1827. *Asteracantha longifolia* (L.) Nees in Wall Pl. Asiat. Rar. 3 : 90. 1832 ; Wight, Ic. 2(2) : 3. t. 449. 1841 ; Duthie, Fl. Gangetic Plain 2 : 184. 1911. *Hygrophila spinosa* T. Anders. in Thw. Enum. Pl. Zeyl. 225. 1860 ; Clarke in Hook. f. Fl. Brit. India 4 : 408. 1884. 'Oont-katela' (Hindi).

Hispid annuals, 75 cm to 1 m high herbs, with thickened nodes. Leaves 5-16 × 1-3 cm, sessile, oblong or lanceolate, hispid, in verticels of 6 at a node. Axillary spines 2.5-4.0 cm long, hispid, yellow. Flowers many in each axillary whorl, purple-blue. Bracts 2-seriate, upto 4 cm long, lanceolate, ciliate ; bracteoles linear-lanceolate, hyaline-margined. Calyx 4-partite ; lobes linear-lanceolate, hairy, hyaline-margined. Filaments glabrous, 1 short and 1 long filament of each pair united at base. Style pubescent. Capsules linear-oblong, 4 to 8-seeded.

Fl. & Fr. : August-February.

Abundant in swampy habitats, waste places along ditches and canals in association with grasses and sedges.

Selected specimens : Banswara : Lamero tank, Singh 3637 (BSJO) ; Bharatpur : Ghana bird sanctuary, Parmar 8613 (BSJO) ; Jaipur : Daosa, Sharma Acc. No. 12542 (RUBL) ; Jodhpur : Mandor, Singh 3597 (BSJO) ; Kota : Shahabad, Jain 28949 (BSI) ; Sirohi : Mt. Abu, Jain 60128 (BSI)

2. *Hygrophila serpyllum* (Nees) T. Anders. in Journ. Linn. Soc. 9 : 456. 1867 ; Clarke in Hook. f. Fl. Brit. India 4 : 406. 1884 ; Duthie, Fl. Gangetic Plain 2 : 186. 1911 ; Santapau in Univ. Bombay Bot. Mem. 2 : 19. 1951. *Physichilus serpyllum* Nees in Hook. Comp. Bot. Mag. 2 : 311. 1837 ; Wight, Ic. 4(3) : 18. t. 1493. 1849.

Procumbent, pubescent herbs or undershrubs ; root stock woody. Leaves subsessile, upto 2.0 × 0.5 cm, elliptic, acute, entire, hairy on both

surfaces. Flowers in terminal, dense spikes, blue violet or purplish. Bracts elliptic, acute, pubescent. Calyx lobes 5, linear, densely ciliate. Corolla-throat white, bearded. Filaments glabrous; anthere-cells unequal. Style pubescent. Capsules 5-8 mm long, linear-oblong, pointed, glabrous, valves grooved on the back, 8 to 10-seeded. Seeds c. 0.75 mm across, orbicular, compressed, hairy, reddish brown.

Fl. & Fr. : October - February.

Common in moist places, particularly along Aravalli hills.

Selected specimens : Banswara : Danpur, *Singh* 4259 (BSJO); Kota : Chhabra, *Singh* 90902 (LWG); Pali : Kan Pahar R.F., *Pandey* 1606 (BSJO); Sirohi : Mt. Abu, *Kanodia* 62182, 62206 (BSI); UJaipur : Jaisamand, *Verma* 4252 (BSA).

19. INDONEESIELLA Sreemadhavan

Indoneesiella echioides (L.) Sreemadh. in *Phytologia* 16 : 466. 1968. *Justicia echioides* L. Sp. Pl. 16. 1753. *Andrographis echioides* (L.) Nees in *Wall. Pl. Asiat. Rar.* 3 : 117. 1832; *Wight, Ic.* 2(4) : 4. t. 467. 1841; *Clarke in Hook. f. Fl. Brit. India* 4 : 505. 1884; *Duthie, Fl. Gangetic Plain* 2 : 197. 1911; *Santapau in Univ. Bombay Bot. Mem.* 2 : 51. 1951. '*Jodapatta, Pattar*' (Hindi).

Erect, annual herbs, upto 50 cm high. Leaves sessile, 2-10 × 1-4 cm, elliptic-oblong or oblanceolate, obtuse, base rounded or cuneate, margins subentire, glabrous above, lineolate beneath. Flowers in subsecund, simple or branched racemes, pinkish-white, pink or white. Bracts linear-lanceolate; bracteoles subulate, hairy. Calyx-lobes linear, glandular-pubescent, acute. Lower lip of corolla mottled with red or dark purple patches. Anthers and filaments bearded, red. Capsules c. 1 × 0.5 cm, elliptic-oblong, somewhat compressed, acute, cuneate at the base, glabrescent, with persistent calyx. Seeds upto 2.5 × 2.5 mm, brownish.

Fl. & Fr. : August - November.

Commonly found as a forest undergrowth, along the streams and in wastelands, particularly in moist and shady localities throughout Rajasthan.

Selected specimens : Alwar : Kankwari, *Parmar* 8782 (BSJO); Banswara : Pipalkhunt, *Singh* 2916 (BSJO); Barmer : Sela forest, *Pandey* 8047 (BSJO); Jaipur : Ramgarh, *Sharma* 183 (RUBL); Kota : Shahabad, *Majumdar* 28957 (BSI); Pali : Goram Ghat, *Shetty* 1834 (BSJO); Tonk : *Maheshwari* 52930 (LWG).

20. JUSTICIA L.

1a. Calyx 5-partite :

- 2a. Flowers in axillary whorls. Capsules dimor-
phous. ... 5. *J. hetero-
carpa*
- 2b Flowers in spikes. Capsules homomorphous :
- 3a. Small procumbent herbs. ... 12. *J. trinervia*
- 3b. Large shrubs or undershrubs :
- 4a. Bracts ovate, white, with green veins.
Bracteoles lanceolate. ... 1. *J. betonica*
- 4b. Bracts linear, small, green. Bracteoles
absent. ... 4. *J. genda-
russa*

1b. Calyx 4-partite :

- 5a. Bracts and bracteoles as long or longer than
calyx :
- 6a. Sepals scarious, aristate. ... 6. *J. neesii*
- 6b. Sepals neither scarious, nor aristate :
- 7a. Bracts linear, obtuse, glabrous :
- 8a. Leaves linear-lanceolate. Spikes
slender. ... 9. *J. quinque-
angularis*
var. *quin-
queangularis*
- 8b. Leaves oblong. Spikes short and
broad. ... 10. *J. quinque-
angularis*
var.
paploides
- 7b. Bracts elliptic-lanceolate, acute, hairy :
- 9a. Bracts clothed with glistening
jointed hairs. ... 11. *J. simplex*
- 9b. Bracts clothed with simple hairs. ... 7. *J. procum-
bens*

5b. Bracts and bracteoles shorter than the calyx :

- 10a. Bracts, bracteoles and calyx-lobes obtuse at
apex. ... 9. *J. quinque-
angularis* var.
*quinqueangu-
laris*
- 10b. Bracts, bracteoles and calyx-lobes acute
at apex :
- 11a. Bracts and bracteoles about 2.5 mm long :

- | | | | |
|---|-----|-----|---|
| 12a. Much-branched, prostrate herbs, rooting at nodes. | ... | 8. | <i>J. prostrata</i> |
| 12b. Erect, slender, branched herbs. | ... | 13. | <i>J. vahlii</i> |
| 11b. Bracts and bracteoles hardly 1.25 mm long : | | | |
| 13a. Leaves maximum 5.5 × 2.5 cm. Spikes minimum 2.5 cm long. | ... | 2. | <i>J. diffusa</i>
var. <i>diffusa</i> |
| 13b. Leaves minimum 8 × 3.5 cm. Spikes upto 2 cm long. | ... | 3. | <i>J. diffusa</i>
var. <i>hedyoti-</i>
<i>disolia</i> |

1. *Justicia betonica* L. Sp. Pl. 15. 1753 ; Clarke in Hook. f. Fl. Brit. India 4 : 525. 1885 ; Santapau in Univ. Bombay Bot. Mem. 2 : 85. 1951 ; Mathew, Illus. Fl. Tamil Nadu Carnatic t. 534. 1982. *J. ramosissima* Roxb. Fl. Ind. 1 : 129. 1832. *Adhatoda betonica* (L.) Nees in Wall. Pl. Asiat. Rar. 3 : 103. 1832. *Justicia betonica* L. var. *ramosissima* (Roxb.) Clarke in Hook. f. l.c. 4 : 525. 1885 ; Duthie, Fl. Gangetic Plain 2 : 208. 1911.

Erect or scandent undershrubs. Leaves 6 - 15 × 3.5 - 7.0 cm, ovate elliptic to obovate, acuminate, base tapering, entire or crenate. Flowers in terminal, long spikes, white with pink tinge. Bracts foliaceous, acuminate, veined. Calyx 5 lobed, puberulous. Stamens 2 ; filament - sheath hairy. Capsules c. 1.5 cm long, beaked, pubescent, 4 - seeded. Seeds spherical, intensively rugose.

Fl. & Fr. : August - March.

Rare, found among hedges, in waste places and neglected corners of the gardens.

Selected specimen : Udaipur : Gulab bag, Majumdar 10371 (BSA).

2. *Justicia diffusa* Willd. Sp. Pl. 1 : 87. 1797 ; Clarke in Hook. f. Fl. Brit. India 4 : 538. 1885 ; Duthie, Fl. Gangetic Plain 2 : 209. 1911 ; Santapau in Univ. Bombay Bot. Mem. 2 : 87. 1951. *Rostellaria diffusa* (Willd.) Nees in Wall. Pl. Asiat. Rar. 3 : 100. 1832. *Rostellularia diffusa* (Willd.) Nees in DC. Prodr. 11 : 375. 1847.

var. *diffusa*

Procumbent, strigose herbs. Leaves 1.5 - 5.5 × 0.5 - 2.5 cm, ovate to lanceolate, rarely suborbicular, acute. Flowers in 2.5 - 12.5 cm long, axillary and terminal narrow spikes, pink to purple. Bracts shorter than the calyx, acute. Bracteoles bract-like but slightly narrow. Calyx 4-partite, with scarious margins. Filaments glabrous except at their insertion. Capsules ellipsoid, glabrous. Seeds rugose subconcentrically.

Fl. & Fr. : August March.

Common weed in open wastelands, fallow fields, forests and on hills.

Selected specimens : Ajmer : *Lourie s.n.* (DD) ; Banswara : Dagia Bowji hills, *Singh* 2857 (BSJO) ; Jaipur : Chaksu, *Sharma* 1740 (RUBL) ; Jodhpur : Kailana, *Puri* 21874 (BSI) ; Sirohi : Ambeswar, *Jain* 60463 (BSI).

3. var. *hedyotidifolia* (Nees) Clarke in Hook. f. *Fl. Brit. India* 4 : 538. 1885. *Rostellularia hedyotidifolia* Nees in Wall. *Pl. Asiat. Rar.* 3 : 100. 1832 & in DC. *Prodr.* 11 : 370. 1847 ; Wight, *Ic.* 4(4) : 6 t. 1540. 1850.

Woody herbs. Leaves upto 9.0 × 3.5 cm, ovate, petiolate. Flowers in linear, short dense spikes, pink. Bracts and bracteoles c. 1 mm long, ovate, acute, scarious. Calyx 4 partite ; lobes subequal, margins scarious and ciliate. Capsules 3-4 mm long, glabrescent. Seeds ovate, minutely papillose.

Fl. & Fr. : March August

Occasional, found in mixed habitats. Leaves turn black on drying.

Selected specimen : Ajmer : Along Ajmer-Jodhpur road, *Wadhwa* 4879 A (BSA).

4. *Justicia gendarussa* Burm f. *Fl. Ind.* 10. 1768 ; Clarke in Hook. f. *Fl. Brit. India* 4 : 532. 1885 ; Santapau in Univ. Bombay Bot. *Mem.* 2 : 91. 1951. *Gendarussa vulgaris* Nees in Wall. *Pl. Asiat. Rar.* 3 : 104. 1882 ; Wight, *Ic.* 2(2) : 4. t. 468. 1840-43.

Evergreen perennials. Leaves shortly petioled, upto 15 × 3 cm, oblong-lanceolate, tapering at both ends, glabrous. Flowers in terminal, long spikes, creamy white or pale - yellow with brown or dark purple spots within, scented. Bracts c. 3.5 mm long, lanceolate, shorter than calyx. Calyx-5-partite, linear lanceolate. Corolla nearly glabrous. Stamens 2 ; lower anther-cells distinctly tailed. Capsules clavate, glabrous, 4 seeded.

Fl. & Fr. : November April.

Found in moist places along streams, on hills etc. ; sometimes grown in the gardens. Probably a native of China.

Selected specimens : Chittorgarh : *Majumdar and Murti* 12454 (BSA) ; Kota : *Singh* 90899 (LWG).

5. *Justicia heterocarpa* T. Anders. in *Journ. Linn. Soc.* 7 : 41. 1863 ; Clarke in Hook. f. *Fl. Brit. India* 4 : 531. 1885 ; Raizada, *Suppl. Duthie, Fl. Gangetic Plain* 206. 1976 ; Bhandari, *Fl. Ind. Desert* 303. f. 115. 1978.

Decumbent, erect or straggling, pubescent annuals. Leaves upto 5.0×3.75 cm. membranous, ovate - lanceolate or ovate, acute, cuneate or rounded at base, entire, pubescent on both surfaces. Flowers sessile, in axillary clusters, white or bluish purple. Calyx lobes linear lanceolate, glandular - pubescent outside. Corolla - throat with few purple strips. Filaments glabrous; anther - cells spirally twisted. Capsules dimorphic; normal ones c. 3.75 mm long, ellipsoidal, beaked, pubescent, compressed, 4-seeded; seeds tuberculate, glabrous, cordate at the base, brown. Abnormal capsules c. 3.25 mm long, with deeply dissected, 6 longitudinal wings; teeth densely retrorsely barbellate, 1 seeded, brown; seeds c. 1.25 mm long, obliquely ovoid, glabrous, minutely punctate.

Fl. & Fr. : August - November.

Commonly found as a forest undergrowth in moist-shaded places in the rocky habitats.

Selected specimens : Barmer : Kundal, Pandey 8021 (BSJO); Bhilwara : Bhimar, Singh 5998 (BSJO); Jaipur : Amer, Sharma 111, 132 (RUBL); Pali : Paras Ram Mahadev R.F., Shetty 1916 (BSJO); Tonk : Toda Rai Singh, Maheshwari 52906 (LWG).

6. *Justicia neesii* Ramam. in Saldanha & Nicolson, Fl. Hassan 551. 1976. *J. micrantha* Wall. ex Clarke in Hook. f. Fl. Brit. India 4 : 536. 1885, non Pohl ex Nees 1847; Santapau in Univ. Bombay Bot. Mem. 2 : 87. 1951. *Rostellularia crinita* Nees in Wall. Pl. Asiat. Rar. 3 : 101. 1832, non *Justicia crinita* Thunb. 1784.

Erect, much-branched herbs. Leaves upto 4×2 cm, ovate or elliptic, acute, base attenuate, entire, scabrid pubescent. Flowers in spikes, pale purple or pink. Bracts and bracteoles linear spatulate, with white, bulbous-based hairs along margins. Calyx 4-lobed; lobes lanceolate, with scarious margins and mid-rib produced into a long arista. Stamens 2; filaments glabrous. Capsules c. 3.5 mm long, oblong, stalked, 4 seeded. Seeds 0.75 - 1.0 mm across, finely rugose.

Fl. & Fr. : January - July.

Commonly found in open wastelands, scrub forests and near moist places.

Selected specimens : Jaipur : Amer, Sharma 320, 987 (RUBL); Jhalawar : Bijliya Bhadok, Wadhwa 7425 (BSA); Orai dam, Verma 1677 (BSA); Kota : Majumdar 10872 (BSA).

7. *Justicia procumbens* L. Sp. Pl. 15. 1753; Clarke in Hook. f. Fl. Brit. India 4 : 539. 1885; Santapau in Univ. Bombay Bot. Mem. 2 : 90.

1951. *Rostellaria procumbens* (L.) Nees in Wall. Pl. Asiat. Rar. 3 : 101.
1832. *Rostellularia procumbens* (L.) Nees in DC. Prodr. 11 : 371. 1847.

Suberect or diffuse herbs, often rooting at lower nodes. Leaves upto 3.5×1.5 cm, elliptic, ovate or lanceolate, acute or obtuse at both ends, softly pubescent. Flowers in terminal spikes, bright rosy purple or lilac. Bracts and bracteoles linear-lanceolate, acute, hairy, with scarious margins. Calyx lobes 4 or rarely 5, subequal, lanceolate, with scarious and ciliate margins. Stamens 2, with glabrous filaments. Capsules 0.5 - 1.75 mm long, oblong, stalked, beaked, pubescent. Seeds c. 0.75 mm across, finely tuberculate, brownish.

Fl. & Fr. : Almost throughout the year.

Commonly found throughout Rajasthan in mixed habitats. This is a highly polymorphic species with regards to habit, shape and size of leaves, capsules, seeds and hairiness.

Selected specimens : Alwar : Umarai, *Parmar* 9594 (BSJO) ; Bharatpur : Pahartal forest, *Parmar* 8503 (BSJO) ; Jaisalmer : Pokaran, *Tiwari* 767 (BSJO) ; Sirohi : Mt. Abu, *Mehta* 789 (JAC). Also reported by Nair, *et al.* (1961) from Jhunjhunu, Ratnam (1951) from Sikar, Majumdar (1976) from Jhalawar and Ramdeo (1969) from Udaipur.

8. *Justicia prostrata* (Clarke) Gamble, Fl. Madras 2(6) : 1081. 1924 ; Santapau in Univ. Bombay Bot. Mem. 2 : 88. 1951 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 207. 1976. *J. diffusa* Willd. var. *prostrata* Clarke in Hook. f. Fl. Brit. India 4 : 538. 1885. *Rostellularia prostrata* (Clarke) Majumdar in Bull. Bot. Soc. Bengal 25 : 75. 1971.

Prostrate or decumbent, branched annuals. Leaves upto 3.0×2.5 cm, ovate, broadly elliptic or suborbicular, obtuse, rounded at the base, entire. Flowers in axillary and terminal, 1.5 - 9.0 cm long spikes, white or pink. Bracts and bracteoles lanceolate, pubescent. Calyx - lobes 4, scarious, lanceolate, acute, ciliate along midrib and margins. Capsules upto 4.5 mm long, ellipsoid or oblong-ellipsoid, beaked, grooved, glabrous at top. Seeds 0.5 - 1.25 mm across, ovoid-orbicular, reddish-brown.

Fl. & Fr. : September - March.

Common in mixed habitats, particularly on rocky slopes, in open grasslands and other wastelands.

Selected specimens : Chittorgarh : Senwa, *Jain* 58716 (BSI) ; Dungarpur : Ratanpur, *Kanodia* 82093 (BSI) ; Jaipur : Deosa, *Wadhwa* 8139 (BSA) ; Jaisalmer : Pokaran, *Wadhwa* 5020 (BSA) ; Kota : Shahabad, *Verma* 683 (BSA) ; Pali : Erinpura, *Rao* 66810 A (BSI).

9. *Justicia quinqueangularis* Koenig ex Roxb. Fl. Ind. 1 : 134. 1832 ; Clarke in Hook. f. Fl. Brit. India 4 : 536. 1885 ; Duthie, Fl. Gangetic Plain 2 : 209. 1911 ; Santapau in Univ. Bombay Bot. Mem. 2 : 89. 1951. *Rostellaria quinqueangularis* (Koenig ex Roxb.) Nees in Wall. Pl. Asiat. Rar. 3 : 101. 1832. *Rostellularia quinqueangularis* (Koenig ex Roxb.) Nees in DC. Prodr. 11 : 375. 1847.

var. quinqueangularis

Suberect, glabrous herbs. Leaves upto 7.5×1.5 cm, linear-lanceolate or linear-oblong, obtuse, entire. Flowers in elongated, terminal spikes, bright pink or purple. Bracts, bracteoles and sepals are similar, linear, with scarious margins. Calyx 4-partite. Stamens 2 ; filaments glabrous. Capsules 0.75 cm long, oblong, pointed, stalked, 4-seeded. Seeds c. 0.5 mm across, compressed, reticulately rugose.

Fl. & Fr. : August December.

Common weed throughout the state.

Selected specimens : Alwar : Neldeshwar, *Parmar* 9516 (BSJO) ; Bhilwara : Amarpura, *Singh* 6222 (BSJO) ; Chittorgarh : Gosunda, *Singh & Pandey* 6959 (BSJO) ; Churu : Baman ka Bas, *Roy* 2764 (BSJO) ; Jaipur : Durgapura, *Sharma* 1203 (RUBL) ; Kota : Shahabad, *Wadhwa* 9281 (BSA).

10. var. *peplodes* (Nees) Clarke in Hook. f. Fl. Brit. India 4 : 537. 1885 ; Duthie, Fl. Gangetic Plain 2 : 209. 1911 ; Santapau in Univ. Bombay Bot. Mem. 2 : 89. 1951. *Rostellaria peplodes* Nees in Wall. Pl. Asiat. Rar. 3 : 101. 1832. *Rostellularia peplodes* (Nees) Nees in DC. Prodr. 11 : 375. 1847.

Erect or procumbent-ascending annuals, often rooting at lower nodes. Leaves $0.5 - 5.0 \times 0.5 - 3.0$ cm, ovate-lanceolate to ovate-oblong, subobtuse, base attenuate, subentire. Flowers in axillary and terminal, upto 5.5 cm long spikes, pink white or bluish-white. Bracts and bracteoles c. 3-5 mm long, oblong. Calyx-lobes c. 3.5 mm long, ciliate, obtuse. Corolla with dark purple streaks in the throat. Capsules c. 5.5 mm long, ellipsoid, beaked, glabrous. Seeds c. 1 mm across, suborbicular, brown.

Fl. & Fr. : August November.

Common weed in sandy-loam soils.

Selected specimens : Banswara : Dagia Bowji tank, *Singh* 3700 (BSJO) ; Jaipur : Nariana, *Sharma* 1512 (RUBL) ; Pali : Sarandana, *Shetty* 1803 (BSJO) ; Sirohi : Mt. Abu, *Mehta* 450 (JAC) ; Tonk : Kakor, *Shetty* 1283 (BSJO).

11. *Justicia simplex* D. Don, Prodr. 118. 1825 ; Clarke in Hook. f. Fl. Brit. India 4 : 539. 1885 ; Duthie, Fl. Gangetic Plain 2 : 210. 1914 ; Santapau in Univ. Bombay Bot. Mem. 2 : 89. 1951. *Rostellaria mollissima* Nees in Wall. Pl. As. Rar. 3 : 101. 1832. *Rostellularia mollissima* (Nees) Nees in DC. Prodr. 11 : 373. 1847. 'Kagner' (Hindi).

Erect or prostrate annuals, often rooting at the lower nodes. Leaves upto 7.5×3.25 cm, ovate, ovate-lanceolate or elliptic-oblong, obtuse or acute at the apex, margins subentire, glabrous or hairy. Flowers in axillary and terminal spikes, pale-purple to bright rosy purple. Bracts c. 0.5 cm long, elliptic-ovate, ciliate. Bracteoles slightly longer than the calyx. Corolla-throat mottled within. Capsules c. 5 mm long, linear-oblong, slightly pubescent at the top. Seeds 0.75 - 1.0 mm across, rugose.

Fl. & Fr. : July - March.

Common weed throughout Rajasthan in mixed habitats.

Selected specimens : Barmer : Haldeshwar Mahadev R.F., Pandey 7931 (BSJO) ; Bharatpur : Loharsar, Parmar 8595 (BSJO) ; Jaipur : Jagatpura, Sharma 239 (RUBL) ; Jhunjhunu : Pilani, Prasad 31169 (LWG) ; Sirohi : Mt. Abu, Jain 48192, 5624 (BSI) ; Udaipur : Sira Magra, Kanodia 82184 (BSI).

12. *Justicia trinervia* Vahl, Enum. 1 : 56. 1804 ; Clarke in Hook. f. Fl. Brit. India 4 : 526. 1885 ; Santapau in Univ. Bombay Bot. Mem. 2 : 86. 1951 ; Sharma & Tiagi, Fl. N-E Rajasthan 319. 1979. *Adhatoda trinervia* (Vahl) Nees in Wall. Pl. Asiat. Rar. 3 : 103. 1832.

Procumbent herbs, with woody root-stock. Leaves upto 4×1 cm, variable, upper sessile, lower ones petiolate, elliptic - oblong or obovate - oblong, obtuse. Flowers in lax spikes, pinkish. Bracts and bracteoles lanceolate, acute. Calyx 5 - partite, pubescent ; lobes lanceolate, acute, 3 - nerved. Corolla pubescent outside. Filaments glabrous above, pubescent at the base. Capsules c. 1 cm long, oblong - clavate, pointed, pubescent, 4-seeded. Seeds 0.25 - 0.5 mm across, compressed, tuberculate.

Fl. & Fr. : December - March.

Rare, found in rocky habitats in moist situations.

Selected specimen : Jaipur : Amer, Sharma 1042 (RUBL).

13. *Justicia vahlii* Roth, Nov. Pl. Sp. 14. 1821 ; Santapau in Univ. Bombay Bot. Mem. 2 : 88. 1951 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 207. 1976. *Rostellaria vahlii* (Roth) Nees in Wall. Pl. Asiat. Rar. 3 : 102. 1832. *Justicia diffusa* Willd. var. *vahlii* (Roth) Clarke in Hook. f. Fl. Brit. India 4 : 538. 1885.

Erect to suberect or straggling herbs, with long internodes. Leaves petiolate, 2.5-12.0 × 0.5-2.0 cm, ovate-lanceolate or elliptic-lanceolate, acute-acuminate, narrowed at the base, entire. Flowers in axillary and terminal, upto 70 cm long spikes, pink or pale purple. Bracts and bracteoles shorter than the calyx, lanceolate, scarious and ciliate-margined. Calyx 4-lobed, upto 5 mm long. Corolla-throat with dark pink markings. Stamens 2; anthers spurred. Capsules c. 5.5 mm long, oblong-ellipsoid, beaked, 4-seeded, pubescent. Seeds c. 1.25 mm across, ovoid-orbicular, concentrically rugose or papillose, yellowish-brown

Fl. & Fr. : August - November.

Commonly found in rocky habitats.

Selected specimens : Banswara : Asargarh, *Kanodia* 75625 (BSI); Barmer : Samadari, *Shetty* 2187 (BSJO); Churu : Sadulpur, *Roy* 3990 (BSJO); Jaisalmer : Kuri, *Jain* 40536 (BSI); Jhalawar : Aklera, *Wadhwa* 7577 (BSA); Pali : Jawai dam, *Rao* 66810 (BSI).

21. LEPIDAGATHIS Willd

1a. Seeds 2 :

2a. Calyx 4-partite :

3a. Bracts spinous-pointed :

4a. Bracts lanceolate, ciliate with long white hairs on the margins. ... 4. *L. hamiltoniana*

4b. Bracts ovate, obovate or elliptic, eciliate. ... 2. *L. cristata*

3b. Bracts not spinous - pointed. ... 6. *L. mitis*

2b. Calyx 5-partite :

5a. Bracteoles uniform :

6a. Bracts glabrous, with long recurved spines. ... 7. *L. trinervis*

6b. Bracts softly hairy, with straight apical spines. ... 5. *L. lutea*

5b. Bracteoles dimorphous. ... 1. *L. bandraensis*

1b. Seeds 4. ... 3. *L. cuspidata*

1. *Lepidagathis bandraensis* Blatter in Journ. Asiat. Soc. Bengal (n.s.) 26 : 347. 1930; Santapau in Univ. Bombay Bot. Mem. 2 : 75. 1951;

Bhandari, Fl. Ind. Desert 305. 1978. *L. trinervis sensu* Blatter & Hallberg in Journ. Bombay Nat. Hist. Soc. 26 : 812. 1919, non Nees 1832. 'Unt-Kantab' (Hindi).

Prostrate perennials, with woody root - stock. Leaves upto 6.0×0.5 cm, elliptic - lanceolate, tapering at the base, mid - rib prominent beneath. Flowers in dense, one-sided, ovoid spikes, white or pale-pink. Bracts fertile and barren, pointed. Bracteoles oblong-lanceolate, spine-tipped, ciliate. Calyx 5-partite, stiff. Upper lip of corolla mottled with brown and purple spots. Stamens 4 ; anther-cells unequal, bearded. Capsules 7 - 10 mm long, slightly compressed, acute at the top, 2-seeded. Seeds 2-3 mm across, compressed, covered with white, silky hygroscopic hairs.

Fl. & Fr. : Almost throughout the year.

Found in sandy as well as rocky habitats in W. Rajasthan. The plant is highly variable.

Selected specimens : Jodhpur : Bhandari 7, 210, 1387 (JAC), Puri 218521 (BSI).

2. *Lepidagathis cristata* Willd. Sp. Pl. 3 : 400. 1800 ; Wight, Ic. 2 (2) : 3. t. 455. 1841 ; Clarke in Hook. f. Fl. Brit. India 4 : 516. 1885 ; Santapau in Univ. Bombay Bot Mem. 2 : 71. 1951 ; Bhandari, Fl. Ind. Desert 307. 1978. 'Aewal Kangio' (Hindi).

Procumbent, suffruticose perennials. Branches spreading, almost winged. Leaves upto 7.5×1.25 cm, linear - oblong, margins spinous serrulate. Flowers in subradical, globose heads, white or pale pink with brown or purple spots and streaks. Bracts ovate, acuminate, spinous pointed, hairy ; bracteoles membranous, spine tipped. Calyx 4 partite ; lobes unequal, ciliate, hairy on both surfaces, spine tipped. Lower - lip of corolla 3 - lobed. Filaments glabrous, brownish. Seeds 2 - 3 mm across, ovoid - oblong densely clothed with hygroscopic hairs.

Fl. & Fr. : October - March.

Commonly found in rocky to sandy habitats throughout Rajasthan.

Selected specimens : Alwar : Kankawari, Parmar 9421 (BSJO) ; Barmer : Kundal, Pandey 8028 (BSJO) ; Jaipur : Sharma 971, 1280 (RUBL) ; Jhalawar : Sharma 194, 161 (RUBL) ; Sirohi : Mt. Abu, Mehta 1521 (JAC).

3. *Lepidagathis cuspidata* Nees in Wall. Pl. Asiat. Rar. 3 : 97. 1832 ; Clarke in Hook. f. Fl. Brit. India 4 : 519. 1885 ; Duthie, Fl. Gangetic Plain 2 : 204. 1911 ; Beddome, Icon. Pl. Ind. Or. 54. t. 227. 1874 ; Santapau in Univ. Bombay Bot. Mem. 2 : 73. 1951. *Ruellia cuspidata* Wall. Cat. 2405. 1830, *nom. nud.*

Perennial undershrubs or herbs. Leaves upto 14×4 cm : of the main stem larger, petiolate, oblong-lanceolate, acute to acuminate, decurrent into the petiole; those of branches smaller, sessile, ovate elliptic, mucronate, cuspidate, glandular pubescent. Flowers pale purplish pink or white. Bracts leafy, 3 nerved. Bracteoles smaller, spine-tipped, 1 nerved. Calyx lobes glandular ciliate. Corolla pubescent outside, lower lip with dark coloured transverse markings. Anther cells bearded. Capsules c. 1 cm long, acute, glabrous, brown. Seeds c. 2.5 mm long, compressed, hairy.

Fl. & Fr. : November - April.

Occasionally found along the streams in moist situations.

Selected specimens : Pali : Stream near Paras Ram Mahadev R.F., Pandey 4190 (BSJO); Sirohi : Mt. Abu, Jain 62111 (BSI), Puri 56617 (BSI).

4. *Lepidagathis hamiltoniana* Wall. ex Nees in Wall. Pl. Asiat. Rar. 3 : 96. 1832 ; Clarke in Hook. f. Fl. Brit. India 4 : 516. 1885 ; Duthie, Fl. Gangetic Plain 2 : 203. 1911. "Kateli" (Hindi).

Stiff perennials. Leaves upto 16.5×1.0 cm, linear or narrowly oblong, nearly glabrous, entire. Flowers in globose spikes arising from the base of stem, white or pink, mottled. Bracts upto 1.25 cm long, lanceolate, acuminate, spine-tipped, margins ciliate. Calyx lobes membranous, tough, lanceolate, acuminate, spine-tipped, not thickened upwards, the lower ones usually broader and bifid. Corolla strigose outside with white hairs, mottled within. Capsules conical, 2-seeded, scarious on the back. Seeds ovate, covered with long, hygroscopic hairs.

Fl. & Fr. : November - March.

Found along river beds, rocky habitats and on the hills.

Selected specimens : Ajmer : Akhjitgarh, Duthie 4805 (DD), Kaul 8452 (LWG); Alwar : Bala forest, Hira Lal 34490 (LWG); Kota : Shahabad, Singh 90425 (LWG). Also reported by Nair & Kanodia (1959) from Jhunjhunu and by Ramdeo (1969) from Udaipur.

5. *Lepidagathis lutea* Dalz. in Kew Journ. Bot. 2 : 139. 1850 ; Clarke in Hook. f. Fl. Brit. India 4 : 517. 1885 ; Santapau in Univ. Bombay Bot. Mem. 2 : 73. 1951.

Perennial herbs, with woody root-stock. Leaves sessile, $2.8 \times 0.5 - 1.75$ cm, lanceolate to linear, acute, 1 nerved, glabrous. Flowers in velvety, axillary spikes and subradical, globose heads, white. Bracts

softly hairy, with an apical spine. Calyx segments thick, spinous pointed. Capsules ovoid lanceolate, 2 seeded, with scarious back. Seeds clothed with hygroscopic and mucilaginous hairs.

Fl. & Fr. : September - March.

Rare, found in forests. Denizen of W. Peninsula.

Selected specimen : Banswara : Hura Bowji forest, Singh 3677 (BSJO).

6. *Lepidagathis mitis* Dalz. in Kew Journ. Bot. 3 : 226. 1851 ; Clarke in Hook. f. Fl. Brit. India 4 : 516. 1885 ; Santapau in Univ. Bombay Bot. Mem. 2 : 71. 1951.

Spreading perennials. Leaves 2-3 × 0.5-1.25 cm, linear oblong, acutish, base narrowed, margins ciliolate. Flowers in globose heads at the base of stem, white or pink, mottled inside. Bracts stiff, long acuminate, ovate, densely ciliate margined. Bracteoles membranous, lanceolate, acuminate, margins densely ciliate with white hairs. Calyx 4-partite, pubescent ; lobes unequal. Capsules c. 2.5 mm long, ovoid, glabrous, 2-seeded. Seeds ovoid oblong, covered with long, hygroscopic hairs.

Fl. & Fr. : January - December.

Rare, found in rocky habitats.

Selected specimen : Jaipur : Kaul 18511 (LWG).

7. *Lepidagathis trinervis* Wall. ex Nees in Wall. Pl. Asiat. Rar. 3 : 96. 1832 ; Clarke in Hook. f. Fl. Brit. India 4 : 517. 1885 ; Duthie, Fl. Gangetic Plain 2 : 204. 1911 ; Santapau in Univ. Bombay Bot. Mem. 2 : 72. 1951. 'Pathar-phor' (Hindi).

Branched, suffruticose, pubescent perennials. Leaves sessile, 6.0 × 0.75 cm, linear, acute, base tapering, margins scabrid, 3-nerved at the base. Flowers pink, pale purple or violet, rarely whitish ; spikes axillary, solitary or many, packed together forming ovoid globose heads in the basal portion of the plant. Bracts ovate elliptic ; bracteoles oblong-lanceolate, aristate. Calyx lobes subequal, spinous tipped, densely hairy within and glabrous outside. Corolla throat with transverse streaks and mottled with yellow, brown and purple. Capsules c. 6 mm long, compressed, beaked, glabrous. Seeds c. 3.75 mm long, rounded at the top, grey, covered with long silky white hairs.

Fl. & Fr. : November - April.

Common on low hillocks in rocky to gravelly habitats throughout Rajasthan.

Selected specimens : Banswara : Verma 206 (BSA) ; Bharatpur : Gajipur, Parmar 8756 (BSJO) ; Bhilwara : Banera, Singh 6015 (BSJO) ; Jaipur : Galta, Sharma 2239 (RUBL) ; Jodhpur : Beriganga, Shetty 174 (BSJO) ; Nagaur : Merta road, H. Lal 34842 (LWG) ; Udaipur : Kaul 8503 (LWG).

22. NILGIRIANTHUS Bremek.

Nilgirianthus heyneanus (Nees) Bremek. Mat. Mon. Strob. 173. 1944. *Strobilanthes heyneanus* Nees in Wall. Pl. Asiat. Rar. 3 : 85. 1832 ; Clarke in Hook. f. Fl. Brit. India 4 : 443. 1884 ; Gamble, Fl. Madras 6 : 1041. 1924. *S. rugosus* Wight, Ic. 4 (4) : 17. t. 1619. 1850.

Shrubs, upto 50 cm high ; stem hirsute upwards, not winged. Leaves upto 15 × 6 cm, ovate, unequal below. Flowers in capitate spikes, purplish pink. Bracts orbicular, concave, glabrous, pink. Calyx lobes 5, linear-oblong, 3 nerved. Corolla lobes 5, acute. Stamens 4, included ; filaments bearded at the base. Capsules oblong, 4-seeded. Seeds ovoid, margins hairy.

Fl. & Fr. : December - May.

Rare, found in semi evergreen forests on Aravalli hills.

Selected specimens : Sirohi : Mt. Abu, Jain 5347 (BSI), Mehta 951 (JAC).

23. NELSONIA R. Br.

Nelsonia canescens (Lam.) Spreng. Syst. Veg. 1 : 42. 1825 ; Bremek. in Reinwardtia 3 : 248. 1955. *Justicia canescens* Lam. Encycl. 1 : 41. 1791. *Nelsonia campestris* R. Br. Prodr. 1 : 481. 1810 ; Clarke in Hook. f. Fl. Brit. India 4 : 394. 1884 ; Duthie, Fl. Gangetic Plain 2 : 181. 1911 ; Santapau in Univ. Bombay Bot. Mem. 2 : 11. 1951.

Decumbent ascending, villous pubescent perennials, with fleshy, tuberous roots. Basal leaves petiolate, upper ones sessile, 2 - 20 × 1 - 3 cm, elliptic-ovate to obovate, obtuse or subacute, entire. Flowers in axillary and terminal, long spikes, bluish-purple. Bracts c. 0.65 cm long, ovate-obovate, glandular-ciliate. Bracteoles with a pair of tuft of hairs.

Calyx lobes unequal, gland - ciliate. Capsules c. 0.5 cm long, ovoid, acute, glabrous, valves recurved. Seeds ellipsoid, granular, brown.

Fl. & Fr. : January - May.

Rare, found as a forest undergrowth on the hills and along the streams.

Selected specimen : Kota : Kelwara, Singh 90847 (LWG).

24. NEURACANTHUS Nees

Neuracanthus sphaerostachyus (Nees) Dalz. in Kew Journ. Bot. 2 : 140. 1850 ; Clarke in Hook. f. Fl. Brit. India 4 : 491. 1884 ; Santapau in Univ. Bombay Bot. Mem. 2 : 66. 1951. *Lepidugathis sphaerostachya* Nees in DC. Prodr. 11 : 254. 1847. *Neuracanthus lawii* Wight, Ic. 4 (4) : 5, t. 1531. 1850.

Erect perennials, 20 - 70 cm high. Leaves sessile, upto 10 × 6 cm, elliptic - oblong, hispid on veins, obtuse or shortly acuminate. Flowers in globose, congested, silky hairy, axillary, sessile spikes borne in opposite axils. Bracts 5 to 7 - nerved, ciliate, acuminate. Calyx 2 lipped. Capsules ovoid, glabrous. Seeds compressed, orbicular, silky.

Fl. & Fr. : August - October.

Rare, occurring in shady habitats, particularly in southern parts of the state.

Selected specimens : Banswara : Loharia forest, Singh 3010 (BSJO) ; Dungarpur : Maha Kali ka Dungra, Kanodia 82051 (BS1).

25. PERISTROPHE Nees

Peristrophe paniculata (Forsk.) Brummitt in Kew Bull. 38 : 451. 1983. *Dianthera paniculata* Forsk. Fl. Aegypt. - Arab. 7. 1775. *D. bicalyculata* Retz. in Vet. Acad. Handl. 297, t. 9. 1775. *Justicia bicalyculata* (Retz.) Vahl, Symb. Bot. 2 : 13. 1791. *Peristrophe bicalyculata* (Retz.) Nees in Wall. Pl. Asiat. Rar. 3 : 113. 1832 ; Clarke in Hook. f. Fl. Brit. India 4 : 554. 1885 ; Duthie, Fl. Gangetic Plain 2 : 210. 1911 ; Santapau in Univ. Bombay Bot. Mem. 2 : 93. 1951 ; Mahesh. Illus. Fl. Delhi f. 166. 1966.

Erect, branched herbs or undershrubs, upto 1.75 m high. Leaves upto 8 × 4 cm, ovate or ovate - lanceolate, acute to acuminate, base

rounded or acute, margins ciliate, subentire or crenulate, pilose and strongly lineolate. Flowers in terminal or axillary, lax, divaricate, leafy cymes, pink or purple. Bracts 2, subequal : bracteoles 2, unequal, ciliate. Calyx lobes linear lanceolate, ciliate, acute. Corolla throat hairy and lower lip mottled with dark mauve coloured spots. Filaments bearded. Capsules c. 6 mm long, ellipsoid, acuminate, stalked, pubescent. Seeds c. 2.25 mm across, brown.

Fl. & Fr. : October - February.

Common throughout Rajasthan along the hedges of cultivated fields, in wastelands and grassy localities.

Selected specimens : Alwar : Kankwari, *Parmar* 9414 (BSJO) ; Banswara : Danpur, *Singh* 3715 (BSJO) ; Barmer : Haldeshwar Mahadev R.F., *Pandey* 7929 (BSJO) ; Bikaner : Kolayat, *Roy* 2376 (BSJO) ; Kota : Darah. *Jain* 28705 (BSI) ; Pali : Sadari, *Jain* 48429 (BSI) ; Sirohi : Mt. Abu, *Rao* 66703 (BSI) ; Udaipur : *Jain* 48392 (BSI).

26. PETALIDIUM Nees

Petalidium barlerioides (Roth) Nees in Wall. Pl. Asiat. Rar. 3 : 82. 1832 ; Clarke in Hook. f. Fl. Brit. India 4 : 416. 1884 ; Duthie, Fl. Gangetic Plain 2 : 192. 1911 ; Santapau in Univ. Bombay Bot. Mem. 2 : 29. 1951. *Ruellia barlerioides* Roth, Nov. Pl. Sp. 310. 1821.

Glabrous undershrubs or shrubs, upto 1.5 m high. Leaves 4 - 10 × 3 - 7 cm, broadly ovate, acuminate, crenate - serrate, base rounded, leaves on the flower bearing branches are smaller. Flowers solitary, crowded on the lateral branches, white or yellow. Bracteoles upto 2.5 cm long, leafy, older ones scarious, ciliolate. Calyx - lobes 5, unequal, glandular - hairy, lanceolate subulate. Corolla hairy within. Stamens 4 ; filaments hairy at the base ; anther - cells spurred. Capsules clavate, glabrous, pointed, 2 - seeded. Seeds compressed, orbicular, softly villous.

Fl. & Fr. : January - April.

Found in dry deciduous forests on the Aravalli, particularly in the eastern sector.

Selected specimens : Jhalawar : Manoharthana, *Verma* 3481 (BSA) ; Sirohi : Mt. Abu, *Mehta* 1316, 1320 (JAC). Also reported from Kota by Majumdar (1976).

27. *RUELLIA L. emend. Bremek.*

Ruellia tuberosa L. Sp. Pl. 635. 1753 ; Bremek. in Verh. Kon. Nederl. Akad. Wet. 45 (1) : 11. 1948 & in Densk. Botan. Arkiv. 20 : 64. 1961 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 209. 1976.

Erect annuals, upto 75 cm high, with several tuberous roots. Leaves upto 10 × 5 cm, oblong to obovate, with decurrent base. Flowers paired in leaf - axils, blue - violet. Bracts linear - subulate. Calyx - lobes linear, ciliate. Capsules c. 2.5 cm long, linear fusiform, grooved dorsiventrally. Seeds many, ovate - oblong.

Fl. & Fr. : August - November.

Native of Tropical America ; naturalized in wastelands and forests.

Selected specimens : Alwar : Siligarh, *Hiralal* 34513 (LWG) ; Banswara : Dalya tank, *Kanodia* 75184 (BSI) ; Bikaner : Gajner, *Bhagwat* 23540 (BSI) ; Bundi : Hindoli, *Verma* 1886 (BSA) ; Dungarpur : *Verma* 106, 175 (BSA) ; Udaipur : *Majumdar* 11641 (BSA).

28. *RUNGIA* Nees

- 1a. Bracts dimorphous. Upper lip of corolla acute, not notched :
- 2a. Barren bracts elliptic or oblong, subobtuse. Fertile bracts glabrous, ciliate on margins. ... 3. *R. parviflora*
- 2b. Barren bracts ovate, acute, mucronate or cuspidate. Fertile bracts hairy and ciliate. ... 4. *R. pectinata*
- 1b. Bracts uniform. Upper lip of corolla notched or emarginate :
- 3a. Spikes perfectly 1 - sided. Bracts herbaceous. Corolla 8 - 9 mm long. ... 2. *R. tinifolia*
- 3b. Spikes imperfectly 1 - sided. Bracts with broad, scarious margins. Corolla more than 1 cm long :
- 4a. Decumbent herbs, rooting on the nodes, glabrous. Capsules ovoid, acute. ... 5. *R. repens*
- 4b. Erect, hairy herbs. Capsules obovoid, obtuse. ... 1. *R. elegans*

1. *Rungia elegans* Dalz. in Dalz. & Gibs. Bombay Fl. 196. 1861 ; Clarke in Hook. f. Fl. Brit. India 4 : 549. 1885 ; Cooke, Fl. Bombay 2 : 401. 1905 ; Santapau in Univ. Bombay Bot. Mem. 2 : 78. 1951.

Erect or suberect herbs. Leaves upto 12×2 cm, elliptic - lanceolate, acute to acuminate, narrowed at the base, entire, pubescent. Flowers in sessile, imperfectly 1 - sided, upto 8 cm long spikes, pink, pale purple or white. Bracts broadly elliptic, cuspidate, with scarious and ciliate margins. Bracteoles linear - lanceolate. Calyx 5 - partite, pubescent. Corolla pubescent outside ; lower lip 3 lobed ; throat mottled with pink. Lower cell of the anthers with white appendages. Capsules c. 5 mm long, obovoid, mucronate, pubescent on the margins. Seeds c. 0.75 mm across, broadly oblong or suborbicular, rugose with concentric furrows, pale yellowish - brown.

Fl. & Fr. : August - December.

Occasionally found as a forest undergrowth on the top of hills.

Selected specimens : Banswara : Waghdari hills, Kanodia 75657 (BSI) ; Kota : Darah, Jain 28782 (BSI) ; Pali : Piproli, Shetty 1878 (BSJO).

2. *Rungia linifolia* Nees in Wall. Pl. Asiat. Rar. 3 : 110. 1832 ; Clarke in Hook. f. Fl. Brit. India 4 : 548. 1885 ; Santapau in Univ. Bombay Bot. Mem. 2 : 77. 1951. *Rostellularia gracilis* Wight, Ic. 4 (4) : 6. t. 1541. 1850.

Suberect annuals, with filiform branches. Leaves upto 7×2 cm, elliptic - lanceolate, acute or subobtuse, glabrous or so. Flowers in terminal, pedunculate, quadrifarious, 1 - sided, secund spikes, pale purple to pink. Bracts leafy, glandular - pubescent ; bracteoles linear - lanceolate. Calyx - lobes linear - lanceolate, ciliate. Corolla pubescent outside. Filaments glabrous ; lower cell of anthers not or slightly appendiculate at base.

Fl. & Fr. : November - March.

Rare, found on the outskirts of forests.

Selected specimen : Banswara : Anand Sagar R.F., Jav. 29238 (BSI).

3. *Rungia parviflora* Nees in Wall. Pl. Asiat. Rar. 3 : 110. 1832 & in DC. Prodr. 11 : 469. 1847 ; Clarke in Hook. f. Fl. Brit. India 4 : 550. 1885 ; Santapau in Univ. Bombay Bot. Mem. 2 : 76. 1951.

Suberect or diffuse herbs. Lower leaves c. 2.5×1.25 cm, petiolate, ovate ; upper ones narrower, sometimes linear. Flowers in axillary or terminal, 1 - sided spikes, blue. Sterile bracts c. 0.35 cm long and the fertile bracts c. 0.25 cm long. Upper lip of corolla acute, not notched. Filaments glabrous ; cells of lower anthers with a long white appendage. Capsules narrowly oblong. Seeds minutely verrucose.

Fl. & Fr. : November - May.

Occasionally found in grassy localities and in wastelands.

Selected specimens : Alwar : Kankwari, *Parmar* 8792 (BSJO) ;
Dungarpur : Ratanpur, *Kanodia* 82082 (BSI) ; Sirohi : Mt. Abu, *Jain*
62108 (BSI).

4. *Rungia pectinata* (L.) Nees in DC. Prodr. 11 : 469. 1847 ; Wight,
Ic. 4 (4) : 6. t. 1547. 1850 ; Santapau in Univ. Bombay Bot. Mem. 2 : 77.
1951. *Justicia pectinata* L. Cent. Pl. 2 : 3. 1756 & Amoen. Acad. 4 : 299.
1759. *Rungia parviflora* (Retz.) Nees var. *pectinata* (L.) Clarke in Hook. f.
Fl. Brit. India 4 : 550. 1885 ; Duthie, Fl. Gangetic Plain 2 : 212. 1911.
R. parviflora (Retz.) Nees var. *muralis* Clarke in Hook. f. l.c. 4 : 550. 1885.

Much - branched, procumbent annuals. Leaves 3 - 12 × 1 - 5 cm,
elliptic lanceolate, serrulate, acuminate. Flowers in terminal and
axillary, dense, 1 sided spikes, blue. Sterile and fertile bracts dissimilar,
scarious margined. Bracteoles oblong. Upper lip of corolla acute.
Capsules ovoid, 4 seeded. Seeds compressed, orbicular, yellow.

Fl. & Fr. : October May.

Commonly found in moist and shady habitats in the forests, waste
lands, among grassy localities.

Selected specimens : Banswara : Kotharia forest, *Singh* 3759 (BSJO) ;
Kota : Shahabad, *Nautiyal & Raizada* 25374, 25352 (DD) ; Sirohi : Mt.
Abu, *Jain* 62108 (BSI) ; Udaipur : *Majumdar* 12500 (BSA).

5. *Rungia repens* (L.) Nees in Wall. Pl. Asiat. Rar. 3 : 110. 1832 ;
Wight, Ic. 2 (2) : 4. t. 465. 1841 ; Clarke in Hook. f. Fl. Brit. India 4 :
549. 1885 ; Duthie, Fl. Gangetic Plain 2 : 211. 1911 ; Santapau in Univ.
Bombay Bot. Mem. 2 : 78. 1951. *Justicia repens* L. Sp. Pl. 15. 1753.
'*Kharmar*' (Hindi).

Decumbent, glabrous herbs. Leaves upto 5 × 2 cm, elliptic -
lanceolate or oblong - lanceolate, acute or obtuse, tapering at the base,
subentire. Flowers in erect terminal spikes, white or pinkish - purple.
Bracts 4 merous, foliaceous, pubescent, with scarious and ciliate
margins ; bracteoles lanceolate, ciliate, acuminate. Calyx 5 - lobed ; lobes
lanceolate, acute, ciliate. Corolla - throat with dark purple markings.
Filaments minutely hairy. Capsules c. 5.5 mm long, pubescent, brown.
Seeds c. 0.75 mm across, suborbicular, compressed, concentrically tuber-
culate, pale brownish.

Fl. & Fr. : July - November.

Common weed in fallow and cultivated fields throughout the state.

Selected specimens : Banswara : Danpur, *Singh* 2986 (BSJO) ; Bharatpur : Kalyanpur, *Parmar* 8676 (BSJO) ; Bhilwara : Ganthila, *Singh* 6565 (BSJO) ; Kota : *Majumdar* 10476 (BSA) ; Pali : Sarandana, *Shetty* 1803 A (BSJO) ; Sawaimadhopur : *Verma* 1931 (BSA).

29. STROBILANTHES Blume

Strobilanthes hallbergii Blatter in Journ. & Proc. Asiat. Soc. Bengal (n.s.) 26 (1) : 345. 1930.

Shrubs, upto 3 m high. Leaves upto 2.5 cm long, ovate - elliptic, acuminate, with dentate - ciliate margins. Flowers in spikes, purple. Bracts 2, opposite, ovate, obtuse, entire. Calyx 5 - partite ; lobes linear, entire, appressedly hairy. Corolla bearded at the throat with yellow hairs. Stamens 4 ; longer filaments bearded. Capsules c. 1.5 × 0.75 cm, compressed, 2 - seeded. Seeds c. 0.75 × 0.5 cm, flattened, rectangular, glabrous.

Fl. & Fr. : October - March.

Rare ; endemic to Mt. Abu.

Selected specimen : Sirohi : Mt. Abu - behind the low ridge N.E. of Usrat valley, *Hallberg & Blatter* 22675 (BLAT, Type).

30. THUNBERGIA Retz. *nom. cons.*

- | | | |
|--|-----|--------------------------|
| 1a. Erect shrubs, neither climbing nor twining. | ... | 2. <i>T. erecta</i> |
| 1b. Climbers or twiners : | | |
| 2a. Flowers axillary, solitary or in pairs, pedicelled. Calyx 10 to 16 - toothed : | | |
| 3a. Petioles not winged. Flowers white. | ... | 4. <i>T. laevis</i> |
| 3b. Petioles winged. Flowers yellow. | ... | 1. <i>T. alata</i> |
| 2b. Flowers in racemes. Calyx an entire or crenulate ring. | ... | 3. <i>T. grandiflora</i> |

1. *Thunbergia alata* Boj. ex Sims in Curtis, Bot. Mag. t. 2591. 1825 ; Clarke in Hook. f. Fl. Brit. India 4 : 391. 1884 ; Duthie, Fl. Gangetic Plain 2 : 179. 1911 ; Santapau in Univ. Bombay Bot. Mem. 2 : 10. 1951.

Climbers. Leaves upto 8.5×6.5 cm, ovate, cordate or hastate, softly villous, subentire, mucronate; petioles winged. Flowers solitary or paired, axillary, yellow or whitish with purple spots. Bracts leafy, folded in the middle like wings. Calyx - lobes upto 16, subulate, ciliate. Stamens 4; anthers bearded, unequal. Capsules c. 7.5 mm across, depressed-globose, pubescent, beaked. Seeds c. 3.5 mm across, wrinkled.

Fl & Fr. : January - December.

Mostly cultivated in the gardens; often runs wild along the streams in the forests.

Selected specimens : Chittorgarh : *Majumdar* 11636 (BSA). Also reported by Puri *et al.* (1964) from Jodhpur.

2. *Thunbergia erecta* (Benth.) T. Anders. in Journ. Linn. Soc. Bot. 7 : 18. 1864; Santapau in Univ. Bombay Bot. Mem. 2 : 10. 1951; Bor & Raizada, Beaut. Ind. Climbers 107. 1954. *Meyenia erecta* Benth. in Hook. Niger Fl. 476. 1849.

Erect shrubs. Leaves $2 \frac{7}{2} \times 2 \frac{3}{3}$ cm, variable, elliptic obovate to rhomboid, acute, rounded at the base, entire. Flowers mostly solitary, axillary, white or purple. Bracteoles soon deciduous. Calyx teeth 12-15, subulate, glandular hairy. Corolla - lobes 5, subequal, obtuse. Stamens 4; filaments glandular - hairy; anthers bearded.

Fl. & Fr. : Almost throughout the year.

Native of tropical America; mostly cultivated in the gardens, bungalows and often runs wild in the forests.

Selected specimens : Kota : Bara bag, Singh 90862 (LWG); Udaipur : Gulab bag, *Majumdar* 10374, 11649 (BSA).

3. *Thunbergia grandiflora* (Roxb. ex Rottl.) Roxb. in Lodd. Bot. Cab. t. 324. 1819 & Fl. Ind. 3 : 34. 1832; Wight, Ic. 3 (2) : 6. t. 872. 1843-45; Clarke in Hook. f. Fl. Brit. India 4 : 392. 1884; Duthie, Fl. Gangetic Plain 2 : 179. 1911; Santapau in Univ. Bombay Bot. Mem. 2 : 9. 1951. *Flemingia grandiflora* Roxb. ex Rottl. in Ges. Naturf. Fr. Neue Schr. 4 : 202. 1803.

Extensive, woody climbers or twiners. Leaves $5-8 \times 3-5$ cm, deltoid or ovate-lanceolate, acute to acuminate, subcordate at the base, margins crenate-serrate. Flowers usually in terminal racemes, rarely solitary, blue, purple or lilac. Calyx reduced to a velvety rim. Corolla lobes subequal. Stamens 4; filaments flattened; one lobe of anthers spurred. Capsules glabrous, brown.

Fl. & Fr. : Throught the year.

Mostly grown in the gardens ; sometimes runs wild. Reported from N.W. Rajasthan by Sankhala (1951).

4. *Thunbergia laevis* Nees in Wall. Pl. Asiat. Rar. 3 : 77. 1832 & in DC. Prodr. 11 : 56. 1847 ; Bremek. in Verh. K. Nederl. Acad. Wet. 50 (4) : 51. 1955. *T. fragrans* Roxb. var. *laevis* (Nees) Clarke in Hook. f. Fl. Brit. India 4 : 391. 1884. *T. fragrans auct. plur. non Roxb.* 1796 ; Duthie, Fl. Gangetic Plain 2 : 179. 1911.

Climbing herbs ; stem dilated at nodes. Leaves 3 5 × 1 3 cm, triangular ovate to ovate lanceolate, acute, entire or undulate, rounded or cordate - hastate at base. Flowers axillary, solitary or more, pediceiled, white. Bracts foliaceous ; bracteoles oblong - lanceolate, acute. Calyx teeth 12 15, acute. Capsules upto 2.5 cm long, grey - puberulous. Seeds 4, rugose, hemispheric, excavated on plane face.

Fl. & Fr. : November - March.

Grown along the walls and trellis ; occasionally found among hedges in wild state.

Selected specimen : Bundi : Singh 74722 (LWG).

DOUBTFUL TAXA

Justicia caloneura Kurz in J. Asiat. Soc. Bengal 2 : 96. 1873 ; Clarke in Hook. f. Fl. Brit. India 4 : 529. 1885.

Perennial herbs. Leaves elliptic, acute, pubescent. Spikes terminal, dense. Bracts 4 ranked, striate, green, black tipped, ciliate. Bracteoles exceeding the calyx. Corolla straw - coloured, hairy. Anther - cells white - tailed.

Sarup reported this taxon from Jodhpur (*see Puri et al.* in Rec. Bot. Surv. India 19 : 106. 1964). No specimen of this taxon is traceable in any of the Indian herbaria. Clarke (*l. c.*) also included the species on the authority of Kurz (1873). Occurrence of this species is doubtful in Rajasthan.

Justicia heterocarpoides Blatter in Journ. & Proc. Asiat. Soc. Bengal n.s. 26 (1) : 344. 1931.

Straggling herbs. Petioles grooved ventrally. Flowers in sessile, axillary clusters. Bracts absent ; bracteoles 2, subulate. Calyx 5 - lobed. Corolla pink, pubescent outside. Stamens 2 ; anther - cells spirally twisted. Fruits dimorphic. Seeds tuberculate.

Blatter reported this taxon from Mt. Abu. The type specimen *Blatter & Hallberg 258857* (BLAT) and *Mehta 31* (JAC) are not traceable in respective herbaria. The species finds close affinity with *J. heterocarpa* T. Anders. and the authors could not distinguish the two by any character. Therefore, before reducing this taxon under the synonymy of *J. heterocarpa* T. Anders., this taxon is tentatively being dealt under doubtful.

Justicia diffusa Willd. var. *orbiculata* Clarke in Hook. f. Fl. Brit. India 4 : 538. 1885.

Undershrubs, with spreading dichotomous branches. Leaves petioled, ovate, hairy beneath. Capsules glabrous. Seeds with lines of papillae.

The present area, however, comes within the range of distribution of this taxon. Since no specimen is available from Rajasthan, the species is dealt under doubtful.

Lepidagathis simplex T. Anders. in Journ. Linn. Soc. 9 : 497. 1867 ; Clarke in Hook. f. Fl. Brit. India 4 : 520. 1885 ; Puri *et al.* in Rec. Bot. Surv. India 19 : 105. 1964.

Erect herbs. Leaves sessile, oblong, obtuse, entire. Spikes sessile, solitary, terminal, 1 sided. Calyx 5 partite. Capsules 4 seeded. Seeds densely hairy.

Sarup recorded this taxon from Jaisalmer (*see Puri et al. l. c.*). No specimen is available in any of the Indian herbaria. The taxon finds distribution in Tenasserim.

CULTIVATED SPECIES

Pachystachys coccinea Nees (*Justicia coccinea* Aubl., *Jacobinia coccinea* Hiern.) — Large, glabrous shrubs, with scarlet flowers in dense terminal heads. Staminodes are represented by 2 hairy elevations on the corolla - tube. Cultivated in the gardens for ornamental purposes. Native of Brazil.

Psenderanthus atropurpureum Bailey Glabrous shrubs. Leaves broadly ovate, usually marked with wine - red. Flowers white with rose - purple centre and spots or purplish. Cultivated in the gardens for ornamental purposes.

Rhinacanthus nasutus (L.) Kurz (*Justicia nasuta* L., *Rhinacanthus communis* Nees) - Shrubs, with oblong or ovate oblong leaves. Panicles large, spreading, terminal and lateral. Flowers often clustered. Calyx

densely pubescent. Corolla white with purple mottling. Capsules pubescent. Cultivated ornamentally in the gardens.

100. VERBENACEAE

(R.P. Pandey)

- 1a. Leaves digitately 3 to 7 - foliolate. ... 10. *Vitex*
- 1b. Leaves simple :
 - 2a. Flowers in spikes. Bracts conspicuous in fruits :
 - 3a. Spikes elongate. Calyx tubular, ribbed. Ovary 4 - celled, 1 - ovuled in each locule ; stigma terminal. Fruits schizocarpic, dry, with four, 1 - seeded locules. ... 9. *Verbena*
 - 3b. Spikes condensed. Calyx cupular or truncate, not ribbed. Ovary 1 to 2 - celled, 1 to 2 - ovuled ; stigma lateral. Fruits dry or fleshy, with two, 1 to 2 - seeded pyrenes :
 - 4a. Shrubs. Calyx truncate ; lobes obscure. Fruits of fleshy, succulent pyrenes, 2 - loculed, 2 - seeded. ... 6. *Lantana*
 - 4b. Herbs. Calyx cupular ; lobes distinct. Fruits of dry pyrenes, 1 - loculed, 1 - seeded :
 - 5a. Prostrate herbs, rooting at nodes. Hairs medifixed. Flowers very small, in compact, spicate heads. ... 7. *Phyla*
 - 5b. Erect herbs, with woody root - stock, not rooting at the nodes. Hairs simple. Flowers conspicuous, in elongated spikes. ... 1. *Chascanum*
 - 2b. Flowers in racemes or cymes. Bracts either absent or inconspicuous in fruits :
 - 6a. Corolla regular ; lobes 4 - 8. Stamens all equal, as many as corolla - lobes. ... 8. *Tectona*
 - 6b. Corolla irregular, bilabiate ; lobes mostly 5. Stamens unequal, didynamous :
 - 7a. Inflorescence cymose. Stamens exerted, inserted well below the tube. ... 2. *Clerodendrum*
 - 7b. Inflorescence racemose. Stamens mostly included, inserted near the middle of the tube :

- 8a. Corolla - tube long, inflated, infundibuliform ; lobes distinctly 2 - lipped. ... 4. *Gmelina*
- 8b. Corolla - tube short, cylindrical ; lobes obscurely 2 - lipped :
- 9a. Straggling shrubs. Calyx petaloid, saucer - shaped in fruit. ... 5. *Holmskioldia*
- 9b. Erect shrubs or trees. Calyx sepaloid, tubular or cupular in fruit. ... 3. *Duranta*

1. CHASCANUM E. Mey.

Chascanum marrubifolium Fenzl ex Walp. Repert. 4 : 38. 1845 ; Gillett in Kew Bull. 10 : 133. 1955 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 212. 1976. *Rouchea marrubifolia* (Fenzl ex Walp.) Schauer in DC. Prodr. 11 : 558. 1847 ; Wight, Ic. 4 (3) : 10. t. 1461. 1849 ; Clarke in Hook. f. Fl. Brit. India 4 : 564. 1885. 'Bai' (Hindi).

Much - branched, pubescent, perennial herbs, with woody root stock. Leaves 1.5 - 3.5 × 0.75 - 2.25 cm, broadly ovate to suborbicular or elliptic, coarsely dentate, obtuse, pubescent on both surfaces, distinctly nerved. Flowers white or cream - coloured, in long, terminal, bracteate spikes. Fruits 2.5 - 4.0 mm long, with two, 1 seeded, oblong, smooth, glabrous pyrenes truncate at the top and enclosed in calyx tube.

Fl. & Fr. : September - December.

Common in western Rajasthan, particularly in open, gravelly plains.

Selected specimens : Ajmer : Beawar, *Sharma* 1849 (LWG) ; Bikaner : Gajner, *Roy* 2085 (BSJO) ; Barmer : *Tiwari* 974 (BSJO) ; Jaisalmer : Devikot, *Shetty* 3355 (BSJO) ; Jodhpur : Phalodi, *Singh* 4372 (BSJO) ; Nagaur : Rupasar, *H. Lal* 34970 (LWG).

2. CLERODENDRUM L.

- 1a. Plants armed. ... 1. *C. aculeatum*
- 1b. Plants unarmed :
- 2a. Stem fistular. Leaves verticillate, sessile. Corolla - tube upto 1 cm long. ... 2. *C. indicum*
- 2b. Stem solid. Leaves opposite, petiolate. Corolla - tube more than 2 cm long. ... 3. *C. phlomidis*

1. *Clerodendrum aculeatum* (L.) Griseb. Fl. Brit. W. Ind. 500. 1864 ; Clarke in Hook. f. Fl. Brit. India 4 : 589. 1885 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 212. 1976. *Volkameria aculeata* L. Sp. Pl. 637. 1753.

Erect, armed shrubs, 1-4 m tall ; older branches having conical remnants of petioles. Leaves 1.5 × 1.2 cm, elliptic, oblong elliptic or ovate, acute, entire, glabrous, petiolate. Flowers white, in few-flowered, lax, axillary cymes. Corolla-lobes 1.25-1.75 cm long. Stamens exserted. Drupes c. 1 cm long, obovoid, yellowish green, breaking into 2 pyrenes at maturity.

Fl. : August - November ; *Fr.* : April - May.

Native of West Indies ; not only planted in gardens and bungalows, but also found in rocky habitats in semi-naturalized state.

Selected specimens : Churu : Sardar Shahar, Roy 2606 (BSJO) ; Ganganagar : Roy 5015 (BSJO) ; Jodhpur : Nagadari lake Mandore, Tiwari 612 (BSJO).

2. *Clerodendrum indicum* (L.) Kuntze, Rev. Gen. Pl. 586. 1891 ; Mahesh. Fl. Delhi 284. 1963. *Siphonanthus indica* L. Sp. Pl. 109. 1753. *Clerodendrum siphonanthus* R. Br. in Ait. f. Hort. Kew, ed. 2. 4 : 65. 1812 ; Clarke in Hook. f. Fl. Brit. India 4 : 595. 1885 ; Duthie, Fl. Gangetic Plain 2 : 227. 1911.

Erect shrubs, c. 2 m tall. Leaves sessile, verticillate, 8-18 × 0.75-2.0 cm, narrowly lanceolate, acute, entire. Flowers white, in terminal, verticillately arranged long panicles. Corolla-tube 0.75-1.0 cm long. Drupes c. 1.5 × 1.0 cm, obovoid, blackish-brown, enclosed by enlarged red-coloured calyx.

Fl. & Fr. : July - March.

Naturalized in and around the gardens, probably an escape from cultivation.

Selected specimen : Kota : Singh 90117 (LWG).

3. *Clerodendrum phlomidis* L. f. Suppl. 292. 1781 ; Wight, Ic. 4(3) : t. 1473. 1849 ; Clarke in Hook. f. Fl. Brit. India 4 : 590. 1885 ; Duthie, Fl. Gangetic Plain 2 : 225. 1911. 'Arni' (Hindi).

Erect or rarely subscaudent shrubs, 1-3 m tall ; stems and branches whitish pubescent. Leaves petiolate, 1.8 × 1-6 cm, rhomboid-ovate, acute to acuminate, base truncate to acute, coarsely serrate or subentire, glabrescent, gland-punctate beneath. Flowers white or creamish, fragrant, in axillary and terminal panicles. Calyx lobes acuminate, with few,

sessile glands outside. Corolla-tube upto 3.5 cm long, much exerted; lobes 5, sub-equal, obtuse. Drupes 0.5 - 1.25 cm long, obovoid, 4-lobed, glabrous, blackish brown, with persistent calyx. Seeds 5 - 7 mm long, oblong, dirty white.

Fl. & Fr. : August - March.

Common in sandy to rocky wasteland habitats. Also grown as a hedge plant along the boundaries of cultivated fields.

Selected specimens : Ajmer : Todgarh, *Duthie* 4826 (DD) ; Banswara : Ghatol, *Majumdar* 10225 (BSA) ; Barmer : Piploon, *Pandey* 8037 (BSJO) ; Jaipur : Deosa, *Wadhwa* 8129 (BSA) ; Jhalawar : Dug, *Verma* 6701 (BSA) ; Jodhpur : Beriganga, *Singh* 190 (BSJO) ; Pali : Lalpur, *Pandey* 10307 (BSJO).

3. DURANTA L.

Duranta repens L. Sp. Pl. 637. 1753 ; Mold. in Ann. Missouri Bot. Gard. 60 : 90. 1973. *D. erecta* L. Sp. Pl. 637. 1753. *D. plumieri* Jacq. Select. Strip. Amer. Hist. 186. t. 176. f. 76. 1763 ; Cooke, Fl. Bombay 2 : 437. 1903.

Evergreen shrubs, about 2 m high. Leaves opposite or whorled, 5 - 7 × 2.0 - 3.5 cm, obovate, elliptic or oblong-lanceolate, serrate towards apex. Flowers c. 1.5 cm long, blue, lilac or white, in racemes. Berries c. 1 cm in diam., globose, yellow or orange when ripe, enclosed within the calyx. Seeds c. 8, compressed.

Fl. & Fr. : Throughout the year.

Native of S. America and West Indies ; naturalized in wastelands near habitations and in open scrub forests. Also cultivated as a hedge plant.

Selected specimens : Jodhpur : Balsamand, *Singh* 3789 (BSJO) ; Sirohi : Mt. Abu, *Kaul* 9516 (LWG) ; Udaipur : Dabok, *N. Lal* 107/ Bot. (LWG). Also reported from Ajmer (Sharma, 1958) and Jhunjhunu (Nair, 1956, 61).

4. GMELINA L.

Spineless deciduous trees. Leaves more than 7 cm long, ovate-cordate. Petioles more than 5 cm long. Flowers brownish yellow or yellow.

... 1. *G. arborea*

Armed, evergreen shrubs. Leaves less than 4.5 cm long, elliptic-ovate or obovate. Petioles less than 1.5 cm long. Flowers bright or golden yellow.

... 2. *G. asiatica*

1. *Gmelina arborea* Roxb. Pl. Cor. 3 : 42. t. 246. 1815 & Fl. Ind. 3 : 84. 1832 ; Wight, Ic. 4(3) : 12. t. 1470. 1849 ; Clarke in Hook. f. Fl. Brit. India 4 : 581. 1885 ; Duthie, Fl. Gangetic Plain 2 : 220. 1911.

Unarmed, deciduous trees, 7-15 m tall ; tender parts fulvous-tomentose; bark grey. Leaves 7-15×4-14 cm, broadly ovate, acuminate, subentire, base acute to truncate and 3 to 5-nerved, tomentose on both surfaces ; petioles 5-12 cm long. Flowers 2.5-3.5 cm long, yellow to yellowish-brown, in large terminal or axillary panicles. Calyx with 2-7 glands on the anterior part. Corolla-tube pinkish-red, densely pubescent outside, 2-lipped ; lobes obtuse. Drupes c. 2.75×1.75 cm, obovoid, yellowish-orange when ripe, with persistent calyx. Seeds oblong.

Fl. : March - May ; Fr. : July - August.

Common in rocky habitats, more particularly along the streams in wastelands and forests.

Selected specimens : Ajmer : Kaul 8470 (LWG) ; Alwar : Udainath, Parmar 9776 (BSJO) ; Banswara : Danpur forest block, Singh 4262 (BSJO) ; Chittorgarh : Pratapgarh, Verma 268 (BSA) ; Jaipur : Amer, Sharma Acc. No. 3722, 8596 (RUBL) ; Pali : Ghanerao R.F., Pandey 4650 (BSJO).

2. *Gmelina asiatica* L. Sp. Pl. 626. 1753 ; Wight, Illus. Ind. Bot. t. 174. 1850 ; Clarke in Hook. f. Fl. Brit. India 4 : 582. 1885 ; Duthie, Fl. Gangetic Plain 2 : 221. 1911 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 213. 1976. *G. parvifolia* Roxb. Pl. Cor. 2 : 32. t. 162. 1802.

Armed shrubs, 2-4 m tall ; spines upto 2.75 cm long, often bearing leaves. Leaves 1-4.5×1-3 cm, elliptic-ovate or obovate, obtuse or acute, base cuneate, entire or lobed, glabrous ; petioles upto 1.5 cm long. Flowers 3-4 cm long, bright or golden yellow, clustered in axillary or terminal racemes. Calyx campanulate, pubescent, with small glistening glands, 5-toothed. Corolla-lobes acute, with glistening glands. Drupes c. 2×2 cm, ovoid or obovoid, 2-seeded, mature ones yellow.

Fl. : July - August ; Fr. : February - April.

Native of America ; cultivated in the gardens for ornamental purposes ; rarely naturalized around the gardens in wastelands.

Selected specimen : Dungarpur : Majumdar and Mishra 10332 (BSA).

5. HOLMSKIOLDIA Retz.

Holmskioldia sanguinea Retz. Obs. Bot. 6 : 31. 1791 ; Clarke in Hook. f. Fl. Brit. India 4 : 596. 1885 ; Duthie, Fl. Gangetic Plain 2 : 228. 1911 ; Jafri & Ghafoor in Nasir & Ali, Fl. W. Pak. 77 : 35. f. 5. 1974. 'Kilhou' (Hindi).

Subscandent, large, evergreen shrubs, with pubescent, 4-angular branches. Leaves 3-10 × 1.5-5.5 cm, ovate or elliptic-ovate, entire or serrate, acuminate, glabrescent. Flowers scarlet, orange or yellow, in terminal or axillary cymes. Calyx petaloid. Corolla sub-bilabiate ; tube curved. Drupes 4-7 mm long, obovoid, 4-lobed, fleshy, enclosed within enlarged, petaloid calyx.

Fl. & Fr. : September - February.

Mostly grown in the gardens ; sometimes found as an escape.

Selected specimen : Udaipur : Gulab Bag, *Majumdar* 10376 (BSA).

6. LANTANA L.

Armed. Flowers multi-coloured, in condensed inflorescences. Bracts narrow, not ribbed. ... 1. *L. camara*

Unarmed. Flowers white, in elongated inflorescences. Bracts leafy, 3 to 7-ribbed. ... 2. *L. wightiana*

1. *Lantana camara* L. Sp. Pl. 627. 1753 ; Clarke in Hook. f. Fl. Brit. India 4 : 562. 1885 ; Duthie, Fl. Gangetic Plain 2 : 216. 1911. *L. aculeata* L. Sp. Pl. 627. 1753. *L. camara* L. var. *aculeata* (L.) Moldenke in *Torrey* 34 : 9. 1934.

Evergreen, rambling, prickly shrubs, 1.5 - 3.0 m high ; branches pubescent with hooked, minute prickles. Leaves 3.0 - 9.0 × 1.0 - 5.0 cm, thickly-coriaceous, ovate, ovate-oblong, acuminate or acute, cuneate or truncate, crenate-serrate, scabrid-rugose on the upper surface and densely to sparsely pubescent beneath, under surface often glandular. Flowers multi-coloured, orange-yellow, pink or red, in spikes. Drupes 3.0 - 5.25 mm across, globose, shining bluish-black when ripe, 2-seeded.

Fl. & Fr. : Almost throughout the year.

Native of tropical America ; naturalized on Aravalli hills, particularly along streams and valley as a most troublesome weed forming extensive thickets.

Selected specimens : Alwar : Malarwa, *Parmar* 9659 (BSJO) ; Bharatpur : Kunder, *Parmar* 8647 (BSJO) ; Banswara : Paloda, *Singh* 2802 (BSJO) ; Ganganagar : Sadhawali, *Roy* 5021 (BSJO) ; Pali : Ranakpur, *Pandey* 4140 (BSJO) ; Jaipur : Ramgarh, *Wadhwa* 8416 (BSA) ; Sirohi : Mt. Abu, *Raizada* 20597 (DD).

2. *Lantana wightiana* Wall. ex Gamble, Fl. Madras 2 : 761. 1087. 1924 ; Matthew, Illus. Fl. Tamil Nadu Carnatic t. 551. 1982. *L. indica* Roxb. var. *albiflora* Wight ex Clarke in Hook. f. Fl. Brit. India 4 : 562. 1885. *L. indica sensu* Duthie, Fl. Gangetic Plain 2 : 216. 1911, non Roxb. 1832.

Erect, unarmed, pubescent shrubs, 1.0-2.0 m tall ; stem and branches 4-angular. Leaves 2.5-10.0 × 1.0-6.75 cm, thick, chartaceous, elliptic-ovate, ovate lanceolate or oblong, base acute or rounded, apex acute or subacute, crenulate or crenate-serrate, scabrid and rugose above and densely glandular-pubescent beneath. Flowers white, mildly fragrant, axillary, pedunculate, in elongated spikes. Corolla-throat yellowish. Drupes 2.5-5.0 mm across, globose, dark, shining, violet or purple when ripe, with 2, 1-seeded pyrenes.

Fl. & Fr. : Almost throughout the year.

Found as forming clumps in mixed dry deciduous forests on Aravalli hills.

Selected specimens : Alwar : Sariska, *Parmar* 9639 (BSJO) ; Barmer : Kundal R.F., *Pandey* 8057 (BSJO) ; Banswara : Paloda village, *Singh* 2804 (BSJO) ; Tonk : Kachha Bundha, *Shetty* 1046 (BSJO) ; Jaipur : *Sharma* 73 (RUBL) ; Udaipur : *Kaul* 8587 (LWG).

7. PHYLA Lour.

Phyla nodiflora (L.) E. Greene in Pittonia 4 : 46. 1899. *Verbena nodiflora* L. Sp. Pl. 20. 1753. *Lippia nodiflora* (L.) A. Rich. in Michaux, Fl. Bor. Amer. 2 : 15. 1803 ; Wight, Ic. 4(3) : 11. t. 1463. 1849 ; Clarke in Hook. f. Fl. Brit. India 4 : 563. 1885 ; Duthie, Fl. Gangetic Plain 2 : 217. 1911. 'Jal Butii' (Hindi).

Prostrate, perennial herbs, rooting at nodes. Leaves fleshy, 0.5-2.75 × 0.25-1.75 cm, obovate spatulate or oblanceolate, upper half serrate-dentate, lower half entire, narrowed, pubescent or glabrescent. Flowers pale pink, purple or white, in elongated, solitary, bracteate, pedunculate spikes. Calyx and corolla 2-lipped. Stamens 4, didynamous. Fruits c. 1 mm across, enclosed within the persistent calyx, separating at maturity into two, 1-seeded pyrenes ; each pyrene c. 1.25 mm long, plano-convex, pale brown.

Fl. & Fr. : Almost throughout the year.

Abundant in moist and marshy habitats.

Selected specimens : Ajmer : *Lourie* 4820 (DD) ; Alwar : Bhangarh, *Parmar* 9789 (BSJO) ; Barmer : Luni river near Gandhav, *Shetty* 2348 (BSJO) ; Bharatpur : Dig. *Parmar* 8555 (BSJO) ; Bhilwara : Badwov, *Singh* 6468 (BSJO) ; Pali : Kolar tank side, *Pandey* 4635 (BSJO) ; Tonk : Tordi Sagar, *Shetty* 581 (BSJO).

8. TECTONA L. f. *nom. cons.*

Tectona grandis L. f. *Suppl. Pl.* 151. 1781 ; *Beddome, Fl. Sylv. S. India t.* 250. 1872 ; *Clarke in Hook. f. Fl. Brit. India 4* : 570. 1885 ; *Duthie, Fl. Gangetic Plain 2* : 220. 1911. 'Sagwan' (Hindi).

Tall, deciduous trees ; tender parts densely pubescent with stellate hairs. Leaves 10 - 40 × 7 - 30 cm, broadly elliptic, subentire, acute or acuminate, base rounded to acute, glabrescent above, stellate-tomentose beneath. Flowers white or pinkish, in terminal, long cymes. Calyx 5 to 7-lobed, bladder-like. Corolla sub-rotate. Drupes 1.0 - 1.5 cm across, subglobose, stellately tomentose ; endocarp stony, 4-celled, enclosed in enlarged calyx. Seeds oblong, brown.

Fl. & Fr. : August - November.

Native of tropical S. Asia and Malaysia ; a chief component of deciduous forests, dominating in southern parts of the state. The plant is well reputed for its highly valued timber.

Selected specimens : Ajmer : *Lourie* 4822 (DD) ; Banswara : Wadita Hillage forest, *Singh* 2891 (BSJO) ; Chittorgarh : Bansi, *Majumdar* 12278 (BSA) ; Jhalawar : Kapildhara, *Verma* 772 (BSA) ; Kota : Atru, *Singh* 90199 (LWG).

9. VERBENA L.

Leaves lyrate-pinnatifid, base narrowed. Spikes lax and elongating in the fruits. Corolla-tube less than 6 mm long. Anther-connectives appendaged. ... 2. *V. officinalis*

Leaves not lyrate-pinnatifid, base semiamplexicaul. Spikes dense, paniculately corymbose. Corolla-tube more than 6.5 mm long. Anthers not appendaged. ... 1. *V. bonariensis*

1. *Verbena bonariensis* L. Sp. Pl. 20. 1753 ; Clarke in Hook. f. Fl. Brit. India 4 : 565. 1885 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 215. 1976.

Erect, scabrous, perennial herbs, upto 1 m high ; stem and branches 4-angular. Leaves 3-8 × 0.3-1.5 cm, oblong-lanceolate, acute, sub-amplexicaul at the base, serrate. Flowers violet or pale purple, in terminal, compact spikes. Calyx-lobes 5, subulate, pubescent. Corolla-lobes 5, emarginate. Fruits separating into 4 pyrenes, enclosed in the calyx.

Fl. & Fr. : April - June.

Native of S. America ; found as a weed along irrigation channels and elsewhere.

Selected specimen : Ajmer : *Lourie* 4821 (DD). Also reported by Dhillon & Bajwa (1969) from Ganganagar.

2. *Verbena officinalis* L. Sp. Pl. 20. 1753 ; Clarke in Hook. f. Fl. Brit. India 4 : 565. 1885 ; Duthie, Fl. Gangetic Plain 2 : 218. 1911 ; Jafri & Ghafoor in Nasir & Ali, Fl. W. Pak. 77 : 4. f. 1 A-B 1974.

Erect, perennial herbs or undershrubs, with root-stock woody and 4-angular branches. Leaves 2.5-7.5 × 1.5-3.0 cm, oblong-lanceolate to oblong, narrowed at base, lyrate-pinnatifid to subentire ; upper leaves sessile. Flowers pale pink to purplish, in terminal spikes. Calyx 5-toothed, ribbed, pubescent. Corolla 5-lobed, hairy. Anthers mostly 4, appendaged. Fruits of four, 1-seeded pyrenes.

Fl. & Fr. : July - February.

Found near water courses and as a weed in cultivated fields.

Selected specimen : Ganganagar : Netwali, *Roy* 4993 (BSJO).

10. VITEX L.

Leaflets 3-5. Flowers not fragrant. Cymes peduncled. ... 2. *V. negundo*

Leaflets 5-7. Flowers fragrant. Cymes sessile or subsessile. ... 1. *V. agnus-castus*

1. *Vitex agnus-castus* L. Sp. Pl. 638. 1753 ; Jafri & Ghafoor in Nasir & Ali, Fl. W. Pak. 77 : 25. f. 6 A-B. 1974 ; Parmar in J. Econ. Tax. Bot. 4 : 1039. f. 1-5. 1983.

Tall shrubs or small trees ; tender parts whitish-tomentose. Leaves 5 to 7-foliolate ; leaflets petiolulate, 3.5-9.5 × 1.0-2.5 cm, two basal-

lowest leaflets much shorter than the others, lanceolate, rarely obovate, acuminate, acute or rarely retuse, margins subentire, whitish-tomentose beneath. Flowers light blue or purplish-pink, in compact, terminal cymes. Drupes 2.0-2.75 mm across, 4-celled, with one seed in each cell, enclosed in calyx.

Fl. & Fr. : January-December.

A native of E. Mediterranean region ; commonly planted in the orchards, gardens etc. ; rarely escapes.

Selected specimens : Ganganagar : Rai Singh nagar, Roy 3861, 4967 (BSJO).

2. *Vitex negundo* L. Sp. Pl. 638. 1753 : Wight, Ic. 2(3) : 1. t. 519. 1842 ; Clarke in Hook. f. Fl. Brit. India 4 : 583. 1885 ; Duthie, Fl. Gangetic Plain 2 : 224. 1911. 'Nirgundi' (Hindi).

Evergreen shrubs, c. 3-5 m tall ; tender parts whitish-grey, pubescent. Leaves 3 to 5-foliolate ; leaflets subsessile to petiolulate, 4-15 × 0.5-3.5 cm, lanceolate to oblanceolate, terminal one is the largest, acuminate, tapering at the base, subentire, glabrous above and whitish-grey tomentose beneath, lateral nerves 12-16 pairs. Flowers violet or blue to pale violet, in terminal, long panicles. Drupes 3.5-4.25 × 2-3 mm, ovoid, 4-celled, each cell with one seed, enclosed by persistent calyx.

Fl. & Fr. : Almost throughout the year.

Very common along the streams and river beds throughout the Aravalli range. It is also grown in gardens, lawns, parks and bungalows for ornamental purposes.

Selected specimens : Alwar : Sariska R.F., Parmar 9541 (BSJO) ; Banswara : Ghatol city, Singh 2892 (BSJO) ; Bhilwara : Amarpura, Singh 6235 (BSJO) ; Jodhpur : Mandor garden, Singh 3599 (BSJO) ; Pali : Desuri R.F., Pandey 4675 (BSJO) ; Tonk : Mayola forest-Bisalpara, Shetty 1081 (BSJO) ; Udaipur : Dabok, Gamawat 20/Bot. (BSA).

CULTIVATED SPECIES

Callicarpa macrophylla Vahl Evergreen shrubs. Leaves opposite, ovate-lanceolate to oblong-lanceolate, acuminate, densely woolly-tomentose beneath. Flowers pink, reddish or rosy, in dense, axillary, dichotomous cymes. Mostly grown in the gardens, parks etc.

Cithraxylum subserratum Sw. - Shrubs or small trees, with quadrangular branches. Leaves elliptic-lanceolate or obovate, acute, margins

subserrate. Flowers fragrant, white, in pendulous racemes. Native of W. Indies ; mostly planted in the gardens.

Clerodendrum inerme (L.) Gaertn. (*Volkameria inermis* L.) Erect or subscandent shrubs. Leaves obovate, elliptic or elliptic-ovate, entire, glabrous. Flowers white, in axillary, trichotomous cymes. Native of the sea coasts of India and Sri Lanka ; mostly cultivated as a hedge plant in the gardens and bungalows.

Clerodendrum philippinum Schauer - Erect shrubs or undershrubs, with quadrangular and pubescent branches. Leaves broadly ovate, acute, irregularly dentate, pubescent and glandular at the base. Flowers fragrant, pinkish, in terminal, corymbose, compact cymes. Native of China ; mostly grown in the gardens. The plants often spread by root-suckers.

Clerodendrum serratum (L.) Moon (*Volkumeria serrata* L.) Erect shrubs. Leaves obovate-lanceolate, acute to acuminate, margins coarsely-serrate. Flowers violet to purplish-pink, in terminal panicles. Mostly planted in the gardens, bungalows etc.

Stachytarpheta jamaicensis (L.) Vahl (*Verbena jamaicensis* L.) Glabrescent undershrubs. Leaves obovate-elliptic, with decurrent base and serrate margins. Flowers blue to violet. Stamens 2. Pyrenes oblong. Mostly grown in the gardens, parks etc. for ornamental purposes.

Verbena bipinnatifida Nutt. ex Schauer Prostrate, hirsute, perennial herbs. Flowers lilac-purple, in dense heads. Mostly grown as an ornamental plant.

101. LAMIACEAE (LABIATAE *nom. alt.*)

(P.J. Parmar)

1a. Stamens erect or ascending :

2a. Corolla 4-lobed, not 2-lipped. Stamens 4, equal or subequal :

3a. Calyx 5-partite ; segments plumose, longer than the tube. Stamens included. ... 5. *Colebrookea*

3b. Calyx 5-toothed ; segments neither plumose nor longer than the tube. Stamens exerted. ... 14. *Pogostemon*

2b. Corolla 2-lipped. Stamens 2, if 4, then didynamous :

4a. Perfect stamens 2. ... 15. *Salvia*

- 4b. Perfect stamens 4, didynamous :
- 5a. Calyx 5 to 10-nerved, Lower pair of stamens longer :
- 6a. Calyx-limb 5-lobed ; lobes acuminate at the apex ; mouth uniformly level. Upper lip of corolla nearly flat. ... 3. *Anisometes*
- 6b. Calyx-limb 8 to 10-toothed ; lobes aristate or spinescent at the apex ; mouth generally oblique. Upper lip of corolla hooded :
- 7a. Calyx-tube dotted with sessile glands outside. Lower lip of corolla shorter than the upper. Filaments villous at the base. ... 8. *Leonotis*
- 7b. Calyx-tube eglandular. Lower lip of corolla longer than the upper. Filaments glabrous or finely pubescent at the base. ... 9. *Leucas*
- 5b. Calyx 15-nerved. Upper pair of stamens longer. ... 10. *Nepeta*
- 1b. Stamens declinate :
- 8a. Lower lip of corolla 3-lobed. Basal scar of nutlets placed obliquely. ... 7. *Lavandula*
- 8b. Lower lip of corolla 1-lobed. Basal scar of nutlets basilar :
- 9a. Lower lip of corolla deflexed, concave or boat-shaped :
- 10a. Corolla 5-lobed, lowest lobe shorter or equalling the other lobes, abruptly deflexed, saccate, contracted at the base. ... 6. *Hyptis*
- 10b. Corolla distinctly 2-lipped ; lower lip longer than the upper, concave or boat-shaped :
- 11a. Calyx accrescent in fruit ; tube 10-nerved ; upper lip 3-toothed, not concealing the mouth of the calyx in fruit. ... 13. *Plectranthus*
- 11b. Calyx not enlarged in fruit ; tube not distinctly ribbed ; upper lip of the calyx entire, concealing the mouth of the calyx in fruit. ... 2. *Anisochilus*
- 9b. Lower lip of corolla declinate, flat or nearly so :
- 12a. Fruiting calyx deflexed ; upper lobe recurved ; the margins decurrent on the tube :

- 13a. Corolla-tube exceeding the calyx.
Stamens included. Stigma entire. ... 12. *Orthosiphon*
- 13b. Corolla - tube not exceeding the calyx.
Stamens exerted. Stigma 2-fid. ... 11. *Ocimum*
- 12b. Fruiting calyx sub-erect or declinate, not recurved ; margins not decurrent on the tube :
- 14a. Flowers in globose or cylindric heads. ... 1. *Acrocephalus*
- 14b. Flowers in racemes. ... 4. *Basilicum*

1. ACROCEPHALUS Benth.

Acrocephalus hispidus (L.) Nicolson & Sadasivan in Taxon 29 : 324. 1980. *Gomphrena hispida* L. Sp. Pl. ed. 2. 1 : 326. 1762. *Brunella indica* Burm. f. Fl. Ind. 130. 1768, "Prunella". *Ocimum capitatum* Roth, Nov. Pl. Sp. 276. 1881. *Acrocephalus capitatus* (Roth) Benth. in Edward's Bot. Reg. 15 : 1300. sub. t. 1282. 1829 ; Hook. f. Fl. Brit. India 4 : 611. 1885 ; Duthie, Fl. Gangetic Plain 2 : 237. 1911. *A. indicus* (Burm. f.) O. Kuntze, Rev. Gen. 2 : 511. 1891.

Annual herbs ; stem simple or branching from the base, obtusely quadrangular. Leaves opposite or whorled, 1.5 - 3.5 × 0.5 - 1.5 cm, ovate or lanceolate, subacute, coarsely serrate, glabrous, base tapering into a petiole. Flower-whorls close, in terminal, globose or cylindric, bracteate heads, pale purple. Bracts shorter than the fruiting calyx. Nutlets oblong - ellipsoid, compressed, smooth, brownish-black.

Fl. & Fr. : September - January.

Rare, on hills in north-east of the Aravalli.

Selected specimen : Sawaimadhopur : Bondal, Verma 1917 (CAL.).

2. ANISOCHILUS Wall. ex Benth.

- Calyx glabrous or pubescent. ... 1. *A. carnosus* var. *carnosus*
- Calyx villous and glandular. ... 2. *A. carnosus* var. *eriocephalus*

1. *Anisochilus carnosus* (L. f.) Wall. ex Benth. in Wall. Pl. As. Rar. 2 : 18. 1831 ; Hook. f. Fl. Brit. India 4 : 627. 1885 ; Duthie, Fl. Gangetic Plain 2 : 240. 1911. *Lavandula carnosus* L. f. Suppl. 273. 1781. 'Panjiri' (Hindi).

VAR. *CARNOSUS*

Erect, annual herbs, 30-60 cm high, with stout, quadrangular stem often tinged with red. Leaves petiolate, 2.5-6.5 × 1.25-4.0 cm, broadly ovate, crenate, obtuse, glabrous or pubescent above, tomentose beneath. Flowers sessile, in dense, 1.5-3.5 cm long, cylindric spikes, pale purple. Bracts ovate, glandular pubescent, caducous. Style 2-fid. Nutlets sub-orbicular, compressed, smooth, brown.

Fl. & Fr. : September - January.

Common in the forests and wastelands, in moist rock-crevices.

Selected specimens : Alwar : Kankwari forest, *Parmar* 9434 (BSJO) ; Bhilwara : On the way to Bijalia, *Singh* 6068 (BSJO) ; Jaipur : Ramgarh, *Sharma* 180 (RUBL) ; Kota : Darah, *Singh* 83829 (LWG) ; Tonk : Toda Rai Singh R.F., *Shetty* 1306 (BSJO) ; Sirohi : Mt. Abu, *Rao* 66677 (BSI).

2. var. *eriocephalus* (Benth.) Cooke, *Fl. Bombay* 2 : 450. 1906. *Anisochilus eriocephalus* Benth. in DC. *Prodr.* 12 : 81. 1847 ; Hook. f. *Fl. Brit. India* 4 : 627. 1885.

Very similar to var. *carnosus*, but can be distinguished by its more slender stem, more numerous heads and calyx being villous and glandular.

Fl. & Fr. : September - January.

Rare, in the dry deciduous forests, particularly in moist crevices of rocks.

Selected specimens : Alwar : Bala fort, *H Lal* 34421 (LWG) ; Sirohi : Mt. Abu, *Raizada* 20681, 20668 (DD).

3. *ANISOMELES* R. Br.

Stem and branches acutely quadrangular. Leaves broadly ovate. ... 1. *A. indica*

Stem and branches terete or obtusely quadrangular. Leaves oblong, linear-oblong or oblong-lanceolate. ... 2. *A. malabarica*

1. *Anisomeles indica* (L.) O. Kuntze, *Rev. Gen. Pl.* 2 : 512. 1891 ; Raizada, *Suppl. Duthie, Fl. Gangetic Plain* 217. 1976. *Nepeta indica* L. *Sp. Pl.* 571. 1753. *Anisomeles ovata* R. Br. in Ait. *Hort. Kew.* ed. 2. 2 : 364. 1811 ; Wight, *Jc.* 3(2) : 5. t. 865. 1843-45 ; Hook. f. *Fl. Brit. India* 4 : 672. 1885 ; Duthie, *Fl. Gangetic Plain* 2 : 245. 1911.

Suffruticose herbs, upto 1.5 m high, sparingly hairy or densely pubescent. Leaves 3-15 × 2.5-10.0 cm, ovate, acute or obtuse to subacuminate, crenate-serrate, softly pubescent on both surfaces, rounded-cordate to cuneate at base. Flowers sessile or so, in dense axillary whorls, combined into terminal dense spikes, bluish-purple. Calyx 5 to 10-ribbed. Anther-cells of upper pair dimidiate and of lower pair transverse. Nutlets c. 3 mm long, broadly ovoid, with rounded ends, subcompressed, polished, nearly black.

Fl. & Fr. : August-December.

Fairly common in wastelands, open forests and neglected corners of gardens, particularly in the east of Aravalli.

Selected specimens : Ajmer : On Udaipur road, Kaul 8536 (LWG) ; Alwar : Kankwari forest block, Parmar 9431 (BSJO) ; Banswara : Near Lasora village, Singh 3613 (BSJO) ; Barmar : Haldeshwar - Mahadev Forest, Pandey 8003 (BSJO) ; Sirohi : Mt. Abu, Puri 56746 (BSI) ; Tonk : Toda Rai Singh R.F., Shetty 1301 (BSJO).

2. *Anisomeles malabarica* (L.) R. Br. ex Sims in Curtis, Bot. Mag. 46 : t. 2071. 1819 ; Wight, Ic. 3(2) : 5. t. 864. 1843-45 ; Hook. f. Fl. Brit. India 4 : 673. 1885 ; Cooke, Fl. Bombay 2 : 461. 1906. *Nepeta malabarica* L. Mant. Pl. Alt. 2 : 566. 1771.

Erect, densely tomentose or thickly woolly shrubs ; branches many from the base. Leaves 3.5-16.0 × 1.5-7.0 cm, acute or acuminate, rounded or cuneate at the base, crenate-serrate, softly woolly. Flowers in dense, axillary whorls, distant below, approximate above, passing into a more or less interrupted terminal spicate inflorescence, purple. Bracts filiform. Nutlets ellipsoid, compressed, polished, brown.

Fl. & Fr. : September-December.

Included on the Authority of Bajpai and Verma (1964) and Ramdeo (1969) who reported this from Jaipur and Udaipur respectively.

4. *BASILICUM* Moench

Basilicum polystachyum (L.) Moench, Suppl. Meth. Pl. 143. 1802 ; Keng in Gard. Bull. Singapore 24 : 39. 1969. *Ocimum polystachyum* L. Mant. Pl. Alt. 2 : 567. 1771. *Moschosma polystachyum* (L.) Benth. in Wall. Pl. As. Rar. 2 : 13. 1831 ; Hook. f. Fl. Brit. India 4 : 612. 1885 ; Cooke, Fl. Bombay 2 : 445. 1906.

Erect, annual, much-branched herbs ; branches sharply 4-angled, glabrous. Leaves 1.8-4.0 × 1.0-2.5 cm, broadly ovate, truncate to cuneate

at base, acuminate at apex, irregularly crenate-serrate, glabrous or nearly so. Flowers in closely placed numerous whorls of spicate racemes, bright purple. Nutlets broadly ellipsoid, compressed, dark brown.

Fl. & Fr. : October - December.

Included on the authority of Sarup (1951), who reported it from Jodhpur.

5. COLEBROOKEA Smith

Colebrookea oppositifolia Smith, Exot. Bot. 2 : 111. t. 115. 1805 ; Hook. f. Fl. Brit. India 4 : 642. 1885 ; Duthie, Fl. Gangetic Plain 2 : 243. 1911.

Erect, tomentose, much branched shrubs ; branches pale, sub-quadrangular, grooved, often whorled in threes. Leaves crowded towards the end of branches, opposite or verticillate in threes, 7-19 × 2.4-6.0 cm, oblong-lanceolate, acute at both ends, crenulate or serrulate, softly pubescent on both surfaces. Flower-whorls dense, in paniculate spikes, white. Anthers orbicular ; cells confluent. Nutlets usually solitary, oblong-ovoid, hairy at the tip.

Fl. & Fr. : December - May.

Rare, in the moist rocky habitats, in the east of Aravalli.

Selected specimen : Kota : Kunda Khoa (Shahabad), Wadhwa 9239 (BSA). Also reported from Alwar (Vyas, 1967) and from Udaipur (Vyas, 1965).

6. HYPTIS Jacq. *nom. cons.*

Hyptis suaveolens (L.) Poit. in Ann. Mus. Natl. Hist. Paris 7 : 472. t. 29. f. 2. 1806 ; Hook. f. Fl. Brit. India 4 : 630. 1885 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 220. 1976. *Ballota suaveolens* L. Syst. Nat. ed. 10. 1100. 1759.

Erect, much-branched, rigid annual herbs or undershrubs ; stem obtusely quadrangular, patently hirsute. Leaves 3.2-9.5 × 2.6-8.9 cm, broadly ovate to sub-orbicular, lower ones subcordate and upper ones acute at base, all obtusely acute, sparsely pilose above, densely so beneath, shallowly crenate-serrulate. Flowers in 2 to 5-flowered secund cymes, arranged racemosely towards the end of branches in the axils of small

leaves. Calyx strongly 10-ribbed. Nutlets oblong, compressed, with a central ridge on either face, pubescent, emarginate at the apex ; areole white.

Fl. & Fr. : Almost throughout the year.

Native of Tropical America ; imperfectly naturalized in dry open wastelands from plains to the foot of hills.

Selected specimens : Kota : Chambal dam, *Verma* 1843 (BSA) ; Atru, *Singh* 90313 (LWG).

7. LAVANDULA L.

Bracts awned.	1. <i>L. bipinnata</i> var. <i>rothiana</i>
Bracts awnless.	...	2. <i>L. gibsoni</i>

1. *Lavandula bipinnata* (Roth) O. Kuntze var. *rothiana* O. Kuntze, *Rev. Gen. Pl.* 2 : 521. 1891. *Lavandula multifida* Burm. f. *Fl. Ind.* 126. 1768, excl. t. 38, f. 1., non L. 1753. *L. burmanni* Benth. *Lab. Gen. et Sp.* 151. 1833 ; *Wight, Ic.* 4 (3) : 8. t. 1438. 1849 ; *Hook. f. Fl. Brit. India* 4 : 631. 1885 ; *Duthie, Fl. Gangetic Plain* 2 : 240. 1911.

Erect herbs, upto 1 m high ; stem simple or branched, finely pubescent. Leaves sessile or nearly so, 3 - 10 cm long, pinnatisect ; segments linear or linear - lanceolate, simple or cut. Flowers in simple or branched, axillary and terminal spikes, blue. Bracts 6 - 8 mm long, longer than calyx, broadly ovate at base, finely pubescent, produced into a long capillary awn at the apex. Nutlets oblong - ellipsoid, smooth, black.

Fl. & Fr. : October - February.

Common in rocky habitats, particularly along Aravalli.

Selected specimens : Ajmer : Todgarh, *Sharma* 1324 (LWG) ; Banswara : Jordha falls, *Kanodia* 75629 (BSI) ; Barmer : Haldeshwar Mahadev R.F., *Pandey* 7948 (BSJO) ; Chittorgarh : Bansi, *Majumdar* 12333 (BSA) ; Pali : Kalia Pahar, *Shetty* 1418 (BSJO) ; Sirohi : Mt. Abu, *Duthie* 6801 (DD).

2. *Lavandula gibsoni* Grah. *Cat. Bombay Pl.* 149. 1839 ; *Hook. f. Fl. Brit. India* 4 : 631. 1885. *L. perrattetil* Benth. in *DC. Prodr.* 12 : 147. 1848. *L. lawii* *Wight, Ic.* 4 (3) : 8. t. 1439. 1849.

Densely villous undershrubs, upto 1 m high. Lower leaves long petioled, upper almost sessile, 15 - 20 cm long, pinnatisect or pinnatifid,

with oblong, acute or obtuse lobes which are again toothed, villous on both sides. Spikes 3 - 10 cm long, softly villous. Bracts 5 - 7 × 5 - 7 mm, ovate, acuminate, ciliate, strongly nerved, persistent, covering flowers, not awned. Calyx tube ribbed, glandular and hispid; teeth equal, ciliate. Nutlets ellipsoid-oblong, with a white areole on the dorsal side.

Fl. & Fr. : December - May.

Rare, in the forests. Included on the authority of Raizada (1954) from Mt. Abu.

8. LEONOTIS R. Br.

Leonotis nepetiifolia (L.) R. Br. Prodr. 504. 1810 & in Ait. Hort. Kew. ed. 2. 3 : 409. 1811; Wight Ic. 3 (2) : 5. t. 867. 1845; Hook. f. Fl. Brit. India 4 : 691. 1885; Duthie, Fl. Gangetic Plain 2 : 253. 1911. *Phlomis nepetiifolia* L. Sp. Pl. 586. 1753.

Erect, annual herbs, upto 2 m high; stem stout, puberulous, bluntly quadrangular, deeply sulcate, the faces concave. Leaves 1.5 - 12.0 × 0.8 - 7.0 cm, ovate or ovate-lanceolate, finely pubescent, acute, coarsely crenate-serrate, rounded or cordate at the base. Flowers in globose, axillary whorls of 3 - 5 cm in diam., orange-red. Calyx teeth spine-tipped. Nutlets oblong-obovoid, trigonous, brown, obliquely truncate at the apex.

Fl. & Fr. : November - April.

Common in waste places, open forests, on the walls of old buildings etc., particularly in south-eastern parts of the state.

Selected specimens : Banswara : Anjuna village, Singh 3764 (BSJO); Bhilwara : Bijolia, Singh 6091 (BSJO); Chittorgarh : Bansi, Verma 1727 (BSA); Jhalawar : Kyarra, Verma 6785 (BSA); Kota : Kelwara, Singh 90830 (LWG).

9. LEUCAS R. Br.

1a. Calyx - tube bent; mouth oblique :

2a. Calyx - mouth produced on lower side. ... 13. *L. urticaefolia*

2b. Calyx - mouth produced on the upper side :

3a. Calyx - mouth glabrous or minutely pubescent within. ... 1. *L. aspera*

3b. Calyx - mouth villous within :

- 4a. Calyx - teeth very short, triangular :
- 5a. Leaves linear, entire. Bracts linear. Floral whorls less than 2.5 cm in diam. ... 14. *L. zeylanica*
- 5b. Leaves ovate, crenate - serrate. Bracts lanceolate. Floral whorls more than 2.5 cm in diam. ... 4. *L. cephalotes*
- 4b. Calyx - teeth long and slender :
- 6a. Stem densely tawny hispid. Calyx - teeth equal. Bracts lanceolate, foliaceous. ... 11. *L. nutans*
- 6b. Stem finely pubescent. Upper calyx - teeth very long. Bracts linear, spinous. ... 9. *L. martinicensis*
- 1b. Calyx - tube straight ; mouth never oblique :
- 7a. Floral whorls 6 to many - flowered :
- 8a. Leaves entire. Flowers in terminal whorls :
- 9a. Erect herbs. Corolla annulate within. ... 12. *L. stricta*
- 9b. Procumbent herbs. Corolla not annulate within. ... 8. *L. macrantha*
- 8b. Leaves crenate or serrate. Flowers in axillary whorls :
- 10a. Hairs on the stem and branches erect and spreading. ... 7. *L. lanata*
- 10b. Hairs on the stem and branches deflexed or plants almost glabrous :
- 11a. Suffruticose, erect herbs. Leaves obtuse at apex, rounded at base ; petioles very short. ... 10. *L. montana*
- 11b. Straggling, weak herbs. Leaves acute at apex, cuneate at base ; petioles upto 2.5 cm long :
- 12a. Pubescent or hoary tomentose herbs. ... 5. *L. flaccida* var. *flaccida*
- 12b. Almost glabrous herbs. ... 6. *L. flaccida* var. *scaberula*
- 7b. Floral whorls 1 to 4 - flowered :
- 13a. Softly pubescent herbs. Calyx - teeth one half to one - fourth the length of the tube. ... 2. *L. biflora* var. *biflora*

- 13b. Glabrous herbs. Calyx teeth small, less than one-fourth the length of the tube. ... 3. *L. biflora* var. *procumbens*

1. *Leucas aspera* (Willd.) Link, Enum. Pl. Hort. Berol. 2 : 113. 1822 ; Hook. f. Fl. Brit. India 4 : 690. 1885 ; Duthie, Fl. Gangetic Plain 2 : 250. 1911. *Phlomis aspera* Willd. Enum. Pl. Hort. Berol. 2 : 621. 1809.

Densely hairy, erect herbs. Leaves subsessile or shortly petiolate, 1.9 × 0.8-4.5 cm, linear-oblong or oblong lanceolate, obtuse at apex, tapering at base, entire or crenate, more or less hairy. Flowers sessile or so, in terminal and axillary whorls reaching c. 2.5 cm in diam., white. Bracts linear, acute, bristle-tipped. Nutlets oblong, smooth, brown.

Fl. & Fr. : Almost throughout the year.

Common from plains to hills throughout the state.

Selected specimens : Bikaner : Near Gharsisar tank, Roy 2151 (BSJO) ; Bundi : Kalakhet, Verma 1761 (BSA) ; Jaipur : Ajmer Road, Wadhwa 4854 (BSA) ; Sirohi : Pindara Arnu, Jain 47960 (BSI).

2. *Leucas biflora* (Vahl) R. Br. Prodr. 504. 1810 ; Wight, Ic. 3 (2) : 5. t. 866. 1843-45 ; Hook. f. Fl. Brit. India 4 : 683. 1885 ; Cooke, Fl. Bombay 2 : 469. 1906. *Phlomis biflora* Vahl, Symb. Bot. 3 : 77. 1794. *Nepeta indica* Burm. f. Fl. Ind. 126. 1768, non L. 1753.

var. biflora

Slender, procumbent, hairy herbs ; branches acutely 4-angular, pubescent with retrorse hairs. Leaves variable, 1.0-5.5 × 0.6-1.8 cm, ovate or elliptic-oblong, acute or obtuse, coarsely and distantly serrate, pubescent on both surfaces. Flowers in distant, axillary whorls, white. Bracts small, subulate. Calyx pubescent, reticulately veined. Nutlets oblong, trigonous, truncate, pale brown.

Fl. & Fr. : September-February.

Common on Aravalli range in the forests.

Selected specimens : Chittorgarh : Bansi, Verma 1778 (BSA) ; Oraindam, Verma 1692 (BSA) ; Kota : Chhabra, Singh 90945 (LWG) ; Papi stream, Wadhwa & Prasad 9333 (BSA) ; Sirohi : Pindra-Arnu, Jain 47994 (BSI) ; Udaipur : Majumdar & Mishra 10358 (BSA).

3. var. *procumbens* (Desf.) Gamble, Fl. Madras 1151. 1924. *Leucas procumbens* Desf. in Mem. Mus. Hist. Nat. Paris 11 : 7. t. 3. f. 2. 1824 ;

Hook. f. Fl. Brit. India 4 : 683. 1885 ; Duthie, Fl. Gangetic Plain 2 : 252. 1911.

Very similar to type variety, but can be distinguished by stem and branches being glabrous, usually narrower leaves, shorter calyx teeth and longer pedicels.

Fl. & Fr. : September - February.

Rare, in moist rock crevices on the Aravalli.

Selected specimens : Jhalawar : Aklera, Verma 7614 (BSA) ; Sirohi : Mt. Abu, Puri 56771 (BSI).

4. *Leucas cephalotes* (Koen. ex Roth) Spreng. Syst. Veg. 2 : 743. 1825 ; Wight, Ic. 2 (1) : 2. t. 337. 1840 ; Hook. f. Fl. Brit. India 4 : 689. 1885 ; Duthie, Fl. Gangetic Plain 2 : 251. 1911. *Phlomis cephalotes* Koen. ex Roth, Nov. Pl. Sp. 262. 1821. *Leucas capitata* Desf. in Mem. Mus. Hist. Nat. Paris 11 : 8. t. 4. 1824. 'Udapata' (Hindi).

Erect, annual, hispid herbs. Leaves 1.2 - 7.0 × 0.6 - 3.0 cm, ovate or ovate lanceolate, subacute, membranous, more or less pubescent, crenate serrate, base tapering. Flowers sessile, in dense, globose, terminal whorls of 3 - 5 cm in diam. Bracts imbricate, foliaceous, lanceolate, acute, awned, ciliate. Nutlets obovoid oblong, rounded at apex, smooth, brown.

Fl. & Fr. : August - February.

Common weed in wastelands and cultivated fields.

Selected specimens : Ajmer : Lowrie 4831 (DD) ; Alwar : Keraska forest block, Parmar 9574 (BSJO) ; Banswara : Dagia Bowji hills, Singh 2861 (BSJO) ; Barmer : Haldeshwar Mahadev, Pandey 7970 (BSJO) ; Ganganagar : Najeemgarh, Roy 5074 (BSJO) ; Sirohi : Malanghur, Jain 60479 (BSI).

5. *Leucas flaccida* R. Br. Prodr. 505. 1810 ; Hook. f. Fl. Brit. India 4 : 684. 1885 ; Keng. in van Steenis, Fl. Malesiana ser. 1. 8 : 340. 1978. *L. mollissima* Wall. ex Benth. in Wall. Pl. As. Rar. 1 : 62. 1830 ; Hook. f. l.c. 4 : 682. 1885 ; Duthie, Fl. Gangetic Plain 2 : 252. 1911.

var. flaccida

Annual herbs ; stem and branches slender, covered with soft appressed or long villous hairs. Leaves thick to membranous, 2 - 4 × 1.5 - 3.0 cm, lanceolate to broadly ovate, obtuse or acute, base rounded or cuncate, crenate - serrate, densely tomentose on both surfaces. Flowers

many, in axillary verticils, white or purple. Bracts linear, shorter than the calyx. Nutlets obovoid, subtruncate above, smooth.

Fl. & Fr. : August - March.

Rare, in thickets, grasslands, forest edges or sometimes on the hills.

Selected specimens : Alwar : Kankwari forest block, *Parmar* 7902 (BSJO) ; Bhilwara : Meja dam, *Singh* 6046 (BSJO).

6. var. *scaberula* (Hook. f.) Srinivasan in Henry *et al.* Fl. Tamil Nadu 2 : 176. 1987. *Leucas mollissima* Wall. ex Benth. var. *scaberula* Hook. f. Fl. Brit. India 4 : 682. 1885 ; Mukerjee in Rec. Bot. Surv. India 14 : 184. 1940.

Very similar to var. *flaccida*, but can be distinguished by its more glabrous habit and hispid calyx.

Fl. & Fr. : August - March.

Rare, on the forest edges and rarely on the hills, particularly in south - eastern parts of Rajasthan.

Selected specimen : Kota : Shahabad, *Nautiyal & Raizadu* 25376 (DD).

7. *Leucas lanata* Wall. ex Benth. in Wall. Pl. As. Rar. 1 : 61. 1830 ; Hook. f. Fl. Brit. India 4 : 681. 1885 ; Duthie, Fl. Gangetic Plain 2 : 252. 1911.

Softly woolly or subsilky, perennial herbs ; stem and branches bluntly 4 angled. Leaves thick, sessile or shortly petiolate, 2.5 - 6.5 × 1.25 - 3.0 cm, ovate, obtuse or acute, more or less deeply crenate, rugose, velvety, base rounded or cuneate. Flowers sessile, in many - flowered, axillary whorls. Bracts linear, densely hairy, ciliate. Nutlets oblong - obovoid, trigonous.

Fl. & Fr. : September - January.

Rare, on low Aravalli hills. Included on the authority of Vyas (1965, 1967), who reported it from Udaipur & Alwar districts respectively.

8. *Leucas macrantha* Blatt. & Hallb. in Journ. Ind. Bot. 2 : 47. 1921 ; Mukerjee in Rec. Bot. Surv. India 14(1) : 171. 1940.

Procumbent, hirsute herbs, woody at base. Leaves sessile or subsessile, c. 4 × 0.8 cm, lanceolate or linear - lanceolate, subacute, entire, cuneate at base. Flowers in terminal, continuous whorls. Bracteoles

acicular, equalling the calyx, hirsute. Calyx 10 ribbed, inflated in front, hirsute on the nerves. Corolla c. 2.2 cm long; upper lip densely white villous. Nutlets c. 3 mm long, ovoid, 3-quetrous, longitudinally rugose.

Fl. & Fr. : Post monsoon season.

Rare, in the forests in shady habitats. Included on the authority of Blatter & Hallberg (*l.c.*) from Mt. Abu.

9. *Leucas martinicensis* (Jacq.) R. Br. Prodr. 504. 1810; Hook. f. Fl. Brit. India 4 : 688. 1885; Raizada, Suppl. Duthie, Fl. Gangetic Plain 222. 1976. *Clinopodium martinicense* Jacq. Enum. Syst. Pl. 25. 1760 et Amer. Hist. t. 177. f. 75. 1763. *Phlomis martinicensis* (Jacq.) Sw. Prodr. 88. 1788.

Erect, annual, stout herbs; stem and branches obtusely 4-angled, hirsute. Leaves 5.0-8.5 × 2.0-4.5 cm, membranous, oblong or lanceolate-ovate, obtuse to acute at apex, cuneate or rounded at base, crenate serrate, hairy on both surfaces. Flowers sessile, in numerous axillary globose whorls, white. Bracts and calyx teeth spinescent. Nutlets obovoid-oblong, obliquely truncate at the apex, smooth, dark brown.

Fl. & Fr. : October-February.

Rare, on the top of hills; also found as a weed in cultivated fields.

Selected specimens : Ajmer : Taragarh, Sharma 1193 (DD, LWG); Pali : Pnout (along Desuri-Phulad Road), Pandey 1862 (BSJO).

10. *Leucas montana* (Roth) Spreng. Syst. Veg. 2 : 742. 1825; Hook. f. Fl. Brit. India 4 : 682. 1885; Cooke, Fl. Bombay 2 : 469. 1906; Mukerjee in Rec. Bot. Surv. India 14(1) : 182. 1940. *Phlomis montana* Roth, Nov. Pl. Sp. 263. 1821. *Leucas hamiltoniana* Wall. ex Benth. in Wall. Pl. As. Rar. 1 : 61. 1830.

Small, shrubby plants, with straggling branches covered densely with soft wool or tomentose with deflexed hairs. Leaves shortly petioled. 2.5-5.0 × 1.5-3.0 cm, ovate or slightly orbicular, obtuse at apex and rounded at base, crenate, silky above or sometimes almost glabrescent. Flowers in few to many flowered, axillary whorls, white. Nutlets trigonous, black.

Fl. & Fr. : January-April.

Rare, on the forest edges and low hills in north-east & south-eastern parts of the state.

Selected specimens : Alwar : Kankwari forest block, Parmar 9425 (BSJO); Bundi : Hindoli, Singh 74092 (LWG).

11. *Leucas nutans* (Roth) Spreng. Syst. Veg. 2 : 743. 1825 ; Hook. f. Fl. Brit. India 4 : 688. 1885 ; Duthie, Fl. Gangetic Plain 2 : 251. 1911. *Phlomis nutans* Roth, Nov. Pl. Sp. 263. 1821. 'Chatia' (Hindi).

Small, diffusely branched, annual herbs. Leaves sessile, or shortly petioled, 2.5-7.5 × 1.5-3.5 cm, membranous, ovate or oblong lanceolate, obtuse, serrate, hairy on both surfaces, base cuneate. Flowers sessile, in many flowered, axillary and terminal whorls, white. Bracts spine-tipped. Nutlets obovoid, trigonous, obliquely truncate at the apex, brown, smooth.

Fl. & Fr. : October - January.

Common in gravelly places among small grasses and in dry exposed habitats in the forests.

Selected specimens : Bhilwara : Gunthila village, Singh 6548 (BSJO) ; Chittorgarh : Oriá dam, Verma 1678 (BSA) ; Jhalawar : Sarhod, Wadhwa 7699 (BSA) ; Jodhpur : Balarwa, Blatter 10406 (BLAT) ; Kota : Garari Mahadeo, Singh 74643 (BSJO).

12. *Leucas stricta* Benth. in Wall. Pl. As. Rar. 1 : 61. 1830 : Hook. f. Fl. Brit. India 4 : 688. 1885 ; Bhandari, Fl. Ind. Desert 313. 1978.

Erect, annual herbs, branched from the base ; branches grooved, hispid with spreading hairs. Leaves 2.5-6.25 × 0.5-1.25 cm, linear-oblong or oblong lanceolate, obtuse, entire, hispidly hairy, narrowed at the base, mid nerve prominent beneath. Flowers shortly pedicellate, in terminal, solitary, many flowered whorls, white. Bracts rigid, spinous pointed, ciliate with bulbous based hairs. Nutlets oblong, rounded at the apex, smooth, brown.

Fl. & Fr. : September - January.

Rare, found on the forest edges in moist habitats.

Selected specimens : Banswara : Anand Sagar forest, Kanodia 75209 (BSI) ; Kalingra, Kanodia 75650 (BSI) ; Mahi forest, Kanodia 75411 (BSI) ; Sikar : Gorion, Stower C-32 (BSI) ; Udaipur : Parshad, Kanodia 82179 (BSI).

Note : Blatter & Haliberg (1918 : 21) reported this species from Jodhpur and on their authority Bhandari (*l.c.*) also included it in his flora. But collection No. 10410/13 could not be traced in Blatter herbarium.

13. *Leucas urticaefolia* (Vahl) R. Br. Prodr. 504. 1810 ; Wight, Ic. 4(3) : 9. t. 1451. 1849 ; Hook. f. Fl. Brit. India 4 : 680. 1885 ; Duthie,

Fl. Gangetic Plain 2 : 249. 1911. *Phlomis urticaefolia* Vahl, Symb. Bot. 3 : 76. 1794.

Erect, annual herbs ; branches hoary tomentose or finely pubescent. Leaves membranous, 4.0 7.5×2.5 3.5 cm, ovate, acute, coarsely crenate serrate, more or less pubescent, base acute or rounded. Flowers in many flowered, dense, globose axillary whorls. Bracts linear lanceolate, acute, aristate, ciliate. Nutlets obovoid oblong, obtuse, trigonous, obliquely truncate and glandular at the apex.

Fl. & Fr. : October February.

Very common throughout the state in open dry wastelands and on hills to the moist banks of lakes and tanks.

Selected specimens : Ajmer : Jessa khera, *Duthie* 4832-A (DD) ; Alwar : Balafort, *Lal* 34467 (LWG) ; Dungarpur : Mahakalika Nagar, *Kanodia* 82050 (BSI) ; Ganganagar : Sohanlal's orchard, *Roy* 5940 (BSJO) ; Jaisalmer : Rata Ramdeo Sagar, *Tiwari* 733 (BSJO) ; Jhalawar : Misroli, *Wadhwa* 7648 (BSA) ; Sirohi : Mt. Abu, *Raizada* 29554 (DD).

14. *Leucas zeylanica* (L.) R. Br. Prodr. 504. 1810 ; Hook. f. Fl. Brit. India 4 : 689. 1885 ; Cooke, Fl. Bombay 2 : 465. 1906. *Phlomis zeylanica* L. Sp. Pl. 586. 1753.

Erect, annual herbs ; branches from near the base, hispid with long spreading hairs. Leaves subsessile, 2.5 7.5×0.3 1.25 cm, linear to linear lanceolate, obtuse at apex, tapering at base, margins often slightly recurved, entire or distantly serrulate. Flowers sessile or nearly so, usually in sub terminal axillary whorls. Bracts linear, spinous - tipped, ciliate with long bulbous based hairs. Nutlets obovoid oblong, rounded or truncate at the apex, smooth, brown.

Fl. & Fr. : October February.

Rare, weed in cultivated fields.

Selected specimens : Banswara : Shergarh, *Singh* 3067 (BSJO) ; Sirohi : Mt. Abu, *Blatter* 23665 (BLAT).

10. NEPTA L.

Calyx c. 4 mm long ; upper teeth narrowly triangular, aristate.	...	2.	<i>N. hindostana</i>
Calyx c. 6 - 8 mm long ; upper teeth broadly triangular, acute, not aristate.	...	1.	<i>N. bombaiensis</i>

1. *Nepeta bombaiensis* Dalz. & Gibs. Bombay Fl. 209. 1861 ; Hook. f. Fl. Brit. India 4 : 661. 1885 ; Raizada in Ind. For Rec. (n.s.) Bot. 4(3) : 70 1951 et Suppl. Duthie, Fl. Gangetic Plain 225. 1976.

Erect, branched herbs ; branches tomentose or laxly villous. Leaves long petioled, 3.5 5.0 × 3.0 3.5 cm, rounded ovate or ovate cordate, coarsely crenate. Flowers pedicellate, in axillary, pedunculate, 6 to 8 flowered cymes, purple. Bracts elliptic lanceolate, acuminate. Nutlets minute, narrowly ellipsoid, smooth, dark brown, dotted with white.

Fl. & Fr. : Cold season.

Rare, in rocky places, confined to the central part of the state.

Selected specimens : Ajmer : Bhim, *Duthie* 4838, *Lowrie s.n.* (DD) ; Sirohi : Mt. Abu, *Mehta* 625 (JAC).

2. *Nepeta hindostana* (Roth) Haines, Bot. Bihar & Orissa 4 : 744. 1922. *Glechoma hindostana* Roth, Nov. Pl. Sp. 259. 1821. *Nepeta ruderalis* Buch. Ham. ex Benth. in Wall. Pl. As. Rar. 1 : 64. 1830 ; Hook. f. Fl. Brit. India 4 : 661. 1885 ; Duthie, Fl. Gangetic Plain 2 : 254. 1911.

Softly pubescent herbs, branching from the base. Leaves 1.5 5.0 × 0.8 3.5 cm, broadly ovate to sub-orbicular, obtuse, crenate-serrate, green or hoary, base cordate or truncate. Flowers pedicellate, in dense, axillary, many flowered cymes, bluish - purple. Bracts linear lanceolate, acute, densely ciliate. Nutlets oblong-ellipsoid, with a white V - shaped hilum on the inner face near the base, brown.

Fl. & Fr. : Cold season.

Frequent in moist, shady & damp places, particularly on old walls in the south & south eastern parts of the state.

Selected specimens : Ajmer : Todgarh, *Duthie* 1555 (DD) ; Banswara : Chandan Singh ki Bassi village, *Singh* 3638 (BSJO) ; Jhalawar : Manoharthana, *Verma* 3520, 3525 (BSA) ; Pirawa, *Verma* 6052 (BSA) ; Kota : Atru, *Singh* 90991 (LWG) ; Sirohi : Mt. Abu, *Raizada* 20599 (DD).

11. OCIMUM L.

1a. Calyx - tube glabrous within :

2a. Pedicel as long as the calyx. Mouth of calyx open after anthesis. Corolla c. 5 mm long, reddish pink.

... 4. *O. tenuiflorum*

- 2b. Pedicel shorter than the calyx. Mouth of calyx closed after anthesis by upcurved lower lip. Corolla c. 7 mm long, white or greenish-white ... 3. *O. gratissimum*
- 1b. Calyx - tube hirsute - annulate within :
- 3a. Fruiting calyx 3 - 5 mm long. Corolla 5 - 7 mm long. ... 2. *O. canum*
- 3b. Fruiting calyx 6 - 8 mm long. Corolla 0.7 - 1.0 cm long. ... 1. *O. basilicum*

1. *Ocimum basilicum* L. Sp. Pl. 597. 1753 ; Hook. f. Fl. Brit. India 4 : 608. 1885 ; Duthie, Fl. Gangetic Plain 2 : 235. 1911. *O. americanum* L. Cent. Pl. 1 : 15. 1755. *O. thyrsoiflorum* L. Mant. Pl. 84. 1767. *O. basilicum* L. var. *thyrsoiflorum* (L.) Benth. in Wall. Pl. As. Rar. 2 : 13. 1830 et Lab. Gen. & Sp. 5. 1833 ; Wight, Ic. 3(2) : 6. t. 868. 1843 - 45. 'Tulsi' (Hindi).

Aromatic, annual herbs, with short root stock ; stem pubescent with retrorse hairs. Leaves 0.7 - 4.5 × 0.4 - 1.6 cm, oblong to ovate-oblong, cuneate to tapering at base, obtuse, entire or serrulate, glabrous. Flowers in compact or distant whorls, latter in terminal, simple or branched racemes, white. Nutlets 1.5 mm long, ellipsoid or oblong, glabrous, punctate, mucilaginous when wetted.

Fl. & Fr. : Almost throughout the year.

Common in sandy - gravelly soils in open places.

Selected specimens : Ajmer : On Jodhpur road, *Wadhwa* 4876 (BSA) ; Bharatpur : Chautali village, *Parmar* 8764 (BSJO) ; Dungarpur : Range forest office, *Kanodia* 67294 (BSI) ; Ganganagar : 24 P.S. Raisingh Nagar, *Roy* 3882 (BSJO) ; Jaisalmer : Near Mahapalika garden (Pokaran), *Tiwari* 670 (BSJO) ; Jhalawar : *Wadhwa* 5386 (BSA).

Notes : Various authors have considered *O. basilicum* and *O. americanum* as distinct species. Morton (J. Linn. Soc. Bot. 58 : 234. 1962), however, concluded from examination of type material that both plants are conspecific. Keng (Fl. Ceylon 3 : 115. 1981) also agreed with Morton's concept after the examination of types of both.

2. *Ocimum canum* Sims. in Curtis, Bot. Mag. 51 : t. 2452. 1824 ; Hook. f. Fl. Brit. India 4 : 607. 1885 ; Duthie, Fl. Gangetic Plain 2 : 234. 1911. *O. americanum auct. plur.* non L. 1755. 'Tulsi, Bapchi' (Hindi).

Annual herbs ; branches subquadrangular, grooved on opposite sides, pubescent with appressed retrorse hairs. Leaves 1.5 - 4.2 × 0.6 - 2.0 cm, ovate - lanceolate to ovate - oblong, rounded to cuneate at base,

acute, distinctly serrulate. Flower whorls in long racemes, white. Bracts ovate, c. 5×2 mm, clawed, ciliate. Nutlets 0.15×0.1 cm, ovoid, subtrigonal, smooth or punctulate.

Fl. & Fr. : Almost throughout the year.

Common weed in open wastelands, particularly along the roads ; sometimes cultivated.

Selected specimens : Ajmer : Panchkund, Jain 49654 (BSI) ; Alwar : Balafort, Lal 34415 (LWG) ; Barmer : Haldeshwar Mahadev R.F., Pandey 7971 (BSJO) ; Dungarpur : Ratanpur Kanodia 82095 (BSI) ; Jhalawar : Bijliya Bhadak, Wadhwa 7530 (BSA) ; Pali : Sardhana, Shetty 1783 (BSJO) ; Sirohi : Mt. Abu, Mehta 2010 (JAC).

3. *Ocimum gratissimum* L. Sp. Pl. 1197. 1753 ; Hook. f. Fl. Brit. India 4 : 608. 1885 ; Duthie, Fl. Gangetic Plain 2 : 234. 1911. 'Tulsi' (Hindi).

Shrubs or undershrubs ; branches obtusely 4 angular, grooved on opposite side, glabrous and woody towards the base. hispidulous above. Leaves $4.8 - 12.8 \times 3 - 9$ cm, ovate to ovate lanceolate, subcuneate at the base and subdecurrent on petiole, acuminate to subacuminate, copiously glandular punctate on both sides. Flower - whorls in long terminal racemes, rarely in the axils of upper leaves, greenish white to greenish yellow. Bracts sessile, lanceolate, awned, longer than calyx. Nutlets c. 2 mm in diam., subglobose, faintly foveolate.

Fl. & Fr. : August - January.

Common weed on Aravalli and in waste grounds in shady habitats, particularly in central and southern parts of the state.

Selected specimens : Ajmer . Aravalli hills, Lowrie 4829 (DD) ; Banswara : Anand Sagar forest, Kanodia 75258 (BSI) ; Sirohi : Mt. Abu, Mehta 1028 (JAC) ; Udaipur : Parshad village, Kanodia 82232 (BSI) ; Chhapli, Kanodia 82492 (BSI).

4. *Ocimum tenuiflorum* L. Sp. Pl. 597. 1753 ; Keng in van Steenis, Fl. Malesiana ser. 1. 8 : 378. 1978. *O. sanctum* L. Mant. Pl. 1 : 85. 1767 ; Hook. f. Fl. Brit. India 4 : 609. 1885 ; Duthie, Fl. Gangetic Plain 2 : 233. 1911. 'Tulsi' (Hindi).

Much branched undershrubs ; stem and branches clothed with spreading reddish purple hairs. Leaves $1.3 - 3.0 \times 0.8 - 2.0$ cm, ovate-oblong or elliptic-oblong, obtuse or acute, entire or sub serrate, hairy on both surfaces. Flowers borne in whorls on upto 12 cm long simple or

occasionally basally branched racemes, reddish pink. Nutlets ellipsoid, minutely warty, dark brown.

Fl. & Fr. : Almost throughout the year.

Mostly cultivated ; sometimes escape or apparently wild near habitations.

Selected specimens : Banswara : Mahi river Parsolia, Kanodia 75603 (BSI) ; Bharatpur : Near Wair, Parmar 8733 (BSJO) ; Churu : Gopalpura, Roy 2533 (BSJO) ; Jaisalmer : Amarsagar, Blatter 10412 (BLAT) ; Jhalawar : Aklera, Wadhwa & Prasad 9605 (BSA) ; Jodhpur : Tandon 118933 (DD).

12. ORTHOSIPHON Benth.

Corolla - tube as long as the calyx.	...	1. <i>O. pallidus</i>
Corolla - tube double the length of calyx.	...	2. <i>O. thymiflorus</i>

1. *Orthosiphon pallidus* Benth. Lab. Gen. & Sp. 708. 1835 *et in* Hook. Bot. Misc. 3 : 370. 1853 ; Hook. f. Fl. Brit. India 4 : 613. 1885 ; Duthie, Fl. Gangetic Plain 2 : 236. 1911 ; Mahesh. Illus. Fl. Delhi f. 175. 1966. '*Ban tulshi*' (Hindi).

Small herbs or undershrubs, upto 30 cm high ; branches numerous from woody root-stock, more or less finely pubescent. Leaves petioled, 1.25-4.0 × 0.8-2.0 cm, ovate, usually obtuse, crenate-serrate, base shortly cuneate. Flowers in distant, 6 flowered whorls combined into terminal, 6-12 cm long racemes, white or lilac. Calyx tube with many nerves between the main ten nerves. Nutlets subglobose, smooth, yellowish brown.

Fl. & Fr. : July - December.

Common in moist or dry rocky habitats, particularly in the east of Aravalli.

Selected specimens : Ajmer : Todgarh, Sharma 1823 (LWG) ; Banswara : Ghatol, Singh 2904 (BSJO) ; Chittorgarh : Srivastava 65143 (LWG) ; Jhalawar : Bijliya Bhadak, Wadhwa 7514 (BSA) ; Tonk : Kotri village, Pandey 4704 (BSJO).

2. *Orthosiphon thymiflorus* (Roth) Sleerson in Reinwardtia 5 : 42. 1959. *Ocimum thymiflorum* Roth, Nov. Pl. Sp. 269. 1821. *Orthosiphon glabratus* Benth. in Wall. Pl. As. Rar. 2 : 14. 1831. *O. tomentosum* Benth.

L.c. 2 : 14. 1831 ; Hook. f. *Fl. Brit. India* 4 : 613. 1885, incl. vars. except var. *rubiginosa* Clarke ex Hook. f.

Erect or ascending herbs, 30–50 cm high. Leaves 3–7 × 2.5–4.5 cm, ovate, entire or crenate, rounded or truncate at the base, glabrous above, viscous beneath. Flowers in 5 to 6 flowered whorls combined into terminal racemes. Bracts ovate, acuminate. Nutlets subglobose, compressed, minutely glandular, brown.

Fl. & Fr. : Rainy season.

Rare, in dry wastelands.

Selected specimen : Sirohi : Mt. Abu, Mehta 799 (JAC). Also reported from N.W. Rajasthan (Sankhala, 1951).

13. PLECTRANTHUS L.? Herit. *nom. cons.*

Leaves densely white-tomentose beneath. Calyx subequally 5-lobed or very shortly 2-lipped. Fruiting calyx c. 5 mm long. ... 2. *P. rugosus*

Leaves finely pubescent beneath. Calyx distinctly 2-lipped; upper lip shorter than the lower one. Fruiting calyx c. 10 mm long. ... 1. *P. mollis*

1. *Plectranthus mollis* (Ait.) Spreng. *Syst. Veg.* 2 : 690. 1825. *Ocimum molle* Ait. *Hort. Kew.* 2 : 322. 1789. *Plectranthus incanus* Link, *Enum. Pl. Hort. Berol.* 2 : 120. 1822. Hook. f. *Fl. Brit. India* 4 : 621. 1885; Cooke, *Fl. Bombay* 2 : 447. 1906.

Erect herbs, upto 80 cm high; stem thick & fleshy below, finely pubescent. Leaves 5.0–11.5 × 3.0–9.5 cm, broadly ovate, acute, crenate, deeply cordate at base. Flowers in few-flowered cymes borne in 7–22 cm long racemes, rarely reduced to a single flower, light purple or lilac. Lower lip of corolla not gibbous. Nutlets subglobose, pale brown, dotted with dark purple-brown spots, smooth.

Fl. & Fr. : August–December.

Rare, in moist and shady places at Mt. Abu.

Selected specimens : Sirohi : Abu-Dalwara, Tatake 46401, 46487, 46515 (BSI); Mt. Abu, Jain 56993 (BSI); Abu road, Rao 66505 (BSI).

2. *Plectranthus rugosus* Benth. in Wall. *Pl. As. Rar.* 2 : 17. 1831; Hook. f. *Fl. Brit. India* 4 : 620. 1885; Mukerjee in *Rec. Bot. Surv. India* 14 : 47. 1940.

Erect shrubs ; branches slender, hoary with stellate hairs. Leaves shortly petiolate, 1.5-4.0 cm long, ovate or elliptic, obtuse, crenate, subcordate or rarely acute at base, rugose above, tomentose beneath. Flowers in axillary, lax flowered panicle cymes, white with rose purple spots. Lower lip of corolla usually gibbous at the base. Nutlets oblong.

Fl. & Fr. : September - January.

Rare, in moist, shady, rocky habitats on the Aravalli. This taxon is a denizen of W. Himalaya.

Selected specimens : Sirohi : Mt. Abu (Achalgarh), Jain 46630, 46572, 57000, Rao 66612, Tataka 46450, 46543, 46470 (BSI).

14. POGOSTEMON Desf.

1a. Bracts ovate, imbricating, concealing the calyx :

2a. Stem glabrous or nearly so, smooth and shining ... 3. *P. pubescens*

2b. Stem hoary pubescent or villous. ... 1. *P. benghalense*

1b. Bracts lanceolate, neither imbricating nor concealing the calyx.

... 2. *P. heyneanus*

1. *Pogostemon benghalense* (Burm. f.) O. Ktze. Rev. Gen. Pl. 2 : 529. 1891. *Origanum benghalense* Burm. f. Fl. Ind. 128. t. 38. f. 3. 1768. *Pogostemon plectranthoides* Desf. in Ann. Mus. Natl. Hist. Nat. Paris 2 : 156. t. 6. 1808 ; Hook. f. Fl. Brit. India 4 : 632. 1885 ; Duthie, Fl. Gangetic Plain 2 : 241. 1911.

Erect, strongly aromatic, branched undershrubs ; stems often purple tinged, glabrous downwards, pubescent villous above. Leaves 5-12 x 2-7 cm, ovate-lanceolate, acute, double serrate, cuneate or acute at base. Flowers in many-flowered whorls borne in dense, hoary-pubescent or villous, terminal and axillary spikes combined into a paniculate inflorescence, pink or white. Bracts ovate, longer than calyx. Calyx hirsute. Nutlets broadly ellipsoid, smooth, shining, brown or black when ripe.

Fl. & Fr. : January - May.

Common on the forest edges, in scrub jungles and wastelands, particularly in the east of Aravalli.

Selected specimens : Bhilwara : On the way to Bijolia, Singh 7162 (BSJO) ; Chittorgarh : Menal, Majumdar 10415 (BSA) ; Jhalawar :

Asnawar, *Verma* 6891 (BSA) ; Aklera, *Verma* 3445 (BSA) ; Manoharthana, *Verma* 3516 (BSA) ; Kota : Atru forest, *Singh* 90956 (LWG).

2. *Pogostemon heyneanus* Benth. in Wall. Pl. As. Rar. 1 : 31. 1830 ; Wight, Ic. 4(3) : 8. t. 1440. 1849 ; Srinivasan & Agrawal in Bull. Bot. Surv. India 5 : 87. 1963. *P. patchouli sensu* Hook. f. Fl. Brit. India 4 : 633. 1885, non Pellet. 1845.

Shrubs, upto 2 m high ; young parts appressed pubescent. Leaves 3 7 × 2 4 cm, ovate lanceolate, somewhat fleshy, acute, irregularly serrate, decurrent at base. Racemes spicate, interrupted, branched, upto 9 cm long. Bracts ovate lanceolate ; bracteoles linear - lanceolate. Calyx lobes 5, subequal, sericeous outside, glabrous within. Corolla lobes 4, somewhat 2 lipped, glabrous within, white. Stamens 4, didynamous. Nutlets obliquely ovoid, black, smooth.

Fl. & Fr. : Most part of year.

Rare, in the forests. Included on the authority of Raizada (1954) from Mt. Abu.

3. *Pogostemon pubescens* Benth. in DC. Prodr. 12 : 152. 1848. *P. parviflorus* Benth. in Wall. Pl. As. Rar. 1 : 31. 1830, *pro parte* ; Hook. f. Fl. Brit. India 4 : 632. 1885, *pro parte* ; Cooke, Fl. Bombay 2 : 453. 1911.

Erect, stout, suffruticose herbs ; stem and branches usually purple. Leaves 7.5 18.0 × 3.7 8.7 cm, broadly ovate or ovate lanceolate, acute or acuminate, coarsely and irregularly double toothed, cuneate at base, glabrous or slightly pubescent on both sides. Flower whorls in densely pubescent spikes forming pyramidal lax panicles, white with purple spots. Filaments purple, bearded with purple hairs. Nutlets ellipsoid, smooth, shining, black.

Fl. & Fr. : December - March.

Rare, in moist rocky habitats on the Aravalli. It is a denizen of high altitude.

Selected specimens : Sirohi : Mt. Abu, *Mehta* 443 (JAC) ; Udaipur : Gogunda, *Jain* 48631 (BSI).

15. SALVIA L.

- 1a. Erect herbs. Leaves 5 - 10 cm long. Upper lip of calyx entire. ... 2. *S. plebeta*
- 1b. Dwarf straggling undershrubs. Leaves less than 5 cm long. Upper lip of calyx 3 - toothed ;

- 2a. Calyx with gland - tipped hairs. Corolla annulate within. ... 1. *S. aegyptiaca*
- 2b. Calyx with long eglandular hairs. Corolla glabrous within. ... 3. *S. santolinaefolia*

1. *Salvia aegyptiaca* L. Sp. Pl. 23. 1753 ; Hook. f. Fl. Brit. India 4 : 656. 1885 ; Duthie, Fl. Gangetic Plain 2 : 256. 1911.

Much branched, straggling undershrubs ; branches divaricate, rigid, hairy. Leaves subsessile, 0.6-3.5 × 0.25-0.8 cm, linear-lanceolate, acute, crenate, much wrinkled, nerves prominent. Flower whorls 2 to 4 flowered, borne in long racemes, white. Calyx glandular hairy. Nutlets oblong-ellipsoid, smooth, bluish-black.

Fl. & Fr. : December-March.

Common in moist places, along road-sides, borders of cultivated fields and in scrub forests, particularly in the north-west of Aravalli.

Selected specimens : Ajmer : Lowrie 4836 (DD) ; Bharatpur : Lahasar village, Parmar 8594 (BSJO) ; Jaisalmer : Blatter 10390 (BLAT) ; Jodhpur : Keru village, Puri 22961 (BSI) ; Pali : Gundoj hills, Shetty 1397 (BSJO) ; Udaipur : On the way to Sajangarh, Kanodia 82284 (BSI).

2. *Salvia plebeia* R. Br. Prodr. 501. 1810 ; Hook. f. Fl. Brit. India 4 : 655. 1885 ; Duthie, Fl. Gangetic Plain 2 : 256. 1911.

Erect, stout herbs, 30-50 cm high ; stems hoary-pubescent, grooved, obtusely quadrangular. Leaves 3.5-10.0 × 1.5-4.5 cm, oblong-lanceolate, obtuse or subacute, irregularly crenate, base acute, often decurrent into the petiole. Flowers whorls 4 to 6 flowered, combined into false terminal panicle, interrupted, pubescent, spicate racemes, pale blue or nearly white. Bracts linear-spathulate. Nutlets ovoid, smooth, glabrous or rugose.

Fl. & Fr. : December-May.

Common, mostly in the east of Aravalli in moist sandy-loam soils in shady places.

Selected specimens : Ajmer : Around Subash Bagh, Sharma 1526 (LWG) ; Banswara : Majumdar 10219 (BSA) ; Bharatpur : Ghana bird sanctuary, Parmar 8620 (BSJO) ; Ganganagar : Hanumangarh, Roy 5955 (BSJO) ; Kota : Singh 90998 (LWG) ; Udaipur : Nathdwara, Kaul 8576 (LWG).

3. *Salvia santolinaefolia* Boiss. Diagn. Pl. Orient. ser. 1 : 13. 1859. et Fl. Orient. 4 : 632. 1879 ; Hook. f. Fl. Brit. India 4 : 656. 1885. *S.*

pumila Benth. Lab. Gen. & Sp. 726. 1835, *pro parte* & in DC. Prodr. 12 : 356 1848, *p.p.* *S. aegyptiaca* L. var. *pumila* (Benth.) Hook. f. *l.c.* 4 : 656. 1885, *pro parte* ; Duthie, Fl. Gangetic Plain 2 : 256. 1911.

Hispid or scabrid undershrubs. Leaves 0.4 2.0×0.2 - 0.5 cm, linear lanceolate, rugose and rigid, appressed hairy. Flower whorls in 8 - 10 cm long racemes, white. Calyx hispid with long hairs. Nutlets ovoid, glabrous, smooth brown.

Fl. & Fr. : August - February.

Rare, in moist sandy loam soils near dams and on river - beds.

Selected specimens : Barmer : Luni river - bed (along Balotra Barmer road), *Shetty* 2210 (BSJO) ; Naga area, *Tiwari* 1163 (BSJO) ; Bundi : Hindoli, *Singh* 83610 (LWG) ; Jodhpur : Mandor, *Blatter* 10391 (BLAT) ; Pali : Near Jawai dam, *Shetty* 1615 (BSJO).

DOUBTFUL TAXA

Leucas ciliata Benth. in Wall. Pl. As. Rar. 1 : 61. 1830 ; Hook. f. Fl. Brit. India 5 : 687. 1885.

Tall undershrubs, with straggling branches. Leaves shortly petioled, ovate or lanceolate, coarsely serrate, sparsely pubescent. Whorls large, globose, many flowered, terminal and axillary. Calyx straight, hairy outside and with a ring of hairs at the mouth ; teeth ciliate, spinulose. Corolla tube annulate within ; upper lip densely bearded with rufous brown hairs. Nutlets smooth, brown.

Denizen of temperate Himalaya, Khasia hills and Deccan Peninsula ; reported from Jhunjhunu by Nair (1956) and Nair & Kanodia (1959). The author could not see any specimen and doubts on the identity.

Leucas lavandulaefolia Sm. in Rees, Cycl. 20 : n. 2. 1812. *Phlomis linifolia* Roth, Nov. Pl. Sp. 260. 1821. *Leucas linifolia* (Roth) Spreng. Syst. Veg. 2 : 743. 1825 ; Hook. f. Fl. Brit. India 5 : 690. 1885.

Annual herbs, with linear lanceolate or linear oblong, obtuse leaves. Flowers in axillary and terminal verticillasters. Calyx tube curved ; mouth pubescent within, oblique. Corolla white, annulate within near the middle. Nutlets oblong, rounded at apex, pale - brown.

This species is usually found in Eastern India and Deccan Peninsula. Nair & Malhotra (1961) reported it from Sikar. The author could not see any specimen and doubts on its identity.

Leucas suffruticosa Benth. Lab. Gen. et Sp. 611. 1835 ; Hook. f. Fl. Brit. India 5 : 685. 1885.

Low undershrubs, with terete, ascending, densely fulvous tomentose or hispid branches. Leaves sessile, coriaceous, linear, obtuse. Flowers in terminal whorls, on a very long peduncle. Calyx villous ; mouth straight, villous within. Corolla white ; tube included. Nutlets terete, smooth.

Plant of South India ; the only record from Rajasthan is by Nair & Malhotra (1957) from Sikar district.

CULTIVATED SPECIES

Mentha piperita L. '*Pippermint*' (Hindi) A rigid, erect, annual herb with petiolate, ovate or the lower cordate, serrate leaves and blue flowers. Native of Tropical America and W. Indies ; occasionally cultivated in the gardens.

Mentha spicata L. '*Pudina*' (Hindi) Aromatic, perennial, creeping or ascending herbs. Leaves ovate, ovate-elliptic or elliptic oblong, glabrous. Flowers purplish. Native of India (Duthie, 1911) ; commonly grown in Kitchen garden as a pot herb.

Mentha sylvestris L. Erect or diffuse, aromatic herbs with lanceolate, ovate or oblong leaves which are decurrent at the base. Flowers shortly pedicelled, lilac. Commonly grown in the gardens as an ornamental.

Salvia coccinea Buchoz ex Etlinger Erect, perennial, undershrubs, with ovate - cordate leaves which are hairy tomentose beneath. Flower whorls 6 to 10 flowered, in up to 10 cm long racemes, scarlet. Native of Mexico ; commonly cultivated in the gardens for its conspicuous flowers.

Salvia leucantha Cav. Shrubby herbs, with lanceolate leaves and white to lavender purple flowers arranged in 6 to 8 flowered whorls borne in upto 24 cm long racemes. Native of Mexico ; cultivated in the gardens for ornamental purposes.

Salvia officinalis L. Herbs, with ovate lanceolate leaves and spicate flower whorls. Native of South Europe ; occasionally grown in the gardens. It is a very delicate plant and requires special care.

Salvia splendens Shellow ex Nees - Annual herbs, with ovate, serrate - crenate leaves and scarlet flowers. Native of Brazil ; occasionally cultivated in the gardens for ornamental purposes.

Thymus serpyllum L. Small, much branched shrubs with sessile, oblong - ovate or lanceolate leaves and purple flowers arranged in capitate spikes. Native of Europe ; occasionally grown in the gardens for ornamental purposes.

102. PLANTAGINACEAE

(P.J. Parmar)

PLANTAGO L.

- | | | |
|--|-----|----------------------------|
| 1a. Stem well developed. Leaves cauline, opposite. | ... | 3. <i>P. exigua</i> |
| 1b. Stem absent or nearly so. Leaves all radical : | | |
| 2a. Cells of capsule 4 to 8-seeded. | ... | 2. <i>P. erosa</i> |
| 2b. Cells of capsule 1 to 2-seeded : | | |
| 3a. Leaves distinctly amplexicaule, c. 1.25 cm broad. Corolla - lobes ovate, acute. | ... | 1. <i>P. amplexicaulis</i> |
| 3b. Leaves attenuated at the base, base slightly dilated, upto 0.6 cm broad. Corolla - lobes rounded, obtuse, apiculate. | ... | 4. <i>P. ovata</i> |

1. **Plantago amplexicaulis** Cav. Icon. Descr. 2 : 22. t. 125. 1793 ; Hook. f. Fl. Brit. India 4 : 706. 1885 ; Cooke, Fl. Bombay 2 : 477. 1906. *P. bauphula* Edgew. in Hook. Journ. Bot. 2 : 285. 1840. 'Isabgol' (Hindi).

Annual or perennial, more or less hairy herbs. Stem absent or very short, often branched at base. Leaves close or distant, spirally arranged, 6-15 × 0.6-1.25 cm, narrowly lanceolate, entire or distantly toothed, acuminate. Scapes many, axillary, terete, glabrous, usually exceeding the leaves. Flowers in ovoid, 1.5-4.0 cm long spikes. Corolla lobes glabrous. Capsules ellipsoid, subobtuse, 2-celled. Seeds 2, oblong, boat shaped, nearly black.

Fl. & Fr. : January - March.

Rare, weed in sandy loam soils, chiefly in cultivated fields.

Selected specimens : Pali : Hariamali, Shetty 1573 (BSJO) ; near Phulad, Pandey 4700 (BSJO).

Notes : The characters used to separate *P. bauphula* Edgew. from *P. amplexicaulis* Cav. do not hold good and are overlapping. So, the author followed Hook. f. (*l. c.*) in treating *P. bauphula* Edgew. as synonymous to *P. amplexicaulis* Cav.

2. *Plantago erosa* Wall. in Roxb. Fl. Ind. 1 : 143. 1820. *P. major sensu* Hook. f. Fl. Brit. India 4 : 705. 1885, *pro parte*, non L. 1753 ; Duthie, Fl. Gangetic Plain 2 : 260. 1911.

Erect, perennial, glabrous herbs, with short, slender or stout rhizomes. Leaves basal, in rosette, petiolate, 10-20 × 4-9 cm, ovate elliptic to oblong or rotundate, rounded at apex, entire or subentire, 3 to 9 nerved. Flowers in dense to lax, pedunculate, cylindric spikes, pale yellow. Bracts ovate-oblong, nearly acute, with a brown keel, equal or shorter than the calyx. Sepals glabrous, scarious margined. Capsules globose or subconic, glabrous, 2-celled. Seeds angulate, minute, rugulose, dull black.

Fl. & Fr. : Post rainy season.

Rare, in moist and shady places, often as a weed in cultivated fields and gardens in southern parts of the state.

Selected specimens : Sirohi : Mt. Abu, Mehta 935 (JAC) ; Udaipur : Gulab bag, Majumdar 11643 (BSA).

3. *Plantago exigua* Juss. ex Murr. in Comm. Soc. Reg. Sci. Gotting. 1 : 94. t. 5. f. 1-3. 1779. *P. pumila* L. f. Suppl. 125. 1781 ; Hook. f. Fl. Brit. India 4 : 707. 1885 ; Raizada in Journ. Ind. Bot. Soc. 15 : 167. 1936 *et* Suppl. Duthie, Fl. Gangetic Plain 228. 1976.

Small, much branched herbs ; stem ascending, flexuous, nearly glabrous. Leaves filiform, 2-4 cm long, revolute margined. Spikes pedunculate, ovoid or subglobose, axillary, puberulous. Bracts longer than the calyx, lower ones equalling or longer than the spikes. Flowers yellowish white. Corolla lobes finely acuminate. Capsules ellipsoid, 2-celled. Seeds linear-elliptic, shining, reddish brown.

Fl. & Fr. : January-March.

Frequent along road-sides, in waste places and often as a weed in winter crops. Usually confused for *Spergula* species in vegetative state.

Selected specimens : Ajmer : Puskar, Sharma 1466 (LWG) ; Barmer : Parlu, Tiwari 1158 (BSJO) ; Ganganagar : Dhillon 495 (DD) ; Jaipur : Tonk road, Sharma 1129 (RUBL) ; Jodhpur : Bilara, Singh 3502 (BSJO).

4. *Plantago ovata* Forsk. Fl. Aegypt. - Arab. 31. 1775 ; Hook. f. Fl. Brit. India 4 : 707. 1885 ; Duthie, Fl. Gangetic Plain 2 : 262. 1911. 'Isabgol' (Hindi).

Annual, subcaulescent herbs, sparsely or densely covered with long soft hairs. Leaves in rosette, 2-10 × 0.2-0.6 cm, linear or filiform, finely

acuminate, entire or distantly denticulate, densely covered with appressed long woolly hairs. Scapes glabrous or pubescent above. Spikes dense, capituliform or shortly cylindrical. Corolla glabrous. Capsules ellipsoid, obtuse, membranous, glabrous, 2 celled. Seeds 2, ovoid oblong, boat shaped, smooth, yellowish brown.

Fl. & Fr. : January - March.

Common weed in cultivated fields, particularly in western parts of the state.

Selected specimens : Ajmer : *Tiagi* 35 (DD) ; Barmer : Sela (Siwana), *Tiwari* 1184 (BSJO) ; Jhunjhunu : Pilani (Birla college), *Cherian* Acc. No. 44564 (BSI) ; Jodhpur : Bilara, *Singh* 3505 (BSJO).

Notes : The specimen (*Singh* 3505) from Jodhpur has leaves upto 1 cm broad.

103. NYCTAGINACEAE

(R.P. Pandey)

- | | | |
|---|-----|-----------------------|
| 1a. Flowers showy, more than 2 cm long, with an involucre of prominent sepeloid bracts. Fruits ovoid. | ... | 3. <i>Mirabilis</i> |
| 1b. Flowers not showy, less than 8 mm long. Bracts normal. Fruits various, not ovoid : | | |
| 2a. Fruits 10 - ribbed. | ... | 2. <i>Commicarpus</i> |
| 2b. Fruits 5 - ribbed. | ... | 1. <i>Boerhavia</i> |

1. BOERHAVIA L.

- | | | |
|---|-----|------------------------|
| 1a. Plants erect. Fruits obpyramidal, glabrous. | ... | 3. <i>B. erecta</i> |
| 1b. Plants prostrate, diffuse or straggling. Fruits fusiform, glandular, papillose, clavate or turbinate : | | |
| 2a. Branches opposite, 2 per node. Bracts 2. Stamens 2. | ... | 1. <i>B. diandra</i> |
| 2b. Branches alternate, 1 per node. Bracts 0 to 1. Stamens 2 - 3 : | | |
| 3a. Branches erect. Leaves lanceolate or elliptic. Flowering pedicels 2 - 3 cm long. | ... | 6. <i>B. rubicunda</i> |
| 3b. Branches diffuse to prostrate. Leaves ovate to ovate - lanceolate, oblong or subcordate. Flowers sessile or sub - sessile : | | |

- 4a. Flowers in strict, axillary cymes not exceeding the leaves. ... 5. *B. repens*
- 4b. Flowers in diffuse, terminal panicles much exceeding the leaves :
- 5a. Anthocarps turbinate to broadly clavate. ... 4. *B. procumbens*
- 5b. Anthocarps fusiform. ... 2. *B. diffusa*

1. *Boerhavia diandra* L. Sp. Pl. 1194. 1753 ; Nasir in Nasir & Ali, Fl. W. Pak. 115 : 7. f. 2 A. C. 1977. *B. vulvariaefolia* Poir. in Lam. Encycl. 5 : 55. 1804. *B. repens* L. var. *glabra* Choisy in DC. Prodr. 8(1) : 455. 1849. *B. repens* L. var. *vulvariaefolia* (Poir.) Boiss. Fl. Or. 4 : 1045. 1879.

Prostrate, puberulous to glabrescent herbs ; branches opposite. Leaves unequal, 0.4-1.75 × 0.1-1.5 cm, ovate lanceolate or oblong-lanceolate, acute, sinuate repand to sub entire, whitish beneath. Flowers pale pink, in axillary, 1-7 flowered, pedunculate cymes. Bracts 2, 0.5-1.0 mm long, leafy, ovate lanceolate. Anthocarps 2.5-3.0 mm long, broadly clavate, strongly ribbed, often papillose, pale brown.

Fl. & Fr. : August - November.

Rare, found in gravelly habitats. It is a new record for India.

Selected specimen : Bikaner : West of Bap, Roy 2000 (BSJO).

2. *Boerhavia diffusa* L. Sp. Pl. 3. 1753 ; Duthie, Fl. Gangetic Plain 3 : 2 1915 ; Mukherjee in Journ. Econ. Tax. Bot. 5 : 582. 1984. *B. repens* L. var. *diffusa* (L.) Hook. f. Fl. Brit. India 4 : 709. 1885. 'Satha, Sathi' (Hindi).

Decumbent ascending or diffuse, glandular pubescent or glabrescent, perennial herbs ; stem thickened at nodes, pigmented with pink. Leaves unequal, 0.5-4.5 × 0.25-2.75 cm, ovate, ovate lanceolate or ovate oblong, base rounded to subcordate, acute, subentire, glabrous above, whitish beneath. Flowers rose or pink, in axillary and terminal, bracteate panicles or subcapitate umbels. Anthocarps 2.5-4.25 × 1.0-2.25 mm, clavate, 5 ribbed, clothed with densely stalked glandular hairs.

Fl. & Fr. : Almost throughout the year.

Fairly common weed in mixed habitats throughout the state.

Selected specimens : Ajmer : Lourie 4857 (DD) ; Alwar : Wadhwa 7644 (CAL) ; Banswara : Singh 3972 (BSJO) ; Jodhpur : Osian, Singh

3247 (BSJO) ; Kota : *Wadhwa* 1996 (BSA) ; Nagaur : *Merta, H. Lal* 34834 (LWG) ; Sirohi : Mt. Abu, *Mehta* 270 (JAC) ; Udaipur : *Verma* 30 (BSA).

3 *Boerhavia erecta* L. Sp. Pl. 3. 1753 ; Nair in Bull. Bot. Surv. India 9 : 283. 1968 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 229. 1976 ; Mukherjee in Journ. Econ. Tax. Bot 5 : 583. 1984. *B. punarnava* Saha & K. Murthy in Journ. Sci. Ind. Research 21 C : 249 - 55. 1962.

Erect or suberect, perennial herbs ; stem and branches pigmented with red, ribbed, pubescent or glabrescent. Leaves 1.0 - 4.5 × 0.5 - 3.5 cm, ovate, ovate-oblong or ovate-lanceolate, acute or acuminate, subentire, base rounded, acute or subcordate, under surface whitish. Flowers pale pink to white, in lax, leafy, bracteate cymose panicles. Anthocarps c. 4 × 1.5 mm, truncate at the top, tapering at base, grooved with raphides.

Fl. & Fr. : July - October.

Native of tropical America ; rare, naturalized in rocky habitats.

Selected specimens : Jaipur : *Sharma* 1131 (RUBL) ; Jodhpur : *Roy* 1533 (BSJO) ; Pali : Near Barr along Jodhpur - Beawar road, *Shetty* 1778 (BSJO).

4. *Boerhavia procumbens* Banks ex Roxb. Fl. Ind. 1 : 148. 1820 ; Wight, Ic. 3(2) : 6. t. 874. 1844 - 45. *B. repens* L. var. *procumbens* (Banks ex Roxb.) Hook. f. Fl. Brit. India 4 : 709. 1885. *B. coccinea sensu* Stewart, Ann. Cat. Vasc. Pl. W. Pakistan & Kashmir 233. 1972, non Mill. 1768.

Prostrate or decumbent, puberulous, perennial herbs ; stem and branches often pigmented with pink. Leaves 1.5 - 2.5 × 0.25 - 1.5 cm, often unequal, ovate-oblong to subcordate, subentire to repand, acute to cuspidate or obtuse, under surface whitish. Flowers pink to pale pinkish-white, in diffuse, terminal panicles. Stamens 2 - 3, exerted. Anthocarps 3.0 - 3.25 mm long, strongly 5-ribbed, glandular - papillose.

Fl. & Fr. : January - December.

Common weed in W. Rajasthan, particularly in waste places and in cultivated fields.

Selected specimens : Barmer : Tapara village, *Shetty* 2269 (BSJO) ; Bikaner : Balab garden farm, *Roy* 1749 (BSJO) ; Churu : Bhaleri, *Roy* 2588 (BSJO) ; Jodhpur : Beriganga, *Shetty* 175 (BSJO).

5. *Boerhavia repens* L. Sp. Pl. 3. 1753 ; Hook. f. Fl. Brit. India 4 : 709. 1885, excl. var. *diffusa* and *procumbens*. *B. diffusa sensu* Duthie, Fl.

Gangetic Plain 3 : 2. 1915, *pro parte*, non L. 1753 ; Mukherjee in Journ. Econ. Tax. Bot. 5 : 583. 1984.

Straggling, prostrate or diffuse, puberulous, perennial herbs, with woody root stock ; stem and branches pigmented with pink. Leaves unequal, 1.25 4.25 × 0.25 3.0 cm, ovate oblong, puberulous, whitish on under surface. Flowers pink or pinkish mauve, in short, axillary, bracteate, pedunculate cymes. Anthocarps 2.75 3.5 mm long, turbinate to broadly clavate, 5 ribbed, glandular papillose.

Fl. & Fr. : Almost throughout the year.

Occasional, found as a weed in fallow fields and open wastelands.

Selected specimens : Jaipur : *Sharma* 258 (RUBL) ; Jaisalmer : *Wadhwa* 4766 (CAL) ; Jodhpur : *Singh* 5 (BSJO) ; Kota : *Wadhwa* 1996 (CAL) ; Pali : *Rolla* 66743 (CAL).

6. *Boerhavia rubicunda* Steud. Nom. ed. 2. 1 : 213. 1840 ; Nasir in Nasir & Ali, Fl. W. Pak. 115 : 7. f. 3 A C 1977 *B. elegans* Choisy in DC. Prodr. 13 (2) : 453. 1846 ; Hook. f. Fl. Brit. India 4 : 710. 1885.

Erect or diffuse, puberulous to glabrous herbs or undershrubs, with woody root stock. Leaves 1.5 5.0 × 0.4 1.25 cm, lanceolate to elliptic lanceolate or oblong lanceolate, mucronate, rounded at base, entire, whitish beneath. Flowers pale pink to pinkish purple, in very long, lax, di or trichotomously branched panicles. Stamens 2. Anthocarps 2.5 3.25 mm long, narrow to oblong - clavate, 5 ribbed, more conspicuously puberulous in the furrows.

Fl & Fr. : September - December.

Occasional, found in sandy habitats in W. Rajasthan desert.

Selected specimens : Barmer : *Sundra, Shetty* 2313 (BSJO) ; Bikaner : *Roy* 2095 (BSJO) ; Jaisalmer : *Bada Bag, Tiwari* 802 (BSJO) ; Jodhpur : *Phalodi, Singh* 4371 (BSJO).

2. COMMICARPUS Standley

Perianth infundibuliform. Fruits uniformly covered with wart-like glands or tubercles. ... 1. *C. chinensis*

Perianth campanulate. Fruits with a ring of 5 large glands at the top. ... 2. *C. verticillatus*

1. *Commicarpus chinensis* (L.) Heimerl in Engler & Prantl, Nat. Pflanzenf. ed. 2. 16 : 117. 1934. *Valeriana chinensis* L. Sp. Pl. 33. 1753.

Boerhavia repanda Willd. Sp. Pl. 1 : 22. 1797 ; Wight, Ic. 5(2) : 1. t. 1766. 1852 ; Hook. f. Fl. Brit. India 4 : 709. 1885 ; Duthie, Fl. Gangetic Plain 3 : 3. 1915. *B. chinensis* (L.) Aschers. & Schweinf. Beitr. Fl. Aethiop. 1 : 167. 1867.

Scandent, diffuse, glabrous herbs. Leaves 3.0-7.25 × 1.75-5.0 cm, cordate ovate or ovate, acute to subacuminate, sinuate repand, base cordate or truncate, glabrous on both surfaces. Flowers in terminal or axillary, superposed umbels, violet or pink. Perianth 6-7 mm long, infundibuliform. Stamens 3-4, exerted. Anthocarps 6-8 mm long, clavate, inconspicuously ribbed, covered with wart-like glands.

Fl. & Fr. : October - December.

Frequent, in gravelly - rocky habitats, particularly in the east of Aravalli.

Selected specimens : Alwar : Kankwari forest block. Parmar 9415 (BSJO) ; Jaipur : Wadhwa 4879 (CAL) ; Jhalawar : Verma 6813 (BSJO) ; Sirohi : Mt. Abu, Mehta 803 (JAC) ; Udaipur : Gulab - Bag, Majumdar 10364 (BSA).

2. *Commicarpus verticillatus* (Poir) Standl. in Contrib. U.S. Nat. Herb. 18 : 101. 1916 ; Mukherjee in Journ. Econ. Tax. Bot. 5 : 587. 1984. *Boerhavia verticillata* Poir. in Lam. Encycl. 5 : 56. 1804 ; Hook. f. Fl. Brit. India 4 : 710. 1885 ; Duthie, Fl. Gangetic Plain 3 : 3. 1915.

Decumbent or straggling, glabrous, perennial herbs or undershrubs ; stem and branches striated, swollen at nodes, whitish. Leaves equal, paired, variable in shape and size, 1.0-4.75 × 1.0-3.75 cm, broadly ovate or suborbicular, obtuse, acute or retuse, margins sinuate or repand, cordate, rounded or narrowed at base, covered with white raphides. Flowers in 3 to 7 flowered, axillary, bracteate, pedunculate umbels, dark pink. Perianth 5-7 mm long, with white raphides, funnel-shaped, petaloid. Anthocarps 5-7 mm long, clavate or turbinate, with 5, large glands at the crown.

Fl. & Fr. : August - March.

Common among bushes, hedges of cultivated fields and gardens, rarely in sandy plains.

Selected specimens : Ajmer : Sharma 90782 (LWG) ; Barmer : Shetty 2216 (BSJO) ; Bhilwara : Bhimar, Singh 5952 (BSJO) ; Jaipur : Wadhwa 8385 (BSA) ; Jalore : Jagani, Vyas 4504 (BSJO) ; Jodhpur : Choba, Singh 3145 (BSJO).

3. MIRABILIS L.

Mirabilis jalapa L. Sp. Pl. 177. 1753 ; Duthie, Fl. Gangetic Plain 3 : 3. 1915 ; Mukherjee in Journ. Econ. Tax. Bot. 5 : 587. 1984. '*Gul - Abbas*' (Hindi).

Erect, glabrescent to pubescent herbs, 25 - 100 cm high, with tuberous roots. Leaves 1.5 - 8.5 × 1.0 - 6.5 cm, ovate, acuminate or acute, subentire, glabrescent, under surface with raphides ; petioles, 1.0 - 2.5 cm long. Flowers subsessile, in fascicles, scarlet, showy. Stamens 5, exserted ; anthers yellow. Anthocarps 6 - 10 mm long, ovoid, 5 - ribbed, tuberculate, black on maturity. Nuts 6 - 7 mm long, subglobose.

Fl. & Fr. : Almost throughout the year.

Native of S. America ; naturalized as a weed in cultivated fields.

Selected specimens : Ganganagar : Roy 3936 (BSJO) ; Pali : Near Sadari, Pandey 4160 (BSJO) ; Jhalawar : Khanpur, Verma 6966 (BSA) ; Sirohi : Mt. Abu, Mehta 29 (JAC).

CULTIVATED SPECIES

Bougainvillea glabra Choisy - Evergreen climbers, with curved spines. Flowers showy. Native of Brazil ; grown as an ornamental in the gardens, bungalows etc.

Bougainvillea spectabilis Willd. - Large, evergreen, spiny climbers. Flowers with large, showy bracts. Native of Brazil ; grown as an ornamental throughout the state.

104. AMARANTHACEAE

(P.J. Parmar)

1a. Leaves alternate or fascicled or opposite and alternate mixed, never all opposite :

2a. Pseudostaminodes present. ... 2. *Aerva*

2b. Pseudostaminodes absent :

3a. Ovary multiovulate. ... 5. *Celosia*

3b. Ovary uniovulate :

4a. Flowers unisexual. ... 4. *Amaranthus*

- 4b. Flowers bisexual. ... 6. *Digera*
- 1b. Leaves all opposite :
- 5a. Anthers one - celled :
- 6a. Flowers in sessile, axillary head - like spikes. Stigma capitate. ... 3. *Alternanthera*
- 6b. Flowers in peduncled, ovoid or cylindric, terminal, head - like spikes. Stigma bifid. ... 7. *Gomphrena*
- 5b. Anthers two - celled :
- 7a. Flowers in fascicles ; fertile flowers subtended by modified sterile flowers, bearing accrescent hooked spines, forming burr in fruits. ... 9. *Pupalia*
- 7b. Flowers in spikes ; fertile flowers not subtended by such modified sterile flowers :
- 8a. Flowers deflexed, spinescent, in terminal lax spikes. Stamens 5 ; pseudostaminodes present. ... 1. *Achyranthes*
- 8b. Flowers in axillary compact spikes. Stamens 2, pseudostaminodes absent. ... 8. *Nothosaerva*

1. *ACHYRANTHES* L.

- 1a. Basal wing of the bracteoles almost entirely adnate to the spine. Pseudostaminodes between the filament with a narrow, entire or undulate ventral scale and a long fimbriate dorsal scale :
- 2a. Plants sub - glabrous. Leaves membranous, nearly glabrous. ... 3. *A. aspera* var. *parphyristachya*
- 2b. Plants hairy to densely tomentose. Leaves thick, villous to silky pubescent :
- 3a. Leaves pubescent to villous beneath, oval to almost round. ... 1. *A. aspera* var. *aspera*
- 3b. Leaves silvery silky beneath, elliptic - oblong, ovate or obovate. ... 2. *A. aspera* var. *argentea*
- 1b. Basal wing of the bracteoles practically free, somewhat divergent. Pseudostaminodes between the filaments simple, crenate or dentate. ... 4. *A. bidentata*

1. *Achyranthes aspera* L. Sp. Pl. 204. 1753 ; Wight, Ic. 5(2) : 3. t. 1777. 1852 ; Hook. f. Fl. Brit. India 4 : 730. 1885 ; Duthie, Fl. Gangetic Plain 3 : 18. 1915. '*Andhi Jhara*' (Hindi).

var. *aspera*

Erect herbs or undershrubs ; stem stout, quadrangular, tomentose. Leaves $2.8 \times 1.3 - 6.0$ cm, broadly oval to almost round, obtuse or abruptly apiculate at the apex. Flowers c. 3 - 5 mm long, rather plump in appearance. Utricles 1 - 3 mm long. Seeds cylindrical, smooth, filling the utricle.

Fl. & Fr. : Almost throughout the year.

Common along road sides in disturbed ground, dry scrub forests and often as a weed in gardens and fields.

Selected specimens : Ajmer : *Duthie* 6703 (DD) ; Alwar : Kankwari forest block, *Parmar* 9485 (BSJO) ; Banswara : Deriwali dongri, *Kanodia* 75152 (BSI) ; Bharatpur : Nagar village, *Parmar* 8546 (BSJO) ; Jaisalmer : Amarsagar garden, *Tiwari* 854 (BSJO) ; Jodhpur : Bilara, *Singh* 3280 (BSJO) ; Sirohi : Mt. Abu, *Rao* 66518 (BSI) ; Tonk : Niwai, *Shetty* 512 (BSJO).

Note : Very variable species in respect of shape of leaves. Of the above specimens, *Parmar* 9485 having elliptic ovate to ovate lanceolate and acute leaves passes to var. *rubro-fusca* Hk. f. a peninsular element, but leaves are not brown when dry as stated by Hook. f. (*l. c.*).

2. var. *argentea* (Thw.) Hook. f. *Fl. Brit. India* 4 : 730. 1885 ; Sharma & Tiagi, *Fl. North - East Rajasthan* 345. 1979. *Achyranthes argentea* Thw. *Enum. Pl. Zeyl.* 249. 1864.

Very similar to var. *aspera*, but the leaves are elliptic ovate and densely silvery silky beneath in this taxon.

Fl. & Fr. : Almost throughout the year.

Rather common in fallow fields, waste places and in scrub forests.

Selected specimens : Alwar : Pandupole, *Sharma* 3871 (RUBL) ; Bhilwara : Badnor, *Singh* 6270 (BSJO) ; Jaipur : Ramgarh, *Sharma* 1314 (RUBL) ; Jaisalmer : Budli nala, *Wadhwa* 4973 (BSA) ; Jhalawar : *Sharma* 4 (RUBL) ; Jodhpur : Kailana (on hills), *Shetty* 94 (BSJO) ; Sirohi : Mt. Abu, *Mehta* 797 (JAC).

3. var. *porphyristachya* (Wall. ex Moq.) Hook. f. *Fl. Brit. India* 4 : 730. 1885 ; Raizada, *Suppl. Duthie, Fl. Gangetic Plain* 229. 1976. *Achyranthes porphyristachya* Wall. ex Moq. in *DC. Prodr.* 13(2) : 316. 1849.

This variety is distinguished by its leaves which are membranous, $3.7 - 15.0 \times 1.5 - 8.0$ cm, elliptic lanceolate or ovate - lanceolate, glabrous and bright reddish purple flowers arranged in 6-30 cm long spikes.

Fl. & Fr. : August - February.

Frequent in forest undergrowth, particularly in north east and southern parts of the state.

Selected specimens - Alwar : Kankwari R.F., Parmar 9413 (BSJO) ;
Dungarpur : Verma 187 (BSA) ; Jaipur : Golimar, Sharma 1478 (RUBL) ;
Sirohi : Mt. Abu, Mehta 97 (JAC).

4. *Achyranthes bidentata* Blume, Bijdr. Fl. Nederl. Ind. 545. 1826 ;
Wight, Ic. 5(2) : 3. t. 1779. 1852 ; Hook. f. Fl. Brit. India 4 : 730. 1885 ;
Raizada, Suppl. Duthie, Fl. Gangetic Plain 230. 1976.

Erect or ascending, annual herbs ; stem 4 - gonous, flaccid, glabrous or so. Leaves 6-15 × 2-7 cm, elliptic-oblong or ovate-lanceolate, rounded or cuneate at base, acuminate, sub-entire, thinly hairy. Flowers in axillary and terminal, 5-40 cm long spikes, greenish white. Bracteoles equaling the inner perianth segments. Utricles 1.5-2.0 mm long.

Fl. & Fr. : August - February.

Rare, in shady places among the grasses, particularly on the edges of dry scrub forests.

Selected specimens : Sirohi : Mt. Abu, Mehta 1876 (JAC). Also reported by Vyas (1967) & Ramdeo (1969) from Alwar & Udaipur respectively.

2. *AERVA* Forsk. *nom. cons.*

1a. Flowers unisexual, dioecious. Outer tepals with the mid-rib ceasing well below the apex :

2a. Leaves more than 6 mm broad. Spikes dense, ... 1. *A. javanica* var. *javanica* ·
cylindric, naked. Outer tepals upto 3 mm long.

2b. Leaves upto 6 mm broad. Spikes often interr- ... 2. *A. javanica* var. *bovei*
rupted with oblong or globose lateral clusters, leafy. Outer tepals c. 2 mm long.

1b. Flowers hermaphrodite or female and hermaphro-
dite. Outer tepals with the mid-rib excurrent into a distinct mucro :

3a. Leaves alternate. Spikes axillary, usually clustered forming a long leafy inflorescence along the stem and branches. Flowers ... 3. *A. lanata*
bisexual.

- 3b. Leaves alternate and opposite. Spikes in axillary and terminal racemes not subtended by leaves, the whole inflorescence thus appears paniculate. Flowers bisexual or bisexual and female both.

... 4. *A. sanguinolenta*

1. *Aerva javanica* (Burm. f.) Juss. ex Schult. in Ann. Mus. Hist. Nat. Par. II : 13. 1808 & Syst. Veg. ed. 15. 5. 565. 1819; Wight, Ic. 3(2) : 6. t. 876. 1844 - 45; Hook. f. Fl. Brit. India 4 : 727. 1885. *Iresine javanica* Burm. f. Fl. Ind. 212. t. 65. f. 2. 1768. *I. persica* Burm. f. l.c 212. t. 65. f. 1. 1768. *Aerva tomentosa* Forsk. Fl. Aeg. Arab. 122, 170. 1775; Duthie. Fl. Gangetic Plain 3 : 15. 1915. *A. persica* (Burm. f.) Merrill in Philip. Journ. Sci. 19 : 348. 1921. 'Bui' (Hindi).

var. javanica

Perennial herbs or undershrubs; branches many from the base with simple stem or with long ascending branches. Leaves alternate, very variable in size and shape, narrowly linear to sub orbicular, more or less hairy. Flowers in cylindric, dense, sessile spikes, woolly. Outer tepals of male flowers ovate and of female ones oblong obovate or obovate spatulate. Utricles rotund, compressed. Seeds round, slightly compressed, brown or black.

Fl. & Fr. : July - January.

Common in sandy soils, particularly in the desertic zones.

Selected specimens : Ajmer : Tiagi Acc. No. 105095 (DD) ; Banswara : Bhimsore, Majumdar 16282 (BSA) ; Barmer : Near Dhorimanna, Shetty 2351 (BSJO) ; Ganganagar : Suratgarh, Wadhwa 58308 (BS1) ; Sawaimadhopur : Bayana, Uma Sankar & Ghose 46030 (LWG) ; Sirohi : Mt. Abu, Mehta 1072 (JAC).

2. var. *bovei* Webb in Hook. Niger Fl. 173. 1849. *Aerva bovei* (Webb) Edgew. in Journ. Linn. Soc. 6 : 206. 1862. *A. pseudotomentosa* Blatt. & Hallb. in Journ. Bombay Nat. Hist. Soc. 26 : 817. 1919. *A. persica* (Burm. f.) Merrill. var. *bovei* (Webb) Chiov. Fl. Somalia 286. 1929.

Differs from type variety in panicles being leafy; spikes more slender, all spikes except the terminal frequently shortly cylindrical or oblong, usually small and stout, rarely reaching c. 2.5 cm, often compound.

Fl. & Fr. : July - January.

Common in sandy soils, particularly in the dry desertic zones of western parts of the state.

Selected specimens : Ajmer : Puskar to Ajmer, *Sharma* 1470 (LWG) ; Barmer : Sindari, *Rao* 66882 (BSI) ; Jaisalmer : Ramgarh, *Rao* 67252 (BSI) ; Jhunjhunu : Singhana, *Saran* 41935 (LWG) ; Jodhpur : Kharda Randhir village, *Shetty* 204 (BSJO) ; Tonk : Tordi R F., *Shetty* 1109 (BSJO).

3. *Aerva lanata* (L.) Juss. ex Schult. in Ann. Mus. Hist. Nat. Paris 11 : 131. 1808 *et* Syst. Veg. ed. 15. 5 : 546. 1819 ; Wight, Ic. 2(4) : 7. t. 723. 1843 ; Hook. f. Fl. Brit. India 4 : 728. 1885 ; Duthie, Fl. Gangetic Plain 3 : 16. 1915. *Achyranthes lanata* L. Sp. Pl. 204. 1753.

Perennial herbs, sometimes woody and suffrutescent below ; stem and branches terete, striate, densely lanate with whitish shaggy hairs. Leaves alternate, 1.0-5.0 × 0.5-3.5 cm, suborbicular to lanceolate elliptic, cuneate at base, rounded and apiculate to acute at the tip. Flowers white creamy. Outer tepals oval-oblong, hyaline, densely lanate outside. Utricles round, compressed. Seeds reniform, black.

Fl. & Fr. : Almost round the year.

Common in dry disturbed grounds, sandy flats, scrub forests, rocky slopes etc., particularly in the eastern parts of the state.

Selected specimens : Ajmer : *Lourie* 325 (DD) ; Banswara : Ghatol, *Singh* 4210 (BSJO) ; Bharatpur : *Raizada* 61652 (DD) ; Bhilwara : Parvatipur, *Singh* 6579 (BSJO) ; Sirohi. Mt. Abu, *Rao* 66681 (BSI) ; Tonk : On the way to Toda Rai Singh R.F., *Pandey* 4830 (BSJO).

4. *Aerva sanguinolenta* (L.) Blume, Bijdr. Fl. Nederl. Ind. 547. 1826. *Achyranthes sanguinolenta* L. Sp. Pl. ed. 2. 294. 1762. *A. scandens* Roxb. Fl. Ind. 2 : 503. 1824. *Aerva scandens* (Roxb.) Moq. in DC. Prodr. 13(2) : 302. 1849 ; Wight, Ic. 2(4) : 7. t. 724. 1840-43 ; Hook. f. Fl. Brit. India 4 : 727. 1885 ; Duthie, Fl. Gangetic Plain 3 : 16. 1915.

Perennial, erect, prostrate or climbing undershrubs, with hoary tomentose branches. Leaves alternate and opposite, 1.5-18.0 × 0.8-6.0 cm, broadly or narrowly elliptic to elliptic-lanceolate or elliptic-ovate, cuneate to attenuate at the base and acute to acuminate at apex. Flowers in axillary and terminal spikes, silvery white. Outer tepals hyaline, elliptic-oblong, mucronate. Utricles rotund, compressed. Seeds reniform, black, reticulate.

Fl. & Fr. : October-January.

Common in shady habitats, preferably as forest undergrowth and among hedges, particularly in the east of Aravalli.

Selected specimens : Alwar : Pandupole, *Parmar* 9728 (BSJO) ; Barmer : Haldeshwar Mahadev R.F., *Pandey* 7964 (BSJO) ; Jaipur : Ramgarh, *Sharma* 875 (RUBL) ; Kota : Shahabad, *Nautiyal and Raizada* 25380 (DD) ; Sirohi : Mt. Abu, *Jain* 56998 (BSI) ; Udaipur : Near Paras Ram Mahadev Temple, *Shetty* 1598 (BSJO).

3. ALTERNANTHERA Forsk.

- 1a. Bracts and tepals spinescent. ... 3. *A. pungens*
- 1b. Bracts and tepals not spinescent :
- 2a. Leaves sessile or nearly so. All tepals 1 - nerved with the prominent midrib only. Anthers 3. ... 4. *A. sessilis*
- 2b. Leaves distinctly petioled. All tepals prominently 3 - nerved in the lower half. Anthers 5 :
- 3a. Plants erect. Leaves mucronate. Pseudostami - nodes fimbriate at apex, as long as the stamens. ... 1. *A. bettzickiana*
- 3b. Plants prostrate. Leaves acute. Pseudostami - nodes irregularly dentate, much shorter than the stamens. ... 2. *A. paronychioides*

1. *Alternanthera bettzickiana* (Regel) Nicholson, Ill. Dict. Gard. ed. 1. 59. 1884, '*bettzichiana*' ; Voss in Vilm. Blumengart. ed. 3. 1 : 869. 1895. *Gomphrena ficoidea* L. Sp. Pl. 225. 1753. *Telanthera bettzickiana* Regel, Gartenflora 11 : 178. 1862. *Alternanthera ficoidea* (L.) R. Br. ex Roem. & Schult. Syst. Veg. 5 : 555. 1819, non P. Beauv. 1818 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 230. 1976.

Perennial herbs, upto 50 cm high ; stem erect or decumbent, with many branches from the base, tinged with purple on nodes. Leaves 1.6 × 0.5 - 2.0 cm, in subequal pairs, oblong, oblong obovate or spatulate, acute, clothed with fine denticulate hairs. Heads axillary, sessile, usually globose or ovoid, solitary, white. Tepals lanceolate, acute, mucronate. Utricles falling off with the tepals.

Fl. & Fr. : Throughout the year.

Native of Brazil ; naturalized in waste places and road sides, often gregarious. Also cultivated in the gardens. Included on the authority of Majumdar (1969) and Kanodia & Deshpande (1961) who reported it from Jhunjhunu and Sirohi districts respectively.

2. *Alternanthera paronychioides* St. Hill. Voy. Dist. Diamans Bres. (ser. II) 2 : 439. 1833 ; Sundararaj in Journ. Bombay Nat. Hist. Soc. 53 :

525. 1956 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 232. 1976 ; Shah, Fl. Gujarat 1 : 590. 1978.

Prostrate, tufted herbs, rooting at the nodes. Branches more or less white villous when young, finally glabrescent, striate. Leaves opposite, 0.8-4.5 × 0.3-1.5 cm, elliptic, oval or obovate, spatulate, acute or obtuse, narrowed into a long petiole. Flowers in dense, sessile, globose, solitary or 2 to 3 axillary heads, shining white. Bracts ovate, acuminate mucronate. Tepals oblong lanceolate, acute. Utricles narrowly winged, obovate, included in the perianth, brown, shining, faintly reticulate.

Fl. & Fr. : All round the year.

Native of Tropical America ; naturalized in many parts of the state, usually in moist or marshy habitats with sparse grass cover.

Selected specimens : Bharatpur : Near Bharatpur feeder canal, Parmar 8563 (BSJO) ; Jaipur : Jal Mahal, Sharma 360 (RUBL) ; Jaisalmer : Ramgarh lake, Wadhwa 8411 (BSA) ; Kota : Barrage, Wadhwa 9479 (BSA) ; Sirohi : Mt. Abu, Mehta 336 (JAC) ; Udaipur : Hinglasia Block hills, Kanodia 82344 (BSI).

3. *Alternanthera pungens* Kunth in H.B.K. Nov. Gen. Sp. Pl. 2 : 206. 1818 ; Mahesh. Illus. Fl. Delhi f. 180. 1966 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 233. 1976. *Achyranthes repens* L. Sp. Pl. 205. 1753. *Alternanthera repens* (L.) Link, Enum. Pl. Hort. Berol. 1 : 154. 1821, non Gmel. 1791. 'Kante wali - santi' (Hindi).

Prostrate, mat forming perennial herbs, rooting at the lower nodes. Leaves 1.5-4.5 × 0.3-0.7 cm, broadly rhomboid ovate to broadly ovate or obovate, rounded to sub acute at apex, narrowed below to a petiole upto 1 cm long. Flowers in axillary, 1-3, sessile, globose to shortly cylindrical heads, whitish. Bracts lanceolate ovate, aristate, denticulate along the upper margins, glabrous or dorsally pilose. Tepals extremely dissimilar. Utricles c. 2 mm long, lenticular, rounded or retuse above, enclosed by the persistent perianth. Seeds rounded, brownish, faintly reticulate.

Fl. & Fr. : Almost throughout the year.

Native of Tropical America ; wide spread as a weed in disturbed grounds along road - sides, railway lines, in wastelands etc.

Selected specimens : Alwar : Near Pandupole, Parmar 9466 (BSJO) ; Banswara : Anand Sagar forest block, Singh 3742 (BSJO) ; Bhilwara : Parvatipur, Singh 6579 (BSJO) ; Bikaner : Near garden, Roy 2147 (BSJO) ; Jodhpur : Phalodi, Singh 3222 (BSJO) ; Sirohi : Mt. Abu, Rao 66642 (BSI).

4. *Alternanthera sessilis* (L.) R. Br. ex DC. Cat. Pl. Hort. Bot. Monsp. 4 : 77. 1813 ; Wight, Ic. 2(4) : 7. t. 727. 1843 ; Hook. f. Fl. Brit. India 4 : 731. 1885 ; Duthie, Fl. Gangetic Plain 3 : 20. 1915. *Gomphrena sessilis* L. Sp. Pl. 225. 1753. 'Nari - ka bam, Bhaji' (Hindi).

Annual or perennial herbs ; stem and branches green to purplish, with a narrow line or hairs down each side of stem, rooting at the nodes. Leaves extremely variable in shape and size, 1-9 (15) × 0.2-2.0 (3.0) cm, linear-lanceolate to oblong, ovate or obovate-spathulate, obtuse to shortly acuminate at apex, cuneate to attenuate at base. Flowers in axillary, sessile, subglobose heads, whitish. Bracts deltoid-ovate, mucronate, glabrous. Tepals almost equal sized, oval-elliptic. Utricles obovate or cordate-orbicular. Seeds discoid, shining, faintly reticulate, brown.

Fl. & Fr. : Throughout the year.

Common in wet to marshy habitats near ponds, ditches, rice fields, irrigation channels etc.

Selected specimens : Ajmer : *Lourie* 13/28 (DD) ; Alwar : Naldeshwar forest block, *Parmar* 9522 (BSJO) ; Banswara : Ghatol, *Singh* 2893 (BSJO) ; Ganganagar : Sewani, *Roy* 4872 (BSJO) ; Jaisalmer : Barabagh, *Shetty* 4120 (BSJO) ; Sirohi : Mt. Abu, *Jain* 45179 (BSI).

4. AMARANTHUS L.

1a. Plants monoecious :

2a. Capsules circumscissile :

3a. Leaves with axillary spines. ... 7. *A. spinosus*

3b. Leaves without axillary spines :

4a. Flowers in a terminal leafless spike or in spicate panicles. Perianth - segments 5 :

5a. Inflorescence red. Stigma base and upper part of the lid of fruit swollen, so fruit has distinct neck. ... 3. *A. hybridus* subsp. *hybridus* var. *erythrostachys*

5b. Inflorescence green. Stigma base and upper part of the lid of fruit scarcely swollen, so fruit without any distinct neck. ... 4. *A. hybridus* subsp. *cruentus* var. *paniculatus*

4b. Flowers in axillary cymose clusters, never in terminal leafless spikes. Perianth - segments 2 or 3 :

- 6a. Perianth - segments 2. Capsules hyaline, with prominent green longitudinal ribs. ... 8. *A. tenuifolius*
- 6b. Perianth - segments 3. Capsules neither hyaline nor ribbed :
- 7a. Perianth - segments longer than the capsules. ... 9. *A. tricolor*
- 7b. Perianth - segments shorter than the capsules :
- 8a. Perianth - segments shortly mucronate. ... 1. *A. graecizans* subsp. *graecizans*
- 8b. Perianth - segments long aristate. ... 2. *A. graecizans* subsp. *thellungianus*
- 2b. Capsules indehiscent or irregularly rupturing :
- 9a. Capsules smooth or rugulose, distinctly exceeding the female perianth. ... 5. *A. lvidus*
- 9b. Capsules very strongly corrugated, scarcely exceeding the female perianth. ... 10. *A. viridis*
- 1b. Plants dioecious. ... 6. *A. palmieri*

1. *Amaranthus graecizans* L. Sp. Pl. 990. 1753. *A. angustifolius* Lam. Encycl. 1 : 115. 1783, *nomen illegit.* *A. blitum* L. var. *graecizans* (L.) Moq. in DC. Prodr. 13(2) : 263. 1849. *A. polygamus* L. var. *angustifolia* (Lam.) Hook. f. Fl. Brit. India 4 : 721. 1885.

subsp. *graecizans*

Erect, annual herbs ; stem simple or branched, glabrous or covered with multicellular hairs. Leaves long petioled, 1.5-3.7 × 0.9-2.5 cm, broadly ovate to rhomboid ovate, retuse at tip. Flowers in axillary, sessile, cymose clusters, male and female intermixed. Bracts and bracteoles narrowly lanceolate - oblong. Stigmas 3. Utricles subglobose to ovoid, exceeding the perianth. Seeds compressed, black, shining, faintly reticulate.

Fl. & Fr. : July - December.

Rare, in waste places and in the forests.

Selected specimens : Alwar : Umarai forest block, Parmar 9602 (BSJO) ; Barmer : Bamanala village, Shetty 2324 (BSJO) ; Churu : Sardar Shahar, Roy 2755 (BSJO).

2. subsp. *thellungianus* (Nevski) Gusev in Bot. Zhurn. 57 : 462. 1972. *Amaranthus polygonoides sensu* Roxb. Fl. Ind. ed. 2. 3 : 602. 1832,

non L. 1759. *A. polygamus* sensu Hook. f. Fl. Brit. India 4 : 721. 1885, *pro parte*, non L. 1755 ; Duthie, Fl. Gangetic Plain 3 : 14. 1915. *A. thellungianus* Nevski in Act. Acad. Sc. U.R.S.S. 1(4) : 311. 1937.

Very similar to subsp. *graecizans*, but this may be distinguished by leaf-blade being linear-lanceolate to rhomboid-spathulate, perianth-segments long aristate and awn mostly 0.3-0.75 mm in length and frequently somewhat divergent, bracteoles long aristate.

Fl. & Fr. : Post rainy season.

Common in dry wastelands, particularly along the road-sides.

Selected specimens : Banswara : *Majumdar* 10255 (BSA) ; Jaisalmer : *Devikot, Wadhwa* 5298 A (BSA) ; Jaipur : *Amer, Sharma* 2007 (RUBL) ; Jhalawar : *Sharma* 562 (RUBL) ; Jodhpur : *Bhandari* 1295 (JAC) ; Sirohi : *Mt. Abu, Blatter* 24955 (BLAT).

3. *Amaranthus hybridus* L. subsp. *hybridus* var. *erythrostachys* Moq. in DC. Prodr. 13(2) : 259. 1849 ; Townsend in Nasir & Ali, Fl. W. Pakistan 71 : 11. 1974 *et* in Fl. Ceylon 1 : 13. 1980.

Erect, annual herbs. Stem stout, branched, angular, glabrous or slightly hairy. Leaves long-petioled, 3-20 (30) × 1.5-10.0 (12) cm, broadly lanceolate to rhomboid or ovate, gradually narrowed to the blunt to subacute, mucronulate tip, attenuate or shortly cuneate into the petiole below. Flowers in reddish or purple, axillary and terminal spikes formed of cymose clusters which are increasingly closely approximate upwards, the terminal inflorescence varying from a single spike to a broad, much-branched panicle. Utricles subglobose to ovoid or ovoid-urceolate. Seeds black and shining, compressed, faintly reticulate around the margins.

Fl. & Fr. : Almost throughout the year.

Perfectly naturalized near habitations and in and around gardens. Also cultivated ornamentally as well as a field crop.

Selected specimens : Alwar : *Sariska, Parmar* 10209 (BSJO) ; Barmer : *Sinadari, Rao* 66945 (BSI) ; Dungarpur : *Forest office, Kanodia* 82011 (BSI) ; Jaisalmer : *Pokaran, Wadhwa* 5012 A (BSA) ; Pali : *Erinpura, Rao* 66814 (BSI).

Note : The red colouration of this variety vanishes to a greater extent on drying.

4. subsp. *cruentus* (L.) Thell. var. *paniculatus* (L.) Thell. in Asch. & Graebn. Syn. 5(1) : 247. 1914. *A. paniculatus* L. Sp. Pl. ed. 2. 1406.

1763, non Hook. f. Fl. Brit. India 4 : 718. 1885 ; Duthie, Fl. Gangetic Plain 3 : 11. 1915.

Very similar to subsp. *hybridus* var. *erythrostachys*, but can be distinguished by its green inflorescence, longer bracteoles of the female flowers which are usually 1-1.25 times as long as the perianth segments and the mature stigma - bases and upper part of the lid of the fruit which is scarcely swollen, as a result the fruit has no distinct neck.

Fl. & Fr. : Almost throughout the year.

Common in wastelands, neglected corner of fields and gardens.

Selected specimens : Barmer : Mataji ka than, JAV 23292 (BSI) ; Banswara : Kalakhet, Kanodia 75673 (BSI) ; Bundi : Hindoli, Verma 1899 (BSA) ; Nagaur ; Rupasar, H. Lal 34971 (LWG) ; Pali : Erinpura, Rao 66728 (BSI) ; Sirohi : Mt. Abu, Mehta 630 (JAC).

5. *Amaranthus lividus* L. Sp. Pl. 990. 1753. *A. blitum* L. Sp. Pl. 990. 1753, *nomen confusum* ; Hook. f. Fl. Brit. India 4 : 721. 1885, excl. var. *sylvestris* ; Duthie, Fl. Gangetic Plain 3 : 13. 1915. *A. oleraceus* L. Sp. Pl. ed. 2. 1403. 1763.

Erect, ascending or prostrate, annual herbs. Stem almost angular, green to reddish or yellow, glabrous or rarely thinly covered with uni to multicellular hairs. Leaves long petioled (sometimes longer than lamina), 1-8×0.6-6.0 cm, ovate to rhomboid ovate, broad and always emarginate mucronulate at the apex, shortly cuneate at base. Flowers in slender to stout terminal spikes and axillary cymose clusters or rarely panicles, green. Utricles subrotund to shortly pyriform, compressed, wrinkled on drying, exceeding the perianth. Seeds round, compressed, brown to black, shining.

Fl. & Fr. : July - May.

Common weed in cultivation, gardens and waste places.

Selected specimens : Alwar : Akbarpura, Parmar 9746 (BSJO) ; Banswara : Govt. College, Kanodia 51096 (BSI) ; Barmer : Sheo, Rao 67013 (BSI) ; Bikaner : Bichwal, Roy 1679 (BSJO) ; Jaipur : Nim ka thana, Stower A-39 (BSI) ; Jodhpur : Banar, Tondon Acc. No. 118922 (DD) ; Kota : Shahabad, Jain 28703 (BSI) ; Sirohi : Mt. Abu, Blatter 24954 (BLAT).

6. *Amaranthus palmeri* Wats. in Proc. Am. Acad. 12 : 274. 1877 ; Saur in Journ. Indian bot. Soc. 43 : 573-576. 1972.

Erect, annual herbs ; stem nearly glabrous, sulcate angular, pale green. Leaves upto 7 cm long, ovate or rhombic to lanceolate, obtuse, prominently nerved. Flowers in terminal, or often in small axillary spikes. Bracteoles c. 7 mm long, 1.5 to 3 times as long as tepals, spine tipped, rigid in pistillate flowers, shorter and weaker in staminate ones. Staminate flowers with 5, oblong, acute mucronate, c. 3 mm long tepals and 5 stamens. Pistillate flowers with tepals as long as or longer than capsules, oblong to obovate or spatulate, whitish - green. Capsules dehiscent, subglobular, 2 beaked, rugose at top. Seeds c. 1.2 mm in diam., shining, dark brown.

Fl. & Fr. : September - November.

Native of South West United States ; generally found near wet waste places.

Selected specimens : Banswara : Begaycha village, Singh 3054 ♀ (BSJO) ; Bikaner : On Suratgarh road, Roy, 2118 ♂ (BSJO) ; Churu : Sujangarh, Roy 2725 ♂ (BSJO) ; Jaisalmer : Salamsagar dam, Tiwari 701 (BSJO) ; Jodhpur : Ketu, Singh 3194 ♂ (BSJO), Kailana, Singh 317 ♂ (BSJO) ; Luni, Tiwari 664 ♀ (BSJO) ; Pali : Hemawas dam, Shetty 1989 ♂ (BSJO).

Note : Sen & Singhal (Trends Pl. Res. 418-436, 1985, Y.S. Moorthy commemorative vol.) during their studies on "*Amaranthus* complex in Indian sub-continent" pointed out that true *Amaranthus palmeri* is very poorly represented in this region and most of the dioecious *Amaranthus* species are actually hybrids of *A. palmeri* × *A. hybridus* & *A. caudatus*. In the present work all the dioecious specimens from this region are, therefore, kept under *A. palmeri* complex.

7. *Amaranthus spinosus* L. Sp. Pl. 991. 1753 ; Wight, Ic. 2(2) : 8. t. 513. 1840-43 ; Hook. f. Fl. Brit. India 4 : 718. 1885 ; Duthie, Fl. Gangetic Plain 3 : 10. 1915. '*Rajgira*, *Kantewali chaulai*' (Hindi).

Erect, annual herbs. Stem often much branched, angular, glabrous. Leaves long - petioled, 1.5-3.0 × 0.5-1.2 cm, ovate to rhomboid ovate or elliptic, attenuate at the base, blunt or retuse at apex. Spines upto 2 cm long, sharp, divaricate, axillary. Flowers in axillary clusters in the lower part, passing into long dense spikes towards the end of branches with female flowers in the lower region. Bracteoles deltoid ovate. Utricles ovoid, rugose, with a short inflated neck below the style base. Seeds black, shining, very faintly reticulate.

Fl. & Fr. : Almost throughout the year.

Probably a native of America ; common weed of cultivation, gardens and other waste places.

Selected specimens : Ajmer : Govindgarh, Jain 49698 (BSI) ; Alwar : Akbarpura, Parmar 9745 (BSJO) ; Banswara : Ghatol city, Singh 2939 (BSJO) ; Jaisalmer : Kuri katori, Wadhwa 5246 (BSA) ; Jhalawar : Aklera, Verma 7494 (BSA) ; Sirohi : Mt. Abu, Blatter 24964 (BLAT).

8. *Amaranthus tenuifolius* Willd. Sp. Pl. ed. 4. 4 : 381. 1805 ; Wight, Ic. 2(4) : 7. t. 718. 1843 ; Hook. f. Fl. Brit. India 4 : 722. 1885 ; Duthie, Fl. Gangetic Plain 3 : 14. 1915.

Prostrate or ascending, annual herbs ; branches many from the base. Leaves 0.8-3.2 × 0.2-0.5 cm, linear-oblong to linear-oblong, long attenuate at the base into a slender petiole, apex rounded to emarginate, mucronulate, glabrous. Flowers in small axillary cymose clusters, green. Bracts and bracteoles narrowly oblong-elliptic, with a green central vitta and hyaline margins. Utricles ellipsoid, slightly compressed, delicate, hyaline, 4 to 5 ribbed. Seeds visible through the capsule, round, smooth, shining, brown.

Fl. & Fr. : October - April.

Common weed in moist habitats, particularly along tanks, dam sides etc.

Selected specimens : Bhilwara : Along Udaipur road (Ganthila village), Singh 7109 (BSJO) ; Dungarpur : Verma 108 (BSA) ; Jhalawar : Verma 3318 (BSA) ; Jodhpur : Kailana, Rao 67224 (BSI) ; Pali : Kolar tank side, Pandey 4632 (BSJO) ; Tonk : Tordi sagar, Shetty 583 (BSJO).

9. *Amaranthus tricolor* L. Sp. Pl. 989. 1753. *A. tritris* L. Sp. Pl. 989. 1753. *A. mangostanus* L. Cent. Pl. 1 : 32. 1755 ; Hook. f. Fl. Brit. India 4 : 720. 1885. *A. polygamus* L. Cent. Pl. 1 : 32. 1755, non Hook. f. l.c. 4 : 721. 1885 ; Duthie, Fl. Gangetic Plain 3 : 12. 1915. *A. gangeticus* L. Syst. Nat. ed. 10. 1268. 1759 ; Hook. f. l.c. 4 : 719. 1885 ; Duthie, l.c. 3 : 12. 1915, including var. *tristis*. 'Chaulai' (Hindi).

Ascending or erect, annual herbs. Stem much branched, glabrous or sparsely hairy with crisped hairs. Leaves long petioled, 1.0-8.0 × 1.0-3.5 cm, very variable in size, broadly ovate, rhomboid-ovate or broadly elliptic to lanceolate-oblong, emarginate, acute or obtuse at apex, shortly cuneate to attenuate at base. Flowers in globose clusters, arranged in axillary or terminal spikes, green to crimson. Bracts and bracteoles deltoid-ovate. Tepals elliptic-oblong. Utricles ovoid-urceolate. Seeds black or brown, shining, lenticular, very faintly reticulate.

Fl. & Fr. : September - February.

Common weed in wastelands, cultivated fields, gardens etc., preferably in humus rich soils.

Selected specimens : Alwar : Keraska, Parmar 9562 (BSJO) ; Banswara : Kalakhet, Kanodia 75672 (BSI) ; Barmer : Sheo. Rao 67004 (BSI) ; Jaipur : Mansagar, Sharma 993 (RUBL) ; Sirohi : Mt. Abu, Blatter 24959 (BLAT).

10. *Amaranthus viridis* L. Sp. Pl. ed. 2. 1405. 1763 ; Hook. f. Fl. Brit. India 4 : 720. 1885 ; Duthie, Fl. Gangetic Plain 3 : 13. 1915. *A. gracilis* Desf. Tabl. Ecol. Bot. 43. 1804. 'Jangli chauli' (Hindi).

Erect or ascending, annual herbs. Stem glabrous or sometimes softly hairy. Leaves long petioled, 2.7-7.0 × 1.0-4.5 cm, deltoid ovate to rhomboid ovate, obtuse and emarginate at apex, shortly cuneate to sub truncate below. Flowers in slender, axillary or terminal, often paniculate spikes, green. Bracts and bracteoles deltoid ovate or lanceolate ovate. Tepals of male flowers oblong oval, acute, concave ; those of female flowers narrowly oblong spathulate. Utricles subglobose, not or slightly exceeding the perianth, strongly rugose throughout. Seeds round, slightly compressed, shining, dark brown to black.

Fl. & Fr : March - October.

Common in waste and disturbed ground, along road sides, weed in gardens and fields, preferring humus rich soil.

Selected specimens : Alwar : Akbarpura, Parmar 9739 (BSJO) ; Banswara : Singh 3022 (BSJO) ; Bundi : Verma 1909 (BSA) ; Ganganagar : Rai Singh nagar, Roy 4616 (BSJO) ; Jaipur : Durgapura, Sharma 1142 (RUBL) ; Jaisalmer : Jain 40384 (BSI) ; Sirohi : Mt. Abu, Blatter 24950 (BLAT).

5. CELOSIA L.

Celosia argentea L. Sp. Pl. 205. 1753 ; Wight, Ic. 5 (2) : 1. t. 1767. 1852 ; Hook. f. Fl. Brit. India 4 : 714. 1885 ; Duthie, Fl. Gangetic Plain 3 : 7. 1915. 'Surli Garke' (Hindi).

Erect, annual herbs, 15-100 cm tall. Stem and branches ridged, glabrous. Leaves shortly petioled, 2-15 × 0.7-3.0 cm, linear to lanceolate or ovate-elliptic, acute or obtuse, lower petioled, upper sessile. Flowers in dense, cylindric, terminal or axillary, 2.5-15.0 cm long spikes, white or pink. Basal bracts and bracteoles deltoid, upper lanceolate. Utricles 3-4 mm long, ovoid to globular, included in the perianth. Seeds lenticular, black, shining.

Fl. & Fr. : August November.

Common weed in cultivated fields, waste grounds, preferably on sandy or stony ground during post monsoon season.

Selected specimens : Ajmer : Todgarh, *Lowrie* 4840 (DD) ; Alwar : Sariska Tiger Reserve, *Parmar* 9491 (BSJO) ; Banswara : Kushalgarh, *Singh* 3033 (BSJO) ; Barmer : Haldeshwar Mahadev forest, *Pandey* 7985 (BSJO) ; Ganganagar : Najeengarh, *Roy* 5076 (BSJO) ; Sirohi : Delwara, *Raizada* 21126 (DD).

6. DIGERA Forsk.

Digera muricata (L.) Mart. Beitr. Amar. 77, n. 2. 1825 et Nov. Act. Phys. Med. Acad. Caes. Leop. Carol. Nat. Cur. 13 (1) : 285. 1826. *Achyranthes muricata* L. Sp. Pl. ed. 2. 295. 1762. *Digera arvensis* Forsk. Fl. Aeg. Arab. 65. 1775 ; Hook. f. Fl. Brit. India 4 : 717. 1885 ; Duthie, Fl. Gangetic Plain 3 : 8. 1915. 'Lehsua, Khanjru' (Hindi).

Erect, annual herbs ; branches spreading, glabrous. Leaves 1.5-8.0 × 0.5-6.0 cm, variable in shape, ovate or elliptic, acute or rounded at apex, sometimes with reddish margins, glabrous. Flowers in lax, axillary, pedunculate, 10-30 cm long racemes, pinkish. Bracts deltoid-lanceolate, acuminate, persistent, each subtending a very shortly pedunculate partial inflorescence of 3 flowers of which the central flower is fertile and laterals sterile and adpressed against the fertile flower. Utricles 2.0-2.5 mm in diam., globose, somewhat compressed, muriculate, surmounted by a thick rim or corona of firm processes, muriculate. Seeds yellowish brown.

Fl. & Fr. : August November.

Common weed in cultivated fields and waste places.

Selected specimens : Ajmer : Todgarh, *Duthie* 4841 (DD) ; Alwar : Sariska Tiger Reserve, *Parmar* 9607 (BSJO) ; Banswara : Paloda village, *Singh* 2827 (BSJO) ; Ganganagar : Rai Singh nagar, *Roy* 4915 (BSJO) ; Jaisalmer : Salamasagar dam, *Tiwari* 711 (BSJO) ; Sirohi : Matramata, *Jain* 47924 (BSI).

7. GOMPHRENA L.

Gomphrena celosioides Mart. Beitr. Amar. 93. 1825 et Nov. Act. Phys. Med. Acad. Caes. Leop. Carol. Nat. Cur. 13 (1) : 301. 1826 ;

Mahesh. Illus. Fl. Delhi f. 179. 1966; Raizada, Suppl. Duthie, Fl. Gangetic Plain 235. 1976.

Annual or perennial, prostrate or decumbent herbs; branches many from the base, clothed with white shaggy hairs. Leaves subsessile, 1.5 - 5.5 × 0.5 - 1.5 cm. spatulate or oblong-lanceolate, obtuse to sub-acute at the apex, entire, hairy on both sides. Flowers in sessile, terminal, subglobose heads or spikes subtended by a pair of leaves, white. Utricles shortly compressed pyriform. Seeds compressed, ovoid, faintly reticulate, shining brown.

Fl. & Fr. : January - March; rarely major part of the year.

Native of S. America; widely distributed along road sides, in wastelands etc. in dry sandy and rocky habitats.

Selected specimens : Alwar : Sariska, *Parmar* 9684 (BSJO); Banswara : Jua fall, *Singh* 2992 (BSJO); Ganganagar : Hanumangarh, *Roy* 6420 (BSJO); Jaipur : Ram Niwas garden, *Sharma* 216 (RUBL); Jodhpur : Bilara, *Singh* 3277 (BSJO); Sirohi : Mt. Abu, *Mehta* 276 (JAC).

8. NOTHOSAERVA Wight

Nothosaerva brachiata (L.) Wight, Ic. 6 : 1. 1853; Hook. f. Fl. Brit. India 4 : 726 1885; Duthie, Fl. Gangetic Plain 3 : 17. 1915. *Achyranthes brachiata* L. Mant. Pl. 50. 1767. *Pseudanthus brachiatus* (L.) Wight, Ic. 5 (2) : 3. t 1776 bis. 1852.

Erect, annual herbs; stem and branches subterete, striate, glabrous or thinly hairy. Leaves 1.0 - 4.5 × 0.7 - 2.5 cm, narrowly to broadly elliptic or ovate, glabrous or thinly hairy, obtuse to subacute at tip, gradually narrowed to a petiole. Flowers in dense spikes, white; spikes solitary or clustered. Bracts hyaline, minutely erose, concave, acute or acuminate. Tepals broadly oval. Utricles globose or oblong, smooth. Seeds biconvex, black, smooth, glabrous, shining.

Fl. & Fr. : September - May.

Common in wet and shady habitats, cultivated fields etc. preferably in damp depressions.

Selected specimens : Barmer : Devalai village, *Shetty* 2198 (BSJO); Bharatpur : Pahartal forest, *Parmar* 8533 (BSJO); Bhilwara : Bhimar village, *Singh* 5982 (BSJO); Dungarpur : Chowki forest, *Kanodia* 82063 (BSI); Kota : Shahabad, *Jain* 28871 (BSI); Pali : Jakoda hills, *Shetty* 1429 (BSJO).

9. PUPALIA Juss. *nom. cons.*

- 1a. Leaves ovate or elliptic, upto 10 cm long. Awns of modified flowers purple or yellow :
- 2a. Herbaceous. Leaves glabrous or nearly so. Bracts and bracteoles pungent. Awns purple. ... 1. *P. lappacea* var. *lappacea*
- 2b. Shrubby. Leaves tomentose. Outer bracts of the flower - clusters very broad, membranous. Awns yellow. ... 3 *P. lappacea* var. *velutina*
- 1b. Leaves suborbicular, not reaching 3.5 cm in length. Awns of modified flowers brown. ... 2. *P. lappacea* var. *orbiculata*

1. *Pupalia lappacea* (L.) Juss. in Ann. Mus. Natl. Hist. Nat. Paris 2 : 132. 1803 ; Hook. f. Fl. Brit. India 4 : 724. 1885 ; Duthie, Fl. Gangetic Plain 3 : 19. 1915 ; Mahesh. Illus. Fl. Delhi f. 184. 1966. *Achyranthes lappacea* L. Sp. Pl. 204. 1753. *A. atropurpurea* Lam. Encycl. 1 : 546. 1785. *Pupalia atropurpurea* (Lam.) Moq. in DC. Prodr. 13 (2) : 331. 1849 ; Hook. f. l. c. 4 : 723. 1885.

var. *lappacea*

Annual or biennial herbs ; branches cylindric, straggling or scandent, often tinged with purple. Leaves 2.5 - 10.0 × 0.6 - 5.0 cm, ovate or elliptic lanceolate, acuminate, mucronate, suddenly contracted at the base. Flowers in sessile clusters borne in lax pedunculate terminal spikes. Bracteoles of bisexual flowers cordate ovate, mucronate ; spines of modified flowers glabrous. Utricles ovoid, membranous. Seeds oblong ellipsoid, with subtruncate ends.

Fl. & Fr. : Almost all round the year.

Common in gravelly to rocky habitats in wastelands, open forests, edges of fields etc. among bushes.

Selected specimens : Ajmer : On Jodhpur Road, *Wadhwa* 4875 (BSA) ; Alwar : Kankwari forest block, *Parmar* 8769 (BSJO) ; Barmer : Keradu lillock, *Tiwari* 944 (BSJO) ; Dungarpur : Chowki forest, *Kanodia* 82063 (BSI) ; Sirohi : Mt. Abu, *Rao* 66516 (BSI).

2. var. *orbiculata* (Heyne ex Wall.) Townsend in Kew Bull. 29 : 469. 1974. *Achyranthes orbiculata* Heyne ex Wall. in Roxb. Fl. Ind. 2 : 507. 1824. *Pupalia orbiculata* (Heyne ex Wall.) Wight, Ic. 5 (2) : 4. t. 1783.

1852 ; Hook. f. Fl. Brit. India 4 : 724. 1885 ; Bhandari, Fl. Ind. Desert 327. 1978.

Low, usually prostrate, stout herbs. Leaves shortly but quite closely pilose, sub orbicular, apiculate or sometimes retuse. Flowers in distant clusters, forming stout spikes. Burr (- 1.1) 1.3 - 1.7 cm in diam.

Fl. & Fr. : October - January.

Rare, on rocky to gravelly places in same habitats as type variety.

Selected specimens : Jodhpur : Sardar samand, *Bhandari* 1673, 1961 (JAC) ; Kui, *Tiwari* 3161 (BSJO) ; Mandore, *Tiwari* 619 (BSJO) ; Sirohi : Mt. Abu, *Mehta* 1520 (JAC). Also reported from Barmer district (Blatt. & Hallb. 1918 : 21).

3. var. *velutina* (Moq.) Hook. f. Fl. Brit. India 4 : 724. 1885. *Aerva velutina* Moq. in DC. Prodr. 13 (2) : 301. 1849. *Pupalia lappaceu auct. pl.*, non Juss. 1803 ; *sensu* Moq. l. c. 13 (2) : 331. 1849.

Erect, densely villous tomentose herbs. Leaves shortly petioled, 1.25 - 2.5 cm in diam., orbicular, slightly succulent.

Fl. & Fr. : October - January.

Selected specimen : Jaipur : Univ. Res. Farm, *Sharma* 69 (RUBL).

Notes : Sharma and Tiagi (Fl. North - East Rajasthan 353. 1979) included above mentioned collection number under *P. lappacea* with the note that "one of my specimen (*Sharma* 69) possesses characters similar to those mentioned for var. *velutina* Hk. f.". Blatt. & Hallb. (1918 : 21) and Puri *et al.* (1964) also included this taxon on the authority of King (1879).

RECENT INTRODUCTION

Centrosachys aquatica (R. Br.) Wall. ex Moq. in DC. Prodr. 13(2) : 321. 1849 ; Singh & Singh in Indian For. 108(12) : 776 - 778. 1982 ; Prasad & Vijayan in Journ. Econ. Tax. Bot. 14 : 612 - 614. f. 1. 1990. *Achyranthes aquatica* R. Br. Prodr. 417. 1810 ; Hook. f. Fl. Brit. India 4 : 730. 1885.

Perennial, aquatic herbs. Stem straggling or erect, thick, spongy and hollow in lower part. Leaves opposite, entire, c. 5.5 × 2.0 cm, lanceolate or ovate - lanceolate, acute, pilose. Flowers 7.5 - 8.0 mm long, in terminal, elongate, bracteate spikes ; rachis densely pilose. Stamens 5, alternating with pseudostaminodes. Ovary c. 2 mm long, with solitary ovule ; stigma capitate.

Fl. & Fr. : August - November.

Rare, a tropical species has been recently introduced in Bird Sanctuary through migratory birds in aquatic habitats.

Selected specimen : Bharatpur : Keoladeo National park, Vijayan 409 (BNHS, BSJO).

The author came across this taxon a bit late while Flora was in the advanced stage of printing. Hence dealt under this head.

CULTIVATED SPECIES

Amaranthus caudatus L. '*Chauli*' (Hindi) Tall, erect, suffrutescent herbs or undershrubs, with ovate lanceolate to ovate rhomboid and glabrous leaves. Commonly grown in the gardens for its beautiful drooping tail like spikes of crimson flowers.

Gomphrena globosa L. Tall, branched, annual herbs, with elliptic or obovate oblong, acute or obtuse leaves and large, globose, yellowish white or crimson head of flowers with leafy bracts and pinkish purple bracteoles. Probably a native of America; largely cultivated in the gardens for ornamental purposes.

105. CHENOPODIACEAE

(P.J. Parmar)

- | | | |
|--|-----|-----------------------|
| 1a. Embryo annular; albumen copious or scanty : | | |
| 2a. Fruiting perianth with transverse wing. Albumen scanty. | ... | 4. <i>Kochia</i> |
| 2b. Fruiting perianth not winged. Albumen copious : | | |
| 3a. Flowers all similar, hermaphrodite, rarely polygamous as in <i>Chenopodium ambrosioides</i> . | ... | 2. <i>Chenopodium</i> |
| 3b. Flowers dimorphic; males ebracteolate, with 3 - 5 sepals; females with 2 bracteoles, but without sepals. | ... | 1. <i>Atriplex</i> |
| 1b. Embryo spiral; albumen absent : | | |
| 4a. Sepals transversely winged : | | |
| 5a. Stem jointed. | ... | 3. <i>Haloxylon</i> |
| 5b. Stem not jointed. | ... | 5. <i>Salsola</i> |
| 4b. Sepals not winged. | ... | 6. <i>Suaeda</i> |

1. ATRIPLEX L.

Atriplex crassifolia C.A. Mey. in Ledeb. Ic. Fl. Ross. I. 11. t. 42. 1829; Hook. f. Fl. Brit. India 5: 6. 1886; Sirokitamura in Fl. Afghanistan 97. 1960.

Erect or ascending, diffuse, annual herbs. Stem green, hoary; branches white. Leaves petioled, 2.5 - 3.75 cm long, pale, oblong or ovate oblong or hastately ovate, obtuse, entire or sinuate toothed,

upper ones entire, often acute. Flowers monoecious; male clusters in slender leafless interrupted spikes. Fruiting bracts rhombic-ovate or orbicular, herbaceous, entire or toothed with a very thick white convex smooth disk and base.

Fl. & Fr. : September - January.

Included on the authority of Sarup (1954) who reported it from Jodhpur district. According to Hk. f. (*l. c.*) the distribution of this species is N.W. India and Punjab, from Jamuna westwards.

2. CHENOPODIUM L.

- | | | |
|---|-----|---------------------------|
| 1a. Plants glandular. Stigmas 5. | ... | 2. <i>C. ambrosioides</i> |
| 1b. Plants eglandular. Stigmas 2 : | | |
| 2a. Scentless herbs. Perianth - segments with a green swelling on the back near the apex. Seeds smooth, shining; pericarp easily rubbed off from the seeds. | ... | 3. <i>C. murale</i> |
| 2b. Foetid herbs. Perianth - segments without such swellings. Seeds rugose, dull; pericarp very difficultly detached from the seeds. | ... | 1. <i>C. album</i> |

1. *Chenopodium album* L. Sp. Pl. 219. 1753; Hook. f. Fl. Brit. India 5 : 3. 1886; Duthie, Fl. Gangetic Plain 3 : 22. 1915. '*Bathua*' (Hindi).

Erect, annual herbs, clothed with white powdery vesicles. Leaves very variable in size and shape, 0.5-5.5 × 0.3-3.5 cm, oblong-rhomboid or oblong-lanceolate or elliptic-lanceolate, obtuse or acute, entire, toothed or irregularly lobulate, upper ones smaller and more entire. Flowers in clusters borne in dense or lax paniculate ebracteate spikes, pale-green. Seeds orbicular, compressed, with a blunt margin; embryo completely annular.

Fl. & Fr. : October - April.

Common weed in cultivated fields, gardens and other humid places. Plants sometimes attain 2 m height and behave like perennials in favourable habitats.

Selected specimens : Alwar : Akbarpura, Parmar 9741 (BSJO); Banswara : Ghatol, Singh 4206 (BSJO); Ganganagar : Raisingh nagar, Roy 3879 (BSJO); Jaipur : Golimar, Sharma 1072 (RUBL); Jaisalmer : Salamsagar dam, Tiwari 708 (BSJO); Sirohi : Mt. Abu, Jain 62167 (BSI).

2. *Chenopodium ambrosioides* L. Sp. Pl. 219. 1753; Wight, Ic. 5 (2) : 5. t. 1786. 1852; Hook. f. Fl. Brit. India 5 : 4. 1886; Raizada, Suppl. Duthie, Fl. Gangetic Plain 236. 1976.

Much-branched herbs, strongly scented with a camphoraceous odour. Stem and branches striate, more or less glandular pubescent. Leaves often with glands, 3.5-15.0 × 0.8-3.0 cm, oblong lanceolate to elliptic, obtuse or acute, subentire to serrate-dentate, tapering at the base. Flowers minute, in axillary clusters passing into interrupted spikes which are combined into leafy panicles. Seeds orbicular, smooth, shining, with an obtuse margin.

Fl. & Fr. : December - March.

Frequently found as a weed in cultivated fields and gardens; abundant along irrigation channels.

Selected specimens : Banswara : Jolana, *Kanodia* 51182 (BSI) ; Jaipur : Gangwal garden, *Sharma* 1455 (RUBL) ; Jodhpur : *King* Acc. No 369934, 369935, 369936 (CAL) ; Kota : Atru, *Singh* 90635 (LWG) ; Sirohi : Mt. Abu, *Jain* 60129 (BSI).

3. *Chenopodium murale* L. Sp. Pl. 219. 1753 ; Hook. f. Fl. Brit. India 5 : 4. 1886 ; Duthie, Fl. Gangetic Plain 3 : 23. 1915.

Erect or ascending, annual herbs ; branches glabrous or nearly so. Leaves bright green, 1.2-6.5 × 0.7-3.5 cm, deltoid-ovate, acute or obtuse, irregularly lobulate or toothed, base cuneate. Flowers in cymose clusters combined into spikes forming a panicle, greenish. Tepals oblong, slightly keeled. Seeds orbicular with acute margins.

Fl. & Fr. : November - April.

Common weed in cultivated fields and gardens, preferably in humus rich soils.

Selected specimens : Alwar : Akbarpura, *Parmar* 9735 (BSJO) ; Banswara : Nogama, *Kanodia* 51154 (BSI) ; Ganganagar : Naggi, *Roy* 5905 (BSJO) ; Jaipur : Golimar, *Sharma* 1073 (RUBL) ; Jaisalmer : Amar-sagar, *Shetty* 6137 (BSJO) ; Kota : Atru, *Singh* 90325 (LWG) ; Sirohi : Mt. Abu, *Mehta* 150 (JAC).

3. HALOXYLON Bunge

Plant turn blackish - grey on drying. Leaves distinct. ...	1. <i>H. recurvum</i>
Plant pale - yellowish on drying. Leaves reduced to dilated tips of the joints. ...	2. <i>H. salicornicum</i>

1. *Haloxylon recurvum* (Moq.) Bunge ex Boiss. Fl. Orient. 4 : 949. 1879 ; Hook. f. Fl. Brit. India 5 : 15. 1886 ; Bhandari, Fl. Ind. Desert 329. 1978. *Caroxylon recurvum* Moq. in DC. Prodr. 13 (2) : 175. 1849. *C. indicum* Wight, Ic. 5 (2) : 6. t. 1794. 1852. 'Khar' (Hindi).

Straggling, glabrous bush, pruinose with divaricately spreading, straight or recurved branches. Leaves 0.3 - 0.8 cm long, trigonous or half -

terete, ovate - subulate or ellipsoid, obtuse or acute. Flowers axillary, forming strict spikes. Perianth segments somewhat fleshy, ovate, subobtuse, closing over the utricle; wing membranous, finely veined, orbicular. Seeds orbicular, flattened; embryo spirally coiled.

Fl. & Fr. : November - January.

Common in saline habitats in the western part of the state.

Selected specimens : Barmer : Pachpadra salt basin, *Shetty* 2266 (BSJO); Ganganagar : Jalwala, *Roy* 4074 (BSJO); Jaisalmer : 20 km west of Tanot, *Shetty* 6105 (BSJO); Jodhpur : Near Kohila, *Bhandari* 1045 (JAC).

2. *Haloxylon salicornicum* (Moq.) Bunge ex Boiss. *Fl. Orient.* 4 : 949. 1879; *Hook. f. Fl. Brit. India* 5 : 16. 1886; *Bhandari, Fl. Ind. Desert* 330. 1978. *Caroxylon salicornicum* Moq. in *DC. Prodr.* 13 (2) : 174. 1849. 'Lana' (Hindi).

Erect, much - branched, perennial, leafless shrubs. Stem and branches pale yellow, jointed; joints produced into 2, long triangular points which take the place of leaves and are woolly within. Flowers in erect spikes. Bracteoles ovate, with woolly axils. Perianth - segments in flower c. 2 mm long; wings 2.5 mm long, orbicular obovate, veined, membranous. Seeds horizontal, flattened, orbicular.

Fl. & Fr. : August - December.

Very common in sandy saline habitats in the desertic zones of western Rajasthan.

Selected specimens : Bikaner : Near Chattargarh and Ranjitpura, *Roy* 2110, 2390 (BSJO); Ganganagar : Suratgarh, *Stower* A-14 (BSI); Jaisalmer : Near Chandon Rly. station, *Tiwari* 799 (BSJO); Mohangarh, *Wadhwa* 5048 (BSA).

4. KOCHIA Roth

Kochia indica Wight, *lc.* 5 (2) : 5. t. 1791. 1852; *Hook. f. Fl. Brit. India* 5 : 11. 1886; *Duthie, Fl. Gangetic Plain* 3 : 24. 1915.

Tall, erect, annual herbs. Stem and branches more or less white villous or woolly. Leaves sessile, 0.6 - 3.0 × 0.2 - 0.6 cm, linear - lanceolate, acute, pubescent or villous on both sides, base tapering. Flowers axillary, solitary or in pairs, green. Utricles thinly membranous; wings of fruiting perianth short, broadly triangular - ovate, obtuse, nerveless, shorter than the diameter of disk. Seeds orbicular or ovoid, black.

Fl. & Fr. : August - December.

Rare weed in waste places.

Selected specimens : Chittorgath : *Saran* 85131 (LWG) ; Ganganagar : Water works area, *Dhillon* 311 (Khalsa College Herbarium, Ganganagar).

5. SALSOLA L.

Salsola baryosma (Roem. & Schult.) Dandy in F.W. Andrews, Fl. Pl. Anglo. Egypt. Sudan 1 : 111. 1950 ; Mahesh. Illus. Fl. Delhi f. 185. 1966. *Chenopodium baryosma* Roem. & Schult. Syst. Veg. 6 : 269. 1820. *Salsola foetida* Del. ex Spreng. Syst. Veg. ed. 16. 1 : 925. 1825, non Pallas ex Vest, 1820 ; Hook. f. Fl. Brit. India 5 : 18. 1886 ; Duthie, Fl. Gangetic Plain 3 : 26. 1915. 'Lana' (Hindi).

Much branched, spreading, hoary undershrubs. Stem stout ; branches rather slender. Leaves minute, alternate, fleshy, suborbicular, floral leaves imbricating, forming very short cylindrical spikes. Bracteoles broadly ovate or orbicular, fleshy, as long as the perianth lobes or shorter. Perianth oblong, rounded at the apex ; wings horizontal, attached about the middle to the back of the perianth, obovate, flat, membranous, white, shining. Ovary ovoid or subglobose.

Fl. & Fr. : August - December.

Common in sandy - saline habitats, particularly in the west of Aravalli.

Selected specimens : Barmer : Pachpadra salt basin, *Shetty* 2250 (BSJO) ; Bikaner : Shivbari, *Roy* 2392 (BSJO) ; Ganganagar : Sherpura, *Roy* 4876 (BSJO) ; Jaipur : Nalagarden, *Sharma* Acc. No 8591 (RUBL) ; Jaisalmer : Soothali tank - Pokaran, *Tiwari* 766 (BSJO) ; Jodhpur : Phalodi, *Singh* 3224 (BSJO) ; Pali : Khairlao village, *Shetty* 1334 (BSJO).

6. SUAEDA Forsk. ex Scop. *nom. cons.*

1a. Perennial shrubs. Stigmas 3. Seeds usually erect :

2a. Flowers 2 - 5, axillary. Bracteoles with slightly toothed margins. ... 1. *S. fruticosa*

2b. Flowers in dense, many - flowered clusters. Bracteoles with pectinate margins. ... 3. *S. nudiflora*

1b. Annual herbs. Stigma 2. Seeds usually horizontal. ... 2. *S. maritima*

1. *Suaeda fruticosa* (L.) Forsk. Fl. Aegypt. - Arab. 70. t. 9. 1775 ; Hook f. Fl. Brit. India 5 : 13. 1886 ; Duthie, Fl. Gangetic Plain 3 : 24. 1915. *Chenopodium fruticosum* L. Sp. Pl. 221. 1753. 'Lunki' (Hindi).

Erect, much branched, perennial shrubs. Leaves sub - sessile, fleshy, variable in size and shape, 0.5 - 1.5 × 0.15 - 0.3 cm, linear - oblong or obovate, spatulate or elliptic - oblong, obtuse, narrowed at the

base. Flowers axillary, solitary or 2 to 5 together. Bracteoles membranous, ovate, acute. Styles 3, short; stigmas short, spreading. Utricles obovoid. Seeds obliquely ovoid, smooth, shining black.

Fl. & Fr. : March September.

Common in sandy saline habitats.

Selected specimens : Ajmer : Beawar, *Duthie* 4854 (DD) ; Barmer : Pachpadra, *Singh* Acc. No 6613 (RUBL) ; Bharatpur : On the way to Achnera, *Parmar* 8666 (BSJO) ; Ganganagar : Sherpura, *Roy* 4888 (BSJO) ; Jaipur : Phulera, *Wadhwa* 8267 (BSA) ; Pali : Madali village, *Shetty* 1368 (BSJO).

2. *Suaeda maritima* (L.) Dumort. *Fl. Belg.* 22. 1827 ; *Hook. f. Fl. Brit. India* 5 : 14 1886 ; *Duthie, Fl. Gangetic Plain* 3 : 25. 1915 ; *Mahesh. Illus. Fl. Delhi* f. 186. 1966. *Chenopodium maritimum* L. *Sp. Pl.* 221. 1753.

Annual herbs ; stem woody at the base, with numerous, slender, erect branches. Leaves numerous, 0.6 - 2.5 × 0.05 - 0.15 cm, filiform to narrowly linear, fleshy, sub acute, the floral leaves very small. Flowers in small, few flowered, globose clusters forming very slender, elongate, lax spikes. Bracteoles ovate, membranous, entire. Perianth segments rounded, covering the utricles. Style 2, long, slender. Seeds obliquely ovoid or sub orbicular, shining black.

Fl. & Fr. : April September.

Rare, in saline soils ; so far reported only from Jaipur district.

Selected specimens : Jaipur : Mahla, *Singh* Acc. No 12972 (RUBL) ; Nala garden, *Sharma* 8591 (RUBL) ; Sambher, *Sharma* 7497 (RUBL).

3. *Suaeda nudiflora* (Willd.) Moq. in *Ann. Sci. Nat.* 23 : 316. 1831 & in *DC. Prodr.* 13 (2) : 155 1849 ; *Wight. Ic.* 5 (2) : 5. t. 1796. 1852 ; *Hook. f. Fl. Brit. India* 5 : 14. 1886 ; *Cooke, Fl. Bombay* 2 : 505. 1906 ; *Shah, Fl. Gujarat* 1 : 601. 1978. *Salsola nudiflora* Willd. *Sp. Pl.* 2 : 1313. 1797. 'Moras' (Hindi).

Diffusely branched, woody undershrubs. Leaves numerous, soon falling, 0.6 - 1.25 × 0.2 - 0.3 cm, elliptic oblong or linear obovate, obtuse, rigid, glabrous, base narrowed. Flowers in axillary clusters, forming dense spikes, leafless in the upper part. Bracteoles ovate, acute, membranous. Styles 3. Utricles ovoid. Seeds lenticular, smooth, shining black.

Fl. & Fr. : September February.

Rare, in saline habitats.

Selected specimens : Barmer : Sajyali salt bed (Balotra), *Tiwari* 988 (BSJO) ; Bharatpur : Moti Jheel, *Saran* 41923 (LWG) ; Jaipur : Sambher lake, *Lal* 34689 (LWG), *Jain* 47881 (BSI).

DOUBTFUL TAXA

1. *Atriplex stocksii* (Wt.) Boiss. Diagn. (ser. 2) 4 : 73. 1859 ; Hook. f. Fl. Brit. India 5 : 7. 1886. *Obione stocksii* Wight, Ic. 5(2) : 5. t. 1789. 1852.

Perennial, much-branched shrubs. Leaves fleshy, glabrous, white or glaucous beneath. Male flowers in axillary clusters or in short spikes. Utricles membranous, enclosed in persistent bracteoles. Seeds orbicular, compressed, pale brown.

Reported from Jodhpur by Sarup (1951). But in his revised list of plants of Jodhpur (1954) he excluded this species. Except this, no other report or collection of this species are available from the state.

2. *Chenopodium botrys* L. Sp. Pl. 219. 1753 ; Hook. f. Fl. Brit. India 5 : 4. 1886.

Erect, glandular pubescent herbs. Lower leaves petioled, ovate-oblong ; upper ones oblanceolate. Cymes short, axillary and in long terminal racemes.

The only representative specimen of this taxon is of *Patil 553 (CAL)* from Jodhpur. Phytogeographically it is a temperate Himalayan element. Due to lack of healthy specimen, author could not confirm its identity and hence kept under doubtful taxa.

3. *Chenopodium glaucum* L. Sp. Pl. 220. 1753 ; Hook. f. Fl. Brit. India 5 : 4. 1886.

Decumbent or prostrate herbs. Leaves oblong or ovate-oblong. Flowers in short, dense spikes.

Majumdar (1969) reported this species from Jhunjhunu district. The author could not trace the representative specimen of this species. Since, phytogeographically it is a denizen of high altitude (12,000-14,000 ft.), particularly in western Tibet and Ladakh, its occurrence in Rajasthan is doubtful.

4. *Chenopodium hybridum* L. Sp. Pl. 219. 1753 ; Hook. f. Fl. Brit. India 5 : 3. 1886.

Erect, nearly glabrous herbs. Leaves large, broadly triangular ovate, long acuminate. Flowers in lax, axillary and terminal, almost leafless corymbose panicles.

Reported from Jodhpur and Bikaner by Sarup in 1954 & 1957

respectively. Phytogeographically, its distribution is western Tibet and Ladakh (12,000 ft.).

5. *Haloxylon multiflorum* (Moq.) Bunge ex Boiss. Fl. Orient. 4 : 949. 1879 ; Hook. f. Fl. Brit. India 5 : 16. 1886.

Low, erect, 10-15 cm high, pale, much-branched, almost leafless shrubs.

Reported by King (1879) from Sind. Subsequent workers (Blatter & Hallberg, 1918-21 ; Puri *et al.* 1964 and Bhandari, 1978) included this species in their work on the authority of King (1879). Since Sind is now a part of Pakistan, its occurrence in Rajasthan is doubtful.

CULTIVATED SPECIES

1. *Beta vulgaris* L. '*Chukandar*' (Hindi)—Erect, glabrous herbs with red, yellow or orange tap roots. Flowers in axillary and terminal, 2 to 6-flowered clusters combined into a large, widely branched panicle. Widely cultivated for its roots used as vegetable.

2. *Spinacia oleracea* L. '*Palak*' (Hindi) - Erect, annual herbs. Leaves ovate-oblong or triangular-hastate. Flowers green, in spicate clusters combined into a leafy terminal panicle. Commonly cultivated for leafy vegetable.

106. BASELLACEAE

(P. J. Parmar)

BASELLA L.

Basella rubra L. Sp. Pl. 272. 1753 ; Wight, Ic. 3(2) : 9 t. 896. 1845 ; Hook. f. Fl. Brit. India 5 : 20. 1886 ; Duthie, Fl. Gangetic Plain 3 : 27. 1915. *B. alba* L. Sp. Pl. 272. 1753. *B. cordifolia* Lam. Encycl. 1 : 382. 1785.

Glabrous, fleshy, perennial, much-branched twining herbs. Leaves petioled, 5.0 10.0 × 2.5 - 7.5 cm. broadly ovate, acute or acuminate, thick, entire, often cordate at base. Flowers sessile, in lax, pedunculate spikes, white or red. Bracts small, apiculate ; bracteoles longer than the perianth, oblong, obtuse. Perianth divided half-way down. Utricles red, white or black, about the size of pea, surface crinkly in the dry state.

Fl. & Fr. : September - December.

Common among the hedges and fencings of fields and gardens, along road-sides among bushes, particularly in the east of Aravalli.

Selected specimens : Alwar : On the way to Sariska, *Parmar* 9548 (BSJO) ; Bhilwara : Govata dam, *Singh* 5709 (BSJO) ; Jaipur : Bhandana, *Sharma* Acc. No 8583 (RUBL) ; Jhalawar : *Wadhwa* 7518 (BSA) ; Tonk : Baneta village, *Shetty* 1272 (BSJO).

107. PHYTOLACCACEAE

(P. J. Parmar)

RIVINIA L.

Rivinia humilis L. Sp. Pl. 121. 1753 ; Joshi in Journ. Indian Bot. Soc. 15 : 91. 1936 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 237. 1976. *R. laevis* L. Mant. Pl. 1 : 41. 1767. *R. orientalis* Moq. in DC. Prodr. 13 (2) : 12. 1849.

Erect undershrubs. Leaves 3-8 × 1-3 cm, ovate-lanceolate, entire, acuminate. Flowers in terminal, 4-15 cm long racemes, cream-coloured. Berries globose, 3-4 mm in diam., bright red when ripe. Seeds hairy.

Fl. & Fr. : March - April & September - November.

Native of Tropical America ; introduced in the gardens for ornamental purposes ; sometimes escapes from cultivation and naturalizes in and around the gardens in shady habitats.

Selected specimens : Kota : Bara bagh, *Singh* 90108, 90293, 90527 (LWG).

108. POLYGONACEAE

(P. J. Parmar)

- | | |
|---|----------------------|
| 1a. Almost leafless perennial shrubs or with short-lived small leaves. Stamens 12 - 18. Styles 4. ... | 1. <i>Calligonum</i> |
| 1b. Leafy annual herbs, with persistent leaves. Stamens 6 - 8. Styles 2 - 3 : | |
| 2a. Perianth-segments usually 5, rarely 4 or 6, uniseriate. Stigma capitate. ... | 3. <i>Polygonum</i> |

- 2b. Perianth-segments 6, biseriate (3+3). Stigma fimbriate :
- 3a Outer perianth-segments spinescent, inner short & erect. ... 2. *Emex*
- 3b. outer perianth-segments not spinescent, inner enlarged, enclosing the fruit. ... 4. *Rumex*

1. CALLIGONUM L.

Calligonum polygonoides L. Sp. Pl. 530. 1753 ; Hook. f. Fl. Brit. India 5 : 22. 1886 ; Duthie, Fl. Gangetic Plain 3 : 42. 1915 ; Bhandari, Fl. Ind. Desert 331. 1978. 'Phog' (Hindi).

Rigid, much-branched shrubs ; branches terete, pale, glabrous. Leaves when present, alternate, linear, subulate ; stipules short, membranous, cup-shaped, obliquely truncate and produced upwards at one side. Flowers fasciculate in the axils of ochreae, pinkish. Perianth about 3 mm long ; segments obovate, cuneate. Fruits 6-8 mm long (excluding bristles), oblong, densely clothed with reddish-brown bristles, dilated at base. Seeds oblong.

Fl. & Fr. : April - May.

A typical sand-dune plant, often covering the entire dune in western parts of the state.

Selected specimens : Barmer : Near Daba, *Pandey* 7917 (BSJO) ; Bikaner : West of Bhikampur, *Roy* 1712 (BSJO) ; Churu : Near Sujangarh, *Roy* 2546 (BSJO) ; Jaisalmer : Near Longawala, *Shetty* 6110 (BSJO) ; Jaipur : Sambhar lake, *H. Lal*. 34684 (LWG) ; Jodhpur : *Sarup* Acc. No 116202 (DD).

2. EMEX Campd. *nom. cons.*

Emex spinosus (L.) Campd. Monogr. Rum. 58. t. 1. f. 1. 1819 ; Sharma in Journ. Bombay Nat. Hist. Soc. 58 (3) : 836. pl. 1. 1961 ; Bhandari, Fl. Ind. Desert 332. 1978. *Rumex spinosus* L. Sp. Pl. 337. 1753.

Decumbent or ascending, glabrous, annual herbs. Tap root more or less fusiform. Stem cylindrical, sulcate when dry, somewhat swollen at nodes. Leaves long-petioled, 4-10 × 3-6 cm, ovate, entire, glabrous, rounded at apex, base rounded, truncate or cordate, shortly decurrent to the petiole. Ochreae membranous, tubular. Flowers monoecious, in

axillary clusters, reddish. Fruits trigonous, brown. Seeds trigonous with pointed tip.

Fl. & Fr. : January - March.

Common winter weed in gardens and waste places, preferring moist habitats. Often confused for *Rumex* species.

Selected specimens : Ajmer : *Sharma* 1460 (LWG) ; Barmer : Mokalsar, *Tiwari* 1180 (BSJO) ; Bhilwara : Khejari village, *Singh* 7031 (BSJO) ; Bikaner : Bichwal, *Roy* 1660 (BSJO) ; Jaipur : Amer, *Sharma* 1103 (RUBL) ; Jodhpur : Bilara, *Singh* 307 (BSJO).

3. POLYGONUM L.

1a Flowers in axillary clusters :

2a. Stipules longer than the leaves :

- | | |
|---|--|
| 3a. Leaves orbicular or broadly obovate, margins flat, apiculate. ... | 11. <i>P. plebeium</i>
var. <i>griffithii</i> |
| 3b. Leaves elliptic-oblong, margins strongly recurved, obtuse. ... | 14. <i>P. plebeium</i>
var. <i>scindica</i> |

2b. Stipules shorter than the leaves :

4a. Leaves linear. Flowers distinctly pedicellate :

- | | |
|--|---|
| 5a. Internodes long. Leaves 10 - 13 mm long ... | 10. <i>P. plebeium</i>
var. <i>effusa</i> |
| 5b. Internodes short. Leaves 6 - 10 mm long. ... | 13. <i>P. plebeium</i>
var. <i>micranthema</i> |

4b. Leaves obovate, oblong or oblanceolate. Flowers sessile or nearly so :

6a. Flowers sessile, almost concealed by the stipules :

- | | |
|---------------------------------------|---|
| 7a. Sepals broad, rounded. ... | 8. <i>P. plebeium</i>
var. <i>plebeium</i> |
| 7b. Sepals narrow, outer 2 acute. ... | 9. <i>P. plebeium</i>
var. <i>brevifolia</i> |

6b. Flowers shortly pedicellate, not concealed by the stipules. ...

- | |
|--|
| 12. <i>P. plebeium</i>
var. <i>indica</i> |
|--|

1b. Flowers in terminal pseudo-spikes, spurious heads, panicles or racemes :

8a. Flowers in spikes, racemes or panicles :

9a. Stipules echinate at the margins. ... 3. *P. glabrum*

9b. Stipules ciliate at the margins :

10a. Styles 2. Nuts biconvex :

11a. Bracts coarsely hairy or strigose. ... 6. *P. limbatum*

11b. Bracts densely white-woolly. ... 5. *P. lapathifolium*
var. *lanatum*

10b. Styles 3. Nuts trigonous :

12a. Racemes slender, filiform. Bracts more or less distant. Perianth glandular. ... 4. *P. hydropiper*
subsp. *menotarpum*
var. *lenticularis*

12b. Racemes stout and short. Bracts closely imbricate. Perianth glandular :

13a. Leaf-base narrowed, acute. Stem and peduncles appressed-hairy. ... 1. *P. barbatum*
subsp. *barbatum*

13b. Leaf-base usually rounded or sub-ovate. Stem and peduncles glabrous ... 2. *P. barbatum*
subsp. *gracile*

8b. Flowers in spurious heads subtended by a leafy involucre. ... 7. *P. nepalense*

1. *Polygonum barbatum* L. Sp. Pl. 362. 1753 ; Wight, Ic. 5(2) : 6. t. 1798. 1852 ; Hook. f. Fl. Brit. India 5 : 37. 1886 ; Duthie, Fl. Gangetic Plain 3 : 36. 1915. *P. stagninum* Buch. - Ham. ex Meissn. in Wall. Pl. As. Rar. 3 : 56. 1832 ; Hook. f. l. c. 5 : 37. 1886 ; Duthie, l. c. 3 : 36. 1915.

subsp. *barbatum*

Erect to creeping-ascending, annual or perennial herbs. Leaves sessile, 5-10 × 1-2 cm, lanceolate, acuminate at apex and acute at base, ciliolate. Ochreae strigose ; cilia longer than tube. Flowers in pseudo-spikes, white or whitish-pink. Bracts ciliolate, glabrous. Perianth glandular. Nutlets ovate-triangular, blackish brown, shining, enclosed by the persistent perianth.

Fl. & Fr. : September - January.

Common in marshy habitats on the margins of ponds, ditches, irrigation canals, rivers etc., particularly in the east of Aravalli.

Selected specimens : Alwar : Naldeshwar, *Parmar* 9532 (BSJO) ; Bhilwara : Meja-dam, *Singh* 6045 (BSJO) ; Ganganagar : Layalpuria, *Roy* 4999 (BSJO) ; Jhalawar : Kali Sindh river, *Verma* 3406 (BSA) ; Sirohi : Mt. Abu, *Jain* 45173 (BSI).

2. subsp. *gracile* Danser in Bull. Jard. Bot. Buit. ser. 3. 8 : 146. f. 2. 1927 ; Mahesh. Illus. Fl. Delhi f. 189. 1967 ; Sharma and Tiagi, Fl. N. E. Rajasthan 359. 1979. *Polygonum flaccidum* Roxb. Fl. Ind. 2 : 291. 1832, non Meissn. 1856. *P. serrulatum sensu* Hook. f. Fl. Brit. India 5 : 38. 1886, excl. var. *donii*, non Lagasca 1816.

Very similar to subsp. *barbatum*, but can be distinguished by its leaves being rounded or sub-cordate at the base.

Fl. & Fr. : September - January.

Frequent, particularly in the eastern parts of the state in marshy places.

Selected specimens : Alwar : Baranviar, *Parmar* 9753 (BSJO) ; Ganganagar : Hanumangarh, *Roy* 6419 (BSJO) ; Jaipur : Ramgarh, *Sharma* 1813 (RUBL) ; Jhalawar : *Verma* 6706 (BSA) ; Kota : Shahabad, *Wadhwa* 9356 (BSA) ; Sirohi : Mt. Abu, *Blatter* 25010 (BLAT).

3. *Polygonum glabrum* Willd. Sp. Pl. 2 : 447. 1779 ; Wight, Ic. 5(2) : 6. t. 1797. 1852 ; Hook. f. Fl. Brit. India 5 : 34. 1886 ; Duthie, Fl. Gangetic Plain 3 : 35. 1915. '*Pani-ki-Mirch*' (Hindi).

Erect or decumbent, annual, glabrous herbs ; stem usually tinged with reddish below. Leaves 7-20 × 1-3 cm, lanceolate, finely acuminate, tapering at base, glabrous, closely gland-dotted. Ochreae upto 3 cm long, glabrous, eciliate. Flowers clustered in the axils of rhomboid bracts in paniculate slender racemes, pink. Nutlets broadly ovoid or sub-orbicular compressed, biconvex, brown or black, shining.

Fl. & Fr. : Almost throughout the year.

Common in ponds, ditches and other marshy places, particularly in the east of Aravalli.

Selected specimens : Alwar : Minak, *Parmar* 9625 (BSJO) ; Bans-

wara : Kushalgarh - Banswara road, *Singh* 3030 (BSJO) ; Ganganagar : 280 head-along Indira Gandhi canal, *Roy* 3820 (BSJO) ; Jaipur : Ramgarh, *Sharma* 147 (RUBL) ; Kota : Barrage, *Majumdar* 9477 (BSA) ; Sirohi : Abu road, *Mc Cann* 165 (BLAT).

4. *Polygonum hydropiper* L. subsp. *microcarpum* Danser var. *lenticularis* Danser in Bull. Jard. Bot. Buit. ser. 3, 8 : 189, 1927. *P. hydropiper* Meissn. in DC. Prodr. 14 : 109, 1856, *pro parte*, non L. 1753 ; Hook. f. Fl. Brit. India 5 : 39, 1886 ; Duthie, Fl. Gangetic Plain 3 : 37, 1915.

Erect or ascending, glabrous, annual herbs, with a decumbent or creeping base. Leaves sessile, 3.5 - 10.0 × 1.2 - 2.0 cm, linear-lanceolate to ovate-lanceolate, acuminate, gland-dotted. Ochreae glabrous or sparsely strigose, shortly ciliate. Flowers in slender, filiform, flexuous racemes, pink. Bracts glabrous, glandular or not, minutely ciliate or naked at the mouth. Nutlets lenticular, trigonous, granulate.

Fl. & Fr. : September - April.

Rare, in ditches, tanks and other marshy places.

Selected specimen : Kota : Chhabra, *Singh* 74794 (LWG).

Notes : This taxon can be distinguished from other related species by its filiform racemes, distant bracts and bitter taste of leaves.

5. *Polygonum lapathifolium* L. var. *lanatum* (Roxb.) Steward, Contrib. Gray Herb. 5(88) : 46, 1930. *P. lanatum* Roxb. Fl. Ind. 2 : 285, 1824. *P. lanigerum* auct. non R. Br. 1810 ; Hook. f. Fl. Brit. India 5 : 35, 1886 ; Duthie, Fl. Gangetic Plain 3 : 34, 1915 ; Mahesh. Illus. Fl. Delhi f. 187, 1966.

Erect, annual, white-woolly herbs, often tinged with red at the nodes. Leaves 7-20 × 1.5 - 5.0 cm, narrowly lanceolate to ovate-lanceolate, acuminate at apex, cuncate at base, glabrous above, densely silky-woolly beneath. Flowers in terminal or axillary, paniced spikes, pink or white. Nutlets broadly oblong or ovoid, compressed, biconvex, black-brown, smooth and shining.

Fl. & Fr. : August - September.

Rare, in marshy habitats.

Selected specimen : Sirohi : Mt. Abu, *Blatter* 25017 (BLAT). Also reported from Sadhuwali in Ganganagar district by Dhillon & Bajwa (1969) and Dhillon & Bhandari (1974).

6. *Polygonum limbatum* Meissn. in DC. Prodr. 14 : 123. 1856 ; Hook. f. Fl. Brit. India 5 : 30. 1886 ; Duthie, Fl. Gangetic Plain 3 : 34. 1915.

Erect or decumbent, annual herbs. Stem striated, with pubescent branchlets. Leaves 7-15 × 2.5-4.5 cm, lanceolate, entire, acuminate, scabrid, with purple spot on the upper surface. Ochreae appressed hairy, with truncate-ciliate mouth, more than half the length of interaodes. Flowers in short, erect, axillary or terminal paniced racemes, pink. Styles 2, connate for half of their length. Nutlets orbicular, biconvex, smooth, black.

Fl. & Fr. : October - June.

Rare, found on the marshy banks of the rivers.

Selected specimens : Bharatpur : Ghana bird sanctuary, Prasad 182 (BNHS, Ecological Research Centre, Bharatpur) ; Bundi : Kota dam, Singh 74795 (LWG).

7. *Polygonum nepalense* Meissn. Monogr. 84. t. 7. f. 2. 1826 ; Danser in Bull. Jard. Bot. Buit. ser. 3. 8 : 201. 1927. *P. punctatum* Buch. Ham. ex D. Don, Prodr. Fl. Nep. 72. 1825, non Elliot, 1817, nec Ref. 1820. *P. alatum* Buch. Ham. ex D. Don var. *nepalense* (Meissn.) Hook. f. Fl. Brit. India 5 : 41. 1886 ; Duthie, Fl. Gangetic Plain 3 : 39. 1915.

Erect to ascending, annual herbs, with a creeping or decumbent base. Stem glandular hairy towards apex. Ochreae tubular, obliquely truncate, glabrous. Leaves on winged petioles which are with 2, rounded, amplexicaul basal auricles ; blade ovate-triangular to rhomboid, acute or acuminate, hairy on the nerves beneath. Heads 0.5 - 3.0 cm long, on glandular hairy peduncles. Bracts glabrous, ciliate, Perianth red-purple. Stamens 4-5. Style 2-3. Nutlets lenticular or 3-gonous, pitted, red-brown, with a prominent rib on the lateral faces.

Fl. & Fr. : August - November.

Rare, in the forests in shady and moist habitats.

Selected specimens : Sirohi : Mt. Abu, Mehta 1644, 1645 (JAC).

8. *Polygonum plebeium* R. Br. Prodr. 420. 1810, '*plebejum*' ; Hook. f. Fl. Brit. India 5 : 27. 1886 ; Duthie, Fl. Gangetic Plain 3 : 31. 1915.

var. *plebeium*

Diffusely branched, prostrate, annual herbs, with stout or slender

branches. Lower internodes often longer than the leaves, upper shorter. Leaves 4-8 mm long, upper often much shorter, oblong or oblanceolate-linear, obtuse, margins sometimes recurved. Ochreae hyaline, lacerate on the rim. Flowers sunk amongst stipules, rarely exserted, pink or red. Sepals short, broad, rounded. Nutlets rhomboid-trigonal, smooth, shining.

Fl. & Fr. : After rainy season.

Abundant in drying ponds along the roads, banks of rivers, tanks and in other low-lying areas.

Selected specimens : Ajmer : Ajmer-Udaipur road, *Kaul* 8548 (LWG) ; Alwar : Siliserh, *Lal* 34556 (LWG) ; Dungarpur : *Verma* 153 (BSA) ; Ganganagar : Rawala, *Roy* 4071 (BSJO) ; Jaisalmer : Amarsagar, *Rao* 67175 (BSI) ; Sirohi : Mt. Abu, *Blatter* 2185 (BLAT).

9. var. *brevifolia* Hook. f. *Fl. Brit. India* 5 : 28. 1886 ; Duthie, *Fl. Gangetic Plain* 3 : 33. 1915.

Prostrate, diffusely branched herbs, with woody root-stock ; branches stout often 30-60 cm long, dark-brown, grooved ; internodes of branchlets very short, concealed by the leaves and stipules. Leaves 3-6 mm long, obovate, acute or apiculate, flat, coriaceous, dark brown when dry. Flowers sessile, almost concealed by the stipules, pink. Sepals narrow, outer 2 acute. Nutlets 1.7-2.0 mm, trigonal, black.

Fl. & Fr. : After rainy season.

Common in wet and marshy places.

Selected specimens : Bikaner : Kodemadesar, *Roy* 1693 (BSJO) ; Banswara : Raj talab, *Kanodia* 51011 (BSI) ; Jaisalmer : Barabugh, *Shetty* 6153 (BSJO) ; Jodhpur : Bilara, *Singh* 3521 A (BSJO) ; Pali : Jawai dam, *Shetty* 1621 (BSJO) ; Tonk : Banthali near Banas river-bed, *Shetty* 471 (BSJO).

10. var. *effusa* (Meissn.) Hook. f. *Fl. Brit. India* 5 : 28. 1886 ; Duthie, *Fl. Gangetic Plain* 3 : 32. 1915. *Polygonum effusum* Meissn. in DC. *Prodr.* 14 : 63. 1856.

Slender, rather flaccid annual herbs, with long internodes. Leaves 1.0-1.3 cm long, linear or oblanceolate, narrowed at base and rounded at apex. Flowers usually pedicellate ; pedicels longer than stipules. Nutlets trigonal, black, smooth.

Fl. & Fr. : November - March.

Common in wet and marshy places, particularly on the banks of river.

Selected specimens : Ajmer : *Lowrie* 4859 (DD) ; Banswara : *Verma* 211 A (BSA) ; Jaipur : *Amer, Sharma* 1100 (RUBL) ; Jaisalmer : Tank near Pokaran, *Shetty* 6168 (BSJO) ; Pali : Kharda tank, *Moorthy* 352 (BSJO) ; Kota : Chhipabaraut, *Singh* 90652 (LWG) ; Sirohi : Mt. Abu, *Mehta* 802 (JAC).

11. var. *griffithii* Hook. f. *Fl. Brit. India* 5 : 29. 1886 ; *Duthie, Fl. Gangetic Plain* 3 : 33. 1915.

Annual herbs ; branches excessively numerous from the root, very slender, flexuous and quite naked (leafless) below ; internodes very short. Leaves orbicular or broadly obovate, shorter than the stipules ; stipules nerveless. Flowers sessile, hidden in the stipules, pink. Sepals rounded, the outer 2 apiculate. Nutlets trigonous, black, shining.

Fl. & Fr. : September - December.

Occasionally found in drying ponds and in river beds. The lower parts of branches are usually buried in the soil and are therefore, leafless.

Selected specimens : Banswara : *Verma* 212 (BSA) ; Bhilwara : Gangera village, *Singh* 7020 (BSJO) ; Chittorgarh : Orai dam, *Verma* 1667 (BSA) ; Jhalawar : Chhapi river, *Wadhwa* 9531 (BSA) ; Kota : Baran, *Singh* 90502 (LWG).

12. var. *indica* (Heyne ex Roth) Hook. f. *Fl. Brit. India* 5 : 28. 1886 ; *Duthie, Fl. Gangetic Plain* 3 : 33. 1915. *Polygonum indicum* Heyne ex Roth, *Nov. Sp. Pl.* 208. 1821 ; *Wight, Ic.* 5(2) : 7. t. 1808. 1852.

Diffusely branched, prostrate herbs ; branches uniformly spreading all round from the crown, leafy ; internodes short. Leaves 0.6 - 1.25 cm long, linear or obovate-oblong, flat, obtuse or apiculate. Stipules very short. Flowers sessile or shortly pedicellate, pedicel shorter than the perianth. Two outer sepals acute. Nutlets c. 1.6 mm long, trigonous.

Fl. & Fr. : September - January.

Occasionally met with in the wet habitats in open wastelands and river-beds.

Selected specimens : Alwar : Bandipol, *Parmar* 9674 (BSJO) ;

Barmer : Pachpadra, *Tondon* Acc. No 118934 (DD); Jaipur : Chaksu, *Sharma* 1705 (RUBL); Kota : Air port area, *Singh* 90182 (LWG).

13. var. *micranthema* Hook. f. Fl. Brit. India 5 : 29. 1886; Duthie, Fl. Gangetic Plain 3 : 32. 1915.

Small herbs, with slender branches. Leaves 6 - 10 mm long, linear or linear-oblong, obtuse, narrowed at base. Flowers minute, pedicelled, crowded in the upper axils. Sepals narrow, obtuse. Nutlets minute.

Fl. & Fr. : September - January.

Rare, in moist sandy places.

Selected specimen : Sirohi : Mt. Abu, *Mehta* 405 (JAC).

14. var. *scindica* Hook. f. Fl. Brit. India 5 : 29. 1886; Blatter and Hallberg in Journ. Bombay Nat. Hist. Soc. 26 (4) : 969. 1920; Bhandari, Fl. Ind. Desert 334. 1978.

Diffusely branched, prostrate herbs, branches pale-red-brown; internodes very short, woolly from the crinite stipules. Leaves 2.5 - 3.0 mm long, orbicular or broadly obovate, flat, apiculate. Flowers subsessile, sunken amongst the stipules. Nutlets c. 1 mm long, trigonous, black.

Fl. & Fr. : October - November.

Rare, in the rocky places.

Included on the authority of Blatter and Hallberg (1920) who reported it from Jodhpur (Kailana). The specimen *Blatter* 9080 (BLAT) was not traceable in the herbarium.

4. RUMEX L.

- | | |
|---|--|
| 1a. Leaves strongly wavy, tapering at base into a petiole. Flowers polygamous. Inner perianth-segments entire or nearly so at the margins in fruit. ... | 1. <i>R. crispus</i> |
| 1b. Leaves entire, rounded or cordate at base. Flowers bisexual. Inner perianth-segments much dentate or spinose at margins in fruit : | |
| 2a. Teeth of inner fruiting tepals erect. ... | 2. <i>R. dentatus</i>
subsp. <i>klotzschianus</i> |
| 2b. Teeth of inner fruiting tepals hooked. ... | 3. <i>R. nepalensis</i> |

1. *Rumex crispus* L. Sp. Pl. 335. 1753 ; Rech. f. in Candollea 12 : 80. 1949 ; Kanodia in Bull. Bot. Surv. India 5 : 377-379, f. 1-9. 1964.

Erect, glabrous, perennial herbs ; stem cylindrical, ridged, hollow, much branched, swollen at nodes, brownish-red to greenish-brown. Leaves 4-20 × 0.3-4.5 cm, alternate, lanceolate, crumpled, crenulate, acute at apex, glabrous, rarely papillate on veins beneath. Flowers in compound racemes, dark green. Nuts sharply triangular, c. 3 × 2 mm, reddish-brown, glossy.

Fl. & Fr. : March - May.

Native of Europe ; probably introduced through European tourists visiting Mt. Abu (Kanodia *l.c.*) ; naturalized locally near nalas in damp habitats.

Selected specimens : Sirohi ; Mt. Abu (Dirty water nala along road sides), Kanodia 62196, Jain 62092 (BSI).

2. *Rumex dentatus* L. subsp. *klotzschianus* (Meissn.) Rech. f. Beih. Bot. Centralb. 49 : 19. 1932 *et in* Candollea 12 : 119. 1949 ; Babu, Herb. Fl. Dehradun 446. 1977. *R. klotzschianus* Meissn. in DC. Prodr. 14 : 57. 1856. *R. dentatus sensu* Hook. f. Fl. Brit. India 5 : 59. 1886, non L. 1771 ; Duthie, Fl. Gangetic Plain 3 : 41. 1915.

Erect, simple or branched, glabrous, annual herbs ; stem sulcate, fistular, purplish. Leaves radical and cauline ; lower leaves long-petioled, 8-10 × 2.0 - 3.5 cm, linear-lanceolate to oblong or elliptic-oblong. Flowers pedicellate, in distinct whorls, forming leafy racemes, green to greenish-white. Nuts 2.0 - 2.5 × 1 - 5 mm, trigonous.

Fl. & Fr. : January - April.

Common on the margins of the ponds, ditches and irrigation fields, preferably in damp habitats.

Selected specimens : Alwar : Akbarpura, Parmar 9740 (BSJO) ; Barmer : Bhujawas, Tiwari 1137 (BSJO) ; Dungarpur : Verma 105 (BSA) ; Ganganagar : Suratgarh farm, Roy 5920 (BSJO) ; Jaipur : Amer, Sharma 1102 (RUBL) ; Sirohi : Abu, Jain 62098 (BSI).

3. *Rumex nepalensis* Spreng. Syst. Veg. 2 : 159. 1825 ; Wight, Ic. 5(2) : 8. t. 1810. 1852 ; Hook. f. Fl. Brit. India 5 : 60. 1886 ; Duthie, Fl. Gangetic Plain 3 : 41. 1915.

Erect, annual or perennial herbs ; stem glabrous or with scattered

gland-tipped hairs. Leaves 7 - 13 × 2 - 6 cm ; basal leaves oblong-ovate with long petiole and cordate base, upper ones shortly petioled to sessile, lanceolate ; petioles usually winged. Flowers in whorls, combined into leafy racemes, white. Bracts ovate-lanceolate, acute, glabrous. Style 3, connate nearly to the apex. Nuts 3 - 4 mm long, lenticular, minutely areolate, dark brown.

Fl. & Fr. : March - June.

Rare, along railway line near Darah village.

Selected specimen : Kota : Darah, Singh 74870 (LWG).

CULTIVATED SPECIES

Antigonon leptopus Hook. & Arn. Large, handsome climbing shrubs, with ovate-triangular leaves and bright pink flowers. Native of South America ; largely grown in the gardens for ornamental purposes.

Fagopyrum esculentum Moench. Erect, glabrous, annual herbs, with triangular - cordate, acute leaves and white to pink flowers arranged in terminal subcapitate cymes. Nuts trigonous, acutely angled. Native of Central or Northern Asia ; sometimes cultivated ornamentally.

Muehlenbeckia platyclada (F. Muell.) Meissn. (*Coccoloba platyclada* F. Muell.) Curious glabrous shrubs, with flattened leaf-like branches (phylloclades). Native of Solomon Island ; rarely grown in the gardens for ornamental purposes (Sarup, 1954).

Polygonum chinense L. - Diffuse, much-branched, scrambling under-shrubs, with ovate to oblong leaves. Flowers white, in capitate heads which form axillary and terminal, divaricate, glandular-pubescent panicles. Native of Eastern and South-eastern Asia ; occasionally cultivated in the gardens for ornamental purposes.

Rumex hastatus D. Don - Erect, much-branched, perennial shrubs, with broadly triangular or hastately 3-lobed leaves. Flowers minute, polygamous. Sometimes cultivated for its leaves which are very acidic and may be eaten as salad.

Rumex vesicarius L. - Pale-green, fleshy, glabrous, annual herbs, with long-petioled, hastate, acute leaves and pink flowers arranged in axillary, long-peduncled racemes. Sometimes cultivated as a fodder crop.

109. ARISTOLOCHIACEAE

(P. J. Parmar)

ARISTOLOCHIA L.

- Erect herbs, with diffuse branches. Flowers axillary, solitary.
Bracts large, orbicular or reniform. ... 1. *A. bracteolata*
- Twining herbs. Flowers in axillary racemes. Bracts small,
ovate. ... 2. *A. indica*

1. *Aristolochia bracteolata* Lam. Encycl. Meth. Bot. 1 : 258. 1783. *A. bracteata* Retz. Obs. Bot. 5 : 29. 1788 ; Hook. f. Fl. Brit. India 5 : 75. 1886 ; Duthie, Fl. Gangetic Plain 3 : 44. 1915. 'Kiramar' (Hindi).

Erect to prostrate, perennial herbs, with spreading decumbent branches. Leaves petiolate, 2.0 - 8.5 cm long and as broad, broadly ovate or reniform, obtuse, cordate at base, with wide shallow sinus. Flowers dark-purple ; pedicels 1.0 - 2.5 cm long. Perianth-base subglobose ; tube cylindric, with trumpet-shaped mouth. Stamens 6, uniseriately epigynous ; anthers adnate to the column. Capsules 1.0 - 1.5 × 1.5 cm, oblong-ellipsoid, glabrous, ribbed. Seeds horizontal, flattened, deltoid-cordate.

Fl. & Fr. : July - December.

Common in wastelands and road-sides in dry habitats.

Selected specimens : Ajmer : Tiagi 5 (DD) ; Banswara : Pipalkunt, Singh 2924 (BSJO) ; Barmer : Silly pasture, Tiwari 997 (BSJO) ; Churu : Baman ka Bas, Roy 2765 (BSJO) ; Kota : Baran, Singh 90487 (LWG) ; Pali : Busi village, Pandey 4664 (BSJO).

2. *Aristolochia indica* L. Sp. Pl. 960. 1753 ; Hook. f. Fl. Brit. India 5 : 75. 1886 ; Duthie, Fl. Gangetic Plain 3 : 44. 1915. *A. lanceolata* Wight, Ic. 5(2) : 17. t. 1858. 1852. 'Hooka-bel' (Hindi).

Twining woody herbs. Leaves variable in size, 4 - 13 × 1.5 - 8.0 cm, ovate-elliptic, obovate or panduriform, usually obtusely acuminate, cuneate, rounded, subtruncate or subcordate at base. Flowers in axillary racemes. Perianth greenish-white, with globose, inflated base ; mouth trumpet-shaped. Capsules 2-3 cm long, oblong or globose-oblong, black on drying. Seeds flat, deltoid-ovate, winged.

Fl. & Fr. : August - December.

Occasional, climbing on the shrubs and small trees on the fringes of forests in the east of Aravalli.

Selected specimens : Alwar : Bala Fort, *H. Lal* 34404 (LWG) ; Banswara : Chhatripada forest block, *Singh* 3739 (BSJO) ; Jhalawar : Ghatoli forest, *Wadhwa* 7554 (BSA) ; Sawaimadhopur : Bayana, *Sankar & Ghose* 46062 (LWG) ; Tonk : Toda Rai Singh forest, *Shetty* 1303 (BSJO).

DOUBTFUL TAXA

Aristolochia atropurpurea Parish ex Hook. f. *Fl. Brit. India* 5 : 76. 1876.

Straggling herbs, with woody root-stock. Leaves ovate-lanceolate, acuminate, cordate at the base. Flowers in few-flowered, subsessile cymes. Capsules globose, shortly stipitate.

Hooker (*l. c.*) described this species from Tenasserim the type locality. Sankhala (1951) reported it from N.W. Rajasthan. No specimen could be seen in any Indian herbarium from Rajasthan. Since the present area does not come in the range of distribution of this species, the author doubts on the identity of taxon reported by Sankhala (1951).

110. PIPERACEAE

(P. J. Parmar)

PEPEROMIA Ruiz. & Pav.

Peperomia pellucida (L.) Kunth. in H.B. & K. *Nov. Gen. Sp.* 1 : 64. 1816 ; Duthie, *Fl. Gangetic Plain* 3 : 47. 1915 ; Bhandari, *Fl. Ind. Desert* 336. 1978. *Piper pellucidum* L. *Sp. Pl.* 30. 1753.

Delicate, erect or diffuse herbs, rarely rooting at lower nodes. Stem glabrous, pellucid. Leaves alternate, 1.5-3.0 cm, long and nearly as broad, deltoid-ovate, 5-nerved, sub-truncate or cordate at base. Flowers in axillary, terminal or leaf-opposed. 2.5 cm long spikes. Fruits globose, brown-black, sulcately striate, pointed at apex.

Fl. & Fr. : September - December.

Native of south America ; naturalized in many parts of India including Rajasthan. The plants prefer shady habitats in the gardens.

Selected specimen : Jodhpur : Bhandari 1921 (JAC).

CULTIVATED SPECIES

Piper peepuloides Roxb. - Tall shrubs, with angular young branches and alternate, ovate-cordate and acute leaves which are dark green above and light green on abaxial surface. Inflorescence a catkin, white. Denizen of Himalaya ; rarely cultivated in the gardens for ornamental purposes.

111. LAURACEAE

(P.J. Parmar)

CASSYTHA L.

Cassytha filiformis L. Sp. Pl. 35 1753 ; Wight, Ic. 5(2) : 16. t. 1847. 1852 ; Hook. f. Fl. Brit. India 5 : 188. 1886 ; Duthie, Fl. Gangetic Plain 3 : 57. 1915. '*Amerbel*' (Hindi).

Filiform, leafless, twining parasitic herbs forming web over bushes. Flowers small, sessile, in lax, lateral, divaricate spikes. Bracteoles small, rounded, ciliate. Perianth twice as long as the bracteoles ; tube short ; segments 6, in 2 rows, the outer 3 segments short, rounded, ciliate ; inner oblong, acute, concave. Fruits white, globose, smooth, enclosed in the fleshy perianth-tube and crowned with the erect perianth-segments.

Fl. & Fr. : Almost throughout the year.

Rare, parasitizing bushes and shrubs in the wastelands, open forests and boundaries of gardens and fields. Included on the authority of Blatter & Hallberg (1919) from Mandore (Jodhpur) and Vyas (1965 & 1967) from Udaipur and Alwar districts respectively.

112. PROTEACEAE

(P. J. Parmar)

GREVILLEA R. Br. *nom. cons.*

Grevillea robusta A. Cunn. ex R. Br. Prot. Nov. 24. 1830 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 243. 1976 ; Bhandari, Fl. Ind. Desert 335. 1978.

Lofty robust trees, with hoary or rusty-tomentose young branches. Leaves fern-like, bipinnate or sometimes tripinnate; pinnae entire or deeply pinnatifid, lanceolate. Flowers greenish-yellow mixed with orange, in secund, one-sided, showy racemes. Fruits 1.6×1.0 cm, brown, oblique, coriaceous follicle. Seeds 1-2, winged.

Fl. & Fr. : March - June.

Native of Queensland and New South Wales; commonly planted in the gardens, parks and along road-sides for beautiful foliage and flowers.

113. LORANTHACEAE

(P.J. Parmar)

- 1a. Leafy parasites. Branches terete. Flowers bisexual. Style long :
- 2a. Corolla gamopetalous, 5-lobed. 1. *Dendrophthoe*
- 2b. Corolla of 4 free petals. 2. *Hellxanthera*
- 1b. Leafless parasites. Branches flattened. Flowers unisexual. Style short or none. 3. *Viscum*

1. DENDROPTHOE Mart.

Dendrophthoe falcata (L. f.) Etting. in Denkschr. Akad. Wiss. Math. Naturwiss. 32 : 52-53, 58. t. 13. f. 14. 1872. *Loranthus falcatus* L. f. Suppl. 211. 1781. *L. longiflorus* Desr. in Lam. Encycl. 3 : 598. 1772; Wight, Ic. 1 : t. 302. 1840; Hook. f. Fl. Brit. India 5 : 214. 1886, incl. var. *falcata* (L. f.) Kurz & var. *amplexifolia* (DC.) Thw.; Duthie, Fl. Gangetic Plain 3 : 63. 1915. 'Banda' (Hindi).

Dichotomously branched, perennial, partial stem parasites, with twiggy and woody branches. Leaves opposite, $4-25 \times 2.8-13.0$ cm, elliptic-oblong, obovate or ovate-lanceolate, glabrous, coriaceous. Flowers in 5-15 cm long, axillary or supra-axillary, unifateral spikes, red, orange-red or yellowish-red. Stamens 5, epipetalous, upto the corolla throat. Berries 0.7 - 1.0 cm long, globose or ovoid, bright red.

Fl. & Fr. : August - February; rarely December - August.

Common parasite on trees in the forest tracts, wastelands and on road-side trees.

Selected specimens : Ajmer : Duthie 4862 (DD) ; Alwar : Kankwari forest block, Parmar 8796 (BSJO) ; Banswara : Wadita hillage forest block, Singh 2909 (BSJO) ; Pali : Ghanerao R.F., Shetty 1491 (BSJO) ; Sirohi : Mt. Abu, Mehta 960 (JAC) ; Tonk : Toda Rai Singh R.F., Shetty 548 (BSJO) ; Udaipur : Unwali forest, Kanodia 82203 (BSJO).

2. HELIXANTHERA LOUR.

Helixanthera obtusata (Wall. ex Schult.) Danser in Bull. Jard. Bot. Buitenzorg ser. 3, 10 : 317. 1929 ; Sebastine in Bull. Bot. Surv. India 2 : 5. 1960 *Loranthus obtusatus* Wall. ex Schult. Syst. Veg. 7 (2) : 1650. 1830 ; Hook. f. Fl. Brit. India 5 : 205. 1886.

Branches robust ; bark pale. Leaves 7-13×5-8 cm, subopposite, ovate or elliptic, obtuse, coriaceous, pinninerved ; petioles 2.0-2.5 cm long. Racemes solitary, erect, shorter than leaves ; flowers crowded or scattered ; pedicels 3-7 mm long ; buds 4-angled. Calyx angular. Corolla not swollen at base. Ovary ovoid ; style slender ; stigma capitate. Fruits ovoid, closely rugulose.

Fl. & Fr. : Most part of the year.

Rare ; included on the authority of Kanodia (Journ. Univ. Bombay 9 : 64-68. 1941) from Mt. Abu.

3 VISCUM L.

Viscum articulatum Burm. f. Fl. Ind. 311. 1768 ; Hook. f. Fl. Brit. India 5 : 226. 1886 ; Duthie, Fl. Gangetic Plain 3 : 65. 1915. *V. nepalensis* Spreng. Syst. Cur. Post. 47. 1827.

Dichotomously much-branched, leafless, stem-parasitic shrubs, with jointed, flattened, dark-green branches. Flowers monoecious, minute, very shortly stalked, 1-6 in each fascicle at the nodes, greenish-yellow, each with a cupular bract at the base. Perianth of male flowers reflexed. Female flowers with erect, deciduous perianth-lobes and 2 bracteoles at the base. Berries subglobose, smooth, greenish-yellow.

Fl. & Fr. : February - May.

Rare, parasitizing mostly trees in the forests of southern parts of the state.

Selected specimens : Chittorgarh ; Pratapgarh, Verma 258 (BSA) ; Sirohi : Mt. Abu, Mehta 937 (JAC). Also reported from Udaipur (Vyas 1965).

114. SANTALACEAE

(P.J. Parmar)

SANTALUM L.

Santalum album L. Sp. Pl. 349. 1753 ; Hook. f. Fl. Brit. India 5 : 231. 1886 ; Duthie, Fl. Gangetic Plain 3 : 67. 1915. 'Chandan' (Hindi).

Small, glabrous, evergreen trees, with drooping branches and light blackish-brown, rough bark. Leaves 3.5 - 6.0 × 1.5 - 2.5 cm, ovate-lanceolate or elliptic-lanceolate, entire. Flowers in axillary and terminal cymes which are shorter than the leaves, reddish-brown. Pedicels as long as the perianth-tube, opposite. Drupes globose, purple-black, annulated at the apex.

Fl. & Fr. : March - October.

Rare, in mixed deciduous forests ; preliminary introduced, now reproducing naturally ; also planted in the gardens. The plants are partial root-parasites in the early age.

Selected specimens : Ajmer : Duthie 6666 (DD) ; Chittorgarh : Pratapgarh, Mathur 119598 (DD) ; Jaipur : Sambhar, Wadhwa 8281 (BSA) ; Jhalawar : Lotia Jhil, Wadhwa 5377 (BSA) ; Chapi river, Wadhwa 9534 (BSA) ; Udaipur : Majumdar 10356 (BSA).

115. EUPHORBIACEAE

(P.J. Parmar)

- | | |
|---|-----------------------|
| 1a. Plants twining. | 8. <i>Dalechampia</i> |
| 1b. Plants erect or prostrate ; | |
| 2a. Flowers naked, arranged in flower-like cyathia. | 10. <i>Euphorbia</i> |
| 2b. Flowers with perianth, not arranged in cyathia : | |
| 3a. Petals present, at least in male flowers : | |
| 4a. Tree or shrubs : | |
| 5a. Leaves entire or slightly crenulate.
Flowers dioecious, in dense, axillary
clusters on leafless woody branches. | 5. <i>Bridelia</i> |
| 5b. Leaves digitately angled or lobed.
Flowers monoecious, in terminal
cymes, | 11. <i>Jatropha</i> |

4b. Herbs or undershrubs :

6a. Erect or prostrate herbs. Leaves entire or lobed. Seeds estrophiolate :

7a. Plants stellately tomentose. Leaves large, petioate, lobed. Male sepals valvate. Disc obscure.

6. *Chrozophora*

7b. Plants glabrous, glaucous green. Leaves small, sessile, entire. Male sepals imbricate. Disc distinct; glands 2-lobed.

2. *Andrachne*

6b. Erect, woody herbs. Leaves serrate. Seeds with white spongy cap.

7. *Croton*

3b. Petals absent :

8a. Plants with stinging hairs.

18. *Tragia*

8b. Plants without stinging hairs :

9a. Leaves palmately 5 to 9-lobed, serrate. Fruits usually softly echinate.

16. *Ricinus*

9b. Leaves entire or rarely shallowly 3-lobed. Fruits always glabrous :

10a. Medium to large-sized trees :

11a. Leaves palmately veined, red gland-dotted beneath. Fruits covered with red powder.

13. *Mallotus*

11b. Leaves pinnately veined, not gland-dotted beneath. Fruits not covered with red powder :

12a. Plants dioecious. Leaves simple, 6.5 - 20 cm long. Fruits c. 1.5 cm long, dry.

9. *Drypetes*

12b. Plants monoecious. Leaves distichous, 0.5 - 2.5 cm long, having the appearance of pinnate leaves. Fruits c. 2.5 cm in diam, fleshy.

15. *Phyllanthus*

10b. Herbs, shrubs or undershrubs :

13a. Herbs or herbaceous undershrubs :

14a. Female flowers with ac-crescent leafy bracts.

1. *Acalypha*

- 14b. Female flowers without such leafy bracts :
- 15a. Leaves distichous. Male flowers in axillary fascicles. Stamens 3, rarely 4 or 5. 15. *Phyllanthus*
- 15b. Leaves not distichous. Male flowers in racemes. Stamens 5 - 30 :
- 16a. Male sepals 4 - 6, imbricate, free. Stamens 10 - 30. 3. *Ballosperrum*
- 16b. Male sepals 3, valvate. Stamens 5 - 10. 14. *Micropococa*
- 13b. Large woody shrubs :
- 17a. Disc present. Calyx spreading ; lobes obtuse to acute. Stamens 5 :
- 18a. All stamens free. Pistillodes large. Fruits white, coriaceous. 17. *Securinega*
- 18b. Three stamens united, 2 free. Pistillodes absent. Fruits fleshy. 12. *Kirganelia*
- 17b. Disc absent. Male calyx turbinate, with truncate lobes. Stamens 3. 4. *Breynia*

1. ACALYPHA L.

- 1a. Bracts concealing the capsules :
- 2a. Bracts fimbriate. Capsules glabrous. 1. *A. ciliata*
- 2b. Bracts shortly dentate. Capsules hispid. 2. *A. indica*
- 1b. Bracts not concealing the capsules :
- 3a. Bracts glabrous, bordered with gland-tipped hairs. Capsules glabrous or nearly so. 4. *A. malabarica*
- 3b. Bracts hairy, not bordered with gland tipped hairs. Capsules hispid with bulbous-based hairs. 3. *A. lanceolata*

1. *Acalypha ciliata* Forsk. Fl. Aegypt, - Arab, 162. 1775 ; Hook. f. Fl. Brit. India 5 : 417. 1887 ; Duthie, Fl. Gangetic Plain 3 : 108. 1915.

Erect, annual herbs, 30 - 60 cm high. Leaves petiolate, 3.0 - 7.5 × 1.8 - 4.5 cm, ovate, acute or acuminate-caudate at the apex, finely serrate, cuneate or rounded at base, hairy on veins beneath. Flowers in axillary, androgynous spikes; male few, sessile, at the top of spikes; females many, crowded at the base, greenish. Capsules quite glabrous, nearly white, twisted after dehiscence. Seeds globose, ovoid, smooth.

Fl. & Fr. : July - February.

Common weed in moist grounds, preferably among the fencing hedges of gardens and fields.

Selected specimens : Alwar : Kankwari forest block, *Parmar* 8791 (BSJO); Banswara : Paloda village, *Singh* 2821 (BSJO); Barmer : Haldeshwar Mahadev R.F., *Pandey* 8008 (BSJO); Jaipur : Ramgarh, *Sharma* 2077 (RUBL); Sirohi : Mt. Abu, *Mehta* 532 (JAC); Udaipur : Bagdara forest, *Kanodia* 82321 (BSI).

2. *Acalypha indica* L. Sp. Pl. 1003. 1753; Wight, Ic. 3(2) : 6. t. 877. 1844; Hook. f. Fl. Brit. India 5 : 416. 1887; Duthie, Fl. Gangetic Plain 3 : 108. 1915.

Erect, annual herbs, 30 - 75 cm high. Leaves petiolate, 1.7 - 7.0 × 1 - 5 cm, ovate or ovate-rhomboid, acute or obtuse, crenate-serrate, at the base, glabrous. Flowers in long, axillary, lax, androgynous spikes, greenish-yellow; males minute, clustered near the summit; the females scattered. Capsules small, hispid, greyish-white. Seeds ovoid, smooth, pale-brown.

Fl. & Fr. : June - December.

Common weed in moist places, particularly in the gardens and forests.

Selected specimens : Alwar : Bhangarh, *Parmar* 9786 (BSJO); Dungarpur : Forest office, *Kanodia* 82021 (BSI); Jaipur : Amer, *Sharma* 245 (RUBL); Jodhpur : Mandore, *Pandey* 8075 (BSJO); Kota : *Wadhwa* 1950 (BSA); Tonk : Kachha bundha, *Pandey* 4795 (BSJO).

3. *Acalypha lanceolata* Willd. Sp. Pl. 4 : 524. 1805; Raizada, Suppl. Duthie, Fl. Gangetic Plain 245. 1976. *Acalypha fallax* Muell. Arg. in *Linnæa* 34 : 43. 1865; Hook. f. Fl. Brit. India 5 : 416. 1887.

Slender, pubescent, annual herbs, 15 - 50 cm; branches clothed with long weak hairs. Leaves petiolate, 0.9 - 3.5 × 0.5 - 2.5 cm, ovate to ovate-lanceolate, sub-acute, serrate; base acute or rounded. Flowers in

short, sessile, axillary, androgynous spikes, greenish-yellow. Capsules hispid with glandular-based hairs. Seeds ovoid, acute, smooth, yellowish-brown.

Fl. & Fr. : October - December.

Common in moist habitats in the gardens, forests and wastelands.

Selected specimens : Ajmer : Happy valley, *Sharma* 660, 420, 1270 (DD) ; Bhilwara : Ganthila village, *Singh* 6552 (BSJO) ; Jaisur : Maota, *Sharma* 1939 (RUBL) ; Galta, *Jain* 58497 (BSI) ; Jhalawar : *Verma* 7464 (BSA).

4. *Acalypha malabarica* Muell. - Arg. in *Linnaea* 34 : 42. 1865 ; Hook. f. *Fl. Brit. India* 5 : 416. 1887 ; Cooke, *Fl. Bombay* 2 : 611. 1906 ; Shah, *Fl. Gujarat* 2 : 611. 1978.

Stout, annual, hairy herbs. Leaves petiolate, rigid, 1.5-4.0 × 1.0-1.8 cm, ovate, elliptic or elliptic-lanceolate, sub-acute, sub-serrate, base usually cuncate. Flowers minute, in axillary, androgynous spikes. Males few, terminal ; females numerous. Capsules glabrous. Seeds globose, ovoid, smooth, pale-brown.

Fl. & Fr. : July - November.

Rare, in moist places, particularly near tanks and in low lying fields.

Selected specimens : Banswara : Nathela tank, *Kanodia* 75344 (BSI) ; Chittorgarh : Pratapgarh, *Majumdar* 12354 (BSA), Rothola, *Jain* 55949B (BSA) ; Jaipur : Galta, *Jain* 49590 (BSI) ; Kota : *Verma* 474, *Majumdar* 10383 (BSA).

2. ANDRACHNE L.

Andrachne telephioides L. *Sp. Pl.* 1014. 1753 ; Hook. f. *Fl. Brit. India* 5 : 284. 1887 ; *Majumdar* in *Bull. Bot. Surv. India* 18 : 70. 1979 ; *Parmar* in *Journ. Econ. Tax. Bot.* 3 : 955-956. 1983.

Small, glaucous, prostrate, perennial herbs ; stems many from the base. Leaves c. 1.1 × 0.7 cm, ovate to elliptic or obovate, acute or sub-acute, entire, somewhat coriaceous. Flowers 1 to 3-together, almost in the all axils of leaves, yellowish-green ; pedicels usually shorter than the leaves. Sepals rounded or rhombic, free. Petals lanceolate. Capsules 2-4 mm in diam., depressed-globose, glabrous. Seeds triquetrous, with a convex, punctulate back.

Fl. & Fr. : December March.

Rare, in moist places, particularly near ponds & rivers.

Selected specimens : Bhilwara : Bijolia. *Singh* 7139 (BSJO) ; Jhalawar : Bakani (Near Kalisind river-bed), *Verma* 7024 (BSA) ; Jodhpur ; Pond near Sarech village, *Singh* 429 (BSJO).

3. BALIOSPERMUM Blume

Baliospermum montanum (Willd.) Muell.-Arg. in DC. Prodr. 15(2) : 1125. 1866. *Jatropha montana* Willd. Sp. Pl. 4 : 563. 1805. *Baliospermum axillare* Blume, Bijdr. 604. 1826 ; Hook. f. Fl. Brit. India 5 : 461. 1887 ; Duthie, Fl. Gangetic Plain 3 : 107. 1915. *B. polyandrum* Wight, Ic. 5(2) : 23. t. 1885. 1852.

Tall, stout, erect herbs or undershrubs. Leaves petiolate, 3 20 × 1.6 - 15.0 cm, broadly ovate, ovate-lanceolate or elliptic to subpandurate, entire, sinuate-toothed or sometimes shallowly to deeply 3-lobed ; stipules of 2 glands. Flowers monoecious, in axillary or terminal racemes, greenish-yellow ; female flowers in the lower region of the racemes. Disk glands soft, lobulate. Stamens 15-25. Capsules 0.8-1.2 × 0.6-1.0 cm, 3-lobed, obovoid, pubescent. Seeds oblong, trigonous, smooth, glabrous, creamy-white, mottled with light black.

Fl. & Fr. : September March.

Common in the forests, gardens and wastelands in shady habitats, particularly in south-eastern parts of the state.

Selected specimens : Banswara : Khora forest block, *Singh* 3719 (BSJO) ; Jolana. *Kanodia* Acc. No. 30725 (BSI) ; Jhalawar : Aklera, *Majumdar* 10029 (BSA) ; Kota : Sitabari forest, *Wadhwa* 9319 (BSA) ; Udaipur : Kushalgarh, *Kanodia* 75726 (BSI).

4. BREYNIA J. Forster & G. Forster *nom. cons.*

Breynia vitis-idaea (Burm. f.) Fischer in Kew Bull. 1932 : 65. 1932. *Rhamnus vitis-idaea* Burm. f. Fl. Ind. 1768. *Phyllanthus rhamnoides* Retz. Obs. Bot. 5 : 30. 1788. *Melanthesa rhamnoides* (Retz.) Blume, Bijdr. 591. 1826 ; Wight, Ic. 5(2) : 26. t. 1898. 1852. *Breynia rhamnoides* (Retz.) Muell. Arg. in DC. Prodr. 15(2) : 440. 1866 ; Hook. f. Fl. Brit. India 5 : 330. 1887 ; Duthie, Fl. Gangetic Plain 3 : 93. 1915.

Shrubs or small trees, with horizontal, flexuous, bifarious, glabrous branches. Leaves petioled, 2.0-2.5 cm long, elliptic-ovate or rounded, obtuse or subacute, membranous, brown to black when dry. Flowers axillary, monoecious; pedicels short, decurved. Calyx of male flowers turbinate or subcampanulate; of female flowers slightly enlarged in fruit, 6-lobed. Staminal column truncate. Fruits small, globose, seated on the enlarged calyx, succulent, red. Seed testa imperforate except at the base.

Fl. & Fr. : October-December.

Occasionally found in the forests.

Selected specimens : Jaipur : Base of hills (U.R.F.), Sharma 635, 1231, 1079 (RUBL); Jhalawar : Bakani (Modiya Khal), Verma 7048A (BSA).

5. BRIDELIA Willd.

- | | |
|--|-------------------------|
| 1a. Climbing shrubs. Female flowers pubescent inside. | 3. <i>B. stipularis</i> |
| 1b. Erect trees. Flowers glabrous : | |
| 2a. Flowers gathered in clusters on leafless branches, forming long, terminal or axillary paniculate spikes. | 1. <i>B. retusa</i> |
| 2b. Flowers in axillary clusters. | 2. <i>B. squamosa</i> |

1. *Bridelia retusa* (L.) Spreng. Syst. Veg. 3 : 48. 1826; Hook. f. Fl. Brit. India 5 : 268. 1887, excl. vars.; Duthie, Fl. Gangetic Plain 3 : 85. 1915. *Cluytia retusa* L. Sp. Pl. 1042. 1753.

Tall trees, with blackish-brown, irregularly fissured bark. Leaves 4-30 × 2.5-10.5 cm, elliptic-oblong or rarely obovate, obtuse, subacute or rounded at apex, entire or slightly crenulate at margins, glabrous above, tomentose beneath. Flowers in long, terminal panicles of erect or drooping spikes, creamy-white. Capsules subglobose, purplish-black; cocci dehiscent.

Fl. & Fr. : July-December.

Common in dry deciduous forests, particularly on Aravalli.

Selected specimens : Ajmer : Todgarh, Laurie 4688 (DD); Alwar : Pandupole, Parmar 9493 (BSJO); Banswara : Kushalgarh, Singh 3037 (BSJO); Bhilwara : On the way to Bijolia, Singh 6067 (BSJO); Kota : Shahabad, Verma 638 (BSA); Pali : Goramghat, Pandey 10343 (BSJO).

2. *Bridelia squamosa* (Lam.) Gehrm. in Engl. Bot. Jahrb. 41. Biebl. 95 : 30. 1908 ; Santapau in Journ. Bombay Nat. Hist. Soc. 50 : 308. Pl. 1. f. 2. 1951. *Cluytia squamosa* Lam. Encycl. 5(2) : 54. 1790. *Bridelia retusa* (L.) Spreng. var. *squamosa* (Lam.) Muell.-Arg. in DC. Prodr. 15(2) : 493. 1886 ; Hook. f. Fl. Brit. India 5 : 268. 1887.

Tall, deciduous trees, with yellow bark. Leaves 8.5 - 30.0 × 6 - 11 cm, ovate-elliptic or elliptic-oblong, obtuse or subacute, finely pubescent beneath. Stipules ovate-triangulate. Flowers dioecious, in axillary clusters, greenish white. Stamens 1-adelphous. Drupes fleshy, globose, seated on the persistent calyx, dark purple to almost black at maturity.

Fl. & Fr. : August - March.

Frequently seen in the dry deciduous forests on Aravalli.

Selected specimens : Pali : Sewari R.F., Shetty 1461 (BSJO) ; Sawaimadhopur : Mishradara, Jain 18834 (BSI) ; Sirohi : Pindara-Arnuva, Jain 47971 (BSI) ; Mt. Abu, Rao 66687 (BSI) ; Udaipur : Kewad forest, Gemawat 222/Bot. (BSI).

3. *Bridelia stipularis* (L.) Blume, Bijdr. 597. 1826 ; Hook. f. Fl. Brit. India 5 : 270. 1887 ; Nair & Nathawat in Journ. Bombay Nat. Hist. Soc. 54 : 91 - 106. 1956 ; Shah, Fl. Gujarat 2 : 615. 1978. *Cluytia stipularis* L. Mant. Pl. 127. 1767. *Bridelia scandens* Willd. Sp. Pl. 4 : 979. 1805.

Large, subscaudent, evergreen shrubs, with dark-grey bark, sometimes spinous. Leaves 2.5 - 10.0 × 1.25 - 5.0 cm, elliptic-oblong or obovate, obtuse to sub-acute, sub-coriaceous, glabrous above, pale and pubescent beneath, nerves 6 - 9 pairs. Flowers monoecious, in small, dense, axillary clusters or long spikes, greenish - yellow ; males sessile ; females pedicelled. Drupes ellipsoid-oblong, black and juicy when ripe.

Fl. & Fr. : August - January.

Rare, in wastelands. Included on the authority of Nair and Nathawat (1956) from Pilani, Jhunjhunu district.

6. CHROZOPHORA A.H.L. Juss. *nom. cons.*

1a. Ovary and capsules with tomentum and silvery scales.
Stamens 5, rarely 6 - 8 :

2a. Erect shrubs. Leaves twice as long as broad. Ripe capsules bluish-purple.

2. *C. oblongifolia*

2b. Prostrate herbs. Leaves not much longer than broad.
Ripe capsules reddish-purple.

1. *C. hierosolymitana*

1b. Ovary and capsules without scales, but with stellate tomentum. Stamens 15, in two whorls :

3a. Stellately hairy herbs, branched in the upper region. Sepals of female flowers triangular. Stigma red. Capsules purple.

5. *C. rattleri*

3b. Stellately woolly herbs, branched from the root. Sepals of female flowers linear. Stigma orange. Capsules grey or black :

4a. Prostrate herbs. Leaves about as long as broad, obtuse.

3. *C. prostrata*
var. *prostrata*

4b. Erect herbs. Leaves longer than broad, sub-acute.

4. *C. prostrata* var.
parviflora

1. *Chrozophora hierosolymitana* Spreng. Syst. Veg. 3 : 850. 1826 ; Balak. in Bull. Bot. Surv. India 15 : 3. 1976. *C. tinctoria* sensu Stewart, Punjab. Pl. 193. 1869, non. A. Juss. 1824 ; Hook. f. Fl. Brit. India 5 : 408. 1887, *quoad spec. Capsulis lepidotis tantum*. *C. obliqua* Juss. ex Spreng. var. *hierosolymitana* (Spreng.) Duthie, Fl. Gangetic Plain 3 : 105. 1915.

Erect, annual herbs, with densely tomentose branches. Leaves 2.0 - 5.5 × 1.0 - 3.5 cm, ovate or subrhomboid, subobtuse, undulate or distinctly toothed. Flowers in axillary or terminal bracteate racemes. Male flowers sessile, at the top of racemes, female ones pedicellate, scattered in the lower parts of racemes. Capsules trilobed. Seeds roughly tuberculate, scurfy, silvery grey.

Fl. & Fr. : March - May.

Common in the dry sandy beds of the streams or lakes.

Selected specimens : Churu : Puri 39933 (BSI) ; Ganganagar : Suratgarh, Jain 45114 (BSI) ; Kalibunga, Roy 6416 (BSJO) ; Jaipur : Durgapura, Sharma 494 (RUBL) ; Sawaimadhopur : Sewar, Saran 41882 (LWG) ; Sikar ; Bharadwaj 39860 (LWG) ; Tonk : Ghati village, Pandey 4809 (BSJO).

2. *Chrozophora oblongifolia* (Delile) A. Juss. ex Spreng. Syst. Veg. 3 : 850. 1826 ; Balak. in Bull. Bot. Surv. India 15 : 2. 1976. *Croton oblongifolius* Delile, Fl. Egypt. 139. t. 51. f. 1. 1814. *Chrozophora obliqua* non A. Juss. ex Spreng. 1826 ; Muell. - Arg. in DC. Prodr. 15(2) : 749. 1866, excl. syn. ; Hook. f. Fl. Brit. India 5 : 409. 1889, *pro parte*.

Erect or sub-erect herbs, with many, densely white, stellately tomentose branches. Leaves 3-5 × 1-2 cm, ovate, sinuate-toothed, usually with 2-glands beneath near the base of midrib. Flowers in axillary, bracteate racemes. Male flowers sessile, borne at the top of racemes; female ones pedicellate, in the lower parts of the racemes. Capsules bluish-purple. Seeds tuberculate.

Fl. & Fr. : February - May.

Rare, in the sandy plains and on sand-dunes.

Selected specimens : Ajmer : Buda Pushkar, *Sharma* 1508 (LWG); Bikaner : On sand dunes, *Patil* 575 (DD & CAL); Churu : Ludhi village, *Roy* 2642 (BSJO); Sardar Shahar, *Singh* Acc. No. 39199 (LWG). Also reported by Nair & Nathawat (1957) from Sikar and Majumdar (1969) from Kota district.

3. *Chrozophora prostrata* Dalz. in Dalz. & Gibs. Bombay Fl. 233. 1861; Duthie, Fl. Gangetic Plain 3 : 106. 1915. *C. plicata* A. Juss. forma Hook. f. Fl. Brit. India 5 : 410. 1887.

var. prostrata

Prostrate, diffusely branched, stellate-tomentose herbs. Leaves 0.8-4.0 × 0.5-3.0 cm, broadly ovate, suborbicular, oblong or oblong-lanceolate, obtuse or sub-acute, cordate or truncate at base, sometimes with 2-glands beneath near the base on either side of midrib. Flowers in axillary, bracteate racemes. Capsules trilobed, non tinctorial. Seeds scurfy, grey.

Fl. & Fr. : Almost throughout the year.

Common in moist rocky places and sandy beds of the streams.

Selected specimens : Ajmer : Kekri tank, *Sharma* 1386 (LWG); Barmer : Bjujawas, *Tiwari* 1136 (BSJO); Chittorgarh : *Srivastava* 65169 (LWG); Ganganagar : Ghagar bed Hanumangarh, *Roy* 5976 (BSJO); Tonk : Tordi Sagar, *Shetty* 580 (BSJO).

4. *var. parvifolia* (Klotz. ex Schweinf.) Duthie, Fl. Gangetic Plain 3 : 106. 1915. *Chrozophora parvifolia* Klotz. ex Schweinf. Pl. Quaed. Nilot. 110. 1862; Mahesh. Illus. Fl. Delhi. f. 196. 1966. *C. plicata* A. Juss. forma 2, Hook. f. Fl. Brit. India 5 : 410. 1887.

Very similar to the type variety, but can be separated by its oblong-lanceolate, elliptic, subacute, narrower leaves and erect habit.

Fl. & Fr. : Almost throughout the year.

Rare, found in moist habitats, particularly in the east of Aravalli.

Selected specimens : Banswara : Near Danpur village, *Singh* 4266 (BSJO) ; Jaipur : Daosa, *Sharma* 3778 (RUBL) ; Jhunjhunu : Near Lohargal, *Nair* 2036, 2079 (BSD) ; Kota : *Singh* 90953 (LWG).

Notes : Prain (Kew Bull. 1918 : 9. 1918) and many others treated this as a separate species from *C. prostrata* due to the presence of 2-glands beneath at the base of mid-rib in the former. The study revealed that this is not a constant distinguishing character since many specimens of *C. prostrata* also have 2 glands at the base of leaves on lower surface. Hence, the adopted treatment is most satisfactory in the present status of knowledge.

5. *Chrozophora rottleri* (Geis.) A. Juss. ex Spreng. Syst. Veg. 3 : 850. 1826 ; Duthie, Fl. Gangetic Plain 3 : 105. 1915 ; Balak. in Bull. Bot. Surv. India 15 : 4. 1976. *Croton rottleri* Geis. Croton. Monogr. 57. 1807. *Chrozophora tinctoria* non A. Juss. 1824 ; Hook. f. Fl. Brit. India 5 : 408. 1887, *pro parte*, 'Subali' (Hindi).

Diffusely branched, densely stellate tomentose herbs. Leaves 3-10 × 3.0-8.5 cm, entire or 3-lobed, ovate to suborbicular, obtuse, rounded, cuneate or cordate at the base. Flowers in axillary or terminal, 2-6 cm long racemes. Petals longer than sepals in male flowers and shorter in females. Capsules trilobed, tinctorial when wetted. Seeds shining, scurfy, grey.

Fl. & Fr. : August - May.

Common in moist sandy-loam soils, particularly in the east of Aravalli.

Selected specimens : Banswara : Ghatol, *Singh* 2894 (BSJO) ; Jolana, *Kanodia* 51198 (BSI) ; Ganganagar : Loharu, *Jain* 54426 (BSA) ; Jaipur : Daosa, *Wadhwa* 8219 (BSA) ; Jhalawar : Kali Sind river bed, *Verma* 3394 (BSA) ; Tonk : Mohampura, *Pandey* 4705 (BSJO).

7. CROTON L.

Croton bonplandianum Baill. in Adansonia 4 : 339. 1864 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 247. 1976. 'Kala-Bhangra' (Hindi).

Erect or diffusely branched, annual to perennial herbs or undershrubs, clothed with sessile glands. Leaves crowded towards the top of branches, 2.0-4.5 × 0.3-2.0 cm, ovate or ovate-lanceolate, serrate.

Flowers in terminal racemes ; males at the top of inflorescence in the axils of ovate bracts, pale white and female ones at the base, with 2 glands at the base of the pedicel. Capsules trigonous, stellately hairy. Seeds rugose, grey.

Fl. & Fr. : May - September.

Native of S. America ; common weed in wastelands, fallow fields, along the roads and railway lines, particularly in the east of Aravalli.

Selected specimens : Ganganagar : Dhana Ram farm, Roy 6443 (BSJO) ; Jaipur : Phulera, Sharma 1783 (RUBL) ; Kota : Chhabra, Singh 90409 (LWG) ; Tonk : Near Malpura, Pandey 4843 (BSJO).

8. DALECHAMPIA L.

Dalechampia scandens L. var. *cordofana* (Hochst. ex Webb.) Muell. Arg. in DC. Prodr. 15(2) : 1245. 1866 ; Chavan *et al.* in Journ. Bombay Nat. Hist. Soc. 59 : 324. 1962 ; Vyas & Pandey in Bull. Bot. Surv. India 26 : 234. 1986. *Dalechampia cordofana* Hochst. ex Webb. in Hook. Niger. Fl. 178. 1849.

Perennial, twining undershrubs ; stem finely hispid-pubescent. Leaves alternate, deeply 3 to 5-lobed ; lobes $2.9 \times 1.0 - 3.5$ cm, broadly ovate, elliptic-ovate or ovate-lanceolate, acute or acuminate, dentate-seriate. Flowers in androgynous, terminal or apparently axillary heads on long peduncles, yellowish-green. Capsules of 3 cocci, minutely hispidulous. Seeds one in each cell, subglobose or rounded-oval, smooth, grey to creamish-yellow.

Fl. & Fr. : July - October.

Rare, in the forests on Aravalli hills, particularly in central zone.

Selected specimens : Jalore : Sunda hills, Vyas 5231, 6355 (BSJO) ; Bargaon, Shetty 6699 (BSJO) ; Pali : Near Bagol along Desure-phulad road, Shetty 1873 (BSJO).

9. DRYPETES Vahl

Drypetes roxburghii (Wall.) Hurusawa in Journ. Fac. Sci. Univ. Tokyo Sec. 3. Bot. 6 : 337. 1954. *Putranjiva roxburghii* Wall. Tent. Fl. Nep. 61. 1826 ; Wight, Ic. 5(2) : 21. t. 1876. 1852 ; Hook. f. Fl. Brit. India 5 : 336. 1887 ; Duthie, Fl. Gangetic Plain 3 : 99. 1915. '*Putranjiva, Jiaputa, Putjia*' (Hindi).

Tall, evergreen trees, with pendent branches and pale corky bark. Leaves 6.5-10.0 × 2.0-3.7 cm, elliptic-oblong, acute, obtuse or shortly acuminate, distantly serrulate, coriaceous, dark-green. Flowers dioecious, apetalous; males shortly pedicellate, fascicled in rounded axillary clusters on short axillary branches; female ones 1-3 in an axil. Stamens 1-3. Drupes ellipsoid, rounded or pointed at the apex, narrowed at the base, white-tomentose, very hard.

Fl. : April-August; *Fr.* : December-June.

Rare, apparently indigenous in the mixed deciduous forests in S.E. Rajasthan. Also grown in the gardens.

Selected specimens : Jaipur : Ram Niwas garden, *Sharma* Acc. No 6949 (RUBL); Jhalawar : Shivpuri village, *Majumdar* 10004 (BSA); Kota : Shahabad, *Singh* 90647 (LWG).

10. EUPHORBIA L.

- 1a. Stem reduced to a stout underground root-stock. Leaves all radical. ... 6. *E. fusiformis*
- 1b. Stem well developed above the ground. Leaves not all radical :
 - 2a. Perennial shrubs or small trees. Stem armed with spines :
 - 3a. Leaves, when present, less than 2.5 cm long. Style bifid. ... 1. *E. caducifolia*
 - 3b. Leaves, when present, more than 3.5 cm long. Style simple :
 - 4a. Branches distinctly angular; spines on edges or spirally arranged :
 - 5a. Branches prominently 5 to 7-angled, with flat intervening spaces; spines on the undulating edges. ... 18. *E. royleana*
 - 5b. Branches 5-angular; spines arranged spirally on the stem. ... 14. *E. nerifolia*
 - 4b. Branches terete or obscurely angular; spine bearing tubercles arranged vertically on the stem. ... 15. *E. nivulica*
 - 2b. Annual herbs, with slender, erect or prostrate stems, without spines :
 - 6a. Stem, at least in the young stage, geniculate. Involucre-gland solitary. ... 7. *E. geniculata*

- 6b. Stem not geniculate. Involucre-glands 4 or 5, along the upper region :
- 7a. Involucre-glands 2-horned ; horns outwardly directed. ... 4. *E. dracunculoides*
- 7b. Involucre-glands not horned :
- 8a. Involucre-glands with a conspicuous petaloid limb :
- 9a. Floral leaves distichously imbricate, secund, concealing the involucre/capsules :
- 10a. Capsules glabrous :
- 11a. Seeds tuberculate. ... 16. *E. pycnostegia* var. *pycnostegia*
- 11b. Seeds smooth. ... 17. *E. pycnostegia* var. *zorntoides*
- 10b. Capsules hairy. ... 5. *E. elegans*
- 9b. Floral leaves neither distichously imbricate nor concealing the involucre/capsules. ... 12. *E. indica*
- 8b. Involucre-glands without a petaloid limb or limb not conspicuous :
- 12a. Erect or ascending herbs. Leaves 1.2 - 4.0 cm long. ... 11. *E. hirta*
- 12b. Prostrate or ascending herbs. Leaves less than 1.2 cm long :
- 13a. Plants glabrous. Capsules glabrous :
- 14a. Leaves nearly as long as broad. Seeds smooth. ... 10. *E. heyneana*
- 14b. Leaves much longer than broad. Seeds obscurely transversely rugose :
- 15a. Erect herbs, with dichotomous branches. Leaf-margins spinulose-serrate throughout. ... 13. *E. Jodhpurensis*
- 15b. Prostrate herbs with normal branches. Leaf-margins entire or toothed only at the tip. ... 3. *E. clarkeana*

- 13b. Plants hairy. Capsules hairy or pubescent :
- 16a. Capsules hairy only along the keels. ... 2. *E. chamaesyce*
- 16b. Capsules hairy throughout :
- 17a. Leaves crenulate. Capsules pubescent. Seeds furrowed. ... 19. *E. thymifolia*
- 17b. Leaves entire. Capsules hirsute. Seeds pitted :
- 18a. Leaves puberulent on both surfaces. ... 8. *E. granulata* var. *granulata*
- 18b. Leaves glabrous on the upper surface... 9. *E. granulata* var. *glabrata*

1. *Euphorbia caducifolia* Haines in Indian For. 40: 154. 1914 et Bot. Bihar & Orissa 2: 143. 1921; Fischer in Kew Bull. 1925: 341. 1925; Bhandari, Fl. Ind. Desert 339. 1978. *E. nerifolia* auct. plur., non L. 1753, nec. Roxb. 1832. 'Thor, Dandathor' (Hindi).

Glabrous, perennial, fleshy shrubs; branches many from the base, cylindrical, with small, distant, non-confluent tubercles; each tubercle with a black areole bearing a pair of divergent spines. Leaves fleshy, deciduous before anthesis, 0.8-1.2 cm long, suborbicular, acute. Cyathia usually in triad, bracteate, pedicellate, red. Capsules sharply 3-lobed, glabrous. Seeds greyish-brown, with a distinct marginal line, scurfy.

Fl. & Fr. : January-April.

Very common in rocky habitats, particularly in the west of Aravalli.

Selected specimens : Alwar : Near Akbarpura, *Parmar* 9704 (BSJO); Banswara : *Singh* 4233 (BSJO); Barmer : Piplum, *Tiwari* 1159 (BSJO); Bhilwara : Bhojpura, *Singh* 7039 (BSJO); Jaisalmer : West of Devikot, *Shetty* 3486 (BSJO); Jodhpur : Near Satalai village, *Parmar* 1752 (BSJO).

Notes : Very similar to *E. nerifolia* L., but can be easily identified

by the non-confluent, distant tubercles, ovate or oblong-ovate, non-apiculate, caducous leaves and oblong, didymous anthers.

2. *Euphorbia chamaesyce* L. Sp. Pl. 455. 1753; Shah and Yogi in Journ. Bombay Nat. Hist. Soc. 69 : 448. 1972; Raizada, Suppl. Duthie, Fl. Gangetic Plain 247. 1976. *E. prostrata* Ait. Hort. Kew. 2 : 139. 1879; Hook. f. Fl. Brit. India 5 : 266. 1887. *Chamaesyce prostrata* (Ait.) Small. Fl. S.E.U.S. 713. 1903. 'Dudhi' (Hindi).

Prostrate or ascending, slender, annual herbs, with hispidly hairy branches. Leaves opposite, 2-7×1-4 cm, obliquely oblong, obovate-oblong or elliptic-oblong, rounded at the apex, minutely serrate in the upper half towards the tip. Involucre stalked, campanulate, glabrous or slightly pubescent, with 4 glands and lobes. Capsules usually deflexed, subglobose trigonous, ciliate on the keel of cocci. Seeds 4-angled, transversely furrowed, reddish.

Fl. & Fr. : Almost throughout the year.

Common in moist sandy-clay soils, usually on the sides of tanks etc.

Selected specimens : Alwar : Pandupole, *Parmar* 9461 (BSJO); Bikaner : Shivbari, *Roy* 2138 (BSJO); Chittorgarh : *Verma* 1604 (BSA); Jhalawar : *Wadhwa* 9556 (BSA); Jodhpur : Near Sarecha village, *Singh* 435 (BSJO); Sirohi : Mt. Abu, *Blatter* 13418 (BLAT).

3. *Euphorbia clarkeana* Hook. f. Fl. Brit. India 5 : 253. 1887; Duthie, Fl. Gangetic Plain 3 : 82. 1915. *Euphorbia heyneana* Boiss. in DC. Prodr. 15 (2) : 35. 1862, *pro parte*, non Spreng. 1826.

Diffuse, prostrate or sub-erect, glabrous, annual herbs. Leaves distichously arranged, 0.15-1.0×0.05-0.4 cm, much longer than broad, obliquely oblong or linear-oblong, with the base almost auricled on one side, entire or toothed at the tip. Cyathia usually solitary in each axil. Involucre stalked, campanulate, glabrous, with 5, lanceolate, toothed lobes. Capsules trigonous; cocci glabrous, keeled. Seeds ovoid, distinctly 4-angled, reddish, transversely rugose.

Fl. & Fr. : Almost throughout the year.

Common in moist and sandy habitats, particularly in the west of Aravalli.

Selected specimens : Barmer : Pond near Bandara, *Pandey* 7916 (BSJO); Ganganagar : Ramawal, *Roy* 4944 (BSJO); Jaipur : Jagatpura, *Sharma* 227 (RUBL); Jaisalmer : Sudasari R.F., *Pandey* 7847 (BSJO); Tonk : Near Niwai, *Pandey* 4758 (BSJO).

4. *Euphorbia dracunculoides* Lam. Dict. 2 : 428. 1786 et Encycl. 2 : 428. 1788 ; Hook. f. Fl. Brit. India 5 : 262. 1887 ; Duthie, Fl. Gangetic Plain 3 : 78. 1915 ; Mahesh. Illus. Fl. Delhi f. 192. 1966. 'Ban-bui, Jayanti' (Hindi).

Erect, annual, dichotomously branched, deep-rooted, glabrous herbs. Leaves sessile, 0.5-5.5 × 0.2-0.8 cm, linear-lanceolate or rarely ovate-lanceolate, acute, entire. Cyathia subsessile, solitary in each axil, hairy inside, campanulate, subtended by lanceolate floral leaves. Capsules glabrous, 3-lobed, 3-seeded. Seeds oblong, obovoid or ellipsoid, rugose or tuberculate, strophiolate, whitish.

Fl. & Fr. : August - May.

Common weed during winters in cultivated and fallow fields.

Selected specimens : Banswara : Pipalkunth, Singh 4226 (BSJO) ; Barmer : Near Bhujawas, Tiwari 1131 (BSJO) ; Bharatpur : Near Bahaz village, Parmar 8551 (BSJO) ; Ganganagar : Palewali, Roy 5949 (BSJO) ; Tonk : Deoli, Shetty 461 (BSJO).

5. *Euphorbia elegans* Spreng. Syst. Veg. 3 : 794. 1826 ; Hook. f. Fl. Brit. India 5 : 246. 1887 ; Duthie, Fl. Gangetic Plain 3 : 79. 1915 ; Bhandari, Fl. Ind. Desert 340. 1978.

Erect, annual herbs, with dichotomous branches clothed with long spreading soft hairs. Leaves opposite, distant, subsessile, 0.6-2.0 × 0.4-1.2 cm, obliquely oblong, obtuse, serrulate. Floral leaves broadly elliptic or obovate, dorsally hairy. Involucre turbinate, pubescent on both sides ; lobes obovate ; limb of glands large, sinuate, rosy. Capsules pubescent ; cocci subglobose. Seeds 4-gonous, bluntly pointed, transversely parallel-grooved, glabrous.

Fl. & Fr. : October - January.

Rare, in rocky habitats.

Selected specimens : Chittorgarh : Pratapgarh Majumdar 12331 (BSA) ; Kota : Kotakhet, Verma 1734 (BSA).

Notes : Bhandari (*J. c.*) included this species on the authority of Blatter and Hallberg (1920) who reported it from Jodhpur fort. The authors could not trace out the plant in the field as well as Blatter's specimen No 2959 (BLAT).

6. *Euphorbia fusiformis* Buch. Ham. in D. Don, Prodr. Fl. Nep. 62. 1825 ; Hook. f. Fl. Brit. India 5 : 257. 1887. *E. acaulis* Roxb. Fl. Ind. 2 : 472. 1832 ; Duthie, Fl. Gangetic Plain 3 : 74. 1915. 'Van muli' (Hindi).

Dwarf, glabrous herbs ; stem reduced to a long, stout, underground cylindrical root-stock. Leaves subsessile, 15-30 × 3.75-6.5 cm, fleshy, ovate or oblanceolate, obtuse or subacute, cuneate at base, with curled margins, nerveless. Cymes from the crown of the root-stock, dichotomously branched, variable in length, 3 to many-flowered, appearing after the leaves have fallen. Bracts ovate or the upper or all truncate and 3-fid. Involucre subsessile or on long peduncles of different lengths, hemispheric ; lobes spatulate, fimbriate. Capsules c. 8 mm in diam., cocci compressed. Seeds broadly ovoid, subacute.

Fl. & Fr. : April - June.

Rare, in wastelands, particularly in the southern parts of the state.

Selected specimen : Banswara : Ghatol, *Kanodia* 75508 (BSI).

7. *Euphorbia geniculata* Orteg. Nov. Pl. Hort. Maurit. Decad. 18. 1797 ; Duthie, Fl. Gangetic Plain 3 : 83. 1915 ; Santapau in Bull. Bot. Soc. Bengal 8 : 5. 1954. *E. prunifolia* Jacq. Hort. Schoenbr. 3 : 15. 1798 ; Hook. f. Fl. Brit. India 5 : 266. 1887.

Erect, annual, glabrous herbs, 30-60 cm high. Stem fistular, ribbed. Leaves 2.3-11.0 × 0.6-7.0 cm, oblong-obovate or broadly elliptic, subentire to dentate, narrowed at the base. Stipules stalked, gland-like. Cyathia 5 to 7-lobed, arranged in dense, corymbose cymes. Capsules 3-lobed ; placenta persistent after dehiscence. Seeds obovoid, obscurely trigonous, truncate at one end, acute at the other, tuberculate, grey.

Fl. & Fr. : Almost throughout the year.

Native of Tropical America ; naturalised in the gardens, cultivated fields and forests.

Selected specimens : Banswara : Anand sagar forest, *Singh* 2970 (BSJO) ; Bhilwara : Gangapur, *Singh* 6524 (BSJO) ; Jodhpur : *Bhandari* 152 (JAC) ; Pali : Khan pahar, *Shetty* 1957 (BSJO) ; Sirohi : Mt. Abu, *Mehta* 1867 (JAC) ; Udaipur : Khamblighat, *Kanodia* 82455 (BSI).

Notes : Similar to *E. heterophylla* L., but can be distinguished by somewhat coarser habit ; leaf blades not pandurate or quercine, acute or acuminate at apex ; floral leaves not purplish or reddish-blotched, involucre cylindrical-turbinate, very shortly pedicellate, 5 to 7-lobed.

8. *Euphorbia granulata* Forsk. Fl. Aegypt. - Arab. 94. 1775 ; Hook. f. Fl. Brit. India 5 : 252. 1887 ; Duthie, Fl. Gangetic Plain 3 : 81. 1915. *Euphorbia aegyptiaca* var. *indica* Boiss. in DC. Prodr. 15 (2) : 35. 1862. 'Dudheli' (Hindi).

var. *granulata*

Small, hispidly villous, prostrate herbs. Leaves opposite, 3-6×1-3 mm, obliquely ovate, obtuse or rounded at apex, very unequal at the base, entire, puberulent on both surfaces. Involucre sessile, turbinate, subsolitary, axillary, on short leafy raceme-like branchlets; glands usually without a limb. Capsules puberulent all over; cocci hirsute, not keeled. Seeds 4-angled, slightly transversely rugose or scrobiculate.

Fl. & Fr. : August - March.

Very common in sandy plains and gravelly fields, especially in the west of the Aravalli.

Selected specimens : Barmer : Kadden fallow fields, *Tiwari* 936 (BSJO); Bhilwara : Badnor, *Singh* 7072 (BSJO); Ganganagar : Near Raisingh nagar, *Roy* 3888 B (BSJO); Jaipur : Phulera, *Wudhwa* 8296 (BSA); Jaisalmer : Near Ganga along Nimba, *Pandey* 7806 (BSJO); Sirohi : Mt. Abu, *Mehta* 1728 (JAC).

9. var. *glabrata* Bioss. in DC. Prodr. 15 (2) : 34. 1862; Bhandari, Fl. Ind. Desert 341. 1978. *E. granulata* Forsk. var. *glabra* Blatt. & Hallb. in Journ. Bombay Nat. Hist. Soc. 26 (4) : 97. 1920. 'Dudheli' (Hindi).

Very similar to var. *granulata*, but can be easily recognised by its leaves being glabrous on the upper surface. In var. *granulata*, the leaves are pubescent on both surfaces.

Fl. & Fr. : September - December.

Rare, in the same habitats as the type variety.

Selected specimen : Jodhpur : *Bhandari* 1563 (JAC).

10. *Euphorbia heyneana* Spreng. Syst. Veg. 3 : 791. 1826. *E. microphylla* Heyne ex Roth, Nov. Pl. Sp. 229. 1821, non Lam. 1788; Hook. f. Fl. Brit. India 5 : 252. 1887; Duthie, Fl. Gangetic Plain 3 : 82. 1915. *E. orbiculata* Miq. Fl. Ind. Bat. 1(2) : 421. 1859, non H.B.K. 1817. *E. bombaiensis* Santapau in Bull. Bot. Soc. Bengal 8 : 17. 1955, *excl. syn.*

Prostrate, dichotomously branched, glabrous herbs, with ribbed internodes. Leaves opposite, 2-6×1-4 mm, obliquely oblong or obovate-oblong, apex retuse or sub-truncate, serrate in upper part, entire towards base. Cyathia reddish-green. Involucre stalked, axillary, campanulate, glabrous; glands with a very small sinuately lobed limb. Capsules obtusely keeled glabrous. Seeds ovoid, obtusely triangular, blunt at apex, pale-brown, red when ripe.

Fl. & Fr. : October - March.

Common in rock crevices and marshy places, particularly in the east of Aravalli.

Selected specimens : Bharatpur : Near Deeg, *Parmar* 8578 (BSJO); Dungarpur : Ratanpur, *Kanodia* 82100 (BSI); Ganganagar : Hanumanagarh, *Roy* 5957 (BSJO); Jaipur : Durgapura, *Sharma* 1216 (RUBL); Jodhpur : *Bhandari* 919 (JAC); Kota : Shahabad, *Wadhwa* 9204 (BSA); Sirohi : Mt. Abu, *Mehta* 828 (JAC).

11. *Euphorbia hirta* L. Sp. Pl. 454. 1753; Duthie, Fl. Gangetic Plain 3 : 80. 1915; Mahesh. Illus. Fl. Delhi f. 193. 1966. *E. pilulifera* auct. plur. non L. 1753; Hook. f. Fl. Brit. India 5 : 250. 1887. 'Dudhi' (Hindi).

Procumbent, ascending or erect, annual, hairy herbs. Leaves opposite, variable in size, 1.5 × 0.5 - 1.8 cm, obliquely lanceolate, ovate or rhomboid-oblong, acute, serrate. Stipules subulate. Cyathia many, crowded in axillary and terminal, shortly pedunculate cymes. Involucre stalked, cup-shaped; glands stalked, globose, pink. Ovary on a long stalk, hairy. Capsules globose-trigonous, appressedly hairy. Seeds ovoid, with 3 sharp and one blunt angles, transversely rugose, reddish.

Fl. & Fr. : Almost throughout the year.

Common weed in variable habitats like forests, fallow fields, cultivated fields, lawns etc.

Selected specimens : Ajmer : Phulera road, *Puri* 39741 (BSI); Alwar : Kankwari forest block, *Parmar* 9405 (BSJO); Dungarpur : Dungarpur forest office, *Kanodia* 82003 (BSI); Ganganagar : Anupgarh 5 K, *Roy* 4891 (BSJO); Jaisalmer : Salam Sagar dam, *Tiwari* 717 (BSJO); Sirohi : Mt. Abu, *Rao* 66624 (BSI).

12. *Euphorbia indica* Lam. Encycl. 2 : 423. 1786; Raju & Rao in Indian Journ. Bot. 2 : 205. 1979. *E. hypericifolia* auct., non L. 1753; Hook. f. Fl. Brit. India 5 : 249. 1887; Duthie, Fl. Gangetic Plain 3 : 80. 1915. *E. parviflora* auct., non L. 1759; Bhandari, Fl. Ind. Desert. 343. 1978. 'Dudhali' (Hindi).

Erect or ascending, glabrous or sparsely hairy herbs. Stem and branches light pink to red. Leaves opposite, 1.5 - 3.5 × 0.5 - 1.8 cm, broadly oblong, elliptic or ovate, obtuse or rounded at apex, oblique at base. Cymes pedunculate, axillary, also pass into terminal racemose clusters with a few or many involucre. Involucre cup-shaped, puberulent, with 4-appendaged glands. Capsules sub-globose, pubescent, dark brown. Seeds ellipsoid, 4-angled, transversely rugose.

Fl. & Fr. : Almost throughout the year ; mostly during September - November.

Common in wastelands, forests and cultivated fields.

Selected specimens : Ajmer : Phulera road, *Puri* 39718 (BSI) ; Alwar : Kankwari forest block, *Parmar* 8800 (BSJO) ; Banswara : Wadita hillage, *Singh* 2866 (BSJO) ; Barmer : Sela forest block, *Pandey* 8048 (BSJO) ; Jhunjhunu : Ajit Sagar, *Kanodia* 257 (DD) ; Sirohi : Mt. Abu, *Jain* 60184 (BSI).

13. *Euphorbia jodhpurensis* Blatt. & Hallb. in Journ. Bombay Nat. Hist. Soc. 26 : 971. 1920 ; Bhandari, Fl. Ind. Desert 342. 1978.

Erect, annual, glabrous herbs. Stem dichotomously branched, filiform, straw-coloured. Leaves opposite, often crowded at the end of branches, 1.2 - 1.5 × 0.2 - 0.5 cm, obliquely linear-oblong, coriaceous, margins usually spinulose-serrate. Involucre solitary, axillary campanulate, glabrous. Capsules glabrous, 1.5 - 1.7 mm broad ; cocci somewhat carinate. Seeds 4-angled, attenuated and obtuse at apex, distinctly transversely rugose, rose-brown, delicately foveolate, mucous when wetted.

Fl. & Fr. : September - November.

Rare, in sandy habitats.

Endemic to north-west Rajasthan.

Selected specimens : Barmer : *Bhandari* 429 (JAC) ; Ganganagar : Govt. farm, *Roy* 5008 (BSJO) ; Jodhpur : *Bhandari* 62, 1126 (JAC), *Tandon* 107 (JAC).

Notes : Very similar to *Euphorbia clarkeana* Hook. f., but can be separated on the basis of its erect habit, dichotomous branches and throughout spinulosely serrate leaf margins.

14. *Euphorbia nerifolia* L. Sp. Pl. 451. 1753 ; Hook. f. Fl. Brit. India 5 : 255. 1887 ; Duthie, Fl. Gangetic Plain 3 : 76. 1915, *pro parte* ; Mahesh. Illus. Fl. Delhi f. 191. 1966. '*Danda thor*' (Hindi).

Erect, deciduous shrubs or small trees ; stem 5-angled. Leaves 5.5 - 25.0 × 3.0 - 13.5 cm, obovate-oblong, crowded at the end of stem, sub-fleshy, glabrous. Involucre 3-nate, lateral ones pedicellate, bisexual, central ones male and sessile ; glands without petaloid limb. Capsules obovoid-trigonous, deep red or pale-brown, smooth, glabrous. Seeds smooth.

Fl. & Fr. : March - July.

Common in rocky habitats in plains or on naked hills ; often planted on the boundaries of fields and gardens for fencing.

Selected specimens : Bhilwara : Meja dam, Singh 7136 (BSJO) ; Jaipur : Jaigarh, Sharma 1181 (RUBL) ; Jhalawar : Manoharthana, Verma 3478 (BSA) ; Sirohi : Mt. Abu, Jain 62135 (BSI) ; Udaipur : Banki block, Verma 32 (BSA).

15. *Euphorbia nivulia* Buch. Ham. in Trans. Linn. Soc. 14 : 286. 1825 ; Wight, Ic. 5(2) : 19. t. 1862. 1852 ; Hook. f. Fl. Brit. India 5 : 255. 1887. *E. nerifolia sensu* Roxb. Fl. Ind. 2 : 467. 1832, non L. 1753 ; Duthie, Fl. Gangetic Plain 3 : 76. 1915, *pro parte*. 'Ghota-thor' (Hindi).

Tall shrubs or small trees, with cylindrical stem and branches. Leaves 8.5 20.0 × 3.5 6.5 cm, obovate or spatulate, fleshy, retuse, crowded at the end of branches. Cymes 3-flowered, born from above the leaf-scars on the tubercles. Capsules glabrous, trigonous. Seeds globose, dorsally lined, smooth.

Fl. & Fr. : February - July.

Common in the east of Aravalli on exposed rocky land. New leaves appear during rainy season.

Selected specimens : Ajmer : Todgarh, Duthie 4864 (DD) ; Alwar : Kankwari forest block, Parmar 9705 (BSJO) ; Banswara : Singh 4235 (BSJO) ; Kota : Shahabad, Verma 628 (BSA) ; Sirohi : Nautiyal & Raizada 25439 (DD).

16. *Euphorbia pycnostegia* Boiss. Cent. Euphor. 9. 1860 ; Hook. f. Fl. Brit. India 5 : 246. 1887 ; Cooke, Fl. Bombay 2 : 565. 1906 ; Raizada in Indian For. 80 (4) : 214. 1954.

var. *pycnostegia*

Slender, erect, annual herbs. Stem tinged with purple, terete, smooth with swollen nodes ; branches dichotomous. Leaves opposite, sessile, 2.5 3.75 × 1.25 1.5 cm, oblong, obtuse or sub-acute, entire or finely serrulate, glabrous or nearly so. Floral leaves broadly ovate or orbicular, imbricating, involucre axillary, solitary ; lobes toothed ; limb of gland obovate. Capsules glabrous ; cocci obtusely keeled. Seeds obtusely 4-gonous, tuberculate.

Fl. & Fr. : October - December.

Rare, on hill-slopes.

Selected specimens : Sirohi : Mt. Abu, Jain 60153, 46614, 46665 (BSI).

17. var. *zornioides* (Boiss.) Santapau in Bull. Bot. Soc. Bengal 8 : 11. 1955. *Euphorbia zornioides* Boiss. in DC. Prodr. 15 (2) : 19. 1862 ; Hook. f. Fl. Brit. India 5 : 246. 1887 ; Cooke, Fl. Bombay 2 : 565. 1906.

Very similar to type variety, but can be separated by cocci keeled and angled at base, nearly glabrous. Seeds ovoid, smooth and limb of glands white or pink. In var. *pynostegia* cocci are obtusely keeled, hirsute or glabrous. Seeds obtusely 4-angled, transversely furrowed, tuberculate and limb of glands white.

Fl. & Fr. : September - December.

Rare, on hill-slopes.

Selected specimen : Sirohi : Mt. Abu, Rao 66669 (BSI).

18. *Euphorbia royleana* Boiss. in DC. Prodr. 15 (2) : 83. 1862 ; Hook. f. Fl. Brit. India 5 : 257. 1887 ; Duthie, Fl. Gangetic Plain 3 : 76. 1915. 'Thor' (Hindi).

Tall, erect, glabrous, fleshy shrubs. Branches with 5-7 prominent angles and 5-7 broad, flat intervening faces ; spines in pairs on the protuberant portions of the undulating edges. Leaves few, soon falling, alternate, sessile, 10-15 cm long, spatulate, rounded or shortly mucronate. Involucre hemispheric, greenish-yellow, arranged 3 or more together in axillary sub-sessile cymes ; lobes cuneate, fimbriate. Capsules trigonous, cocci compressed, glabrous.

Fl. & Fr. : During hot season.

Rare, on exposed rocky slopes in the N.E. and Eastern parts of the state ; sometimes cultivated as hedge for fencing.

Selected specimen : Kota : Chhabra, Singh 90946 (LWG). Also reported from Jaipur (Joshi, 1957 ; Bajpai & Verma, 1964) and from Jodhpur (Sarup, 1951).

19. *Euphorbia thymifolia* L. Sp. Pl. 454. 1753 ; Hook. f. Fl. Brit. India 5 : 252. 1887 ; Duthie, Fl. Gangetic Plain 3 : 81. 1915. *E. prostrata* Graham, Cat. 179. 1839, non Ait. 1789. 'Duddhi' (Hindi).

Small, annual, more or less pubescent, prostrate herbs. Leaves opposite, 0.2 - 1.0 × 0.1 - 0.7 cm, oblong or obovate-oblong, crenulate, oblique at the base. Stipules fimbriate. Involucre axillary, solitary or 2 to 3-together, campanulate, hairy ; glands stipitate, without limb. Capsules obtusely keeled, pubescent. Seeds quadrangular, bluntly pointed, transversely 5 to 6-furrowed.

Fl. & Fr. : August - December.

Common weed in wastelands, cultivated fields and gardens in various types of soils.

Selected specimens : Alwar : Nilkanth, *Parmar* 9698 (BSJO) ; Banswara : Near Paloda, *Singh* 2851 (BSJO) ; Bikaner : *H. Lal* 35024 A (LWG) ; Jaipur : *Sharma* Acc. No. 4215 (RUBL) ; Jaisalmer : Pokaran, *Jain* 40688 (BSI) ; Sirohi : Mt. Abu, *Jain* 60115 (BSI).

11. JATROPHA L.

Plants glandular hairy. Flowers blood-red.	...	2. <i>J. gossypifolia</i>
Plants eglandular. Flowers greenish-yellow.	...	1. <i>J. curcas</i>

1. *Jatropha curcas* L. Sp. Pl. 1006. 1753 ; Hook. f. Fl. Brit. India 5 : 383. 1887 ; Duthie, Fl. Gangetic Plain 3 : 116. 1915. 'Ratanjot, Jamalghota' (Hindi).

Soft-wooded, deciduous shrubs or small trees. Leaves 4.5-15.0 × 4.8-14.5 cm, cordate-ovate to nearly orbicular, palmately 3 to 5-angled or lobed, glabrous, 5 to 7-nerved at the base. Flowers in 6-8 cm long, terminal or extra-axillary corymbose cymes. Petals hairy inside. Stamens 10. Capsules 2.0-2.5 × 1.5-2.0 cm, globose or broadly ovoid, yellow, smooth. Seeds 1.5 × 1.25 cm, oblong.

Fl. & Fr. : Mostly throughout the year.

Native of Tropical America ; commonly grown as a fence near villages ; also naturalized in wastelands.

Selected specimens : Banswara : Dagia Bowji, *Singh* 2854 (BSJO) ; Bhilwara : Suwana, *Singh* 5715 (BSJO) ; Chittorgarh : Panch Devla, *Singh & Pandey* 6198 (BSJO) ; Jaipur : Chammu, *Wadhwa* 8356 (BSA) ; Kota : Chhabra, *Singh* 40947 (LWG).

2. *Jatropha gossypifolia* L. Sp. Pl. 1006. 1753 ; Hook. f. Fl. Brit. India 5 : 383. 1887 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 251. 1976. 'Mayla, Ratanjoti' (Hindi).

Tall, erect, glandular hairy shrubs, with deep reddish-purple branches. Leaves 5-12 × 6-13 cm, orbicular to obovate, palmately 3 to 5-lobed, 3-nerved and cordate at the base. Flowers in terminal, trichotomous cymes. Bracts ovate, acute. Filaments of inner whorls connate at the base, longer than outer ones. Capsules 3-lobed, smooth, glabrous. Seeds oblong, glabrous, greyish-brown with pale-yellow or brown strophiole.

Fl. & Fr. : Almost throughout the year.

Native of Brazil ; naturalised in wastelands near habitations ; also cultivated in the gardens and on the edges of fields.

Selected specimens : Banswara : Soorpur village, *Singh* 2956 (BSJO) ; Bharatpur : Near Weir, *Parmar* 8717 (BSJO) ; Bhilwara : Mandal, *Singh* 5767 (BSJO) ; Jhalawar : Jhalarapatan, *Verma* 3351 (BSA) ; Udaipur : Kherwada, *Gemawat* 239/Bot. (BSI).

12. KIRGANELIA JUSS.

Kirganelia reticulata (Poir.) Baill. *Etud. Gen. Euphor.* 614. 1874 ; Rao & Razi in *Journ. Mysore Univ.* 23 (1 & 2) : 47. 1969-70. *Phyllanthus reticulatus* Poir. in *Lam. Encycl.* 5 : 298. 1804 ; Hook. f. *Fl. Brit. India* 5 : 288. 1887 ; Duthie, *Fl. Gangetic Plain* 3 : 95. 1915. *Anisonema multiflorum* Wight, *lc.* 5 (2) : 26. t. 1899. 1852. 'Kambhoe, Nedbadi' (Hindi).

Large, glabrous, monoecious straggling shrubs. Leaves sessile, 0.8-3.0 × 0.6-2.0 cm, elliptic or oblong to rotundate, acute to truncate, glabrous. Flowers axillary, greenish-yellow ; male ones in 2 to 6-flowered clusters, female ones solitary. Disk 5-lobed. Berries globose, smooth, deep-purple to black. Seeds irregularly trigonous, glabrous, finely reticulate.

Fl. & Fr. : August - January ; rarely most part of the year.

Common in the dry deciduous forests, wastelands, on the edges of fields and gardens, particularly in the eastern parts of the state.

Selected specimens : Ajmer : *Lowrie* 151/24 (DD) ; Bharatpur : Ghana bird sanctuary, *Parmar* 8713 (BSJO) ; Banswara : Kushalgarh, *Singh* 3780 (BSJO) ; Jhalawar : Bakani, *Verma* 7048 A (BSA) ; Jodhpur : Bhavari, *Puri* 56541 (BSI) ; Sirohi : Mt. Abu, *Jain* 60200 (BSI).

13. MALLOTUS LOUR.

Mallotus philippensis (Lam.) Muell. *Arg. in Linnaea* 34 : 196. 1865 ; Hook. f. *Fl. Brit. India* 5 : 442. 1887 ; Duthie, *Fl. Gangetic Plain* 3 : 110. 1915. *Croton philippense* Lam. *Encycl.* 2 : 206. 1786. 'Senduria' (Hindi).

Small, much-branched, dioecious, evergreen trees, with thin, dark-grey bark. Leaves alternate, 4-25 × 2.5-12.5 cm, variable in size and shape, ovate to ovate-lanceolate, acuminate, entire to slightly toothed, subcoriaceous, puberulous and glandular beneath. Flowers small ; males nearly sessile, clustered in erect terminal spikes ; female solitary in short spikes. Capsules 3-lobed, 3-valved. Seeds globose, smooth, black.

Fl. & Fr. : December - March.

Common in the dry deciduous forests in the east of the Aravalli.

Selected specimens : Alwar : Kankwari forest block, *Parmar* 9688 (BSJO) ; Bhilwara : Bijolia, *Singh* 6094 (BSJO) ; Bundi : Kota dam, *Singh* 74407 (LWG) ; Jaipur : Ramgarh, *Sharma* 2164 (RUBL) ; Sirohi : Abu road, *Puri* 56794 (BSI) ; Udaipur : Khambli ghat, *Kanodia* 82421 (BSI).

14. MICROCOCCA Benth.

Micrococca mercurialis (L.) Benth. in Hook. Niger Fl. 503. 1849 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 252. 1976. *Tragia mercurialis* L. Sp. Pl. 980. 1753. *Claoxylon mercurialis* (L.) Thw. Enum. Pl. Zeyl. 271. 1861 ; Hook. f. Fl. Brit. India 5 : 412. 1887.

Erect, annual, glabrous herbs. Leaves numerous, spreading, 2.5-5.0 × 1.25-2.5 cm, broadly ovate to ovate-lanceolate, rounded or acute at base, glabrous. Flowers few, distant, in slender racemes longer than the leaves ; female flowers usually solitary, with several males. Sepals glabrous. Capsules subglobose, of three hairy cocci. Seeds globose, deeply foveolate, pale-brown.

Fl. & Fr. : August - October.

Rare, in moist shady habitats on gravelly hilly slopes, particularly in the N.E. parts of the state.

Selected specimens : Jaipur : Ramgarh village, *Sharma* 134, 789 (RUBL) ; Digotha hills, *Sharma* 3766 (RUBL) ; Amer, *Sharma* 830 (RUBL) ; Jodhpur : Bilara, *Singh* 4427 (BSJO). Also reported by Nair and Malhotra (1961) from Sikar district.

15. PHYLLANTHUS L.

- | | | |
|---|-----|-----------------------|
| 1a. Large trees. Fruits fleshy. Seeds bony. | ... | 3. <i>P. emblica</i> |
| 1b. Herbs. Fruit a small capsule. Seeds crustaceous : | | |
| 2a. Capsules echinate. | ... | 7. <i>P. urinaria</i> |
| 2b. Capsules smooth : | | |
| 3a. Stipules peltate : | | |
| 4a. Stipules red-brown, sagittate at base. Leaves linear-oblong, rounded at base. | ... | 8. <i>P. virgatus</i> |

- 4b. Stipules scarious, whitish. Leaves obovate, cuneate at base. ... 5 *P. maderaspatensis*
- 3b. Stipules simple, not peltate :
- 5a. Glabrous annuals :
- 6a. Leaves closely distichous, obtuse to rounded at apex. Style minute, 2-lobed :
- 7a. Disc of female flowers flat, deeply 5-lobed. ... 1. *P. amarus*
- 7b. Disc of female flowers irregularly cup-shaped, with deep, 6 - 9 crenulate-lacerate segments. ... 4. *P. fraternus*
- 6b. Leaves not imbricating, acute. Styles 2, distinct, with reflexed and recurved arms. ... 2. *P. debilis*
- 5b. Hispid annuals. ... 6. *P. scabrifolius*

1. *Phyllanthus amarus* Schum. & Thom. in Kongel. Danske Vidensk. Selsk. Skr. 4 : 195. 1829 ; Brenan in Kew Bull. 1950 : 215. 1950 ; Bhandari, Fl. Ind. Desert 345. 1978. 'Gugario' (Hindi).

Erect or ascending, annual herbs, with terete, smooth stem. Leaves 0.5 - 1.0 × 0.4 - 0.5 cm, arranged on 15 to 30-leaved branchlets, obovate, obtuse, rounded and often apiculate at tip. Flowers minute, with a pair of male and female in each axil, greenish. Capsules c. 2 mm in diam., obtusely trigonous, smooth. Seeds sharply trigonous, radially and tangentially with 5 - 7, straight, subparallel, longitudinal ribs on the back which are minutely transversely striate.

Fl. & Fr. : Almost throughout the year, but more profuse during rains.

Often found as a weed in the gardens.

Selected specimens : Alwar : Pandupole, Parmar 9484 (BSJO) ; Jaisalmer : Amar sagar, Tiwari 855 (BSJO) ; Jodhpur : Bhandari 1552, 1805 (JAC), Tandon 353 (JAC).

2. *Phyllanthus debilis* Klein ex Willd. Sp. Pl. 4 : 582. 1805 ; Hook. f. Fl. Brit. India 5 : 299. 1887 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 253. 1976.

Erect, annual, glabrous herbs, with a woody base and subterete or obtusely 3-gonous stem. Leaves petiolate, 0.5 - 2.0 × 0.2 - 1.0 cm, ovate-elliptic or obovate, acute or cuneate at base, sub-acute at apex. Stipules

lanceolate, acuminate. Flowers axillary, males in fascicles, females solitary, yellowish. Disc of female flowers sub-entire or shallowly 6-lobed. Capsules oblate, 2-3 mm across. Seeds longitudinally ribbed with transverse striate between the ribs on the back side, brown.

Fl. & Fr. : After the rainy season.

Rare, in cultivated fields and wastelands.

Selected specimens : Banswara : Kotharfa forest block, Singh 3038 (BSJO) ; Bundi : Kota dam, Singh 90147 (LWG) ; Jaisalmer : Pokaran, Jain 49465 (BSI).

Notes : Very similar to *P. fraternus* Webster, but differs in having elliptic-acute leaves, free styles appressed to the ovary and disc of female flowers which is sub-entire to shallowly 6-lobed.

3. *Phyllanthus emblica* L. Sp. Pl. 982.1753 ; Hook. f. Fl. Brit. India 5 : 289. 1887 ; Duthie, Fl. Gangetic Plain 3 : 96. 1915. *Emblica officinalis* Gaertn. Fruct. 2 : 122. t. 108. 1791 ; Wight, Ic. 5(2) : 26. t. 1896. 1852. 'Amla' (Hindi).

Large, deciduous trees, with greyish-brown, smooth bark exfoliating into scales. Leaves subsessile, distichous, 0.5-2.2 × 0.2-0.5 cm, narrowly linear-lanceolate or linear-oblong, glabrous. Flowers in axillary fascicles on the leaf-bearing branchlets or on the naked portion of branchlets below the leaves, greenish-yellow. Disk of minute glands. Fruits 2.0-2.5 cm in diam., fleshy, globose, obscurely 6-lobed, pale-yellow. Seeds 6, trigonous.

Fl. : March - May ; *Fr.* : June - November.

Sparsely distributed in deciduous forests on Aravalli, particularly in the eastern parts of the state ; also planted in the gardens, along roadsides and near villages.

Selected specimens : Alwar : Tehla, Parmar 9790 (BSJO) ; Banswara : Bagaycha forest block, Singh 3772 (BSJO) ; Dungarpur : JAV 29396 (BSI) ; Ganganagar : Kumbharwali, Roy 3916 (BSJO) ; Jaipur : Amer-lake, Wadhwa 8421 (BSA) ; Sirohi : Mt. Abu, Jain 46617 (BSI).

4. *Phyllanthus fraternus* Webster, Contr. Grey. Herb. 176 : 53. 1955 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 254. 1976. *P. niruri* auct. pl. non L. 1753 ; Wight, Ic. 5(2) : 25. t. 1894. 1852 ; Hook. f. Fl. Brit. India 5 : 298. 1887 ; Duthie, Fl. Gangetic Plain 3 : 98. 1915. *P. asperulatus* auct. pl. non Hutch. 1920 ; Sharma & Tiagi. Fl. N.E. Rajasthan 379. 1979.

Erect, glabrous herbs, 10-60 cm high. Branches spreading, resembling a compound leaf. Leaves 0.5-1.7 × 0.3-0.9 cm, oblong, distichous,

often overlapping. Flowers axillary, hidden under the leaves below the branchlets, yellowish-green; male flowers 1 to 3-together, females solitary. Capsules c. 2 mm in diam., depressed globose, smooth. Seeds 3-gonous, longitudinally ribbed, pale-brown.

Fl. & Fr. : August - December.

Common weed in cultivated fields, gardens etc. Very close to *P. asperulatus* Hutch. which, however, bears longer pedicels, entire female disc and spreading styles.

Selected specimens : Ajmer : Punch Kund, *Jain* 49657 (BSI); Alwar : Siliserh, *H. Lal* 34514 (LWG); Banswara : Near Paloda, *Singh* 2828 (BSJO); Ganganagar : Near Rai Singh nagar, *Roy* 4917 (BSJO); Jaisalmer : Salam Sagar, *Tiwari* 689 (BSJO); Sirohi : Mt. Abu, *Rao* 66705 (BSI).

5. *Phyllanthus maderaspatensis* L. Sp. Pl. 982. 1753; Wight, Ic. 5(2) : 25. t. 1895. f. 3. 1852; Hook. f. Fl. Brit. India 5 : 292. 1887; Duthie, Fl. Gangetic Plain 3 : 97. 1915. '*Htzarmani*' (Hindi).

Erect or decumbent, glabrous herbs, 30 - 60 cm high, with slender, angular branches. Leaves distantly borne, alternate, 1.0 - 2.5 × 0.5 - 1.0 cm, truncate or rounded at apex. Flowers axillary; males sessile, fasciated; female ones solitary, pedicelled, creamy white. Capsules globose, 3-lobed, glabrous, with obovate and persistent sepals at the base. Seeds 3-gonous, muricated on fine longitudinal lines.

Fl. & Fr. : August - October.

Common weed in gardens, cultivated fields, wastelands etc.

Selected specimens : Banswara : Pipalkhunt, *Singh* 2911 (BSJO); Barmer : Luni river-beds, *Shetty* 2209 (BSJO); Churu : Bamanka-Bas, *Roy* 2766 (BSJO); Jaipur : Ramgarh, *Sharma* 871 (RUBL); Kota : Shahabad, *Majumdar* 10816 (BSA); Sirohi : Mt. Abu, *Mehta* 897 (JAC).

6. *Phyllanthus scabrifolius* Hook. f. Fl. Brit. India 5 : 299. 1887; Cooke, Fl. Bombay 2 : 588. 1906; Shringi & Sharma in Journ. Econ. Tax. Bot. 9 : 19. 1987.

Erect, annual herbs; stem and branches angular, hispidulous with white hairs. Leaves sessile, elliptic or obovate, rounded at apex, hispid beneath. Flowers shortly pedicellate. Sepals scarious-margined, of the males shorter than those of females. Filaments united to the middle; anther-cells confluent. Styles 3, each 2-fid, arms recurved. Capsules depressed globose, smooth or granulate. Seeds 3-gonous, with 7 to 9 parallel ribs on the back and concentric ribs on faces.

Fl. & Fr. : Post monsoon season.

Rare, in moist habitats. It finds distribution in Western peninsula. Shringi & Sharma (*l.c.*) reported this taxon from Jhalawar district basing on specimen No. Shringi 673 (RUBL). The authors could not see this specimen.

7. *Phyllanthus urinaria* L. Sp. Pl. 982. 1753 ; Hook. f. Fl. Brit. India 5 : 293. 1887 ; Duthie, Fl. Gangetic Plain 3 : 97. 1915. *P. leprocarpus* Wight, Ic. 5(2) : 25. t. 1895. f. 4. 1852.

Erect or decumbent, much-branched, annual herbs, with margined branchlets. Leaves 1.0 - 2.4 × 0.3 - 0.9 cm, falcate-lanceolate or oblong-obovate, rounded at apex, oblique at the base. Stipules ovate-triangular acuminate. Flowers axillary ; male flowers pedicellate, fascicled ; females sessile, solitary. Lobes of disc glandular. Capsules verrucose. Seeds transversely ribbed on the back, rarely with 1 - 3 circular pits on lateral sides, greenish-brown.

Fl. & Fr. : After the rainy season.

Common weed in grasslands, cultivated fields, gardens, wastelands etc., particularly in the eastern parts of the state.

Selected specimens : Banswara : Hudiani Dungri, Kanodia 75480 (BSI) ; Dungarpur : Range forest, Kanodia 67293 (BSI) ; Jhunjhunu : Ghanshyamgarh, Puri 22355 (BSI) ; Kota : Shahabad, Singh 90446 (LWG) ; Udaipur : Diwan Hundi, Kanodia 82369 (BSI).

8. *Phyllanthus virgatus* Forst. f. Insul. Austr. Prodr. 65. 1786. *P. simplex* Retz. Obs. Bot. 5 : 29. 1788 ; Hook. f. Fl. Brit. India 5 : 295. 1887 ; Duthie, Fl. Gangetic Plain 3 : 97. 1915 ; Mahesh. Illus. Fl. Delhi f. 199. 1966. 'Gujarati-Bawal' (Hindi).

Erect or decumbent-ascending, annual-perennial herbs, with woody base. Leaves 1.0 - 3.5 × 0.3 - 0.8 cm, elliptic-lanceolate to oblong, rounded at the base, obtuse at apex, entire. Flowers pedicelled, axillary, solitary, unisexual, greenish-yellow. Disc cup-shaped, glandular. Style divaricate. Capsules warty. Seeds 3-gonous, brown, tuberculate.

Fl. & Fr. : August - December.

Common in grasslands, forests and cultivated fields, particularly in the eastern parts of the state.

Selected specimens : Alwar : Kankwari forest block, Parmar 9429 (BSJO) ; Banswara : Wadita hillage, Singh 2865 (BSJO) ; Jaipur : Lalset, Sharma 1876 (RUBL) ; Kota : Shahabad, Wadhwa 10485 (BSA) ; Sirohi : Dilwara, Rao 6662 ; (BSI).

16. RICINUS L.

Ricinus communis L. Sp. Pl. 1007. 1753; Hook. f. Fl. Brit. India 5 : 457. 1887; Duthie, Fl. Gangetic Plain 3 : 113. 1915. '*Erandi, Arand*' (Hindi).

Large, erect shrubs or small trees with fistular stem and glaucous-grey or reddish, smooth bark. Leaves 10-30 cm in diam., palmately 5 to 10-lobed; lobes oblong, lanceolate or linear, acuminate or acute at apex, irregularly serrate on margins; petioles 8-25 cm long, with one or two glands at the apex. Flowers in pyramidal, leaf-opposed and pseudo-terminal, erect panicles; pedicels jointed. Perianth spathaceous, splitting into 3-5, valvate lobes. Capsules depressed-globose, of three 2-valved cocci. Seeds oblong-ovoid, smooth, shining, mottled, caruncled.

Fl. & Fr. : Almost throughout the year.

Native of Africa; naturalized in wastelands near habitations; also cultivated for ornamental purposes and for oil-yielding seeds.

Selected specimens : Ajmer : Bhim, Kaul 8515 (LWG); Alwar : Naldeshwar forest block, Parmar 9513 (BSJO); Banswara : Shergarh village, Singh 3080 (BSJO); Ganganagar : Gharsana, Roy 4905 (BSJO); Jaisalmer : Ramgarh, Wadhwa 5116 (BSA); Sirohi : Dalwara, Tataka 46508 (BSI).

17. SECURINEGA Commerson ex Juss. *nom. cons.*

Plants armed. Leaves hardly exceeding 3.5 cm in length. ... 1. *S. leucopyrus*

Plants unarmed. Leaves upto 8 cm long. ... 2. *S. virosa*

1. *Securinega leucopyrus* (Willd.) Muell. - Arg. in DC. Prodr. 15(2) : 451. 1866. *Flueggea leucopyrus* Willd. Sp. Pl. 4 : 757. 1806; Wight, Ic. 5(2) : 21. t. 1875. 1852; Hook. f. Fl. Brit. India 5 : 328. 1887; Duthie, Fl. Gangetic Plain 3 : 92. 1915.

Erect, rigid, much-branched shrubs, with straggling branches; branchlets angular, slender, usually ending in sharp spines. Leaves 1.5-2.5 × 1.25-1.5 cm, ovate-lanceolate, obcordate or rotundate. Flowers dioecious; staminate in axillary fascicles, greenish-yellow; pistillate solitary. Fruits globose, c. 6 mm in diam., 3-celled, smooth, white when ripe. Seeds trigonous, smooth, pale-brown.

Fl. & Fr. : June - September.

Common in open wastelands, as forest undergrowth or among hedges.

Selected specimens : Ajmer : Lowrie 151/36 (DD); Alwar : Balafort, *H. Lal* 34418 A (LWG); Jaisalmer : Mohangarh, *Wadhwa* 5137A (BSA); Jhalawar : Kokanda, *Wadhwa* 5479 (BSA); Jodhpur : Kailana, *Moorthy* 72 (BSJO); Sirohi : Mt. Abu, *Mehta* 950 (JAC); Udaipur : *Majumdar* 12496 (BSA).

2. *Securinea virosa* (Roxb. ex Willd.) Baillon in *Adansonia* 6 : 334. 1865 - 66, excl. descr. *Phyllanthus virosus* Roxb. ex Willd. Sp. Pl. 4 : 578. 1805. *Flueggea microcarpa* Blume, *Bijdr.* 580. 1826; Hook. f. *Fl. Brit. India* 5 : 328. 1887, *pro parte*; Duthie, *Fl. Gangetic Plain* 3 : 91. 1915.

Undershrubs, with sulcate, glabrous stems and light-brown bark. Leaves 2.5 - 8.0 × 1.5 - 5.5 cm, obovate, ovate-elliptic or rhomboid to nearly orbicular, cuneate at base. Flowers of both sexes in axillary clusters, greenish-white to creamy-yellow. Disk glandular; pistillodes 2-lobed. Fruits fleshy, 4 - 5 mm in diam., turning white with age. Seeds punctate.

Fl. & Fr. : August - April.

Common in forests and wastelands as an undergrowth, particularly in the eastern parts of the state.

Selected specimens : Alwar : Balafort, *H. Lal* 34418 (LWG); Banswara : Bhingarh, *Kanodia* 75369 (BSI); Jaisalmer : Badabagh, *Puri* 23051 (BSI); Jhalawar : *Verma* 7519 (BSA); Jhunjhunu : Mandnera, *Khisti* 59946 (BSI); Udaipur : *Puri* 56977 (BSI).

18. TRAGIA L.

Leaves palmately 3-partite. Styles spreading.	...	2. <i>T. plukenetii</i>
Leaves simple. Styles circinate-revolute.	...	1. <i>T. involucrata</i>

1. *Tragia involucrata* L. Sp. Pl. 980. 1753; Hook. f. *Fl. Brit. India* 5 : 465. 1888; Duthie, *Fl. Gangetic Plain* 3 : 114. 1915.

Perennial, erect, trailing or straggling, hispid herbs. Leaves 5 - 12 × 1 - 5 cm, very variable from oblong-lanceolate to broadly ovate or linear-elliptic, acuminate or cuspidate at apex, margins serrate, rounded to subcordate at the base. Flowers in terminal, axillary and leaf-opposed, hairy racemes. Capsules 3-lobed, hispid, white. Seeds globose, smooth.

Fl. & Fr. : November - December.

Rare, in south eastern parts of the state in waste places near villages.

Selected specimen : Jhalawar : Piplosa, *Verma* 6960 (CAL.).

2. *Tragia plukenetii* R. Smith in *Kew Bull.* 37 : 688. 1983. *T. cannabina* L. f. *Suppl.* 415. 1781, *nom. illegit.* *T. involucrata* L. var. *cannabina* Muell. Arg. in *DC. Prodr.* 15(2) : 944. 1866 ; Hook. f. *Fl. Brit. India* 5 : 465. 1888.

Tall, erect or straggling, hispid undershrubs, clothed with stinging hairs. Leaves 2.0 - 7.5 × 0.6 - 3.5 cm ; lobes toothed or pinnatifid, the middle lobes much larger. Flowers in terminal and axillary racemes. Capsules 3-lobed, hirsute. Seeds globose, smooth, glabrous, brown.

Fl. & Fr. : May - October.

Occasionally found in the south-eastern parts of the state in wastelands.

Selected specimen : Kota : Chhipa-baraut, *Singh* 90806 (LWG).

DOUBTFUL TAXA

Euphorbia helioscopia L. *Sp. Pl.* 459. 1753 ; Hook. f. *Fl. Brit. India* 5 : 262. 1887.

Erect, annual, umbellately or dichotomously branched herbs. Leaves obovate-cuneate, with a narrow entire base. Involucre glabrous, reniform, greenish. Capsules depressed-globose, smooth. Seeds rounded-obovoid, coarsely reticulate, pitted.

Denizen of Punjab and Western Himalaya. Sankhala (1951) reported from N.W. Rajasthan, no specimen is available from Rajasthan in any Indian Herbaria.

Euphorbia pilosa L. *Sp. Pl.* 460. 1753 ; Hook. f. *Fl. Brit. India* 5 : 260. 1887.

Tall, erect, glabrous or pubescent herbs. Leaves sessile or subsessile, membranous, linear to oblong, acute or obtuse. Involucre rounded or broadly ovate and acute. Capsules small, glabrous, smooth or minutely warted.

The specimen *Kaul* 18516 (LWG) collected from Sasdarpur is the only representative of this taxon from Rajasthan. This species is a denizen of high altitude in Western Himalaya from Garhwal westwards to Murree. We could not locate the locality 'Sasdarpur' in the map of Rajasthan and, therefore, consider it doubtful.

Euphorbia thomsoniana Boiss. in *DC. Prodr.* 15 (2) : 113. 1862 ; Hook. f. *Fl. Brit. India* 5 : 260. 1887.

Quite glabrous herbs. Stem simple, sparingly leafy. Leaves sessile, elliptic or ovate, obtuse or subacute. Involucre campanulate, glabrous outside, small ; glands substipitate transversely oblong. Capsules shortly stipitate, oblong, smooth. Seeds oblong, smooth, caruncled.

This species is a inhabitant of high altitude (10-12,000 ft.) in western Tibet. The specimen *G. Saran* 65165 (LWG) from Chittorgarh district is so poor that identity could not be confirmed.

Phyllanthus macropus Hook. f. Fl. Brit. India 5 : 287, 1887.

Glabrous herbs. Leaves with 4.5-10.0 cm long petiole, ovate or oblong-lanceolate, membranous, finely acuminate. Female pedicels long, axillary. Capsules small, dry.

This species is usually found in upper Assam. Sarup (1951) reported it from Jodhpur district and Puti *et al.* (1964) also included it in his work on Sarup's authority. Lack of specimen to confirm the identity and range of distribution create doubts regarding its occurrence in Rajasthan.

CULTIVATED SPECIES

Acalypha godseffiana Mast. Erect shrubs, with ovate-lanceolate leaves margined with cream colour. Flowers light purple, in axillary racemes. Cultivated for ornamental purposes in the hedges and fences of gardens.

Acalypha hispida Burm. f. Dioecious, erect shrubs, with broadly ovate, acute leaves and drooping, dense cylindrical, red-flowered spikes. Native of New Guinea ; cultivated in the gardens for ornamental purposes.

Codiaeum variegatum (L.) Juss. (*Croton variegatum* L.) Glabrous shrubs or small trees, with entire or lobed, ovate-lanceolate to linear leaves marked with white, yellow or red patches. Flowers greenish, in terminal racemes. Native of Pacific Island ; cultivated in the gardens for ornamental purposes.

Croton roxburghii Balk. Medium - sized, deciduous trees with crowded leaves towards the end of branchlets. Flowers yellowish - green, solitary or clustered in the axils of minute bracts on long erect often fascicled racemes. Occasionally planted in the gardens for ornamental purposes.

Euphorbia heterophylla L. - Erect, annual herbs with petioled, often pinnatifid, ovate-oblong leaves, upper leaves green with a bright red base, lower ones with small red spots near the base. Native of Tropical America ; commonly cultivated in the gardens for ornamental purposes.

Euphorbia milii Ch. Des Moul. Spiny shrubs, with alternate, spatulate or elliptic-oblong leaves. Involucre arranged in dichotomous cymes; each cythium subtended by two opposite rose-coloured bracts. Native of Madagascar; commonly cultivated in the gardens in rockeries/pots for its ornamental look.

Euphorbia pulcherrima Willd. ex Klotz. Large shrubs, with very beautiful crimson or whitish upper floral leaves. Native of Tropical/Central America; extensively grown in the gardens for its beautiful leaves.

Euphorbia truncati L. Shrubs or small trees, with smooth, spreading, terete, rush-like, almost leafless branches. Native of East Africa; cultivated as hedge plant in many parts of the state.

Jatropha hastata Jacq. A pretty shrubs, with panduriform leaves and crimson flowers arranged in terminal corymbose cymes. Native of China; sometimes cultivated in the gardens for ornamental purposes.

Jatropha panduraefolia Andr. Erect shrubs, with reddish-brown bark and ovate to panduriform leaves. Flowers purple, in terminal corymbose cymes. Native of Cuba; cultivated in the gardens as an ornamental shrub.

Pedilanthus tithymaloides (L.) Poir. (*Euphorbia tithymaloides* L.) Succulent, deciduous, geniculate undershrubs, with broadly ovate, glabrous leaves and scarlet or bright rosy-pink inflorescence. Native of Florida to Venezuela; cultivated in the gardens for its ornamental beautiful foliage.

116. ULMACEAE

(P.J. Parmar)

1a. Leaves palmately veined :

2a. Leaves silky tomentose beneath. ... 3. *Trema*

2b. Leaves glabrous beneath or slightly pubescent. ... 1. *Celtis*

1b. Leaves pinnately veined. ... 2. *Holoptelea*

1. *CELTIS* L.

Celtis tetrandra Roxb. Fl. Ind. 2 : 63. 1832; Hook. f. Fl. Brit. India 5 : 482. 1888. *C. serotina* Planch. in Ann. Sci. Nat. Bot. ser. 3. 10 : 300. 1848; Wight, Ic. 6 : 8. t. 1970. 1853.

Medium-sized trees; branchlets grey pubescent. Leaves *c.* 10 × 4.5 cm, ovate, acute or acuminate, serrate, oblique at base, with a few pinnate veins above basal veins. Flowers in short, bisexual cymes; females in upper axils. Petals imbricate, ciliate, deciduous in female and bisexual flowers. Stamens 4, around a hairy torus. Ovary sessile; pistillode of hairs. Drupes solitary or binate, globose or ovoid.

Fl. & Fr. : February August.

Rare, in the forests and wastelands.

Selected specimen : Sirohi : Mt. Abu, Mehta 627 (JAC).

2. HOLOPTELEA Planch.

Holoptelea integrifolia (Roxb.) Planch. in Ann. Sci. Nat. Bot. ser. 3. 10 : 269. 1848; Wight, Ic. 6 : 8. t. 1968. 1853; Hook. f. Fl. Brit. India 5 : 481. 1888; Duthie, Fl. Gangetic Plain 3 : 120. 1915. *Ulmus integrifolia* Roxb. Pl. Cor. 1 : 56. t. 78. 1796-98. 'Papri, Kanjeri, Churil' (Hindi).

Large, spreading, almost glabrous, deciduous trees, with greyish-white or ash-coloured smooth bark exfoliating into small scales. Leaves 5.0 15.5 × 2.5 9.5 cm, ovate to abruptly acuminate, rounded or subcordate at the base. Flowers greenish-yellow. Tepals 4 8, imbricate. Anthers hairy. Fruits 1.5 2.5 cm in diam., broadly oblong or orbicular, deeply notched at apex, flat, winged. Seeds ovate or ovate-oblong.

Fl. & Fr. : December - May.

Common in the dry deciduous forests, wastelands etc., particularly in the eastern parts of the state; also planted as an avenue tree.

Selected specimens : Ajmer : Nasirabad, Wadhwa 9502 (BSA); Alwar : Bharathri forest block, Parmar 9763 (BSJO); Banswara : Pipalkhunt, Singh 4224 (BSJO); Jhalawar : Manoharthana, Verma 3460 (BSA); Pali : Paras Ram Mahadev R.F., Pandey 4176 (BSJO); Sirohi : Delwara temple, Kaul 9544 (LWG).

3. TREMA Lour.

Leaves membranous, distinctly unequal at the base. Cymes longer than the petioles. ...

1. *T. orientalis*

Leaves coriaceous, almost equal at the base. Cymes equal or shorter than the petiole. ...

2. *T. politoria*

1. *Trema orientalis* (L.) Blume. Mus. Bot. Lugd. Bat. 2 : 62. 1856 ; Hook. f. Fl. Brit. India 5 : 484. 1888 ; Duthie, Fl. Gangetic Plain 3 : 122. 1915. *Celtis orientalis* L. Sp. Pl. 1044. 1753, *pro parte*, excl. syn. *Saponia wightii* Planch. in Ann. Sci. Nat. ser. 3. 10 : 322. 1848 ; Wight, Ic. 6 : 9. t. 1971. 1853.

Small, much-branched, evergreen trees, with ash-coloured, rough, lenticellate bark. Leaves alternate, 5.5-12.5 × 3.5-5.0 cm, obliquely ovate or ovate-oblong, acuminate, cordate at base, sharply serrate, scabrid above, pubescent beneath. Flowers in axillary cymes, greenish-yellow. Stigma villous, reflexed in fruit. Drupes ovoid or globose, glabrous, yellowish, turning black when ripe.

Fl. & Fr. : August - December.

Common on the hills of south and south-eastern parts of the state in dry deciduous forests.

Selected specimens : Bundi : Kota dam, *Singh* 74649 (LWG) ; Kota : Shahabad, *Verma* 602, 795 (BSA) ; Sirohi : Mt. Abu, *Jain* 5319, 5485 (BSI) ; *Mehta* 96 (JAC) ; Udaipur : Khamblighat, *Kanodia* 82419 (BSI).

2. *Trema politoria* Planch. in Ann. Sci. Nat. ser. 3. 10 : 326. 1848 ; Hook. f. Fl. Brit. India 5 : 484. 1888 ; Duthie, Fl. Gangetic Plain 3 : 123. 1915. '*Rabna*' (Hindi).

Small, sparingly branched, evergreen trees, with short trunk and stout branchlets which are scabrid with firm white hairs, swollen at base. Leaves bifarious, 3.5-6.5 × 1.5-2.5 cm, oblong or ovate-lanceolate, acuminate, densely scabridly hairy beneath. Flowers in compact cymes, usually monoecious, greenish-yellow. Drupes globose, seated on the persistent perianth.

Fl. & Fr. : August - December.

Rare, found in the dry deciduous forests.

Selected specimens : Kota : Parbati river bank, *Wadhwa & Prasad* 9376 (BSA) ; Pali : Sadri, *Jain* 48443 (BSI). Also reported from N.W. Rajasthan by *Shankhala* (1951).

117. CANNABINACEAE

(R.P. Pandey)

CANNABIS L.

Cannabis sativa L. Sp. Pl. 1027. 1753 ; Hook. f. Fl. Brit. India 5 :

487. 1888 ; Duthie, Fl. Gangetic Plain 3 : 124. 1915. '*Bhang, Charas, Ganja*' (Hindi).

Erect, dioecious, aromatic, suffruticose herbs, upto 2 m high. Stem and branches angular, appressedly pubescent. Leaves 3 to 9-foliolate, upper ones simple ; leaflets 2-10 \times 0.5-1.75 cm, lanceolate or lanceolate-oblong, acuminate, coarsely serrate, glandular-pubescent on both sides ; petioles upto 8.5 cm long. Stipules 3-5 mm long, subulate, filiform. Flowers white or cream ; male flowers in short, terminal panicles ; female ones solitary, axillary, forming leafy-spikes. Fruits c. 4.5 mm long, compressed, brownish-yellow.

Fl. & Fr. : January - April.

Native of Central Asia ; naturalized near habitations, particularly in damp habitats. Often cultivated for its narcotic properties.

Selected specimens : Bhilwara : Mandalgarh. *Singh* 5713 (BSJO) ; Dungarpur : *Verma* 177 (BSA) ; Jaipur : Durgapura, *Sharma* 1250 (RUBL) ; Kota : Dadabari, *Singh* 90526 (LWG).

118. MORACEAE

(P.J. Parmar)

FICUS L.

- | | | |
|---|-----|---|
| 1a. Leaves opposite. | ... | 5. <i>F. hispida</i> |
| 1b. Leaves alternate : | | |
| 2a. Receptacles distinctly pedunculate : | | |
| 3a. Leaves entire. Receptacles in fascicles, on old trunk or on leafless, reduced branches. | ... | 9. <i>F. racemosa</i> |
| 3b. Leaves serrate-dentate. Receptacles-solitary, axillary. | ... | 8. <i>F. palmata</i>
subsp. <i>virgata</i> |
| 2b. Receptacles sessile or subsessile : | | |
| 4a. Leaves caudate : | | |
| 5a. Base of leaves slightly narrowed to the petiole, 5-nerved ; apical tail 1/5 as long as blade ; petiole usually longer than the blade. | ... | 11. <i>F. rumphii</i> |
| 5b. Base of leaves cordate, rounded or truncate, 5 to 7-nerved ; apical tail 1/4 to 1/2 as long | | |

as blade : petiole usually shorter than the blade :

- 6a. Base of leaves deeply cordate, tail $1/3 - 1/4$ as long as blade. Stipules 1.2 - 1.5 cm long. Receptacles born below the leaves, depressed at apex ; basal bracts glabrous. ... 2. *F. arnottianu*
- 6b. Base of leaves rounded or truncate, tail $1/2$ as long as blade. Stipules minute. Receptacles axillary, with a protuberance at the apex ; basal bracts silvery pubescent. ... 10. *F. religiosa*
- 4b. Leaves not caudate, may be shortly acuminate or apiculate :
 - 7a. Leaves more or less tomentose beneath, at least when young :
 - 8a. Leaves obtuse to bluntly apiculate. Receptacles globose or pisiform, puberulous to tomentose :
 - 9a. Leaves obtuse, dark green above. Receptacles globose, c. 2.0 cm in diam., puberulous, red. ... 3. *F. benghalensis*
 - 9b. Leaves bluntly apiculate, yellowish-green. Receptacles pisiform, grey-tomentose. ... 7. *F. mollis*
 - 8b. Leaves shortly abruptly acuminate. Receptacles oblong or sub-obovate, nearly glabrous when ripe. ... 4. *F. drupacea* var. *pubescens*
 - 7b. Leaves glabrous :
 - 10a. Petiole articulated. Male flowers ostiolar :
 - 11a. Receptacles 4 to 6-together on short, persistent tubercles; borne on old wood. ... 12. *F. tsjahela*
 - 11b. Receptacles in pairs, not on tubercles; borne on new wood :
 - 12a. Leaves 8.0 - 12.5 cm long, rounded or cordate at base. ... 13. *F. virens* var. *virens*
 - 12b. Leaves upto 6.5 cm long, narrowed at the base. ... 14. *F. virens* var. *wightiana*

10b. Petiole not articulated. Male flowers disperse :

13a. Lateral and secondary nerves close, fine and parallel. Stipules c. 1.0 cm long. Receptacles in axillary pairs. ...

6. *F. microcarpa*

13b. Lateral and secondary nerves not close and parallel. Stipules 1.25 - 2.5 cm long. Receptacles crowded towards the end of branches ...

1. *F. amplissima*

1. *Ficus amplissima* Smith in Rees, Cyclop. 14 : no. 68. 1810. *F. tsiela* Roxb. ex Buch. - Ham. in Trans. Linn. Soc. London 15 : 149. 1826 ; Wight, Ic. 2(4) : 3. t. 668. 1843 ; King in Hook. f. Fl. Brit. India 5 : 515. 1888 ; Cooke, Fl. Bombay 2 : 650. 1907.

Large, spreading trees, with light grey, smooth bark. Leaves 5 - 18 × 3.5 - 11.0 cm, broadly ovate or elliptic-lanceolate, acute or obtusely cuspidate, narrowed or rounded at base, thinly coriaceous. Receptacles axillary, born from leaf-scars, globose, purple when ripe ; basal bracts 3, broadly ovate, scarious. Male flowers sessile ; stamen 1. Gall flowers sessile or pedicelled. Female ones sessile. Sepals 3, ovate, shorter than achenes in latter two. Achenes ovoid-reniform.

Fl. & Fr. : Almost throughout the year.

Rare, found near villages in southern parts of the state.

Selected specimen : Banswara : Jolana, *Kanodia* Acc. No 30742 (BSI).

2. *Ficus arnottiana* (Miq.) Miq. in Ann. Mus. Bot. Lugd. Bat. 3 : 287. 1867 ; King in Hook. f. Fl. Brit. India 5 : 513. 1888 ; Duthie, Fl. Gangetic Plain 3 : 152. 1915. *Urostigma arnottiana* Miq. in Hook. London Journ. Bot. 6 : 564. 1847. *Ficus cordifolia* Garh. Cat. 197. 1839, non Roxb. 1832. 'Pimpli, Palhi' (Hindi).

Glabrous, deciduous trees, 5 - 8 m high, with greyish-white, smooth bark. Leaves 5 - 18 × 5 - 13 cm, undulate, ovate-oblong or elliptic-oblong, sub-coriaceous ; stipules ovate-lanceolate. Receptacles 0.5 - 1.0 cm across, spherical, smooth, dark purple when ripe ; basal bracts 3, membranous. Male flowers few, sessile near the mouth ; stamen one. Gall and fertile female flowers sessile or pedicellate. Perianth toothed, invasting the ovary. Style elongate ; stigma flat.

Fl. & Fr. : September - March.

Common in scrub and dry deciduous forests in rocky habitats.

Selected specimens : Barmer : Haldeshwar, *Tiwari* 1168 (BSJO) ; Jodhpur : Bap, *Khisti* 40770 (BSI) ; Sirohi : Mt. Abu, *Jain* 5348, *JAY* 22493 (BSI) ; Tonk : Toda Rai Singh R.F., *Shetty* 1305 (BSJO) ; Udaipur : Chhapli, *Kanodia* 82493 (BSI).

3. *Ficus benghalensis* L. Sp. Pl. 1059. 1753 ; King in Hook. f. Fl. Brit. India 5 : 499. 1888 ; Duthie, Fl. Gangetic Plain 3 : 147. 1915. *Urostigma benghalense* (L.) Gasp. Nov. Gen. Fic. 7. 1844 ; Wight, Ic. 6 : 12. t. 1989. 1853. 'Bargad, Bar' (Hindi).

Large, evergreen trees, with straight trunk and grey to greyish-brown, rough bark. Leaves 6 - 22 × 4.5 - 15.0 cm, ovate-oblong, ovate-orbicular or elliptic, coriaceous, base rounded or sub-cordate, lateral nerves less than 6 pairs. Receptacles axillary, geminate, depressed-globose, silky-pubescent, bright-red when ripe ; basal bracts 3. Male flowers many ; perianth-lobes 4, lanceolate ; stamen one. Gall and fertile female flowers with elongate style.

Fl. & Fr. : Almost throughout the year.

Common in wastelands, walls of old buildings and on other trees. Also planted as an avenue tree along the roads and near temples.

Selected specimens : Alwar : Minak forest block, *Parmar* 9627 (BSJO) ; Banswara : Ghatol - Pipalkhunt road, *Singh* 2890 (BSJO) ; Barmer : Haldeshwar, *Tiwari* 1165 (BSJO) ; Ganganagar : Raising nagar, *Roy* 4959 (BSJO) ; Jaipur : Jaigarh, *Sharma* 450 (RUBL) ; Sirohi : Mt. Abu, *Kaul* 9506 (LWG).

4. *Ficus drupacea* Thunb. var. *pubescens* (Roth) Corner in Gard. Bull. Straits Settlem. 17 : 381. 1960. et 21 : 13. 1965. *F. mysorensis* Heyne ex Roth var. *pubescens* Roth in Roem. & Schult. Syst. Veg. 1 : 508. 1817 ; King in Hook. f. Fl. Brit. India 5 : 500. 1888 ; Bhandari, Fl. Ind. Desert 348. 1978. 'Paras pipal' (Hindi).

Medium-sized trees, densely tomentose in younger parts. Leaves 9 - 20 × 7.5 - 11.0 cm, ovate-oblong or elliptic-oblong, shortly acuminate, glabrous, rounded or cordate and 3-nerved at the base. Receptacles axillary, solitary or in pairs, oblong, deep rusty red when ripe ; basal bracts orbicular, concave, pilose outside. Male flowers many, near the apex ; stamen 1, exserted. Female flowers with ovoid achenes and elongate lateral style.

Fl. & Fr. : March - June.

Rare, found in forests ; usually planted along road-sides as an avenue tree in the western parts of the state.

Selected specimens : Barmer : Sanchor, Tiwari 1202 (BSJO) ; Jodhpur : Bhandari 1138 (JAC). Also reported from Sikar by Rainam (1951) and Nair & Malhotra (1961).

5. *Ficus hispida* L. f. Suppl. 442. 1781 ; King in Hook. f. Fl. Brit. India 5 : 522. 1888 ; Duthie, Fl. Gangetic Plain 3 : 155. 1915. *F. oppositifolia* Roxb. Pl. Cor. 2 : 14. t. 124. 1798 ; Wight, Ic. 2(4) : 1. t. 638. 1843. 'Katamar, Ghauter, Kalmungri' (Hindi).

Large, hispidly hairy shrubs or small trees, with hollow internodes. Leaves 6-30 × 3-12 cm, ovate, obovate or obovate-oblong, abruptly acuminate, dentate or serrulate, hirsute. Receptacles extra axillary, on leafless branches or on special shoots, sub-globose or obovoid, tomentose. Bracts three, triangular. Male and gall flowers in one set of receptacles ; female flowers in another. Stamen one. Achenes lenticular, keeled, with prominent hilum.

Fl. & Fr. : Most part of the year, but more profusely in May-June.

Common in the forests, particularly near water resources and in shady habitats in south and south-eastern parts of the state.

Selected specimens : Banswara : Shergarh forest, Singh 3092 (BSJO) ; Majumdar 10245 (BSA) ; Dungarpur : Verma 154 (BSA) ; Jhalawar : Ameth, Verma 3412 (BSA) ; Khanpur, Wadhwa 6934 (BSA) ; Kota : Sitabari, Jain 29104 (BSI).

6. *Ficus microcarpa* L. f. Suppl. 442. 1781. *F. retusa* auct. pl. non L. 1767 ; King in Hook. f. Fl. Brit. India 5 : 511. 1888 ; Duthie, Fl. Gangetic Plain 3 : 149. 1915.

Large or medium-sized, evergreen trees, with dark grey bark and few aerial roots. Leaves 3.5-9.0 × 3-5 cm, ovate, elliptic, rhomboid-elliptic or obovate, rounded or bluntly acuminate at the apex, cuneate at base. Receptacles in axillary pairs, depressed-globose, glabrous, pink to purple when ripe. Bracts 3, broadly ovate. Male flowers numerous, scattered ; female flowers usually sessile ; gall flowers sessile or pedicellate. Stamen 1, hardly exerted. Achenes smooth.

Fl. & Fr. : April - November.

Common in wastelands and along roadsides ; rarely found in the forests, particularly in south and eastern parts of the state.

Selected specimens : Banswara : Near Danpur village, Singh 4268 (BSJO) ; Kota : Shahabad, Nautiyal & Raizada 25366 (DD) ; Kunda-koh, Wadhwa 9237 (BSA) ; Sirohi : Mt. Abu, Mehta 497 (JAC).

7. *Ficus mollis* Vahl, Symb. Bot. 1 : 82. 1790. *Ficus tomentosa* Roxb. ex Willd. Sp. Pl. 4 : 1136. 1806 ; Wight, Ic. t. 647. 1843 ; King in Hook. f. Fl. Brit. India 5 : 501. 1888 ; Duthie, Fl. Gangetic Plain 3 : 148. 1915.

Large shady trees, with smooth, greenish-white bark and with few, thin aerial roots from the branches. Leaves coriaceous, crowded towards the end of branches. Leaves coriaceous, crowded towards the end of branches, 5.0 - 12.5 × 3.0 - 7.5 cm, elliptic - ovate or obovate, grey-tomentose beneath, base rounded or cordate. Receptacles sessile, axillary, in pairs, globose, covered with rusty-grey tomentum ; basal bracts 3. Male flowers few, near the mouth. Tepals of gall and female flowers shorter than the ovary. Achenes tuberculate.

Fl. & Fr. : March - June.

Frequently found in the forests of the north-eastern parts of the state in rocky places.

Selected specimens : Alwar : pandupole, Parmar 9482 (BSJO) ; Jaipur : Parker 5952, 4463 (DD) ; Sawaimadhapur : Ranthambhore, Das 9032 (BSJO) ; Sapotra R.F., Das 10153 (BSJO).

8. *Ficus palmata* Forsk. subsp. *virgata* (Roxb.) Browicz in Rechinger, Fl. Iranica 153 : 12. 1982 ; Singh, Fl. Banswara 216. 1983. *F. virgata* Roxb. Fl. Ind. 3 : 529. 1832. *F. caricoides* Roxb. l. c. 3 : 529. 1832 ; Wight, Ic. 2 (4) : 1. t. 634. 1843. *F. palmata sensu* King in Hook. f. Fl. Brit. India 5 : 530. 1888, non Forsk. 1775 ; Duthie, Fl. Gangetic Plain 3 : 158. 1915. 'Jangli-Anjir' (Hindi).

Small or medium-sized trees, with pubescent branches and a ring of lenticels on the nodes. Bark smooth, dull ashy-grey. Leaves membranous, 4 - 14 × 4 - 12 cm, ovate to orbicular-ovate, acute to obtuse, entire or lobed, serrate or dentate, cordate or truncate and 3 to 5-nerved at base. Receptacles axillary, solitary, sub-globose or pyriform, pubescent, yellow when ripe. Bracts ovate. Male and gall flowers in one set of receptacles ; females in another. Stamens 2.

Fl. & Fr. : February - July.

Common in the neglected corners of gardens, boundaries of the fields and often on the fringes of forests, particularly in the east of Aravalli.

Selected specimens : Alwar : Naldeshwar forest block, Parmar 9508 (BSJO) ; Banswara : Shergarh forest, Singh 3091 (BSJO) ; Bhilwara : Shahpura, Singh 5716 (BSJO) ; Jhalawar : Aklera, Wadhwa 7617 (BSA) ; Sirohi : Delwara temple, Kaul 9540 (LWG) ; Udaipur : Baspal, Majumdar 10359 (BSA).

9. *Ficus racemosa* L. Sp. Pl. 1060. 1753. *F. glomerata* Roxb. Pl. Cor. 2 : 13. t. 123. 1798 ; Wight, Ic. 2(4) : 3. t. 667. 1843 ; King in Hook. f. Fl. Brit. India 5 : 535. 1888 ; Duthie, Fl. Gangetic Plain 3 : 160. 1915. 'Gular' (Hindi).

Tall, evergreen trees, with greyish or blackish-brown bark and with few short aerial roots. Leaves 5-15 × 2.5-6.5 cm, ovate to ovate-oblong or elliptic-lanceolate, obtuse or acute, glabrous at length. Receptacles on short, warted, tubercled, leafless branchlets, ovoid, subglobose or sub-turbinate, tomentose. Bracts lateral, at the middle of peduncles. Male, female and gall flowers are found together in the same receptacle. Stamens 2, exserted. Achenes reddish-brown, obovoid.

Fl. & Fr. : Almost round the year.

Commonly planted along road-sides as an avenue tree ; often found in the forests along water courses.

Selected specimens : Ajmer : Bali-slope along Ajmer-Udaipur road, Kaul 8489 (LWG) ; Alwar : Kankwari forest block, Parmar 9701 (BSJO) ; Dungarpur : Verma 155 (BSA) ; Ganganagar : Raisingh nagar, Roy 4968 (BSJO) ; Jodhpur : Near Barli temple, Pandey 6179 (BSJO) ; Sirohi : Pindara - Arnua, Jain 47958 (BSI).

10. *Ficus religiosa* L. Sp. Pl. 1059. 1753 ; King in Hook. f. Fl. Brit. India 5 : 513. 1888 ; Duthie, Fl. Gangetic Plain 3 : 150. 1915. *Urostigma religiosum* (L.) Gasp. Ric. Caprif. 82. t. 7. f. 1-5. 1845 ; Wight, Ic. 6 : 8. t. 1967. 1853. 'Pipal' (Hindi).

Large, deciduous, glabrous trees, with grey or greyish-black bark. Leaves 6.5-20.0 × 6-12 cm, ovate to ovate-suborbicular, entire or undulate, caudate-acuminate, truncate or cordate at base ; tail 3-5 cm long. Receptacles c. 1 cm in diam., in axillary pairs, spherical, reddish-purple when ripe ; basal bracts 3. Male flowers very few, sessile, situated near the mouth ; stamen one. Fertile female flowers sessile or pedicellate, with 5 perianth-lobes. Gall flowers sessile, with 3-lobed perianth.

Fl. & Fr. : Almost throughout the year.

Common in wastelands, on the walls of old buildings, on large trees ; also planted along road-sides as an avenue tree and near temples.

Selected specimens : Banswara : Ghatol, Kanodia 75464 (BSI) ; Bikaner : Gajner, Roy 2060 (BSJO) ; Jaipur : Rajasthan College, Sharma 1675 (RUBL) ; Jaisalmer : Barabagh, Shetty 4110 (BSJO) ; Kota : Kishanganj, Verma 676 (BSA) ; Sirohi : Mt. Abu, Jain 62050 (BSI).

11. *Ficus rumphii* Blume, Bijdr. 437. 1825 ; King in Hook. f. Fl.

Brit. India 5 : 512. 1888 ; Duthie, Fl. Gangetic Plain 3 : 151. 1915. *F. cordifolia* Roxb. Fl. Ind. 3 : 548. 1832. non Blume 1825 ; Wight, Ic. 2(4) : 1. t. 640. 1843. "*Pipli, Paras pipal*" (Hindi).

Medium-sized, deciduous trees, with grey bark exfoliating in to roundish, irregular flakes. Leaves 7.5 - 15.0 × 4.5 - 10.0 cm, glabrous and shining, broadly ovate, acuminate at apex, margins entire or sub-undulate. Receptacles axillary, in pairs, whitish with dark spots when young, nearly black when ripe ; basal bracts 3. Male flowers few, near the mouth. Achenes minutely tuberculate, mucilaginous.

Fl. & Fr. : March - June.

Rare, in the wastelands and in the forests ; perhaps planted.

Selected specimen : Ganganagar : Kumbharwali, Roy 3922 (BSJO). Also reported from Ajmer (Sharma, 1958), Jodhpur (Sarup, 1951) and from N.W. Rajasthan (Sankhala, 1951).

12. *Ficus tsjahela* Burm. f. Fl. Ind. 227. 1768, '*tjakela*' ; Wight, Ic. 2(4) : 3. t. 668. 1843 ; King in Hook. f. Fl. Brit. India 5 : 514. 1888 ; Cooke, Fl. Bombay 2 : 650. 1907.

Large, glabrous, deciduous trees, with dark, rough bark. Leaves coriaceous, 7.0 - 14.5 × 4.0 - 7.5 cm, ovate-oblong or ovate-lanceolate, abruptly acuminate, rounded-truncate at base. Receptacles in the axils of leaves or in the axils of the scars of fallen leaves, depressed-globose, whitish-yellow, dotted when ripe ; basal bracts 3. Male flowers few, near the mouth ; stamen 1. Gall and fertile female flowers alike, except as regard the contents of the ovary. Achenes smooth.

Fl. & Fr. : March - June.

Rare, in the rocky places on Aravalli near Mt. Abu.

Selected specimen : Sirohi : Mt. Abu, Jain 62152 (BSI).

13. *Ficus virens* Ait. Hort. Kew. 3 : 451. 1789. *F. infectoria sensu* Roxb. Fl. Ind. 3 : 551. 1832, non Willd. 1806 ; Wight, Ic. 2(4) : 3. t. 665. 1843 ; King in Hook. f. Fl. Brit. India 5 : 515. 1888 ; Duthie, Fl. Gangetic Plain 3 : 153. 1915. '*Pilkhan*' (Hindi).

var. *virens*

Medium-sized, deciduous trees, with grey bark. Leaves 5 - 12 × 2.0 - 4.5 cm, ovate, ovate-lanceolate or elliptic-lanceolate, glabrous, acute at apex, rounded or truncate at base. Receptacles in axillary pairs, globular, glabrous, creamy white ; basal bracts 3, ovate-rotund. Male flowers sessile,

with single stamen ; gall and fertile female flowers with 3-4, linear-lanceolate lobes. Achenes smooth.

Fl. & Fr. : October - June.

Common in the wastelands, gardens and in the forests.

Selected specimens : Alwar : Udainath forest block, *Parmar* 9771 (BSJO) ; Bhilwara : On the way to Bijolia, *Singh* 6098 (BSJO) ; Bikaner : Gajner Garden, *Roy* 1685 (BSJO) ; Jhalawar : Kapildhara, *Verma* 757 (BSA) ; Sirohi : Mt. Abu, *Jain* 9315 (BSI) ; Tonk : Toda Rai Singh R.F., *Shetty* 1304 (BSJO).

14. var. *wightiana* (Miq.) Chitra in Henry *et al.* Fl. Tamil Nadu 2 : 256. 1987. *Urostigma wightiana* Miq. in Hook. Lond. Journ. Bot. 6 : 566. 1847. *Ficus infectoria* Roxb. var. *wightiana* (Miq.) King in Ann. Roy. Bot. Gard. Calcutta 63. t. 77. 1887-88 & in Hook. f. Fl. Brit. India 5 : 516. 1888 ; Duthie, Fl. Gangetic Plain 3 : 154. 1915.

Very similar to the type variety, but can be easily separated by its smaller leaves which are narrowed at the base and receptacles being pendunculate.

Fl. & Fr. : March - June.

Rare, on low hills or at the foot of hills, particularly in N. - Eastern parts of the state.

Selected specimen : Alwar : Narayaniji forest block, *Parmar* 9634 (BSJO).

CULTIVATED SPECIES

***Artocarpus heterophyllus* Lam.** '*Kathal*' (Hindi). Evergreen trees, with light-black mottled green or dark-brown bark and elliptic-oblong or obovate, glabrous leaves. Receptacles axillary, solitary. Cultivated in the fruit orchards and in the gardens for its fruits used as vegetable.

***Artocarpus lakoocha* Roxb.** '*Barhal Dheu*' (Hindi) large, deciduous trees, with thick, rough, dark-grey bark and sub-coriaceous, oblong, elliptic or sub-obovate leaves. Receptacles axillary. Occasionally planted in the gardens for fruits cooked as vegetable.

***Broussonetia papyrifera* (L.) Vent.** (*Morus papyrifera* L.) - Tall trees, with greyish pubescent twigs and ovate or oblong-ovate leaves. Male flowers in 5 - 8 cm long spikes ; female ones in 1.5 - 2.0 cm long, globose heads. Rarely planted in the gardens.

Ficus carica L. 'Anjir' (Hindi) - Tall trees, without aerial roots. Leaves broadly ovate, entire or lobed, softly pubescent beneath. Receptacles axillary, obovoid-oblong, thinly pubescent. Cultivated for its sweet, edible figs used as dry fruit.

Ficus benghalensis L. var. *krishnae* (C. DC.) Ball. (*Ficus krishnae* C. DC.) Very similar to *Ficus benghalensis* var. *benghalensis*, but with most or all the leaves having the side of the lamina in its lower half reflexed and connate to form a cup. Reported as cultivated by Nair and Kanodia (1959) from Jhunjhunu district.

Ficus pumila L. Scandent or creeping shrubs. Leaves of stem alike in shape. Receptacles c. 2.5 cm in diam., solitary, axillary, pyriform, truncate at apex, borne on leafy branches. Native of China and Japan; rarely planted in the gardens and parks against walls.

Morus alba L. 'Shetut' (Hindi) Medium-sized, deciduous trees, with ovate, serrate or crenate-dentate leaves. Flowers monoecious, in short, ovoid spikes. Fruiting spikes white or red, sweet. Commonly cultivated in the gardens for supplying food for silkworms and for its edible fruits.

Morus australis Poir. (*M. indica* Thunb., non L. 1753). Medium-sized, deciduous trees, with ovate, entire or 3-lobed leaves. Flowers in peduncled spikes. Fruits an aggregate of drupelets, enclosed in the succulent perianth. Native of China; usually cultivated in the gardens for its edible fruits.

Morus macroura Miq. (*M. laevigata* Wall. ex Hk. f.) Medium-sized trees; shoots, stipules and peduncles softly hairy. Leaves membranous, sparsely pubescent when young, cordate or rounded at base. Male flowers in villous spikes, female ones glabrous. Reported by Rao & Kanodia (1963) from Pali as planted in the Dak Bungalow.

Morus serrata Roxb. Large, deciduous trees, with broadly ovate cordate, acuminate leaves. Flowers dioecious, in cylindric spikes. Fruits greenish-red, sweet. Frequently cultivated in the gardens and near the the temples.

119. URTICACEAE

(P.J. Parmar)

1a. Plants with stinging hairs :

2a. Leaves opposite. Stigma penicillate. ...

7. *Urtica*

2b. Leaves alternate. Stigma linear :

- 3a. Perennial undershrubs. Flowers in paniced spikes. Female perianth with one free and 3 connate tepals. ... 1. *Girardinia*
- 3b. Annual herbs. Flowers in clustered cymes on long floral axis. Female perianth 4-partite ... 2. *Laportea*
- 1b. Plants without stinging hairs :
- 4a. Stamens 2. ... 4. *Neodistemon*
- 4b. Stamens 4-5 :
- 5a. Stipules inter-petiolar, connate. Style absent ; stigma penicillate : ...
- 6a. Leaves entire ; petiole c. 3 mm long. Staminodes scale-like, inflexed in female flowers... 5. *Pilea*
- 6b. Leaves serrate ; petiole 1-5 cm long. Staminodes absent or not inflexed in female flowers. ... 3. *Lecanthus*
- 5b. Stipules free lateral, not interpetiolar. Style filiform, laterally stigmatic. ... 6. *Pouzolzia*

1. GIRARDINIA Gaud.

Girardinia zeylanica Decne. in Jacq. Bot. Voy. Bon. 152. 1844. *Urtica heterophylla* Willd. Sp. Pl. 4 : 362. 1805, non Vahl 1790 ; Wight, Ic. 2(4) : 4, t. 687. 1843. *Girardinia heterophylla* (Willd.) Decne. var. *zeylanica* (Decne.) Hook. f. Fl. Brit. India 5 : 551. 1888 ; Duthie, Fl. Gangetic Plain 3 : 125. 1915.

Perennial undershrubs, closely armed with slender stinging hairs. Leaves 6-15 cm in diam., with long petiole, broadly ovate or sub-orbicular, entire or 3 to 5-lobed, coarsely serrate, base cordate or truncate, stingingly hairy. Stipules 2-fid. Flowers in simple or paniced cymes, monoecious. Fruiting cymes densely clothed with irritant hairs. Achenes obliquely ovate, much compressed.

Fl. & Fr. : July - November.

Rare, in moist and shady habitats on Arvalli near Mt. Abu.

Selected specimens : Sirohi : Mt. Abu. Tatake 46536, Kanodia 62214 (BSI). Also reported by Sarup (1951) from Jodhpur and by Sankhala (1951) from N.W. Rajasthan.

2. LAPORTEA Gaud. *nom. cons.*

Laportea interrupta (L.) Chew. in Gard. Bull. Singapore 21(2) : 200. 1965 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 258. 1976. *Urtica interrupta* L. Sp. Pl. 985. 1753. *Fleurya interrupta* (L.) Gaud. in Freyc. Voy. Bot. 497. t. 83. 1826 ; Wight, Ic. 6 : 10. t. 1975. 1853 ; Hook. f. Fl. Brit. India 5 : 548 1888.

Densely hairy, erect, annual herbs. Leaves 3.5 - 9.5 × 2.3 - 7.5 cm, broadly ovate or ovate-rhomboid, crenate-serrate, acuminate, cordate or shortly cuneate to sub-truncate at the base. Stipules 2-fid. Flowers in distant, speciform or paniculate cymes, monoecious, greenish-yellow. Female perianth compressed, keeled on one side ; keels decurrent on the stipes, reflexed, exposing the cordate achenes.

Fl. & Fr. : August - October.

Rare, in wet and shady places in the south-eastern parts of the state.

Selected specimens : Kota : Singh 90522 (LWG) ; Sirohi : Mt. Abu, Mehta 829 (JAC). Also reported by Puri *et al.* (1964) without locality.

3. LECANTHUS Weddell.

Lecanthus peduncularis (Wall. ex Royle) Wedd. in DC. Prodr. 16 : 164. 1869. *Procris peduncularis* Wall. ex Royle, Illus. Bot Himalaya t. 83. f. 2. 1836. *Lecanthus wightii* Wedd. in Ann. Sc. Nat. ser. 4. 1 : 187. 1854 ; Hook. f. Fl. Brit. India 5 : 559. 1888 ; Cooke, Fl. Bombay 2 : 633. 1908.

Weak, prostrate or suberect herbs. Stem succulent, usually thread-like, some-times hardly 2.5 cm long, rarely well developed and upto 15 cm long. Leaves opposite, 0.8 - 6.5 × 0.4 - 3.0 cm, obliquely ovate, subcuneate at base, obtuse or acute to acuminate, crenate-serrate or coarsely toothed to subentire. Stipules membranous, entire or toothed. Flowers unisexual, in sessile or pedunculate heads ; heads monoecious or dioecious. Achenes oblong-ovoid, compressed, longer than perianth, red to light brown.

Fl. & Fr. : July - November.

Rare, in wet and shady habitats on the Aravalli.

Selected specimen : Sirohi : Mt. Abu, Rao 66671 A (BSI).

Notes : It is much variable plant ; Wedd. (*l.c.*) distinguished two varieties under it viz. var. *wallichii* - with acutely serrate leaves and dioecious heads and var. *major* - with obtusely serrate leaves and monoecious

heads. Material at authors disposal was very limited, hence, could not recognise varieties.

4. NEODISTEMON Babu & Henry

Neodistemon indicum (Webb.) Babu & Henry in *Taxon* 19 : 651. 1970. Raizada, Suppl. Duthie, Fl. Gangetic Plain 257. 1976. *Distemon indicum* Webb. Arch. Mus. Hist. Nat. Paris 9 : 551. t. 20 A. 1857 ; Hook. f. Fl. Brit. India 5 : 588. 1888.

Erect, annual, thinly hairy herbs. Leaves 2 10 × 2 6 cm, ovate, acuminate, contracted at base, serrate, sparsely hairy. Flowers monoecious, in few-flowered clusters which are combined into axillary and terminal, 10 15 cm long pseudo-spikes. Bracts ovate, acuminate. Achenes broadly ovoid, c. 3 mm long, beaked, longitudinally obtusely ribbed, enclosed in the thick, fleshy or crustaceous perianth.

Fl. & Fr. : August - November.

Rare, in the forests and wastelands in moist and shady habitats.

Selected specimen : Banswara : Hundiani - Dungri-Ghatol, *Kanodia* 75487 (BSI).

5. PILEA Lindl. *nom. cons.*

Pilea microphylla (L.) Liebm. in *Vidensk. Selsk. Skr.* 5(2) : 296. 1851 ; Cooke, Fl. Bombay 2 : 660. 1908. *Parietaria microphylla* L. *Syst. Nat.* ed. 10. 1308. 1759. *Pilea muscosa* Lindl. *Coll. Bot.* t. 4. 1821 ; Hook. f. Fl. Brit. India 5 : 551 1888.

Prostrate or decumbent-ascending, delicate, annual, fleshy herbs ; stem hyaline, sub-terete, ribbed, usually red-blotched. Leaves sessile, 2 8 × 1 - 5 mm, ovate-spathulate or elliptic-suborbicular, seemingly whorled due to well-developed leaves of axillary shoots, entire, obtuse at apex, acute at base. Flowers minute, in axillary, compact, globose monoecious clusters, yellowish-green. Achenes oblong to ellipsoid, brown.

Fl. & Fr. : September - December.

Native of South America ; naturalized in damp places. Plants discharge clouds of pollens, therefore, called "The Gun powder plant".

Selected specimen : Sirohi : Mt. Abu, Rao 66539 (BSI).

6. *POUZOLZIA* Gaud.

Leaves pinnately rerved. Male perianth-segments and stamens 4. Fruiting calyx ribbed. ...	2. <i>P. zeylanica</i>
Leaves 3 to 7-nerved. Male perianth-segments and stamens 5. Fruiting calyx 2 to 3-winged. ...	1. <i>P. pentandra</i>

1. *Pouzolzia pentandra* (Roxb.) Benn. Pl. Jav. Rar. 64. t. 14. 1838 ; Wight, Ic. 6 : 41. t. 2100. f. 40. 1853 ; Hook. f. Fl. Brit. India 5 : 583. 1888 ; Duthie. Fl. Gangetic Plain 3 : 32. 1915. *Urtica pentandra* Roxb. Fl. Ind. 3 : 583 1832 ; Wight, Ic. 2 (4) : 5. t. 696. 1843.

Erect-decumbent, glabrous to sparsely hairy herbs. Stem terete below and angular above. Leaves opposite below, alternate and gradually smaller above, sessile or shortly petioled, 2-10 × 0.5-2.0 cm, lanceolate to oblong-linear-lanceolate, acute to acuminate, base often cordate. Flowers in clusters, in the axile of floral leaves, greenish-white or pinkish-green. Achenes ovate, acute, enclosed in persistent calyx, shining black.

Fl. & Fr. : October - January.

Rare, found on the banks of canals in marshy or wet and shady places.

Selected specimens : Bundi : Kota dam, Singh 74480 (LWG) ; Ganganagar : Najecmgarh, Roy 5073 (BSJO). Also reported from Udaipur district by Vyas (1965) and Ramdeo (1969).

2. *Pouzolzia zeylanica* (L.) Benn. Pl. Jav. Rar. 67. 1838. *Parietaria zeylanica* L. Sp. Pl. 1052. 1753. *P. indica* L. Mant. Pl. 1 : 128. 1767. *Pouzolzia indica* (L.) Gaud. Freyc. Voy. Bot. 503. 1826 ; Wight, Ic. 6 : 10. t. 1980. f. 1. 1853 & 6 : 43. t. 2096. f. 20. 1853 ; Hook. f. Fl. Brit. India 5 : 581. 1888 ; Duthie, Fl. Gangetic Plain 3 : 132. 1915.

Erect or prostrate, perennial herbs. Stem glabrous, hoary or pubescent. Leaves opposite or rarely alternate, with 0.4 - 1.2 cm long petioles, 1.0 - 2.5 × 0.4 - 1.5 cm, lanceolate - rhomboid to ovate, acute or acuminate, entire, cuneate or subtruncate to rounded at base, ciliate, lateral nerves not forking. Flowers in loose axillary clusters, pale-green. Male flower-buds rounded. Achenes ovate to broadly ovoid, enclosed by ribbed calyx, shining black, 2-winged.

Fl. & Fr. : September - December.

Rare, in swampy localities among grasses, particularly in the ravines.

Selected specimens : Sirohi : Mt. Abu, Rao 66675, 66538, Jain 46731 (BSI). Also reported from Sikar district by Nair & Malhotra (1961).

7. URTICA L.

Urtica dioica L. Sp. Pl. 984. 1753 ; Hook. f. Fl. Brit. India 5 : 548. 1888 ; Ghafoor in Nasir & Ali, Fl. W. Pakistan 137 : 3. 1981. 'Bichu - Booti' (Hindi).

Deciduous, perennial, monoecious or dioecious herbs, with dense stinging hairs and angled stems. Leaves long petioled, 5-12 × 2.5-8 cm, narrowly lanceolate to ovate, acute-acuminate at apex, cordate at base, serrate. Stipules free lateral. Flowers in axillary, unisexual or androgynous, bracteate cymes, pale-greenish to whitish. Achenes ovoid ellipsoid, pale-green or brownish.

Fl. & Fr. : May - September.

Included on the authority of Sarup (1951), Ratnam (1951) and Sankhala (1951) who reported it from Jodhpur, Sikar and N.W. Rajasthan respectively. This species is a denizen of N.W. Himalaya.

DOUBTFUL TAXON

Villebrunea frutescens (Thunb.) Blume, Mus. Bot. 2 : 168. 1856 ; Hook. f. Fl. Brit. India 5 : 590. 1888. *Urtica frutescens* Thunb. Fl. Jap. 70. 1784.

Large shrubs or small trees, with pubescent young shoots. Leaves ovate-elliptic or oblong-lanceolate, caudate-acuminate, crenulate-serrate, 3-nerved, membranous, sparsely pilose above, woolly or glabrate below. Flowers in axillary, many-flowered sessile clusters or very short cymes.

It is a denizen of tropical Himalaya from Kumaon eastwards between 4,000 - 5,000 ft. Its record from dry habitats in Sikar district (Nair & Malhotra, 1961) and absence of representative specimen creates doubts regarding its identity and occurrence.

120. CASUARINACEAE

(R.P. Pandey)

CASUARINA L.

Casuarina equisetifolia L. Amoen. Acad. 4 : 143. 1759 'equisetifolia' ; Hook. f. Fl. Brit. India 5 : 598. 1888 ; Duthie, Fl. Gangetic Plain 3 : 162.

1915 ; Bailey, Man. Cult. Pl. 316. f. 43. 1949 ; Matthew, Illus. Fl. Tam. Carnatic t. 681. 1982. *C. muricata* Roxb. Fl. Ind. 3 : 519. 1832. 'Jhau' (Hindi).

Evergreen, handsome, dioecious trees, 5-10 m tall ; bark rough, blackish brown. Branches slender, drooping. Leaves 5-12 × 2.5-4.0 cm, scaly, ovate-lanceolate to lanceolate. Male flowers yellow, scented, in terminal cylindrical spikes. Female flowers arranged in small cone-like clusters at the end of lateral branches. Nuts winged, crowded into a woody cone.

Fl. & Fr. : Throughout the year.

Commonly planted along the banks of canals and dam sites ; also planted as an ornamental tree.

Selected specimens : Banswara : Anand Sagar, Singh 4608 (BSJO) ; Pali : Jawai dam, Shetty 1619 (BSJO) ; Udaipur : Gulab Bag, Majumdar 10365 (BSA). Also reported from Ajmer (Sharma, 1958) and Jodhpur (Sarup, 1951).

121. SALICACEAE

(R.P. Pandey)

SALIX L.

Leaves linear-lanceolate, entire. Stigma entire. Capsules ovoid-lanceolate, on short pedicels.	...	1. <i>S. acmophylla</i>
Leaves lanceolate, serrulate. Stigma 2-branched. Capsules ovoid, on long pedicels.	...	2. <i>S. tetrasperma</i>

1. *Salix acmophylla* Boiss. Diagn. Pl. Orient. ser. 1. 7 : 98. 1846. & Fl. Orient. 4 : 1183. 1879 ; Hook. f. Fl. Brit. India 5 : 628. 1888 ; Duthie, Fl. Gangetic Plain 3 : 167. 1915. 'Jalmala' (Hindi).

Moderate-sized trees ; branches lax, forming a rounded crown ; branchlets often pendulous. Leaves 5-18 cm long, linear-lanceolate, the upper ones caudate-acuminate, glaucous beneath. Male catkins stalked, 2-5 cm long, cylindrical, dense ; stamens 4-6. Female catkins nodding, 2.0-2.5 cm long, with deciduous bracts. Stigma entire. Capsules ovoid-oblong, shortly stipitate.

Fl. & Fr. : October - February.

Found on hills ; often cultivated.

Selected specimen : Sirohi : Mt. Abu, Mehta, 1973 (JAC). Also reported by Jain (1962).

2. *Salix tetrasperma* Roxb. Pl. Cor. 1 : 66. t. 97. 1798 et Fl. Ind. 3 : 753. 1832 ; Hook. f Fl. Brit. India 5 : 626. 1888 ; Wight, Ic. 6 : 6. t. 1954. 1853 ; Duthie, Fl. Gangetic Plain 3 : 166. 1915.

var. *tetrasperma*

Trees, 4-10 m or more tall, with rough, longitudinally fissured bark. Young parts silky. Leaves 5-20 × 3.5 cm, elliptic-lanceolate, glandular, serrate, membranous. Peduncles 3-12 cm long. Bracts sub-spathulate. Stamens 5-10, villous at base. Female catkins 6-12 cm long. Stigma entire, subsessile. Capsules stipitate, glabrous or puberulous, 4 to 6-seeded.

Fl. & Fr. : October-December.

Commonly found along the streams and river-beds.

Selected specimens : Jaipur : Durgapur, Sharma 1143, 1982 (RUBL); Sirohi : Delwara temple, Kaul 9527 (LWG) ; Mt. Abu, Duthie 6712 (DD).

CULTIVATED SPECIES

Salix babylonica L. Trees with weeping branches. Leaves linear-lanceolate, acuminate, serrulate. Stipules falcate, serrate. Catkins on leafy peduncles. Male pale-yellow ; stamens 2. Capsules sessile. Cultivated in the gardens and along the banks of canals to check erosion.

122. CERATOPHYLLACEAE

(R.P. Pandey)

CERATOPHYLLUM L.

Ceratophyllum demersum L. Sp. Pl. 992. 1753 ; Hook. f. Fl. Brit. India 5 : 639. 1888 ; Duthie, Fl. Gangetic Plain 3 : 168. 1915 ; van Steenis, Fl. Males. I. 4 : 41. f. 1. 1949 ; Subram. Aquat. Angiosp. 52. f. 36. 1962. 'Jal-Butti' (Hindi).

Submerged, rootless, monoecious, much-branched aquatic herbs. Leaves upto 1.5 cm long, more than 5 in a whorl, dichotomously forked ; segments filiform, minutely toothed. Flowers minute, axillary, solitary, sessile or subsessile. Perianth-segments linear, ciliate at the apex. Stamens

many. Ovary sessile. Fruits laterally compressed, ellipsoid, with persistent subulate style, subtended by two basal spines.

Fl. & Fr. : September - February.

Common in ponds, pools, tanks and in slow running water.

Selected specimens : Alwar : Siliserh, *Hiralal* 34578 (LWG) ; Chittorgarh : *Verma* 192 (BSA) ; Jaipur ; Amer, *Sharma* 1111 (RUBL) ; Kota : Kothari tank, *Singh* 90857 (LWG) ; Tonk : Tordi Sagar, *Shetty* 1086 (BSJO). Also reported from Bundi (*Maheshwari & Singh*, 1974), Sirohi (*Raizada*, 1954) and Udaipur (*Vyas*, 1965 ; *Ramdeo*, 1969).

123. GNETACEAE

(R.P. Pandey)

EPHEDRA L.

Ephedra ciliata Fisch. & Mey. ex C.A. Mey. Monogr. Gatt. *Ephedra* 100. 1846. *E. foliata* Boiss. & Kotschy ex Boiss. Diagn. ser. 1 : 7. 101. 1846 & Boiss. Fl. Orient. 5 : 716. 1884 ; Blatt. & Hallb. in Journ. Bombay Nat. Hist. Soc. 26 : 972. 1920 ; *Bhandari*, Fl. Ind. Desert 439. 1978. *E. peduncularis* Boiss. Fl. Orient. 5 : 717. 1884 ; Hook. f. Fl. Brit. India 5 : 640. 1888. *E. foliata* Boiss. var. *ciliata* (Fisch. & Mey. ex Mey.) Stapf, Die Artend. Gatt. *Ephedra* 49. 1889 ; *Raizada*, Suppl. *Duthie*, Fl. Gangetic Plain 262. 1976. '*Lana, Andho-Khimp*' (Hindi).

Dioecious, much-branched, climbing or scandent shrubs. Branches smooth, often fascicled, slender. Leaves 2-4 at each node, shortly connate at the base, upto 25 × 1.5 mm long, setaceous. Male spikes yellow, ovate, 1 to 3-together, on 1-2 cm long peduncles ; bracts upto 2 mm long, rotund, obtuse, connate upto their length from the apex. Perianth obovate, ciliate, exceeding the bracts. Staminal column shortly exerted. Female spikes often in cymes or on c. 8 mm long peduncles ; bracts 3 paired. Fruits c. 8 × 7 mm, white, semi-transparent, fleshy. Seeds 2, plano-convex, acute at the apex, rounded at the base, glabrous, brown.

Fl. & Fr. : January - April.

Not common ; generally found in W. Rajasthan desert on sandy to gravelly or even on rocky plains.

Selected specimens : Ajmer : Budha Puskar, *Tiagi* Acc. No. 101125, 101126, 101127 (DD) ; Barmer : Nanga area, *Tiwari* 1164 (BSJO) ;

Bikaner : Sri Balaji, Roy 2578 (BSJO); Churu : Shampur sand dunes, Roy 2578 (BSJO); Jodhpur : Bhandari 1668, 1894 (JAC). Also reported from Jhunjhunu (Nair, 1956 & Nair & Kanodia, 1959).

Notes : This is the only living gymnosperm growing wild in this state. Most of the plants collected and observed in the field are males. This taxon is under great threat due to its exploitation for fuel wood and inadequate reproductive mechanism.

124. HYDROCHARITACEAE

(R.P. Pandey)

1a. Stem branched. Leaves cauline :

2a. Leaves in whorls, rarely lower ones opposite. Male flowers solitary; stamens 3. Styles entire. Fruits cylindrical or narrowly conical. Seeds smooth. ... 1. *Hydrilla*

2b. Leaves alternate. Male flowers many; stamens 2. Styles slightly notched. Fruits ovoid. Seeds scrobiculate. ... 2. *Nechamandra*

1b. Stemless, stoloniferous herbs. Leaves radical :

3a. Leaves sessile, linear, ribbon-like. Flowers unisexual. Peduncle of the female flowers spirally coiled; spathe and fruits not winged. ... 4. *Vallisneria*

3b. Leaves distinctly petioled, ovate-cordate to suborbicular. Flowers bisexual. Peduncle of the female flowers not spirally coiled; spathe and fruits winged. ... 3. *Ottelia*

1. HYDRILLA L.C. Rich.

Hydrilla verticillata (L. f.) Royle, Ill. Bot. Himal. t. 376. 1839; Hartog in van Steenis, Fl. Males. 1. 5 : 385. f. 1 - 3. 1957; Hook. f. Fl. Brit. India 5 : 659. 1888; Duthie, Fl. Gangetic Plain 3 : 173. 1920; Subram. Aquat. Angiosp. 55. f. 37. 1962. *Serpicula verticillata* L. f. Suppl. 416. 1781. *Vallisneria verticillata* (L. f.) Roxb. Fl. Ind. 3 : 751. 1832. *Hydrilla polysperma* Blatt. in Journ. & Proc. Asiat. Soc. Beng. (n.s.) 26 : 356. 1930.

Slender, submerged, fresh-water herbs; roots fibrous. Leaves in whorls of 3 - 8, 5 - 10 × 1 - 3 mm, oblong or linear, sharply serrate-dentate. Flowers white or reddish, unisexual; males solitary, axillary, pedicellate; female ones solitary, axillary, sessile. Perianth of 3 sepals

and 3 petals. Fruits c. 6.0×1.3 mm, shortly echinate. Seeds 2-6, c. 2 mm long, dark brown.

Fl. & Fr. : September - November.

Common in ponds, ditches, tanks and streams forming dense masses, often in association with *Chara* spp., *Potamogeton* L., *Zannichellia* L., *Nymphaea* L. etc.

Selected specimens : Banswara : Lasora talab, *Singh* 3622 (BSJO) ; Bhilwara : Khari dam, *Singh* 6508 (BSJO) ; Bikaner : Lunkaransar, *Roy* 2425 (BSJO) ; Jaipur : Baragaon, *Sharma* 1884 (RUBL) ; Kota : Atru, *Singh* 90358 (LWG) ; Sirohi : *Jain* 1962 (BSI). Also reported from Alwar (Vyas, 1964, 67) and Ganganagar (Dhillon & Bajwa, 1969).

2. NECHAMANDRA Planch.

Nechamandra alternifolia (Roxb.) Thwaites, Enum. Pl. Zeyl. 332. 1864 ; Subram. Aquat. Angiosp. 56. f. 38. 1962 ; Subram. & Balak. in Bull. Bot. Surv. India 3 : 23. 1962. *Vallisneria alternifolia* Roxb. Pl. Cor. 2 : 33. t. 164. & Fl. Ind. 3 : 750. 1832. *Nechamandra roxburghii* Planch. in Ann. Sci. Nat. Pairs ser. 3. 11 : 78. 1849. *Lagarosiphon roxburghii* (Planch.) Benth. in Benth. & Hook. f. Gen. Pl. 3 : 451. 1883 ; Hook. f. Fl. Brit. India 5 : 659. 1888 ; Duthie, Fl. Gangetic Plain 3 : 174. 1920.

Submerged, attached or free-floating, fresh-water perennial herbs. Leaves $1.0-7.0 \times 0.2-0.5$ cm, linear-lanceolate, amplexicaul, acute or acuminate, minutely serrulate. Flowers unisexual ; males sessile, crowded in the leaf-axils in a sessile, ovoid, 2-fid spathe ; female ones solitary, axillary, enclosed in a tubular, 2-fid spathe. Perianth-tube 2.5-5.0 mm long, filiform ; limb with 3, spreading, orbicular lobes. Utricles 6-8 mm long, ovoid. Seeds numerous, c. 1 mm long, oblong-obovate.

Fl. & Fr. : August - April.

Common in ponds, tanks and ditches, forming dense masses. The fruiting plants appear red-coloured.

Selected specimens : Banswara : Lasara village, *Singh* 3623 (BSJO) ; Lamero talab, *Singh* 3642 (BSJO) ; Bhilwara : Dhelano village, *Singh* 6526 (BSJO) ; Jaipur : Baragaon, *Sharma* 1883, 1882 (RUBL) ; Kota : Airport area, *Singh* 90187 (LWG) ; Atru, *Singh* 83702 (LWG) ; Tonk : Tordi Sagar, *Shetty* 1094, 1316 (BSJO).

3. OTTELIA Pers.

Ottelia alismoides (L.) Pers. Syn. Pl. 1 : 400. 1805 ; Hook. f. Fl. Brit. India 5 : 662. 1888 ; Duthie, Fl. Gangetic Plain 3 : 177. 1920 ; Hartog in van Steenis, Fl. Males. I. 5 : 398. 1957 ; Subram. Aquat. Angiosp. 61. f. 43. 1962. *Stratiotes alismoides* L. Sp. Pl. 535. 1753.

Usually submerged aquatic herbs, rooted in the mud. Leaves dimorphic ; normal ones 6-15 × 5-15 cm, with sheathing petiole, ovate-reniform, acute or obtuse, with undulate margins, many-nerved ; abnormal ones linear. Flower white, solitary, axillary, terminating the 5-angled, 10-30 cm long peduncles. Spathes tubular, 2 to 10-winged, margins of the wings wavy and crisped. Sepals linear or narrowly oblong. Petals obovate, with yellow-blotched base. Stamens 6-8 ; filaments pubescent. Ovary beaked ; styles 5-10 ; stigmas fimbriate. Fruits 2.5-4.0 cm long, oblong to ellipsoid, crowned with 1-nerved sepals. Seeds c. 1.5 × 0.5 mm, oblong or fusiform.

Fl. & Fr. : Throughout the year.

Common in stagnant or slow running water in ponds, tanks, streams, ditches, rivers etc ; often found in pure formations.

Selected specimens : Ajmer : Bhim to Todgarh Road, Duthie 4885 (DD) ; Banswara : Kusalgarh river, Singh 3050 (BSIO) ; Chittorgarh : Maslana, Majumdar & Mishra 10161 (BSA) ; Jaipur : Durgapura, Singh Acc. No. 9369 (RUBL) ; Kota : Darah, Nautiyal & Raizada 25360 (DD) ; Atru, Singh 90359 (LWG) ; Udaipur : Sujjangarh, Kanodia 82315, 82353 (BSI).

4. VALLISNERIA L.

Vallisneria spiralis L. var. *denseserrulata* Makino in Bot. Mag. Tokyo 28 : 27. 1914 ; Lowden in Aquat. Bot. 13 : 288. 1982. *Vallisneria spiralis* auct. pl. non L. 1753 ; Wight, Illus. Ind. Bot. t. 33. f. 24. 1840 ; Hook. f. Fl. Brit. India 5 : 660. 1888, in part ; Duthie, Fl. Gangetic Plain 3 : 174. 1920 ; Subram. Aquat. Angiosp. 57. f. 39. 1962. *Physkium natans* Lour. Fl. Cochinch. 663. 1790. 'Jal-bel' (Hindi).

Submerged, tufted, stoloniferous, dioecious aquatic herbs, rooting in the mud. Leaves upto 35 × 0.2-0.8 cm sheathing at the base, subacute, entire or dentate. Male flowers 3-merous, shortly peduncled, many enclosed in an ovoid, 3-lobed spathe ; stamens 1-3. Female flowers solitary in a tubular, 3-toothed spathe borne at the apex of a long, slen-

der, spirally coiled scape ; perianth minute, 1-seriate ; styles 3. Fruit 1.0-1.5 cm long, linear. Seeds oblong-fusiform.

Fl. & Fr. : February - November.

Common in ponds and ditches in association with other aquatic weeds.

Selected specimens : Alwar : Jaisamand, *Hiralal* 34604 (LWG) ; Banswara : Talwara, *Singh* 4603 (BSJO) ; Bikaner : R.D. 264-Lunkaran-sar, *Roy* 2159 (BSJO) ; Jaipur : Maota, *Sharma* 1927 (RUBL) ; Jhalawar : N.K.S. 206, 201 (RUBL) ; Jodhpur : Agolai tank, *Shetty* 297 (BSJO) ; Sirohi : Mt. Abu, *Mehta* 1034 (JAC) ; Tonk : Tordi Sagar, *Shetty* 1093 (BSJO).

125. BURMANNIACEAE

(R.P. Pandey)

BURMANNIA L.

Burmattia coelestis D. Don, *Prodr. Fl. Nepal.* 44. 1825 ; Hook. f. *Fl. Brit. India* 5 : 665. 1888 ; Jonker in van Steenis, *Fl. Males.* I. 4 : 17. 1948. *Gonyanthes pusilla* Wall. ex Miers in *Trans. Linn. Soc. London* 18 : 537. t. 38. f. 3. 1841. *Burmattia pusilla* (Wall. ex Miers) Thwaites, *Enum. Pl. Zey.* 325. 1864. *B. coelestis* D. Don var. *pusilla* (Wall. ex Miers) Trimen, *Handb. Fl. Ceylon* 4 : 138. 1898.

Slender, small, annual herbs. Radical leaves scale-like or none ; cauline ones reduced. Flowers mostly solitary or few. Perianth 2-seriate, with wavy, purple wings starting from an acute base, broadened into truncate-rounded top. Stamens 3. Stigma 3-lobed. Capsules 3-winged. Seeds minute, oblong or sub-globose.

Fl. & Fr. : August - November.

Rare, found on the hill tops.

Selected specimens : Sirohi : Mt. Abu, *without collector* Acc. No. 240, 241 (BSI).

126. ORCHIDACEAE

(R.P. Pandey)

- 1a. Plants epiphytic :
- 2a. Leaves articulate, 1 - 3 toothed at apex ; column & foot small ; spur with calli/appendages at base. ... 5. *Vanda*
- 2b. Leaves not articulate, bi-lobed at the apex ; column & foot long ; spur with calli/appendages within. ... 1. *Aerides*
- 1b. Plants terrestrial :
- 3a. Lip spurred ; spur projecting beyond the lateral sepals :
- 4a. Sepals and petals similar. Anther one ; pollinia globose with a short caudicle. ... 3. *Eulophia*
- 4b. Sepals and petals not similar. Anthers two ; pollinia clavate or pyriform, usually grooved, with a long caudicle ... 4. *Habenaria*
- 3b. Lip not spurred, often saccate with a sac not projecting beyond the sepals :
- 5a. Leaves achlorophyllose, membranous. Flowers erect. Sepals and petals forming hood. ... 6. *Zeuxine*
- 5b. Leaves chlorophyllose, plicate, fleshy. Flowers drooping. Sepals and petals not forming a hood i.e. lanceolate, acuminate. ... 2. *Epipactis*

1. *AERIDES* Lour.

- 1a. Spur pointing forward :
- 2a. Flowers sweetly fragrant. Sepals and petals not spotted ; mid-lobed of lip ovate. Capsules pyriform, deeply ribbed. ... 1. *A. crispum*
- 2b. Flowers almost inodorous. Sepals and petals purple-spotted ; mid-lobe of the lip triangular-cordate. Capsules sub-clavate, not ribbed. ... 3. *A. multiflora*
- 1b. Spur pointing back and down. ... 2. *A. maculosum*

1. *Aerides crispum* Lindl. Gen. Sp. Orch. 239. 1833 ; Hook. f. Fl. Brit. India 6 : 45, 1890 ; Sant. & Kap. Orch. Bombay 122. 1966. *A. lindleyana* Wight, Ic. 5(1) : 9. t. 1677. 1851.

Robust herbs. Leaves channelled, coriaceous, 8 - 20 × 1.5 - 2.5 cm, oblong, unequally 2-lobed at the apex. Flowers rosy pink or white with pink tinge, erect or drooping, often in paniculately branched racemes. Capsules c. 3.0 cm long.

Fl. & Fr. : May September.

Rare, found on the forest trees.

Selected specimens : Banswara : Ghatol, *Kanodia* 75462 (BSI) ; Sirohi : Mt. Abu, *Rao* 660549 (BSI). Also reported from N.W. Rajasthan (Sankhala, 1951).

Notes *A. crispum* can be differentiated from *A. maculosum* Lindl. by the plant being much stouter and more robust, the flowers are large, sepals and petals not at all spotted, the lip is more triangular in shape, geniculately inflexed at the claw, the spur is exactly below the lip, not along the ovary.

2. *Aerides maculosum* Lindl. in *Bot. Reg. t.* 58. 1845 *et in Gard. Chron.* 691. 1845 ; *Hook. f. Fl. Brit. India* 6 : 45. 1890 ; *Sant. & Kap. Orch. Bombay* 120. pl. 30. 1966. *Saccolabium speciosum* Wight, *Ic.* 5(1) : 9. t. 1674 - 75. 1851.

Small herbs. Leaves channelled, coriaceous, 5 - 20 × 1.5 - 3.0 cm, linear-oblong or oblong, unequally 2-lobed at the apex. Flowers dark pink to pale pink, mildly fragrant, in simple or branched racemes. Sepals and petals spotted. Mid-lobe of the lip obtusely quadrate, obtuse or truncate, finely crisped at the margins. Spur hook-like. Capsules 3 - 5 × 0.5 - 1.0 cm, obovoid, strongly ribbed, shortly stalked.

Fl. & Fr. : June August.

Rare, on forest trees.

Selected specimen : Sirohi : *McCann* 5973 (BLAT).

3. *Aerides multiflora* Roxb. *Pl. Cor.* 3 : 63. t. 271. 1795 ; *Hook. f. Fl. Brit. India* 6 : 44. 1890 ; *Duthie, Fl. Gangetic Plain* 3 : 207. 1920.

Herbs. Leaves upto 20 cm long, crowded, oblong, unequally 2-lobed at the apex. Flowers white or pale-violet or dark violet, in racemes. Lip 3-lobed ; spur straight, obtuse, upcurved. Capsules upto 5 cm long, pedicelled.

Fl. & Fr. : May - July.

Rare, on forest trees.

Selected specimens : Sirohi : Mt. Abu, *Blatter* 26525 (BLAT), *Mehta* 1512 (JAC).

2. EPIPACTIS L. *nom. cons.*

Epipactis veratrifolia Boiss. & Hohen. in Boiss. Diagn. Pl. Orient. I. 13 : 11. 1854. *E. consimilis* Wall. ex Hook. f. Fl. Brit. India 6 : 126. 1890, non D. Don 1825 ; Duthie, in Ann. Roy. Bot. Gard. Calc. 9 : 161. 1906 & Fl. Gangetic Plain 3 : 217. 1920.

Erect herbs. Leaves 5 $18 \times 1.0 - 4.5$ cm, lanceolate-oblong, entire, acuminate ; upper ones smaller, passing into bracts. Flowers reddish-purple or purple, in long racemes. Sepals clothed with white hairs outside, unequal. Petals ovate, acute, densely pubescent on the back along the midrib. Lip shorter than the sepals, purplish tinged. Stigmas large, with two glands on the lower margins. Capsules c. 2.5 cm long, oblong, pubescent on the ribs.

Fl. & Fr. : March - July.

Rare, in moist, shady and rocky habitats.

Selected specimen : Chittorgarh : Menal, *Parmar* 7778 (BSJO).

3. EULOPHIA R. Br. *nom. cons.*

Eulophia ochreatea Lindl. in Journ. Linn. Soc. 3 : 24. 1858 ; Hook. f. Fl. Brit. India 6 : 2. 1890 ; Sant. & Kap. Orch. Bombay 109. pl. 27. 1966. *Graphorchis ochreatea* (Lindl.) O. Kuntze, Rev. Gen. Pl. 2 : 662. 1891.

Pseudobulbs c. 3.5×2.5 cm, subterranean, ovoid, with irregular transverse and longitudinal markings. Leaves upto 5, forming a pseudostem, upto 25×8 cm, sheathing at the base, oblong-lanceolate to ovate or ovate-elliptic, acute to acuminate, entire, glabrous. Flowers yellowish-green with purple or brown spots, in dense racemes. Sepals 1-nerved. Petals 3-nerved. Lip c. 12 mm long, elliptic-orbicular ; mid-lobe yellow oblong-orbicular, the nerve ending in hairy outgrowth. Column subclavate. Capsules 25×10 mm, broadly ovoid, deflexed, ribbed, green.

Fl. & Fr. : May - September.

Rare, usually found as undergrowth in the forests.

Selected specimens : Sirohi : Mt. Abu, King 169, Acc. No. 455795 (CAL), Mehta 1006, 833 (JAC), McCann 5963 (BLAT).

4. HABENARIA Willd.

Leaf-margins whitish-yellow. Flowers odourless sessile. Sepals 5-nerved. Petals entire ; spur upto 10 mm long, mouth not liguled. Pollinia ovoid or subfalcate, with an oblong gland. Ovary beaked ...

2. *H. marginata*

Leaf-margins green. Flowers strongly foul-scented after sunset, pedicellate. Sepals 3-nerved. Petals 2-partite ; spur more than 15 mm long, the mouth liguled. Pollinia obovoid, with an orbicular gland. Ovary not beaked. ...

1. *H. digitata*

1. *Habenaria digitata* Lindl. Gen. Sp. Orch. 307. 1835 ; Hook. f. Fl. Brit. India 6 : 134. 1890, *pro parte* ; Sant. & Kap. Orch. Bombay 10. pl. 3. f. 7 - 8. 1966. *H. trinervia* Wight, Ic. 5(1) : 12. t. 1701. 1851.

Tuberous herbs, upto 60 cm tall. Leaves 2 - 10 × 2 - 4 cm, pentastichous, ovate to elliptic-lanceolate or ovate-oblong, acute, entire. Flowers pure green or with a yellowish or whitish tinge, in dense or lax spikes. Lip green ; lobes subequal, similar, fleshy. Ovary green, strongly ribbed, stalked.

Fl. & Fr. : June - August or further late.

Occasionally found in the undergrowth of the forests.

Selected specimens : Kota : Shahabad, Verma 634 (BSA) ; Sirohi : Mt. Abu, Jain 5341 (BSI), Mehta 864 (JAC).

2. *Habenaria marginata* Coleb. in Hook. Exotic Fl. t. 136. 1825 ; Hook. f. Fl. Brit. India 6 : 150. 1890 ; Duthie, Fl. Gangetic Plain 3 : 226. 1920 ; Sant. & Kap. Orch. Bombay 33. pl. 5. f. 17. 1966.

Tuberous herbs, upto 30 cm high. Leaves 2 - 8 × 2.5 cm, sessile, clustered at the base, oblong or linear-oblong, obtuse. Flowers yellow to greenish-yellow in spikes. Lip fleshy, yellow ; lateral lobes equal to mid-lobe. Ovary curved, ribbed.

Fl. & Fr. : July - November.

Rare, found among open grasses in moist soils.

Selected specimens : Sirohi : Mt. Abu, *McCann* 4903 (BLAT), *Mehta* 374 (JAC).

5. VANDA R. Br.

Flowers more than 4 cm across. Sepals and petals more than 20 mm long, greenish-yellow, brown tessellated on the upper surface. Capsules sharply winged; fruiting pedicels upto 1.5 cm long. ...

1. *V. tessellata*

Flowers less than 1.5 cm across. Sepals and petals less than 10 mm long, pale yellow, not tessellated. Capsules not sharply winged; fruiting pedicels more than 4 cm long. ...

2. *V. testacea*

1. *Vanda tessellata* (Roxb.) Hook. ex G. Don in Loud. Hort. Brit. 372. 1830; Sant. & Kap. Orch. Bombay 221. pl. 51. 1966. *Epidendrum tessellatum* Roxb. Pl. Cor. 1 : 34. t. 42. 1795. *Vanda roxburghii* R. Br. Bot. Reg. 6 : t. 506. 1820; Hook. f. Fl. Brit. India 6 : 52. 1890; Duthie in Ann. Roy. Bot. Gard. Calc. 9 : 145. 1906 & Fl. Gangetic Plain 3 : 210. 1920.

Epiphytes; stem sheathed. Leaves 5 - 25 × 1.5 cm, patent, recurved, coriaceous, linear-oblong, strap-shaped, unequally 2-lobed at the apex. Flowers in 2 to 10-flowered racemes. Sepals pure white on the outer surface. Lip 3-lobed, with a conical, pointed spur. Column oblong, clavate, white; foot short, with a median groove and 2 yellow patches on either side. Capsules c. 7.5 × 1.5 cm, oblong, winged.

Fl. : March September; *Fr.* : April onwards.

Common epiphyte, mostly on Mango trees in semi-evergreen to evergreen forests.

Selected specimens : Kota : Sitabari, *Singh* 90840 (LWG).

2. *Vanda testacea* (Lindl.) Reichb. f. Gard. Chron. (n.s.) 2 : 166. 1877; Sant. & Kap. Orch. Bombay 219. 1966. *Aerides testacea* Lindl. Gen. Sp. Orch. 238. 1835, 'testaceum'. *Vanda parviflora* Lindl. Bot. Reg. 30 : Misc. 45. 1844; Wight, Ic. 5(1) : 8. 1669. 1851; Hook. f. Fl. Brit. India 6 : 50. 1890; Duthie in Ann. Roy. Bot. Gard. Calcutta 9 : 144. 1906 & Fl. Gangetic Plain 3 : 210. 1920.

Epiphytes; stem sheathed. Leaves 2 - 12 × 0.5 - 0.7 cm, channelled, coriaceous, oblong or linear-oblong, 2 to 3-toothed at apex. Flowers pale yellow, in racemes. Lip 3-lobed, spotted with pink, with conical pointed spur. Capsules c. 2.5 × 0.75 cm, fusiform or oblong-elliptic.

Fl. & Fr. : May July or further late.

Rare, found in humid-moist forests.

Selected specimen : Sirohi : Mt. Abu, without collector 64, Acc. No. 457596 (CAL).

6. ZEUXINE Lindl. *nom. cons.*

Zeuxine strateumatica (L.) Schlecht. in Fedde, Repert. Beih. 1 : 77. 1911 ; Sant. & Kap. Orch. Bombay 168. pl. 38. 1966. *Orchis strateumatica* L. Sp. Pl. 943. 1753. *Zeuxine sulcata* Lindl. Gen. Sp. Orch. 485. 1840 ; Hook. f. Fl. Brit. India 6 : 106. 1890 ; Duthie in Ann. Roy. Bot. Gard. Calcutta 9 : 168. 1906 & Fl. Gangetic Plain 3 : 219. 1920.

Terrestrial, rhizomatous, erect herbs, upto 30 cm high ; stem pigmented pink. Leaves 1.5 - 10.0 × 0.2 - 0.5 cm, sessile, linear to lanceolate, acute or subacuminate. Flowers white tinged with pale pink, in terminal spicate racemes. Sepals subequal. Corolla-lip saccate, keeled and glandular within. Ovary c. 7.0 × 3.5 mm, ovoid-tumid, sessile, ribbed ; stigmas 2. Capsules ovoid, beakless, strongly ribbed.

Fl. & Fr. : January - April.

Occasional, in marshy, swampy and shady localities among grasses.

Selected specimens : Ajmer : Todgarh, Duthie 4886 (DD) ; Banswara : Jhola, Kanodia 51190 (BSI) ; Bhilwara : Maja dam, Singh 7130 (BSJO) ; Ganganagar : 34 - G.B., Roy 5916 (BSJO) ; Jaipur : Durgapura River, Singh Acc. No. 6782 (RUBL) ; Dausa, Wadhwa 8186 (BSA) ; Kota : Atru, Singh 90955 (LWG) ; Tonk : Niwai temple, Shetty 518 (BSJO).

127. ZINGIBERACEAE

(P.J. Parmar)

CURCUMA L.

1a. Flowering spikes appearing with the leaves. Tubers white or creamish inside :

2a. Corolla purplish with a yellow streak on the lip. ...

4. *C. inodora*

2b. Corolla whitish or bright yellow :

- 3a. Root-stock small, bearing tubers at the end of root-fibers. ... 5. *C. pseudomontana*
- 3b. Root-stock large, bearing sessile tubers. ... 1. *C. amada*
- 1b. Flowering spikes appearing before or after the leaves. Tubers yellow inside :
- 4a. Root-stocks large, with sessile palmate tubers as well as fleshy fibers. Corolla pale-rose. ... 3. *C. aromatica*
- 4b. Root-stocks small, emitting only fleshy fibers. Corolla yellow or white. ... 2. *C. angustifolia*

1. *Curcuma amada* Roxb. in *As. Res.* 11 : 341. 1810 ; Baker in *Hook. f. Fl. Brit. India* 6 : 213. 1890 ; Cooke, *Fl. Bombay* 2 : 731. 1907 ; Majumdar *et al.* in *Bull. Bot. Soc. Bengal (J. Sen. Mem. Vol.)* 643. 1969 ; Majumdar in *Bull. Bot. Surv. India* 18 : 74. 1979. '*Amba Haldi*' (Hindi).

Stemless herbs, with large, sessile, cylindric or ellipsoid tubers. Leaves long-petioled, 30-50 × 7-15 cm, oblong-lanceolate, acute or acuminate, narrowed to the base, glabrous. Flowers in autumnal spikes ; 7-15 × 4-6 cm, in the centre of the tuft of leaves ; peduncle 15 cm or more long ; flowering bracts 2.5 cm long, greenish-white. Calyx obtusely 3-toothed. Corolla white or pale yellow ; tube about 2.5 cm long ; lobes oblong, acute ; lip semi-ellipsoid, yellow, 3-lobed, middle lobes emarginate.

Fl. & Fr. : August - October.

Rare, in the forests. So far reported only from the south-eastern parts of the state.

Selected specimens : Kota : Kishanganj, Verma 687 (BSA) ; Kapildhara (Puraniya), Verma 790, 791 (BSA).

Notes : The above cited field numbers have been identified as *Curcuma angustifolia* Roxb. in the Herbarium of BSA. However, Majumdar *et al.* (1969) reported *C. amada* based on same specimens. The root-stock of *C. amada* smell like unripe mango, which is a very important character for confirming the identity of *C. amada*. Due to lack of fresh material, the dispute regarding the identity of these field numbers could not be confirmed, and Majumdar *et al.* (1969) & Majumdar (1976) have been followed.

2. *Curcuma angustifolia* Roxb. in *Asiat. Res.* 11 : 338. t. 3. 1810 ; Baker in *Hook. f. Fl. Brit. India* 6 : 210. 1890 ; Duthie, *Fl. Gangetic Plain* 3 : 233. 1920.

Erect, perennial herbs, with a short, globose root-stock which emits long, ellipsoid-tuber bearing club-shaped fleshy roots. Petiole 15 - 21 cm long; leaf-blade 30 - 45 × 3 - 12 cm, lanceolate-oblong, acute. Flowering spikes on leafless shoots arising from the base of leafy shoots. Scapes clothed with leaf-sheaths. Flowers longer than bracts. Corolla-tube hairy inside. Capsules ovoid, ultimately opening by 3-valved, appressed hairy. Seeds reddish-brown, many.

Fl. & Fr. June - August.

Rare, found in the forests in moist and shady places.

Selected specimen : Chittorgarh : Bansi, *Majumdar* 12360 (BSA).

3. *Curcuma aromatica* Salisb. *Parad. Lond.* t. 96. 1805; *Wight, Ic.* 6 : 16. t. 2005. 1853; *Baker in Hook. f. Fl. Brit. India* 6 : 210. 1890; *Cooke, Fl. Bombay* 2 : 730. 1907. *C. zedoaria* Roxb. in *Asiat. Res.* 11 : 333. 1810, non *Rosc.* 1828.

Erect, perennial herbs. Leaves 30 - 60 × 10 - 20 cm, elliptic or lanceolate-oblong, caudate-acuminate, often variegated above, base deltoid. Flowers fragrant, shorter than the bracts, in 15 - 30 cm long spikes. Bracts ovate, connate below, recurved, cymbiform, obtuse, pale-green, more or less tinged with red or pink. Corolla pink; lip yellow, obovate, subentire or obscurely 3-lobed. Lateral staminodes oblong, obtuse, as long as corolla-lobes. Anther-base spurred.

Fl. & Fr. : July - November.

Rare, in moist and shady places in the forests, particularly in southern parts of the state

Selected specimens : Banswara : Kushalgarh, *Kanodia* 75507, 75700 (BSI).

4. *Curcuma inodora* Blatt. in *Journ. & Proc. Asiat. Soc. Bengal (n.s.)* 26 : 357. 1930; *Sant. in Journ. Bombay Nat. Hist. Soc.* 51 : 135. f. 1. 1952; *Shah, Fl. Gujarat* 2 : 665. 1978.

Perennial, rhizomatous herbs, with many fibrous roots bearing ovoid tubers at their base. Leaves enclosed in 2, olive or purplish green sheaths, 10 - 50 × 5 - 17 cm, broadly elliptic-lanceolate, acuminate. Flowers in 10 - 20 cm long spikes. Lower bracts much shorter and broader than upper, pale-green, tinged with pink, margins wavy; upper bracts forming a coma, rose-coloured with purple tips. Capsules 3-valved, with arillate seeds.

Fl. & Fr. : August - November.

Rare, among the undergrowth of forests, at the top of hills in moist and shady habitats.

Selected specimens : Pali Kanpabar-Bijapur forest, *Shetty* 1961 (BSJO) ; Sirohi : Mt. Abu, *Mehta* 533 (JAC), *McCann* 5980 (BLAT).

5. *Curcuma pseudomontana* Grah. Cat. Pl. Bombay 210. 1839 ; Sant. in Journ. Bombay Nat. Hist. Soc. 51 : 135, f. 2. 1952 ; Singh, Fl. Banswara 220. 1983 ; *C. montana sensu* Baker in Hook. f. Fl. Brit. India 6 : 214. 1890, non Rosc. 1828.

Scapigerous, rhizomatous herbs ; rhizome tuber bearing. Tubers elliptic or globose. Leaves 16 - 25 × 6 - 13 cm, oblong-lanceolate, acuminate ; petioles upto 20 cm long. Flowers in 6 - 9 cm long, pedunculate spikes. Bracts greenish, tinged with red or purple, each enclosing 2 - 3 flowers. Corolla yellow. Staminodes free from the lip, lateral ones petaloid. Anther-base spurred.

Fl. & Fr. : August - October.

Frequently found in the forests on Aravalli hills, in moist and shady places.

Selected specimens : Banswara : Puna Pathar forest, *Singh* 2860 (BSJO) ; Sirohi : Mt. Abu, *Puri* 56783 (BSI).

CULTIVATED SPECIES

Catimbiun speciosum (Wendl.) Holttum (*Zerumbet speciosum* Wendl.) - Erect, perennial herbs, with rhizomatous root-stock and upto 2 m tall leafy stem. Inflorescence drooping, c. 30 cm long. Secondary bracts white, tinged with pink at the tip. Probably a native of N.E. India, Burma and Indo China ; cultivated in the gardens for ornamental purposes.

Zingiber officinale Rosc. 'Adarak' (Hindi) Erect, perennial herbs, with creeping, tuberous rhizomes. Leaves sessile. Flowers in c. 12 cm long spikes. Scapes leafless, arising directly from the rhizome. Commonly cultivated for its edible rhizomes.

128. CANNACEAE

(R.P. Pandey)

CANNA L.

Canna indica L. Sp. Pl. 1. 1753 ; Baker in Hook. f. Fl. Brit. India 6 : 260. 1892 ; Duthie, Fl. Gangetic Plain 3 : 237. 1920. '*Keli, Sudarsan*' (Hindi).

Erect, perennial, tuberous, rhizomatous herbs ; pseudo-stem leafy. Leaves subsessile, upto 40 × 15 cm, oblong to elliptic-lanceolate, acuminate, entire. Flowers scarlet or yellow, in terminal panicles or racemes. Styles exserted. Capsules 1.8 - 2.0 × 2 cm, 3-gonous, red-muricate. Seeds granulate, hilum with a tuft of hairs, black, shining.

Fl. & Fr. Almost throughout the year.

Common near moist places and canal-sides ; often cultivated in the gardens as an ornamental herb.

Selected specimens : Banswara : *Majumdar* 10240 (BSA) ; Ganganagar : *Netewala, Roy* 3963 (BSJO) ; Kota : *Singh* 90258 (LWG). Also reported from Alwar (*Vyas*, 1967), Jhunjhunu (*Nair*, 1961) and Udaipur (*Ramdeo*, 1969).

129. MUSACEAE

(R.P. Pandey)

MUSA L.

Musa paradisiaca L. Sp. Pl. 1043. 1753. *M. sapientum* L. Syst. Nat. ed. 10. 1303. 1759 ; Hook. f. Fl. Brit. India 6 : 262. 1892. '*Kela*' (Hindi).

Tree-like, stoloniferous herbs, 1.0 - 2.5 m high. Leaves spirally arranged, oblong, 1 - 2 m × 20 - 40 cm, entire. Flowers yellow, the lower female, upper ones male, in drooping spikes. Bracts spathaceous, ovate. Berries oblong, 3-gonous, yellowish-green.

Commonly propagated by suckers in the gardens and orchards for edible fruits.

130. IRIDACEAE

(R.P. Pandey)

BELAMCANDA Adans. *nom. cons.*

Belamcanda chinensis (L.) DC. in Redoute, *Lilia* 3 : t. 121. 1805 ;
Hook. f. *Fl. Brit. India* 6 : 777. 1892. *Ixia chinensis*. L. *Sp. Pl.* 36. 1753.

Erect herbs, upto 1 m high. Leaves sword-shaped. Flowers yellow or orange with red spots within. Capsules c. 2.5 cm long, trigonous.

Native of China ; planted in the gardens and orchards.

131. RUSCACEAE

(R.P. Pandey)

RUSCUS L.

Ruscus hypophyllum L. *Sp. Pl.* 1041. 1753.

Erect undershrubs, 40 - 50 cm high. Cladodes opposite or whorled or upper ones alternate, elliptic or oblong-lanceolate, acuminate. Leaves scally, lanceolate. Flowers white to pale-blue, in clusters on the cladodes. Fruits red, 2-seeded.

Native of Mediterranean region ; sometimes cultivated in the gardens for ornamental purposes.

132. AMARYLLIDACEAE

(P.J. Parmar)

CRINUM L.

Plants stoloniferous. Perianth-lobes longer than the stamens, linear.	...	1. <i>C. defixum</i>
Plants non-stoloniferous. Perianth-lobes as long as the stamens, lanceolate.	...	2. <i>C. protense</i>

1. *Crinum defixum* Ker-Gawl in *Journ. Sci. & Arts* 3 : 105. 1817 ;
Hook. f. *Fl. Brit. India* 6 : 281. 1892 ; Duthie, *Gangetic Plain* 3 : 248.
1920. 'Jal-kanda' (Hindi).

Stout, perennial herbs, with ovoid bulbs and fusiform stoloniferous base, neck about 18 cm long, underground, clothed, with leaf-scars. Leaves 60-90 × 3-5 cm, linear-oblong, channelled, obtuse or acute. Flowers in 6 to 12-flowered umbels, white. Bracts 2, enclosing flower-buds. Perianth-tube straight; lobes 6, linear, spreading. Fruits subglobose or ovoid.

Fl. & Fr. : August - October.

Frequently found in rocky river-beds; often cultivated in the gardens.

Selected specimens : Banswara : Mahi river bed, Pipalkhunt, Singh 3653 (BSJO); Bhilwara : Bijolia, Singh 6089 (BSJO). Also reported from Alwar (Vyas, 1967), Bundi (Maheshwari & Singh, 1974) Jhunjhunu (Nair & Kanodia, 1959) and Jhalawar (Majumdar, 1979).

2. *Crinum pratense* Herb. Amaryllid. 256. 1837; Hook. f. Fl. Brit. India 6 : 282. 1892; Duthie, Fl. Gangetic Plain 2 : 249. 1920.

Scapigerous, perennial herbs, with ovoid bulbs. Leaves 35-55 × 1.8-2.5 cm, 6-8 from each bulb, linear, narrowed towards the obtuse or subacute apex, channelled down the face, margins entire or ciliate. Flowers fragrant, 6-12 in an umbel, on long stout scape, white. Perianth-lobes lanceolate, about as long as the tube. Filaments bright red. Capsules subglobose. Seeds 3-4 in each cell.

Fl. & Fr. : After rainy season.

Rare, in stony, moist or water-logged soils in western parts of the state.

Selected specimen : Barmer : On the way to Kundal R.F., Pandey 8014 (BSJO).

CULTIVATED SPECIES

Crinum asiaticum L. Stout, perennial herbs, with large, tunicated bulbs and widely spreading, repand, linear-lanceolate leaves. Flowers white, sessile, in terminal umbels. Commonly grown in the gardens for ornamental purposes.

Zephyranthes citrina Baker - Scapigerous, perennial herbs, with underground bulbs. Bracts spatheaceous, purple tinged. Corolla yellow.

Stigma 3-lobed. Capsules 3-gonous. Usually cultivated in the gardens for ornamental purposes.

Zephyranthes grandiflora Lindl. Scapigerous, erect, perennial herbs, with 3.5 - 5.0 cm in diam. underground bulbs. Leaves in a basal rosette, linear-lanceolate. Scape fistular, one-flowered. Corolla pink or purple. Native of West Indies; often cultivated in the gardens for ornamental purposes.

133. AGAVACEAE

(P.J. Parmar)

Perianth polyphyllous.	...	2. <i>Furcraea</i>
Perianth gamophyllous.	...	1. <i>Agave</i>

1. AGAVE L.

Out of about 300 species, distributed from southern America to tropical south America, five species are reported from Rajasthan under cultivation along the boundaries of fields and gardens. A key is given here to facilitate the identification.

- 1a. Leaves with horny margins or provided with minute spines. ... 3. *A. sisalana*
- 1b. Leaves with distinct, coarse, marginal spines :
 - 2a. Spines of leaf-margins patent or obliquely deflexed, with upcurved tips :
 - 3a. Leaves oblong-lanceolate, contracted into collar above the base. ... 1. *A. americana*
 - 3b. Leaves linear-oblong, not contracted into a collar. ... 4. *A. vera-cruz*
 - 2b. Spines of leaf-margins erecto-patent, with tips curved towards the leaf apex :
 - 4a. Leaves about 1 m long. Flowers c. 4.0 - 4.5 cm long. Tepals free near to the base or connate at base only. ... 5. *A. wightii*
 - 4b. Leaves about 1.5 - 2.0 m. Flowers c. 7 - 8 cm long. Tepals connate in the lower part. ... 2. *A. cantala*

1. *Agave americana* L. Sp. Pl. 323. 1753 ; Duthie, Fl. Gangetic Plain 3 : 242. 1920. '*Gwar-patha*' (Hindi).

Stemless. Leaves erecto-patent, glaucous, often with longitudinal, white or yellow streaks or bands. Perianth funnel-shaped ; segments oblong, yellowish-green, Capsules oblong-clavate, beaked.

Planted in parks, gardens or along the boundaries of fields.

2. *Agave cantata* Roxb. Fl. Ind. 2 : 167. 1832 ; Duthie, Fl. Gangetic Plain 3 : 243. 1920.

Scapigerous undershrubs. Leaves in rosette, pale green, often glaucous, recurved in the upper part, with a sharp, acicular, spiny tip. Flowers greenish. Tepals lanceolate, with obtuse, ligulate tips. Stamens exerted.

Commonly planted along the boundaries of fields and gardens. It is a good soil binder. The fibers obtained from the leaves are used by villagers for making ropes.

3. *Agave sisalana* Perr. ex Engelm. Trans. Acad. Sci. St. Louis 3 : 305. 1875 ; Duthie, Fl. Gangetic Plain 3 : 244. 1920.

Leaves linear-lanceolate, pruinose. Perianth 5 - 6 cm long ; segments oblong, with tuft of hairs on the inner side at the top ; upper half of the segments soon marcescent with inrolled margins, finely reflexed.

Cultivated in the eastern parts of the state along Aravalli.

4. *Agave vera-cruz* Mill. Gard. Dict. no. 7. 1754 ; Duthie, Fl. Gangetic Plain 3 : 242. 1920.

Leaves linear-oblong, recurved or drooping, glaucous.

Cultivated along the hedges of gardens and fields.

5. *Agave wightii* Drumm. & Prain in Bengal Agricult. Bull. 8 : 15. 1906 ; Duthie, Fl. Gangetic Plain 3 : 244. 1920.

Perennial, somewhat stout herbs. Stem woody, simple, with a rosette of leaves. Leaves erect, narrowed at both ends, constricted at base. Flowers in terminal panicles. Tepals lanceolate, obtuse. Some floral buds modified into bulbils.

Sometimes grown in nurseries and gardens.

2. FURCRAEA Vent.

1. *Furcraea foetida* (L.) Haw. Syn. Pl. Succ. 73. 1812. *Agave foetida* L. Sp. Pl. 323. 1753.

Shrubs. Leaves very long upto 1.5 m, lanceolate, vivid green, rough at the apical part in the middle, with upcurved marginal spines-scapes 30-65 cm long, with cream-yellow flowers, arranged in bracteate racemes. Ovary shorter than perianth.

Often planted in the gardens for ornamental purpose.

134. HYPOXIDACEAE

(R.P. Pandey)

Plants hairy. Leaves plicate. Perianth borne at the tip of stipe from ovary hidden in leaf bases. ...	1. <i>Curculigo</i>
Plants glabrous. Leaves flat, perianth attached to the top of exposed ovary. ...	2. <i>Hypoxis</i>

1. CURCULIGO Gaertn.

Curculigo orchiloides Gaertn. Fruct. Sem. 1 : 63. t. 16. f. 11. 1788 ; Hook. f. Fl. Brit. India 6 : 279. 1892 ; Duthie, Fl. Gangetic plain 3 : 247. 1920. *C. malabarica* Wight, Ic. 6 : 22. t. 2043 A. f. 1. 1853. 'Moosli' (Hindi).

Perennial herbs, with thick, tuberous root-stock, fleshy roots and without aerial stems. Leaves basal, sessile or subsessile, 10-40 × 1.5-5.0 cm, linear-lanceolate to elliptic, acute or acuminate, sparsely hairy above, sometimes white dotted. Flowers 2 to 3-together on 5-10 cm long axillary peduncles hidden among leaf-sheaths, bright yellow. Perianth-segments 6, ciliate at the top. Stamens 6, epiphyllous. Ovary densely hairy. Capsules 1.5-1.8 cm long, 1 to 4-seeded, sessile, beaked. Seeds black, strophiolate.

Fl. & Fr. : August - November.

Common in the grassy plains and on the hills.

Selected specimens : Ajmer : Lowrie 4887 (DD) ; Banswara : Puna Pathar forest block, Singh 2934 (BSJO) ; Chittorgarh : Pratapgarh, Majumdar 12357 (BSA) ; Kota : Shahabad, Majumdar 10496 (BSA) ; Sirohi : Mehta 1026 (JAC).

2. HYPOXIS L.

Hypoxis aurea Lour. Fl. Cochinch. 200. 1790 ; Hook. f. Fl. Brit. India 6 : 277. 1892 ; Duthie, Fl. Gangetic Plain 3 : 246. 1920.

Diocious herbs, with subglobose or elongate root-stock crowned with the fibrous remains of old leaves. Leaves 6 - 12, 10 - 35 cm long, linear, subcoriaceous, keeled. Scapes 1 - 4, subglabrous or thinly hairy. Bracts setaceous. Perianth-segments thinly hairy, yellow, outer ones green outside. Anthers sagittate. Ovary clavate, clothed with golden brown hairs. Capsules thin-walled, 3-valved. Seeds black, tuberculate.

Fl. & Fr. : August - November.

Rare, in the forests. Included on the authority of Chohan *et al.* (1967) from Mt. Abu.

135. DIOSCOREACEAE

(R.P. Pandey)

DIOSCOREA L.

1a. Leaves simple :

2a. Bulbils absent. Stem prickly especially near the base, pubescent or villous. ... 3. *D. esculenta*

2a. Bulbils present. Stem glabrous, never prickly :

3a. Tubers and bulbils short, acrid and nauseous. Leaves shining on the upper surface. Male flowers with the sepals upto 2 mm long. ... 2. *D. bulbifera* var. *vera*

3b. Tubers and bulbils long, not acrid. Leaves not shining on the upper surface. Male flowers with the sepals upto 1.25 mm long. ... 1. *D. bulbifera* var. *bulbifera*

1b. Leaves palmately compound :

4a. Male spikes fragrant, upto 1 cm long. Stamens 6, all antheriferous. Female flowers in solitary distant spikes. Capsules less than 3 cm long. ... 4. *D. hispida*

4b. Male spikes 3.0 - 3.5 cm long, not fragrant. Stamens 3, alternating with 3 staminodes, female flowers in 2 - 3-nate racemes or spikes. Capsules more than 5 cm long. ... 5. *D. pentaphylla*

1. *Dioscorea bulbifera* L. Sp. Pl. 1033. 1753 ; Wight, Ic. 3(2) : 6. t. 878. 1844 ; Duthie, Fl. Gangetic Plain 3 : 254. 1920. *D. sativa* Thunb. Fl. Jap. 151. 1784, non L. 1753 ; Hook. f. Fl. Brit. India 6 : 295. 1892. 'Gaithi, Kanda-Giloe' (Hindi).

var. *bulbifera*

Twining, dioecious, glabrous herbs, with globose or pyriform tubers. Bulbils common in leaf-axils. Leaves upto 20 × 20 cm, alternate, broadly ovate-cordate to suborbicular, acute to acuminate, rarely obtuse, entire, 7 to 13-nerved at the base. Male flowers closely arranged in long, pendulous simple or paniculate spikes, fragrant, white, purple or pale rose. Bracts ovate-acuminate. Perianth-lobes linear. Stamens 6. Female flowers subtended by minute bracts in axillary, solitary or fascicled, pendulous spikes. Perianth-lobes linear. Staminodes 6. Styles conical ; stigmas 3, recurved. Capsules 2.0-2.5 × 0.8-1.25 cm quadrately oblong, winged, reflexed, straw-coloured. Seeds winged on the basal side only.

Fl. & Fr. : August - December.

Common in wastelands and open forests among bushes and shrubs and along hedges ; often cultivated for its edible bulbils and tubers.

Selected specimens : Banswara : Sarvan village, Singh 2993, 2993-A (BSJO) ; Bhilwara : Govata dam, Singh 5710 (BSJO) ; Bundi : Kota dam, Singh 74650 (LWG) ; Jaipur : Galta, Sharma 2279 (RUBL) ; Sirohi : Mt. Abu, Jain 5422, 5339, 5636 (BSI) ; Udaipur : Sajjangarh, Kanodia 82300 (BSI).

2. var. *vera* Prain & Burkill in Journ. Asiat. Soc. Bengal (n.s.) 10 : 26. 1914 ; Duthie, Fl. Gangetic Plain 3 : 254. 1920.

It differs from *D. bulbifera* L. proper by the characters like tubers and bulbils globular, short, acrid and nauseous. Male flowers with the sepals upto 2 mm long.

Fl. & Fr. : August - December.

Rare, in open forests and among hedges.

Selected specimens : Jhalawar : Kotra, Wadhwa 3583 (BSA) ; Jhalawar, Wadhwa 7542 (BSA).

3. *Dioscorea esculenta* (Lour.) Burkill in Gard. Bull. Straits Sett. 1 : 396. 1917 & in Fl. Males. ser. 1. 4 : 307. 1951. *Oncus esculentus* Lour. Fl. Coch. 194. 1790. *Dioscorea aculeata* L. Herb. Amb. 23. 1754 & Amon. Acad. 4 : 131. 1754, non L. 1753 ; Duthie, Fl. Gangetic Plain 3 :

252. 1920. *D. fasciculata* Roxb. Fl. Ind. 3 : 801. 1832 ; Hook. f. Fl. Brit. India 6 : 296. 1892. *D. spinosa* Roxb. ex Hook. f. l.c. 6 : 291. 1892, *quoad plant masul.*

Twinnings. Tuberos roots many, globose or elliptic or cylindrical, c. 10 cm long. Stem pubescent with T-shaped hairs ; basal internodes prickly. Leaves 10 15 × 10 15 cm, alternate, broadly ovate, cordate at base, acute or acuminate, entire, 9 to 13-nerved at base. Male flowers, in long spike-like racemes. Bracts ovate-acuminate, scarious. Outer perianth-lobes broadly lanceolate, acute ; inner ones shorter. Female flowers like males, but solitary. Torus scarcely developed into a tube under the perianth-lobes. Outer perianth-lobes lanceolate-ovate, obtuse, pubescent outside ; inner ones acute. Staminodes 6. Ovary densely pubescent ; stigmas as three pairs of reflexed hooks. Capsules reflexed, rarely produced, subretuse at the apex and nearly truncate at the base. Seeds winged all round.

Fl. & Fr. : August February.

Rare, in the forests. Sometimes cultivated. Reported from Mt. Abu. (Raizada, 1954).

4. *Dioscorea hispida* Dennstedt, Schluss. Hort. Malab. 15. 1818 ; Prain & Burkill in Ann. Roy Bot. Gard. Calc. 14 (1) : 188. t. 77. 1936. *D. triphylla* L. in Stickmann, Herb. Amb. 23. 1754 & Amoen. Acad. 4 : 131. 1754, non L. 1753 ; Duthie, Fl. Gangetic Plain 3 : 254. 1920. *D. daemonia* Roxb. Fl. Ind. 3 : 805. 1832 ; Wight, Ic. 3(1) : 7. t. 811. 1844 ; Hook. f. Fl. Brit. India 6 : 289. 1892.

Herbaceous twinnings, often with bulbils on the nodes. Tubers globose and lobed, poisonous. Stem sparsely prickly near the base, pubescent. Leaves pubescent, 3 to 5-foliolate ; leaflets 9 10 × 3 5 cm, middle one obovate-elliptic, lateral ones ovate-elliptic, acuminate, cuneate at base and 3-nerved. Male spikes solitary or clustered, dense, oblong, on pubescent rachis. Bracts overlapping the flowers, subsaccate and acuminate. Female flowers simple, solitary, in distant spikes. Capsules glabrous, reflexed, oblong, subcordate at the base, rounded at the apex. Seeds winged to the base of the cells.

Fl. & Fr. : August October.

Occasionally found in the forests in south and south-eastern parts.

Selected specimens : Banswara : Shergarh forest block, Singh 3083 (BSJO) ; Jhalawar : Baneth, Verma 3526 (BSA) ; Kotra, Wadhwa 3584 (BSA) ; Kota : Shahabad, Verma 673 (BSA), Majumdar 13189 (BSA) ; Udaipur : Verma 121 (BSA).

5. *Dioscorea pentaphylla* L. Sp. Pl. 1032. 1753 ; Wight, Ic. 3(1) : 7- t. 814. 1844 ; Hook. f. Fl. Brit. India 6 : 289. 1892 ; Duthie, Fl. Gangetic Plain 3 : 253. 1920 ; Prain & Burkill in Ann. Roy. Bot. Gard. Calc. 14 (1) : 160. 1936. *D. triphylla* L. Sp. Pl. 1032. 1753. *D. jacquemontii* Hook. f. l. c. 6 : 290. 1892.

Herbaceous twiners, with globose or pyriform or palmately lobed tubers. Leaves alternate, 3 to 7-foliolate, glabrous or sparsely to densely pubescent beneath ; leaflets 5 10 × 2 5 cm, digitate, obovate-elliptic or ovate-elliptic, acuminate, base oblique. Male flowers in dense, pubescent, pendent, axillary or terminal panicles, white. Female racemes simple, 2 to 3-nate ; flowers inverted after pollination. Ovary hairy outside. Capsules longer than broad, with dark wings, retuse at the apex. Seeds c. 6 mm long, winged only at the base.

Fl. & Fr. : August - November.

Occasional, in the forests, particularly in moist places.

Selected specimens : Banswara, Singhpura, Kanodia 75233 (BSI) ; Sirohi : Mt. Abu, Mehta 820 (JAC).

136. LILIACEAE

(P.J. Parmar)

- | | |
|--|---------------------|
| 1a. Leaves fleshy, mucilaginous, with spiny margins. ... | 1. <i>Aloe</i> |
| 1b. Leaves neither fleshy nor mucilaginous, nor spiny along the margins : | |
| 2a. Leaf-tip modified into a tendril. Perianth-segments strongly undulate. ... | 6. <i>Gloriosa</i> |
| 2b. Leaf-tip not modified into a tendril, Perianth-segments not undulate : | |
| 3a. Leaves reduced to spinescent scales, with needle-like or flattened cladodes. ... | 2. <i>Asparagus</i> |
| 3b. Leaves well developed, cladodes absent : | |
| 4a. Leaves cauline. ... | 7. <i>Iphigenia</i> |
| 4b. Leaves all radical : | |
| 5a. Underground stem a large, ovoid or globose bulb : | |
| 6a. Leaves appearing after the flowers. ... | 9. <i>Urgenia</i> |

- 6b. Leaves appearing with the flowers :
- 7a. Leaves linear. Flowers white or creamy white. Seeds flattened. ... 5. *Dipcadi*
- 7b. Leaves oblanceolate or spatulate. Flowers pale to bright pinkish-purple. Seeds subglobose. ... 8. *Scilla*
- 5b. Underground stem absent or very small; root-fibers large, numerous :
- 8a. Leaves terete or subterete, fistular. Capsules triquetrous. Ovules 2 in each cell. ... 3. *Asphodelus*
- 8b. Leaves flat. Capsules deeply 3-winged. Ovules 1-4 or more in each cell. ... 4. *Chlorophytum*

I. ALOE L.

Aloe vera (L.) Burm. f. Fl. Ind. 83. 1768 ; Gandhi in Sald. & Nicolson, Fl. Hassan 793. 1976. *A. perfoliata* L. var. *vera* L. Sp. Pl. 320. 1753. *A. barbadensis* Mill. Gard. Dict. no. 2. 1768. 'Gheeganwar, Ganwarpatha' (Hindi).

Scapigerous perennials. Leaves in rosette, erect, 10 - 60 × 3.0 - 8.5 cm, lanceolate or ensiform, truncate at base, spine-tipped. Flowers in 20-45 cm long racemes, on a stout scape upto 1 m high, vermilion, tinged with yellow. Bracts lanceolate. Fruits trigonous, oblong, loculicidally 3-valved. Seeds trigonous, winged.

Fl. & Fr. : February - May.

Common in waste places, usually forming clumps. Also cultivated near houses.

Selected specimens : Barmer : Balotra, *Tiwari* 784 (BSJO) ; Churu : Sardarshahar, *Roy* 2616 (BSJO) ; Jaipur : Amer, *Sharma* 1094 (RUBL) ; Jodhpur : Bilara, *Singh* 3588 (BSJO) ; Kota : Atru, *Singh* 90982 (LWG) ; Pali : Ghanerao R.F., *Shetty* 1594 (BSJO) ; Sirohi : Mt. Abu, *Mehta* 303 (JAC).

2. ASPARAGUS L.

- | | | |
|--|-----|------------------------|
| 1a. Flowers in racemes. | ... | 3. <i>A. racemosus</i> |
| 1b. Flowers axillary, solitary or in clusters or umbelled : | | |
| 2a. Leaves strongly spinescent. Flowers axillary, solitary or umbellate. | ... | 1. <i>A. asiaticus</i> |
| 2b. Leaves not or rarely spinescent. Flowers axillary or subterminal, 2 to 4-nate. | ... | 2. <i>A. gracilis</i> |

1. *Asparagus asiaticus* L. Sp. Pl. 313. 1753 ; Hook. f. Fl. Brit. India 6 : 316. 1892 ; Vyas *et al.* in Journ. Econ. Tax. Bot. 6 : 316. 1985.

Scandent shrubs. Stem terete, smooth ; branches deflexed, grooved. Cladodes 6-many, 4-6 mm long, very slender, acicular, terete, acuminate. Flowers axillary, solitary or in umbels, 0.25 cm, in diam. ; pedicels almost equalling the cladodes, jointed in the middle. Fruits subglobose. Seeds 1-6, smooth, black.

Fl. & Fr. : June - November.

Rare, in the forests on Aravalli hills.

Selected specimen : Jalore : Sunda hill-Dantalawas, Vyas 5165 (BSJO).

2. *Asparagus gracilis* Royle, Illus. 1 : 393. 1839 ; Hook. f. Fl. Brit. India 6 : 315. 1892 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 279. 1976. *A. capitatus* Baker in Journ. Linn. Soc. (Bot.) 14 : 607. 1875 ; Hook. f. *l.c.* 6 : 315. 1892 ; Raizada & Sharma in Indian For. 88 : 366. 1962. '*Nar kanta*' (Hindi).

Slender, suberect undershrubs. Stem smooth, subscandent ; branches angled, grooved ; spines straight, upto 1.5 cm long, pungent, curved. Cladodes very small, 3 to 6 nate, acute. Flowers in few-flowered, 3.2 cm long, corymbiform clusters. Bracts minute, lanceolate. Pedicels jointed below the middle. Perianth-segments 6, spreading. Berries 3-lobed, red when ripe.

Fl. & Fr. : June - October.

Rare, in the forests on Aravalli.

Selected specimen : Udaipur : Near Bhim, Duthie 4920 (DD).

3. *Asparagus racemosus* Willd. Sp. Pl. 2 : 152. 1799 ; Wight, Ic. 6 : 26. t. 2056. 1853 ; Hook. f. Fl. Brit. India 6 : 316. 1892 ; Duthie, Fl. Gangetic Plain 3 : 259. 1920. '*Satawari, Safed musali*' (Hindi).

Tall, much-branched, scandent, spinous undershrubs, with faciculated tuberous roots. Stem woody, terete ; branches 3-quetrous, striate, smooth ; spines suberect Cladodes 1-3 cm long, in axillary whorls of 2-6, spreading, linear, falcate, acuminate, channelled beneath. Flowers in axillary, solitary or fascicled, simple or branched racemes terminated by flowers. Bracts triangular. Perianth-lobes spreading. Ovules 6-8 in each cell. Berries nearly globose, scarlet when ripe.

Fl. & Fr. : August - March.

Common in the forests, spreading on the ground or climbing on shrubs and bushes.

Selected specimens : Ajmer : Todgarh, *Duthie* 4888 (DD) ; Bharatpur : Ghana bird sanctuary, *Parmar*, 8606 (BSJO) ; Banswara : Kotharia forest block, *Singh* 3758 (BSJO) Barmer : Haldeshwar Mahadev R.F., *Pandey* 7928 (BSJO) ; Pali : Goramghat, *Shetty* 1482 (BSJO) ; Udaipur : Bagdara, *Jain* 48592 (BSI).

Note : Very close to *Asparagus racemosus* Willd. var. *javanicus* Baker, in which racemes are terminated by cladodes.

3. ASPHODELUS L.

Asphodelus tenuifolius Cav. in Anal. Cienc. Nat. 3 : 46. t. 27. f. 2. 1801 ; Hook. f. Fl. Brit. India 6 : 332. 1892, excl. syn. *A. fistulosus* L. 1753 ; Duthie, Fl. Gangetic Plain 3 : 265. 1920 ; Mahesh. Illus. Fl. Delhi f. 201. 1966. *A. parviflorus* Wight, Ic. 6 : 27. t. 2062. 1853. '*Piazi*' (Hindi).

Annual, slender herbs. Stem scapose, not leafy. Leaves radical, sessile, 10-40 × 0.2-0.3 cm long, acicular, acute, glaucous-green, hollow. Flowers bracteate, racemed on simple or branched, solid scapes longer than leaves, purplish-white. Pedicels jointed below the middle. Capsules 2-4 mm in diam., globose, 3-gonous, 3-valved, glabrous. Seeds two in each locule, obovoid, rounded and rugose on the back, black.

Fl. & Fr. : December - March.

Very common weed during winters in the cultivated and fallow fields.

Selected specimens : Barmer : Luni river bed-Bhujawas, *Tiwari* 1146 (BSJO) ; Banswara : Talwara village, *Singh* 4296 (BSJO) ; Bharatpur : Near Pahartal forest block, *Parmar* 8522 (BSJO) ; Ganganagar : Lalgah, *Roy* 3966 (BSJO) ; Jaipur : Amer, *Sharma* 1113 (RUBL) ; Sirohi : Mt. Abu, *Jain* 48708 (BSI).

4. CHLOROPHYTUM Ker Gawler

Flowers paired, in lax racemes. Capsules broadly obovate, 3-winged. ... 1. *C. laxum*

Flowers solitary, in dense racemes. Capsules obovoid, transversely veined. ... 2. *C. tuberosum*

1. *Chlorophytum laxum* R. Br. Prodr. 277. 1810 ; Hook. f. Fl. Brit. India 6 : 336. 1892 ; Cooke, Fl. Bombay 2 : 773. 1907. *C. parviflorum* Dalz. in Hook. Kew Journ. Bot. Misc. 2 : 141. 1850. *Phalangium parviflorum* (Dalz.) Wight, Ic. 6 : 21. t. 2039. 1853.

Herbs, with oblong tubers at the end of root-fibers. Leaves grass-like, 20-50 × 1.0-1.5 cm, narrowly linear, falcate, flat or folded, acute, entire. Scapes slender, 20-40 cm long, simple or branched. Flowers few, distantly paired on the scapes forming racemes, greenish-white. Capsules 3-celled, 3-winged, 1 to 4-seeded. Seeds irregularly angled, black.

Fl. & Fr. : June - September.

Occasionally found in the crevices of rocks on the hills, particularly in south-eastern parts of the state.

Selected specimen : Kota : Darah, *Singh* 74871 (LWG).

2. *Chlorophytum tuberosum* (Roxb.) Baker in Journ. Linn. Soc. 15 : 332. 1876 ; Hook. f. Fl. Brit. India 6 : 334. 1892 ; Duthie, Fl. Gangetic Plain 3 : 266. 1920. *Anthericum tuberosum* Roxb. Fl. Ind. 2 : 149. 1832. *Phalangium tuberosum* (Roxb.) Wight, Ic. 6 : 21. t. 2036. 1853. '*Safed musali*' (Hindi).

Annual herbs, with small root-stock and many cylindric root-fibers ending in ellipsoid tubers. Leaves 20-35 × 2-3 cm, linear-lanceolate, acute, undulate, margined. Scape solitary, simple or branched, with closed, scattered flowers forming dense racemes. Flowers white. Capsules oblong - subglobose, 3-celled ; the cells 4 to 6-seeded. Seeds irregularly orbicular, usually compressed, pitted, black.

Fl. & Fr. : June October.

Frequent on the hills and in wastelands.

Selected specimens : Jalore : Sunda hills (Dantalawas), Vyas 6324 (BSJO) ; Jhalawar : Singh 91157 (LWG) ; Sirohi : Mt. Abu, Mehta 821 (JAC).

5. DIPCADI Medik.

Scape 10 to 16-flowered. Capsules stipitate.	...	2. <i>D. serotinum</i>
Scape 4 to 12-flowered. Capsules sessile.	...	1. <i>D. erythraeum</i>

1. *Dipcadi erythraeum* Webb. & Berth. Phyt. Canar. 3 : 341. 1848 ; Bhandari, Fl. Indian Desert 352. 1978 ; Deb & Dasgupta in Journ. Bombay Nat. Hist. Soc. 75 : 53. f. 2. 1978. *D. unicolor* Baker in Journ. Linn. Soc. 11 : 397. 1871 ; Hook. f. Fl. Brit. India 6 : 346. 1892.

Bulbous, scapigerous herbs ; bulbs ovoid. Leaves 15 - 20 × 0.2 - 0.3 cm, narrowly linear, sheathing at base, acute at apex. Flowers in lax racemes, greenish. Bracts longer than the pedicels, ovate, finely acuminate. Capsules sessile, orbicular, slightly narrowed at the base, flat, black. Seeds rotund, compressed, narrowly winged, shining brownish-black.

Fl. & Fr. : August November.

Occasionally found in the arid regions on the rocky substratum.

Selected specimens : Barmer : Bhandari 426 (JAC) ; Jaisalmer : Along Miajlar road, Shetty 3402 (BSJO) ; Jalore ; Sunda hills, Vyas 6323 (BSJO) ; Jodhpur : Bhandari 1127 (JAC).

2. *Dipcadi serotinum* (L.) Medik. in Act. Acad. Thead. Palat. 6 : 431. 1790 ; Hook. f. Fl. Brit. India 6 : 346. 1892 ; Deb and Dasgupta in Journ. Bombay Nat. Hist. Soc. 75 : 52. f. 1. 1978. *Hyacinthus serotinus* L. Sp. Pl. 377. 1753.

Perennial herbs, with globose or ovate bulbs. Leaves few, 18 - 34 × 0.2 - 0.4 cm, linear, acuminate, attenuated at base. Flowers in racemes, white or pale pink. Bracts as long as pedicels or longer. Capsules as long as broad, loculicidally dehiscent, subglobose to obovate. Seeds 6 - 8 in each locule, rotundate, compressed, wrinkled, narrowly winged, shining brownish-black.

Fl. & Fr. : August - September.

Rare, in wastelands, particularly in south and south eastern parts of Rajasthan.

Selected specimens : Banswara : *Wadhwa* 5028 (BSA) ; Jhalawar : *Wadhwa* 5317 A (BSA).

6. GLORIOSA L.

Gloriosa superba L. Sp. Pl. 305. 1753 ; Wight, Ic. 6 : 25. t. 2047. 1853 ; Hook. f. Fl. Brit. India 6 : 358. 1892 ; Duthie, Fl. Gangetic Plain 3 : 262. 1620. '*Lalukhri, Kaligari*' (Hindi).

Perennial herbs, 1.5 - 4.0 m high. Leaves sessile, 5 - 12.5 × 1.5 - 3.0 cm, alternate, opposite or in whorls, ovate-lanceolate, acuminate, ending in a tendril. Pedicels 5 - 8 cm long, deflexed at the tip ; flowers axillary, solitary, often forming terminal corymbs, yellow, tinged with red in upper half, at length completely scarlet. Stamens spreading ; anthers dorsifixed. Capsules 2 - 3 cm long, oblong, septicidal. Seeds many, subglobose.

Fl. & Fr. : August - November.

Common among the clumps of trees and shrubs in the forests and wastelands throughout the length of Aravalli hills.

Selected specimens : Ajmer : *Lourie* 4892 (DD) ; Banswara : Chhatripada forest blocks, *Singh* 2976 (BSJO) ; Chittorgarh : Near Sakwaria, *Singh & Pandey* 6944 (BSJO) ; Jalore ; Sunda hills, *Vyas* 6989 (BSJO) ; Kota : Shahabad, *Verma* 770 (BSA) ; Udaipur : Dabok, *Gemawat* 225 (BSI).

7. IPHIGENIA Kunth

Iphigenia indica (L.) A. Gray in Kunth, Enum. Pl. 4 : 213. 1843 ; Hook. f. Fl. Brit. India 6 : 357. 1892 ; Duthie, Fl. Gangetic Plain 3 : 263. 1920. *Melanthium indicum* L. Mant. Pl. 2 : 226. 1771.

Erect, perennial herbs, with subglobose, 7-12 mm in diam., tubers. Leaves few, alternate, sessile, 8 - 15 × 0.3 - 0.6 cm, narrowly linear to linear-lanceolate, acuminate, coriaceous, with sheathing base. Flowers axillary, 1 to 3-together or few to many in terminal erect racemes, star-

like, purple or violet. Filaments flattened. Capsules oblong-ellipsoid, 3-grooved, obtuse. Seeds subglobose, somewhat angled, brown.

Fl. & Fr. : June - September.

Occasionally found in the rock-crevices on Aravalli hills among grasses.

Selected specimens : Ajmer : Montane grasslands, *Sharma* 1753 (LWG) ; Jalore : Sunda hills, *Vyas* 6325 (BSJO) ; Kota : Darah, *Singh* 74872 (LWG) ; Sirohi : Mt. Abu, *Mehta* 289 (JAC).

8. SCILLA L.

Scilla hyacinthina (Roth) Macbr. Contr. Gray Herb. 56 : 14. 1918. *Ledbouria hyacinthina* Roth, Nov. Pl. Sp. 195. 1821. *Barnardia indica* Wight, Ic. 6 : 21. t. 2041. 1853. *Scilla indica* (Wight) Baker in Saund. Refug. Bot. 3 : App. 12. 1870, non Roxb. 1832 ; Hook. f. Fl. Brit. India 6 : 348. 1892 ; Duthie, Fl. Gangetic Plain 3 : 264. 1920. 'Koli-kanda' (Hindi).

Perennial herbs, with ovoid, tunicated bulbs of 2 - 3 × 1.2 - 2.0 cm size. Leaves radical, 2 - 4, 3.5 - 7.5 × 1.0 - 2.5 cm, oblanceolate or spatulate, glabrous, subacute, narrowed into a sheathing petiole, fleshy, undulate, obtusely keeled, sometimes rooting at the tips, dull green above and often with darker blotches, paler beneath. Flowers in long racemes, pale to bright pinkish purple. Capsules globose or ovoid, violet - purple.

Fl. & Fr. : June - August.

Rare, in rocky habitats. Included on the authority of *Vyas* (1965, 1967) from Udaipur and Alwar districts respectively.

9. URGENIA Steinheil

Urgenia indica (Roxb.) Kunth, Enum. Pl. 4 : 333. 1843 ; Wight, Ic. 6 : 27. t. 2963. 1853 ; Hook. f. Fl. Brit. India 6 : 347. 1892 ; Duthie, Fl. Gangetic Plain 3 : 264. 1920. *Scilla indica* Roxb. Fl. Ind. 2 : 147. 1832. 'Jangli Piaz' (Hindi).

Scapigerous, perennial herbs, with ovoid, tunicated bulbs. Leaves radical, spreading on the ground, 3.5 - 30.0 × 1.2 - 4.0 cm, linear, flat, strap-shaped, acute. Flowers few, born in racemes at the upper part of 75-100 cm long scapes, pale brown. Capsules oblong or ellipsoid, 3-

quetrous, each carpel ribbed in the centre and on the margins. Seeds flat, winged, black.

Fl. & Fr. : February May.

Common in wastelands and open forests in gravelly/rocky habitats.

Selected specimens : Ajmer : On Udaipur road, *Kaul* 8489 (LWG) ; Alwar : Narayanijee forest block, *Parmar* 9779 (BSJO) ; Churu : Khanpur tal, *Roy* 5086 (BSJO) ; Jaipur : Ramgarh, *Sharma* Acc. No. 11345 (RUBL) ; Jaisalmer : *Bhandari* 982 (JAC) ; Udaipur : Parshad, *Verma* 129 (BSA).

CULTIVATED SPECIES

Allium cepa L. '*Pyaj*' (Hindi) - Scapigerous annual herbs with fistular leaves and white flowers in umbels. Commonly cultivated for its underground stem (bulb) used as vegetable.

Allium sativum L. '*Lahsun*' (Hindi) - Bulbous herbs ; bulbs short, 2-4 cm in diam., bulblets or cloves fleshy, creamy yellow, ovoid, acuminate. Leaves 15-30 cm long. Flowers white, in umbels. Commonly cultivated in many part of the state as winter crop.

Asparagus plumosus Baker - Shrubs, with many filiform cladodes and globose, 1-seeded berries. Native of south Africa ; commonly cultivated in the gardens for ornamental purposes.

137. SMILACACEAE

(R.P. Pandey)

SMILAX L.

Smilax zeylanica L. Sp. Pl. 1029. 1753 ; Hook. f. Fl. Brit. India 6 : 309. 1892 ; Gandhi in Saldanha & Nicolson, Fl. Hassan 804. f. 120 A. 1976. *S. macrophylla* Roxb. Fl. Ind. 3 : 793. 1832, non Willd. 1806 ; Hook. f. l. c. 6 : 310. 1892 ; Duthie, Fl. Gangetic Plain 3 : 260. 1920. '*Ramdatun*' (Hindi).

Large, deciduous, woody, prickly climbers. Stem smooth, striate, prickly or not. Leaves upto 25 cm long, alternate, glabrous, ovate-elliptic to oblong or suborbicular, acute, rounded or subcordate at base,

acuminate-cuspidate, upto 5-nerved ; petioles c. 1.75 cm long, jointed in the middle. Flowers dioecious, in axillary, pedunculate umbels, greenish-white. Tepals oblong, obtuse. Stamens as long as the tepals. Berries globose, smooth, red.

Fl. : July - September ; *Fr.* : November - March.

Cultivated in the gardens and fern - houses for ornamental purposes ; also occurs in ravines, scrub jungles etc. in wild state.

Selected specimen : Kota : Bara-bagh, *Singh* 83849 (LWG).

138. PONTEDERIACEAE

(R. P. Pandey)

Plants floating ; petioles swollen into floats. Flowers sessile. Perianth strongly zygomorphic, distinctly gamophyllous ; posterior tepals with a central yellow blotch. Filaments hairy, not horned. ...

1. *Eichhornia*

Plants not floating ; petioles not enlarged to form floats. Flowers distinctly pedicelled. Perianth actinomorphic, almost choriphylous ; posterior tepals concoloured. Filaments glabrous, of one larger anther horned on one side. ...

2. *Monochoria*

1. EICHHORNIA Kunth *nom. cons.*

Eichhornia crassipes (Mart.) Solms in DC. Monogr. Phan. 4 : 527. 1883 ; Subram. Aquat. Angiosp. 70. f. 48. 1962 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 279. 1976. *Pontederia crassipes* Mart. Nov. Gen. Sp. 9. t. 4. 1823. 'Jal-kumbhi' (Hindi).

Floating aquatic herbs, upto 50 cm high ; stolons axillary, stout, spongy semicylindric. Leaves radical, 15 - 20 × 15 - 20 cm, broadly ovate to suborbicular, smooth, base cuneate or truncate, obtuse at apex ; petioles c. 10 cm long, swollen. Flowers in 10 - 20 cm long spikes, lilac-blue or mauve. Perianth-lobes ovate to broadly oblong. Larger stamens clothed with glandular hairs, those of smaller stamens glabrous. Styles 3, curved, connate, glabrous ; stigma hairy, fringed. Capsules oblong. Seed minute, oblong or ovoid, ribbed.

Fl. : During rainy season ; *Fr.* : October - November.

A very troublesome weed in ponds, slow-running channels, ditches and marshy areas forming pure formations. Native of Brazil.

Selected specimens : Bharatpur : Ghana, *Khisti* 54986 (BSI) ; Ganganagar : Gharsana, *Roy* 4903 (BSJO) ; Jaipur : Maharaja College, *Singh* Acc. No. 7560 (RUBL) ; Jodhpur : *Bhandari* 193 (JAC) ; Kota : Chambal River, *Singh* 90510 (LWG) ; Udaipur : Near P.W.D. Rest House, *Majumdar* 11618 (BSA) *Kanodia* 82359 (BSI).

2. MONOCHORIA Presl

Root-stock creeping. Leaves triangular ovate, with a hastate or sagittate base and acuminate or acute basal lobes. Perianth 1.5 - 1.8 cm long. ..

1. *M. hastata*

Root-stock suberect or oblique. Leaves broadly ovate to ovate-oblong, with rounded-truncate to cordate base and rounded basal lobes. Perianth less than 1.5 cm long. ...

2. *M. vaginalis*

1. *Monochoria hastata* (L.) Solms in DC. Monogr. Phan. 4 : 523. 1883 ; Subram. Aquat. Angiosp. 69. f. 46. 1962. *Pontederia hastata* L. Sp. Pl. 288. 1753. *Monochoria hastaeifolia* Presl, Rel. Haenk. 1 : 128. 1827 ; Hook. f. Fl. Brit. India 6 : 362. 1892 ; Duthie, Fl. Gangetic Plain 3 : 269. 1920. '*Launkia*' (Hindi).

Perennial, rhizomatous, marshy herbs, upto 1 m high. Leaves 7 - 20 × 4 - 20 cm, faintly many-nerved ; petioles of basal leaves upto 60 cm long, of upper ones shorter. Racemes erect, dense, short-peduncled, deflexed finally. Pedicels 2 - 3 cm long, erecto-patent. Capsules c. 5.5 mm in diameter, subglobose or oblong.

Fl. & Fr. : June - September.

Occasionally found in rice fields and on the banks of rivers, tanks and ditches.

Selected specimens : Jhalawar : Manoharthana, *Singh* 83659 (LWG) ; Kota : Shahabad - Kishanganj, *Verma* 689 (CAL) ; Shahabad, *Majumdar* 10435 (LWG).

2. *Monochoria vaginalis* (Burm. f.) Presl, Rel. Haenk. 1 : 128. 1827 ; Hook. f. Fl. Brit. India 6 : 363. 1892 ; Duthie, Fl. Gangetic Plain 3 : 270. 1920 ; Subram. Aquatic. Angiosp. 69. f. 47. 1962. *Pontederia vaginalis* Burm. f. Fl. Ind. 80. 1768. *P. plantaginea* Roxb. Fl. Ind. 2 : 123. 1832. *Monochoria vaginalis* (Burm. f.) Presl var. *plantaginea* (Roxb.) Solms in DC. Monogr. Phan. 4 : 523. 1883 ; Hook. f. *l.c.* 6 : 363. 1892 ; Duthie, *l.c.* 3 : 270. 1920.

Annual or perennial herbs. Leaves 5.5 10.0 × 0.5 10.0 cm ; petioles upto 40 cm long, broadly sheathing at base. Racemes 0.5 - 2.5 cm long ; pedicels c. 0.5 cm long. Capsules c. 1 cm long, ellipsoid, 3-gonous. Seeds brown, 10-ribbed with transverse striations between the ribs.

Fl. & Fr. : September November.

Common in temporary ponds, ditches and in marshy and swampy habitats.

Selected specimens : Bhilwara : Bijolia, *Singh* 6057 (BSJO) ; Bundi : Talera, *Singh* 83919 (LWG) ; Jaipur : Chaksu, *Singh* Acc. No. 12980 (RUBL) ; Kota : Shahabad, *Majumdar* 13196 (BSA) ; Kota : *Wadhwa* 1957 (BSA). Also reported from Udaipur (Ramdeo, 1965, 1969).

139. COMMELINACEAE

(P.J. Parmar)

- 1a. Perfect stamens 3 ; staminodes 1 3 :
 - 2a. Inflorescence short, condense, enclosed in a spathaceous bract. Flowers irregular. Filaments glabrous... 2. *Commelina*
 - 2b. Inflorescence usually a lax panicles. Bracts not spathaceous. Flowers regular. Filaments bearded. ... 4. *Murdannia*
- 1b. Perfect stamens 6 ; staminodes absent :
 - 3a. Leaf-sheaths inflated. Flowers sessile, in axillary fascicles, enclosed in inflated leaf-sheaths. Bracteoles small. ... 1. *Amischophacelus*
 - 3b. Leaf-sheaths not inflated. Flowers pedicellate, in scorpioid cymes. Bracteoles leafy. ... 3. *Cyanotis*

1. AMISCHOPHACELUS Rolla Roa & Kammathy

- Capsules 3-horned at the apex, with central depression. ... 2. *A. cucullata*
- Capsules simply beaked, without any depression. ... 1. *A. axillaris*

1. *Amischophacelus axillaris* (L.) Rao & Kammathy in Journ. Linn. Soc. Bot. 59 : 306. 1966. *Commelina axillaris* L. Sp. Pl. 42. 1753. *Cyanotis axillaris* (L.) D. Don, Prodr. Fl. Nepal. 46. 1825 ; Hook. f. Fl. Brit. India 6 : 388. 1892 ; Duthie, Fl. Gangetic Plain 3 : 280. 1920 ; Mahesh. Illus. Fl. Delhi f. 205. 1966.

Prostrate or suberect, somewhat fleshy annual herbs, rooting at lower nodes. Leaves sessile, 4 - 15 × 0.3 - 1.0 cm, linear-lanceolate to oblong, acute to acuminate. Flowers axillary, solitary or in cymes which are reduced to axillary fascicles. Filaments densely bearded. Capsules 5 - 6 mm long, oblong or ellipsoid, glabrous. Seeds oblong-subcylindric, pitted, truncate at one end and rounded at the other, grey.

Fl. & Fr. : August - December.

Common in marshy habitats, particularly in the eastern parts of the state.

Selected specimens : Banswara : Kushalgarh, *Kanodia* 75678 (BSI) ; Jaipur : Ramgarh, *Sharma* 771 (RUBL) ; Jhalawar : Kishangang, *Verma* 724 (BSA) ; Jodhpur : *Bhandari* 1962 (JAC) ; Kota : *Jain* 29129 (BSI) ; Tonk : Kakor village, *Shetty* 1282 (BSJO).

2. *Amischophaeelus cucullata* (Roth) Rao & Kammathy in Journ. Linn. Soc. Bot. 59 : 306. 1966. *Tradescantia cucullata* Roth, Nov. Pl. Sp. 189. 1821. *Cyanotis cucullata* (Roth) Kunth, Enum. Pl. 4 : 107. 1843 ; Hook. f. Fl. Brit. India 6 : 389. 1892 ; Raizada, Suppl. Duthie, Fl. Gangetic Plain 283. 1976. *Zygomenes cucullata* (Roth) Rao & Kammathy in Notes Roy. Bot Gard. Edinb. 25 : 187. 1964.

Decumbent or suberect, annual herbs, with glabrous, stout branches usually rooting at the nodes. Leaves sessile, 2.5 - 6.0 × 0.5 - 1.0 cm, spreading or reflexed, linear-lanceolate, distichous ; sheaths globosely inflated. Flowers in axillary fascicles, bright violet-blue or pink. Filaments densely bearded with long, bearded, blue hairs. Capsules trigonous, ellipsoid-oblong, glabrous, almost included in the sheath-pouch, pale straw-coloured. Seeds minute, subquadrate, smooth or obscurely pitted.

Fl. & Fr. : August - November.

Common in rice fields and other low-lying marshy places in the east of Aravalli.

Selected specimens : Ajmer : On Nasirabad-kekri road, *Sharma* 1238 (LWG) ; Banswara : Udaipur road, *Singh* 2994 (BSJO) ; Kota : Irrigation canal, *Majumdar* 10886 (BSA) ; Udaipur : Chhapli, *Kanodia* 82512 (BSI).

Notes : Hook. f. (*l.c.*), Fischer (in Gamble Fl. Madras 3 : 1549, 1931) and Shah (Fl. Gujarat 2 : 685. 1978) have erroneously described the filaments 'glabrous' in this species while distinguishing it from *Cyanotis axillaris* (L.) D. Don, to which it is closely allied.

2. COMMELINA L.

- 1a. Flowers axillary, solitary, pale-brown. ... 11. *C. wightii*
- 1b. Flowers usually in 1 to many-flowered, 2-fid cymes, blue or purplish :
 - 2a. Capsules usually 2-celled, sometimes one-celled :
 - 3a. Each locule of capsule 1-seeded. ... 10. *C. suffruticosa*
 - 3b. Each locule of capsule 2-seeded. ... 2. *C. attenuata*
 - 2b. Capsules 3-celled :
 - 4a. Capsules 3-seeded i.e. all the cells 1-seeded :
 - 5a. Capsules 3-valved. Seeds free in the cells. ... 9. *C. paludosa*
 - 5b. Capsules 2-valved. Seeds free or adnate to the cells :
 - 6a. Seeds oval, black, with a membranous margin, free in the cells. ... 5. *C. erecta*
 - 6b. Seeds obliquely ovoid, dark brown, without membranous margins, adnate to the cells. ... 1. *C. albescens*
 - 4b. Capsules usually 5-seeded, i.e. two anterior cells 2-seeded each and the posterior one 1-seeded or obsolete :
 - 7a. Leaves variously lanceolate. Spathes distinctly pedunculate, complicate or cucullate. Seeds smooth or turbinate :
 - 8a. Seeds reticulate, cylindric. Spathes sometimes cordate at the base. ... 4. *C. diffusa*
 - 8b. Seeds smooth. Spathes always rounded at the base :
 - 9a. Branches of the cymes equal, 1 to 2-flowered. Seeds appendiculate. ... 8. *C. longifolia*
 - 9b. Branches of the cymes unequal, upper one 1 to 4-flowered, lower 1 to 2-flowered. Seeds exappendiculate :
 - 10a. Leaves usually with straight margins. Posterior cell of capsules keeled. Seeds truncate at one end and sub-acute or rounded at the other. ... 7. *C. hagskarlilii*

10b. Leaves usually with wavy margins. Posterior cell of capsules not keeled. Seeds rounded at both ends.

6. *C. forskalaei*

7b. Leaves elliptic-ovate. Spathes sessile or subsessile, turbinate. Seeds closely pitted.

3. *C. benghalensis*

1. *Commelina albescens* Hassk. in Schweinf. Beitr. Fl. Aethiopia 210. 1867; Hook. f. Fl. Brit. India 6 : 373. 1892; Cooke, Fl. Bombay 2 : 785. 1907; Bhandari, Fl. Ind. Desert 355. 1978.

Prostrate or sub-erect, perennial herbs from a woody, knotted rhizomatous stock; root-fibers thick. Leaves 9-14 × 0.8-2.2 cm, linear-lanceolate, broadened a little above the base, gradually tapering to an acute apex, margins often undulate. Spathes 2-3 in each axil at the end of branches, shortly stalked, 1.5-2.0 × 1.2-1.5 cm, cucullate, acute, connate from base. Cymes 3 to 4-flowered. Flowers pale-blue, opening one at a time in each spathe. Capsules 3-celled, 2-valved, the dorsal cell indehiscent, with muriculate ribs. Seeds obliquely ovoid, dark-brown, without membranous margins.

Fl. & Fr. : August - October.

Common on hills in moist places. North-western part of Rajasthan forms the eastern limit of distribution of this species.

Selected specimens : Barmer : *Bhandari* 524 (JAC); Churu : Gopalpura on hills, *Roy* 2682 (BSJO); Jaisalmer : *Bhandari* 1054 (JAC); Jodhpur : Kailana on hills, *Shetty* 92 (BSJO); Pali : Sarandana (near Beawar), *Shetty* 1784 (BSJO); Sirohi : Mt. Abu, *Mehta* 179 (JAC).

2. *Commelina attenuata* Koenig ex Vahl, Enum Pl. 2 : 168. 1805; Hook. f. Fl. Brit. India 6 : 372. 1892; Duthie, Fl. Gangetic Plain 3 : 274. 1920.

Slender, much-branched, glabrous or sparingly hairy herbs. Leaves 6-12 × 0.2-0.5 cm, linear or linear-lanceolate, acute or sub-obtuse; sheaths ciliate, often hardly distinct from leaf-blade. Spathes 2.0-3.5 cm long, ovate-lanceolate, acute or caudate-acuminate at apex and cordate at base, glabrous. Flowers small, blue. Capsules 3-celled and 3-valved, trigonous, obovoid. Seeds oblong-ellipsoid, smooth, truncate and appendiculate at both ends.

Fl. & Fr. : October - November.

Rare, in grassy plains and on the slopes of hills in south-eastern parts of the state.

Selected specimen : Kota : Darah, Singh 74844 (LWG).

3. *Commelina benghalensis* L. Sp. Pl. 41. 1753 ; Wight, Ic. 6 : 29. t. 2065. 1853 ; Hook. f. Fl. Brit. India 6 : 370. 1892 ; Duthie, Fl. Gangetic Plain 3 : 274. 1920. 'Bukana' (Hindi).

Diffusely branched, decumbent-ascending, annual herbs, with fibrous roots. Leaves sub-sessile or narrowed into 0.4-1.0 cm long petiole, 2-8 × 1.2-4.0 cm, ovate or oblong ; sheaths 1.2-1.8 cm long, pubescent outside, bearded at the mouth. Spathes 2-3 at the end of branches, subsessile, cucullate, recurved, mucronate, auricled on one side at the base, hairy outside. Cymes peduncled, with 1-flowered lower branch and 2 to 3-flowered upper one. Flowers blue. Capsules trigonous, shortly stalked, oblong, unequally 3-valved. Seeds 5, pitted, wrinkled. Cleistogamous flowers bisexual, solitary, borne in pear-shaped spathes.

Fl. & Fr. : July - October.

Common weed in fields, gardens, wastelands and forests in moist and shady places.

Selected specimens : Alwar : Pandupole, Parmar 9487 (BSJO) ; Banswara : Near Paloda village, Singh 2840 (BSJO) ; Barmer : Along Balotra road, Shetty 2218 (BSJO) ; Ganganagar : Layalpuria, Roy 4994 (BSJO) ; Jaipur : Ram Niwas Garden, Sharma 209 (RUBL) ; Sirohi : Mt. Abu, Rao 67244 (BSI).

4. *Commelina diffusa* Burm. f. Fl. Ind. 18. t. 7. f. 2. 1768 ; Bhandari, Fl. Ind. Desert 356. 1978. *C. nudiflora* auct. pl. non L. 1753 ; Hook. f. Fl. Brit. India 6 : 369. 1892 ; Duthie, Fl. Gangetic Plain 3 : 272. 1920.

Glabrous, straggling, annual herbs, with arching internodes and rooting at nodes. Leaves sessile, 5-8 × 1.5-2.0 cm, broadly lanceolate or ovate-lanceolate, abruptly acuminate, narrowed at base, sheaths 1.0-1.3 cm long, loose, mottled with red markings. Spathe solitary in almost all axils, ovate-cordate. Peduncle solitary, leaf-opposed, with a line of hairs. Cymes branched, 1 to 3-flowered, bearing usually all male flowers ; outer cymes with 3-4 perfect flowers. Flowers deep cobalt-blue. Capsules broadly oblong, acuminate, 5-seeded. Seeds oblong-cylindric, tubercled and reticulate, brown.

Fl. & Fr. : August - December.

Common in moist and shady places among grasses, particularly in the eastern parts of the state.

Selected specimens: Bundi: Hindoli, Verma 1880 (BSA); Chittorgarh: Pratapgarh, Majumdar 12359 (BSA); Jodhpur: Mandore nala, Bhandari 309 (JAC); Sirohi: Mt. Abu, Blatter 2218 (BLAT); Udaipur: Kamblighat, Kanodia 82443 (BSI).

5. *Commelina erecta* L. Sp. Pl. 41. 1753. *C. undulata* R. Br. Prodr. 1: 270. 1810; Hook. f. Fl. Brit. India 6: 373. 1892; Raizada, Suppl. Duthie, Fl. Gangetic Plain 282. 1976. *C. kurzii* Clarke in Journ. Linn. Soc. Bot. 11: 444. 1871; Hook. f. l.c. 6: 373. 1892; Mahesh. Illus. Fl. Delhi f. 202. 1966.

Profusely branched, erect or straggling herbs, often rooting at the lower nodes. Leaves 6-20 × 1.5-4.0 cm, lanceolate, acuminate; sheaths 1.2-2.5 cm long, sparsely villous, ciliate along the rim of the mouth, strongly veined. Spathes sessile, 2 to 5-together, funnel-shaped, closed at one end and beaked at the other, accompanied with 2-4 smaller leaves in addition to the 2 mature leaves. Cymes bifid, inner represented by a stump, outer 3 to 6-flowered. Flowers violet. Capsules 2-valved, 2-3 in each spathe, oblong, 3-seeded. Seeds oval, black, membranous-margined.

Fl. & Fr.: August - October.

Common in moist and shady places in wastelands and forests, particularly in the east of Aravalli.

Selected specimens: Alwar: Keraska forest block, Parmar 8774 (BSJO); Banswara: Anand forest block, Singh 2968 (BSJO); Barmer: Haldeshwar Mahadev R.F., Pandey 7940 (BSJO); Jaipur: Motidungri, Sharma 1577 (RUBL); Jhalawar: Wadhwa 7431 (BSA); Sirohi: Mt. Abu, Raizada 21114 (DD).

6. *Commelina forsskalaei* Vahl, Enum. 2: 172. 1805; Hook. f. Fl. Brit. India 6: 371. 1892; Mahesh. Illus. Fl. Delhi f. 204. 1966; Raizada, Suppl. Duthie, Fl. Gangetic Plain 281. 1976. 'Kankawa' (Hindi).

Much-branched, diffuse, annual herbs, with aerial chasmogamous and underground cleistogamous flowers, rooting at nodes. Leaves 6.5-7.6 × 0.9-1.3 cm, linear or narrowly oblong-elliptic, often undulate; sheaths pubescent, ciliate along the margin of mouth. Spathes sparsely hairy with long, slender hairs. Cymes axillary, branched, 3 to 5-flowered; inner branches with a single male flowers and outer ones with 2-3 flowers. Flowers sky-blue. Capsules usually 3-seeded, smooth, subglobose, orange-

brown. Cleistogamous flowers usually solitary in a spathe, bisexual, reduced, with usually 1-seeded capsule.

Fl. & Fr. : August November.

Common in cultivated fields, in marshy places and often in the forests.

Selected specimens : Ajmer : Lowrie 4894 (DD) ; Banswara : Near Lasara village, Singh 3619 (BSJO) ; Barmer : Dhorimanna, Shetty 2337 (BSJO) ; Chittorgarh : Near Rappura, Singh & Pandey 6907 (BSJO) ; Jhunjhunu : Rajpura, Stower A 42 a (BSI) ; Sirohi : Mt. Abu, Mehta 90 (JAC) ; Tonk : On the way to Siras forest, Shetty 1020 (BSJO).

7. *Commelina hasskarlii* Clarke, *Comm. & Cyrt.* Beng. 13. t. 5. 1874 et in DC. *Monogr. Phan.* 3 : 157. 1888 ; Hook. f. *Fl. Brit. India* 6 : 370. 1892 ; Duthie, *Fl. Gangetic Plain* 3 : 273. 1920.

Much-branched herbs, rooting at the lower nodes. Leaves 3.8-8.2 × 1-2 cm, lanceolate or ovate-lanceolate, acute ; mouth of the sheaths oblique, ciliate. Spathes c. 1.25 cm long, axillary, ovate-lanceolate, cordate at base with rounded lobes, sparsely hairy with long hairs. Flowers in pubescent, unequal cymes ; inner branch 1 to 2-flowered ; outer 2 to 4-flowered. Flowers blue. Capsules c. 5 mm long, quadrate, apiculate, membranous. Seeds cylindric, truncate at one end, subacute or rounded at the other, without an appendage.

Fl. & Fr. : August November.

Common weed in the cultivated fields ; rarely found in the forests in moist and shady places in the east of Aravalli.

Selected specimens : Banswara : Kothari forest block, Singh 3760 (BSJO) ; Chittorgarh : Pratapagarh, Majumdar 10168 (BSA) ; Jhalawar : Sarhod, Wadhwa 3376 (BSA) ; Kota : Wadhwa & Prasad 9464 (BSA) ; Sirohi : Mt. Abu, Mehta 519 (JAC) ; Tonk : On the way to Rajmahal R.F., Shetty 1214 A (BSJO).

8. *Commelina longifolia* Lam. *Encycl.* 1 : 129. 1783 ; Majumdar in *Bull. Bot. Surv. India* 18 : 76. 1979. *C. salicifolia* Roxb. *Fl. Ind.* 1 : 172. 1820 ; Hook. f. *Fl. Brit. India* 6 : 370. 1892 ; Duthie, *Fl. Gangetic Plain* 3 : 273. 1920.

Erect or decumbent, slender herbs, sometimes rooting at nodes. Leaves 7.5-15.0 cm long, linear-lanceolate, glabrous or so ; sheaths ciliolate. Spathes axillary, ovate-lanceolate, acute or acuminate, rounded

at base. Flowers polygamous, in branched cymes; branches of cymes equal, usually 1 to 2-flowered. Flowers dark-blue. Capsules c. 6 mm long, quadrate, membranous. Seeds ovoid-subglobose, black, covered with white powder, smooth, membranous, appendaged at one end.

Fl. & Fr. : August - November.

Rare, in moist and shady habitats. Included on the authority of Duthie (*l.c.*) from Merwara. Subsequently Nair & Kanodia (1959), Nair *et al.* (1961) and Vyas (1965) also reported this taxon from Jhunjhunu & Udaipur districts respectively.

9. *Commelina paludosa* Blum. Enum. Pl. Jav, 1 : 2. 1827. *C. obliqua* Buch. Ham. ex D. Don, Prodr. 45. 1825, non Vahl 1805; Hook. f. Fl. Brit. India 6 : 372. 1892; Duthie, Fl. Gangetic Plain 3 : 270. 1920. *C. polyspatha* Wight, Ic. 6 : 29. t. 2066. 1853.

Tall, scandent or scrambling, perennial herbs. Leaves 4.0 - 13.7 × 1.6 - 3.2 cm, lanceolate or ovate-elliptic, acute or subobtusate; sheaths ciliate, often hardly distinct from the leaf-blade. Spathes 1.5 - 1.8 cm across, narrowly ovate-lanceolate, acute or caudate-acuminate, glabrous, base deeply sagittate-cordate with large auricles. Flowers small, blue. Capsules c. 6 mm long, 1-celled, with 2-superposed seeds, truncate and appendaged at both ends or one seed subglobose.

Fl. & Fr. : August - October.

Common in damp places, particularly in the eastern parts of the state.

Selected specimens : Jhalawar : *Wadhwa* 7431 (BSA); Jodhpur : Mandore, *Tiwari* 629 (BSJO); Kota : Shahabad, *Verma* 641 (BSA); Sirohi : Mt. Abu, *Mehta* 291 (JAC). Also reported from Alwar (Vyas, 1967), Jhunjhunu (Nair & Nathawat, 1957, Nair & Malhotra, 1961) and Udaipur (Vyas, 1965 & Ramdeo, 1969).

10. *Commelina suffruticosa* Blume, Enum. Pl. Jav. 1 : 3. 1827; Hook. f. Fl. Brit. India 6 : 374. 1892; Raizada, Suppl. Duthie, Fl. Gangetic Plain 281. 1976.

Slender, erect, mostly tufted and branched perennial herbs. Leaves large, sessile, 7.5 - 36.0 × 2 - 5 cm, lanceolate or ovate-lanceolate, entire, scabridly pubescent; sheaths 1.2 - 1.8 cm long, pubescent, ciliate at mouth. Spathes 3 - 8, shortly peduncled, broadly ovate, acute, cucullate. Flowers white or blue. Capsules 6 - 8 per spathe, 2-valved. Seeds ellipsoid, rugose, straw-coloured.

Fl. & Fr. : August - November.

Rare, grows on sandy loam soil of moist and shady habitats in the south-eastern parts of the state.

Selected specimens : Kota : Darah, Singh 74848 (LWG), Kapildhara, Verma 763 (CAL).

11. *Commelina wightii* Rolla Rao in Bull. Bot. Surv. India 3 : 168. 1862. *Heterocarpus glaber* Wight, Ic. 6 : 29. t. 2067. 1853. *Commelina glabra* (Wight) Clarke in DC. Monogr. Phan. 3 : 163. 1888, non Meyer 1818 ; Hook. f. Fl. Brit. India 6 : 371. 1892.

Erect or decumbent, annual herbs. Stem branched, rooting at the lower nodes, slender, pubescent on one side. Leaves sessile, 3.0 - 5.0 × 0.8 - 1.25 cm, narrowly lanceolate, obtuse at apex, glabrous ; sheaths villous along the margins. Spathes longer than their peduncles, ovate-lanceolate, pubescent or ciliate, acuminate, deeply cordate at the base. Flowers axillary, solitary, pale brown. Capsules 3-celled ; lateral cells linear, empty ; dorsal cells globose, membranous. Seed free, globose.

Fl. & Fr. : August - September.

Rare, in moist habitats. Included on the authority of Nair & Kanodia (1959) from Ajit Sagar bundh area in Jhunjhunu district.

3. *CYANOTIS* D. Don. *nom. cons.*

Cottony herbs. Filaments bearded with hairs of two colours. Seeds oblong, faintly rugose. ...

2. *C. fasciculata*

Glabrous or pubescent herbs. Filaments bearded with hairs of one colour. Seeds 3-gonous, striate. ...

1. *C. cristata*

1. *Cyanotis cristata* (L.) D. Don, Prodr. Fl. Nepal. 46. 1825 ; Wight, Ic. 6 : 32. t. 2082. 1853 ; Hook. f. Fl. Brit. India 6 : 385. 1892 ; Duthie, Fl. Gangetic Plain 3 : 279. 1920. *Commelina cristata* L. Sp. Pl. 42. 1753.

Annual, slender herbs, with fibrous roots ; branches many from the base, creeping and rooting below. Leaves sessile, 1.5 - 8.0 × 0.5 - 2.0 cm, ovate-oblong, acute, flat, glabrous or sparsely hairy, softly ciliate on the margins, rounded or cordate at base ; sheaths short, hairy. Flowers in scorpioid recurved cymes which are longer than the bracteoles, violet-purple. Capsules oblong, 3-gonous, truncate, nearly glabrous. Seeds with 2 large pits on two of the faces, black.

Fl. & Fr. : July - December.

Common among undergrowth of forests in moist and shady places, particularly in the eastern parts of the state.

Selected specimens : Alwar : Kankwari forest block, *Parmar* 8790 (BSJO); Banswara : Near Danpur village, *Singh* 4260 (BSJO); Barmer : Near Haldeshwar temple, *Pandey* 8002 (BSJO); Jaipur : Amer, *Sharma* 826 (RUBL); Pali : Paras Ram Mahadev hills, *Shetty* 1931 (BSJO); Sirohi : Mt. Abu, *Tatake* 46446 (BSA).

2. *Cyanotis fasciculata* (Heyne ex Roth) Schult. f. in Roem. and Schult. Syst. 7(2) : 1152. 1830; Wight, Ic. 6 : 32. t. 2086. 1853; Hook. f. Fl. Brit. India 6 : 387, 1892; Cooke, Fl. Bombay 2 : 793. 1907. *Tradescantia fasciculata* Heyne ex Roth, Nov. Pl. Sp. 189. 1821.

Erect, branched, floccosely silky or cobwebby woolly herbs, with fibrous roots. Leaves sessile, 1.75-5.0 × 0.6-1.0 cm, linear lanceolate or narrowed from the base to the tip, acute or acuminate, woolly on both surfaces. Flowers in compact, axillary and terminal cymes, pink to bright-purple. Peduncles about 2.5 cm long, one or more together. Capsules oblong, trigonous, pilose at the apex. Seeds oblong, faintly rugose.

Fl. & Fr. : August - December.

Common in the forests in moist and shady places.

Selected specimens : Ajmer : Todgarh, *Sharma* 550 (DD); Banswara : Ghatol, *Kanodia* 75505 (BSI); Chittorgarh : *Majumdar* 11613 (BSA); Jhalawar : Aklera, *Wadhwa* 5396 (BSA); Sirohi : Abu, *Jain* 46742 (BSI); Udaipur : *Kanodia* 82291 (BSI).

4. MURDANNIA Royle *nom. cons.*

1a. Leaves linear, nearly ten times longer than broad. Fertile stamens 2. Capsules 2 to 6-seeded :

2a. Ovary 2-celled ; cells of capsules 1-seeded or empty.

3. *M. vaginatum*

2b. Ovary 3-celled ; cells of capsules 2-seeded.

1. *M. nudiflora*

1b. Leaves ovate-lanceolate, nearly three times longer than broad. Fertile stamens 3. Capsules 10 or more-seeded.

2. *M. spirata*

1. *Murdannia nudiflora* (L.) Brenan in Kew Bull. 7 : 189, 1952. *Commelina nudiflora* L. Sp. Pl. 41. 1753, *pro typ. parte* (excl. *syn. et. ref.*

Fl. Zeyl. et. Plukenet). *Aneilema nudiflora* (L.) R. Br. Prodr. 271. 1810 ; Hook. f. Fl. Brit. India 6 : 378. 1892 ; Duthie, Fl. Gangetic Plain 3 : 277. 1920.

Suberect or diffuse, annual herbs, with fibrous roots. Stems branched from the base, often rooting below. Leaves sessile, 3 - 10 × 0.3 - 1.0 cm, linear-lanceolate, with a rounded or subcordate base and sub-acute apex, scabrid on margins otherwise glabrous ; sheaths patent hairy on the margins, ciliate on the mouth. Flowers in terminal and axillary, lax, cymose panicles, purplish to pink. Capsules subglobose, mucronate, purple-streaked, 6 seeded. Seeds trigonous, tuberculate, reddish to dark brown.

Fl. & Fr. : August - November.

Common in the east of Aravalli in deciduous forests among grasses in damp places ; also found as a weed of cultivation.

Selected specimens : Alwar : Naldeshwar forest block, *Parmar* 9523 (BSJO) ; Banswara : Shergarh village, *Singh* 3066 (BSJO) ; Bhilwara : Meja dam, *Singh* 6039 (BSJO) ; Kota : Baran, *Majumdar* 10849 (BSA) ; Sirohi : Mt. Abu, *Rao* 66652 (BSI) ; Tonk : On the way to Rajmahal R.F., *Shetty* 1216 (BSJO).

2. *Murdannia spirata* (L.) Brueck. in Engl. & Prantl, Pflanzenfam. ed. 2. 15 a : 173. 1930. *Commelina spirata* L. Mant. Pl. 176. 1771. *Aneilema spiratum* (L.) R. Br. Prodr. 271. 1810 ; Hook. f. Fl. Brit. India 6 : 377. 1892 ; Duthie, Fl. Gangetic Plain 3 : 277. 1920.

Erect or ascending, annual herbs, with fibrous roots. Stem simple or branched from the base, rooting below. Leaves sessile, 1 - 3 × 0.5 - 1.0 cm, subacute or acute, rounded or subcordate at base, crispy-marginated, glabrous ; sheaths ciliate on the margins and mouth. Flowers in terminal cymose panicles, blue. Capsules acutely 3-angled. Seeds trigonous, tuberculate, pale-brown.

Fl. & Fr. : August - November.

Rare, in wet and marshy places. Included on the authority of Nair and Malhotra (1961) from Sikar district.

3. *Murdannia vaginata* (L.) Brueck. in Engl. & Prantl, Pflanzenfam. ed. 2. 15a : 173. 1930. *Commelina vaginata* L. Mant. Pl. 1771. *Aneilema vaginatum* (L.) R. Br. Prodr. 271. 1810 ; Hook. f. Fl. Brit. India 6 : 381. 1892 ; Duthie, Fl. Gangetic Plain 3 : 278. 1920. *A. pauciflorum* Dalz. in Hook. Journ. Bot. 136. 1851, non Wight 1853.

Stout, slender, erect, almost fleshy herbs. Stem profusely branched; flaccid, rooting at lower nodes. Leaves sessile, alternate, 5.0 - 14.0 × 0.6 - 1.0 cm, linear, acuminate, flat, glabrous or sparsely hairy; sheaths short, open, ciliate. Flowers small, 1 to 3-together, fascicled in the axils of distant bracts along the filiform, slender terminations of the branches, blue. Capsules globose, cuspidate, shining, 3-celled. Seeds trigonously conic, truncate at one end, narrowed at the other, slightly rugose, black.

Fl. & Fr. : August - September.

Occasionally met among grasses in wet habitats, particularly in the eastern parts of the state.

Selected specimens : Jaipur : Ramgarh hills, *Sharma* 2094 (RUBL); Athuni-ka-kund, *Sharma* 2127 (RUBL); Jhalawar : *N.K.S.* 74, 100 (RUBL).

140. JUNCACEAE

(R.P. Pandey)

JUNCUS L.

Juncus bufonius L. Sp. Pl. 328. 1753; Baker in Fl. Males. I. 4 : 212. 1951; Hook. f. Fl. Brit. India 6 : 302. 1892; Duthie, Fl. Gangetic Plain 3 : 282. 1929. '*Pola*' (Hindi).

Erect, slender, tufted, annual herbs, 15 - 20 cm high. Stem dichotomously branched from the base. Leaves basal and cauline, grass-like, channelled above, lower ones up to 8.5 cm long, the upper ones smaller, linear, acute; sheaths not auricled. Flowers sessile, solitary or in clusters of 2 - 5, in lax cymes. Bracts and bracteoles membranous, ovate, acute. Outer tepals c. 5 mm long, lanceolate, acute, green, with membranous margins; inner ones c. 4.5 mm long. Stamens 6, often 3 in terminal flowers; anthers pale-yellow. Styles pinkish. Capsules c. 3.5 mm long, shorter than the tepals, obovate to ellipsoid-oblong, trigonous, apiculate, pale-yellow. Seeds numerous, minute, c. 0.5 mm long, ellipsoid, brown.

Fl. & Fr. : February - April.

Common in ditches, dry puddles and in cultivated fields.

Selected specimens : Ajmer : Todgarh, *Sharma* 1716 (LWG); Bhilwara : Ganthila, *Singh* 7110 (BSJO); Jaipur : Sanganer, *Wadhwa & Srivastava* 8414 (BSA); Amer, *Sharma* 2004, 1046 (RUBL); Jhalawar : *Sharma* 532, 533, 581 (RUBL); Jodhpur : Luni river near Bilara, *Singh* 3536 (BSJO); Sirohi : Mt. Abu, *Mehta* 898 (JAC).