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# Angiospermic Flora of Parasitic plants from Sikar District of Rajasthan

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## Abstract

Five parasitic angiosperms belonging to three families such as *Striga gesnerioides* var. *gesnerioides* (Willd.) Vatke, *S. angustifolia* (D. Don) Saldhana (Scrophulariaceae)*; Cuscuta reflexa* Roxb., *C. hyalina* Heyne ex Roth. (Cuscutaceae) and *Orobanche aegyptiaca* Pers. (Orobanchaceae) were collected from Sikar District of Rajasthan during the seasons of winter and summer in 2019-2022. Among these, *Striga gesnerioides* var. *gesnerioides* (Willd.) Vatke, *S. angustifolia* (D. Don) Saldhana and *Orobanche aegyptiaca* Pers. are root parasites while *Cuscuta reflexa* Roxb. and *C. hyalina* Heyne ex Roth. are shoot parasites. These plants are parasite on crops like *Pennisetum* spp. (*S. angustifolia* (D. Don) Saldhana) and *Brassica campestris* Oeder. (*Orobanche aegyptiaca* Pers.) as well as on ornamental or medicinal plants like *Euphorbia caducifolia* Haines (*Striga gesnerioides* var. *gesnerioides* (Willd.) Vatke) and *Adhatoda zeylanica* Medic., *Acacia nilotica* (L.) Del., *Ziziphus nummularia* (Burm. F.) Wt. & Arn., *Z. mauritiana* Lam. *Thevetia peruviana* (Pers.) K.Schum., *Tecoma stans* Juss., *Withania somnifera* (L.) Dunal and *Bougainvillea* spp. (*Cuscuta reflexa* Roxb.) alongwith *Croton bonplandianum* Baill., *Cassia obtusifolia* L., *Dipteracanthus patulus* (Jacq.) Nees, *Trianthema portulacastrum* L., *Tribulus terrestris* L., *Amaranthus* species*, Sphagneticola trilobata* (L.) Pruski, and *Medicago sativa* L. (*C. hyalina* Heyne ex Roth.).

**Keywords:** *Cuscuta, Orobanche,* Parasitic plants, Sikar, and *Striga*

## Introduction

Most plants are photoautotrophic organisms, which need only fundamental abiotic resources for their essential vital processes. However, an exception to this is parasitic plants, which acquire resources by parasitizing other plants through haustoria (Yoshida *et al.*, 2016). Haustoria secure unidirectional connections between the vascular systems of host and parasite, enabling resource flow and freeing parasitic plants from many constraints to growth. Parasitic plants rob all or a large part of the water, assimilates and nutrients which is essential for growth and development (Hearne, 2009; Parker, 2012 and Rodenburg *et al.,* 2016) and therefore parasitic life style requires a close coordination with the life cycle of the host. Plants belonging to Orobanchaceae and Scrophulariacae families such as *Orobanche*

and *Striga* respectively, are root parasites which are completely dependent on a host for survival while the genus *Cuscuta* (Cuscutacae) is a shoot parasite. Although majority of the parasitic plants are harmful to the host plants, few especially *Cuscuta* spp. are also used in traditional medicines for piles, ulcers, stomach problems, skin disease, jaundice, cough and fever by local people.

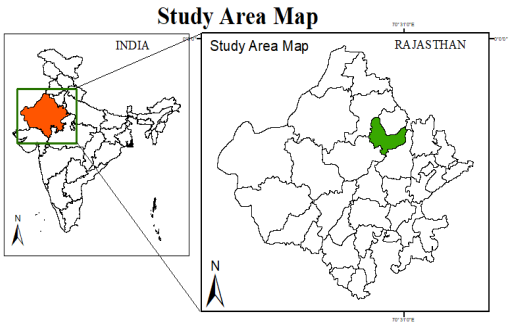


Fig:-1

## Study area

The study area, Sikar is located in the North-eastern part of the Rajasthan state between 27° 21› and 28°12› N and 74° 44′ and 75 ° 25′ E at an average height of 432.21 m above mean sea level. It is spread over 7732 sq. km in area, running from south to north. It is bounded on the North by Jhunjhunu district, in the North-west by Churu district, in the South-west by Nagaur district and in the South-east by Jaipur district. Sikar district area of Rajasthan possesses both arid and semi-arid characteristics. (Fig:-1)

## Materials & Methods

Extensive field survey was carried out in the month of September to April in the year 2019–2022. Data collection on the plant species, occurring in different seasons along with Date of collection, Locality(27°21› and 28°12› N and 74°44′ and 75°25′ E), Habit and Habitat. All the collected plant specimens were identified with the help of published regional floras (Shetty and Singh, 1991). Characterization of Family and Species has been mentioned along with synonymy with nomenclature details of plants. Data regarding Visit duration, Seasons, Latitude, Longitude etc. are recorded on spot (Table-01). Synonymy has been updated with the help of International Plant Names Index (IPNI). The Specimen examination carried out with the help of herbarium, Department of Botany, University of Rajasthan, Jaipur (India). (Fig- 1 and 2).

## Results

Total five plants species were observed. These plants belongs to three families i.e. Cuscutaceae, Scrophulariaceae and Orobanchaceae. *Striga gesnerioides* var. *gesnerioides* (Willd.) Vatke, *S. angustifolia* (D. Don) Saldhana (Scrophulariaceae)*; Cuscuta reflexa* Roxb., *C. hyalina* Heyne ex Roth. (Cuscutaceae) and *Orobanche aegyptiaca* Pers. (Orobanchaceae) are the recorded plants. All species are kept under three genera (*Striga, Cuscuta* and *Oronanche*). Among these, *Striga gesnerioides* var. *gesnerioides* (Willd.) Vatke, *S. angustifolia* (D. Don) Saldhana and *Orobanche aegyptiaca* Pers. are root parasites. *Cuscuta reflexa* Roxb. and *C. hyalina* Heyne ex Roth. are shoot parasites. (Table-1 and Fig.- 2).

### Key

1. Root and leaves absent
    2. Flowers in lax racemes; corolla whitish with scales at base; stigma thick and ovoid; style 1 .....*Cuscuta reflexa*
2. Flowers in dense clusters or pedunculate cyme; corolla pale-yellow without scales; stigma thin and globose; style 2 .....*C. hyalina*
1. Root and leaves present
    3. Ovary unilocular; bracteoles 2; corolla two-lipped.....*Orobanche aegyptiaca*
3. Ovary bi to multilocular
    4. Plant purple; leaves scaly; calyx-tube 5-ribbed; corolla lilac.....*Striga gesnerioides*
    4. Plant green; leaves normal; calyx-tube 10-15-ribbed; corolla white.....*S. angustifolia*

According to the Flora of Rajasthan by Shetty and Singh (1991), these families kept in Order Solanales (Cuscutaceae) and Lamiales (Scrophulariaceae and Orobanchaceae). Taxonomic description has been updated for easy identification. Parasitic flora of study area is not carried out earlier.

**1. Cuscutaceae Dumort.:-** Plant family are characterized by stem parasites, yellow coloured, leafless, much branched with climbing stem. Stamen epipetalous.

***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. *Cuscuta acutissima* Buchinger ex Engelm. in Trans. Acad. Sci. St. Louis 1(3): 490. 1859. *Cuscuta*

*boissieri* Stocks in Hooker's J. Bot. Kew Gard. Misc. 4: 173. 1852. *Cuscuta oxypetala* Boiss. Diagn. Pl. Orient., ser. 2 3: 130. 1856. *Cuscuta epitribulum* Schinz in Bull. Herb. Boissier, sér. 2, 1: 880. 1901. 'Amar-bel, Akash-bel' (Hindi).

Leafless, filiform stem-prasites, with slender, closely twining, much-branched stems forming a tangled mass. Flowers in dense clusters or in pedunculate cymes or recemes. 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.

***Cuscuta reflexa*** Roxb. Pl. Cor. 2: 3. T. 104. 1799; *Cuscuta verrucosa* Sweet. in Brit. Fl. Gard. 1: pl. 6 *1823*.*Cuscuta hookeri* Sweet in Hort. Brit. 290. 1826. *Cuscuta macrantha* G. Don in Gen. Hist. 4: 305. 1838. *Cuscuta elatior* Choisy in Mém. Soc. Phys. Genève 9: 273. 1841. *Cuscuta megalantha* Steud. in Nomencl. Bot. (ed. 2) 1: 456. *Cuscuta reflexa* var. *grandiflora* Engelm. in Trans. Acad. Sci. St. Louis 1: 518 1859. Clarke in Hook. F. Fl. Brit. India 4: 225. 1883; Duthie, Fl. Gangetic Plain 2: 100. 1911. *C. santapaui* Banerji & Das in Journ. Arn. Arb. 46: 87. 1965. *Monogynella reflexa* (Roxb.) Holub in Folia Geobot. Phytotax. 12(4): 429. 1977. '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; tubse cylindric; 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. Capsules depressed globose, glabrous, circumscissile near the base. Seeds 2-4, glabrous, black.

Fl. & Fr.: September-February.

**2. Schrophulariaceae Juss.:-** The family are characterized by Leaves alternate or opposite, stipules absent, flowers zygomorphic, carpels 2, ovary superior, bilocular, ovules many, fruit a capsule.

***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, 15-30 cm high. Leaves sessile, 1-3 × 0.1-0.2 cm, linear to lanceolate, subacute, hispid, entire margin, violet. 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. Stamens epipetalous. Capsules ovoid, 2-valved, apiculate, enclosed in the calyx.

Fl. & Fr.: August-October.

***Striga gesnerioides*** var. ***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, 'Gwal-mehndi' (Hindi).

Erect, rigid, pubescent, purple, root-parasitic herbs, 10-20 cm high, with prominent haustoria and woody root-stock. Leaves opposite or alternate, 5-10 × 2.0-3.5 mm, scally, 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, 6-7 mm long, somewhat scarious, splitting between the teeth. Corolla-tube incurved above the middle, 1.5 cm long, hairy outside and in the throat. Stamens epipetalous, black anthers. Capsules c. 7× 3 mm in diam., ovoid- globose or quandrangular shaped.

Fl. & Fr.: August- October.

**3. Orobanchaceae Vent.:-** Plant root-parasites. Leaves absent or scally and without chlorophyll. Flowers zygomorphic. Stamens didynamous. Placentation parietal are the key characters of family.

***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. *Phelipaea indica* (Buch.-Ham. ex Roxb.) G. Don in Gen. Hist. 4: 632. 1838. *Phelipanche aegyptiaca* (Pers.) Pomel in Nouv. Mat. Fl. Atl. 1: 107. 1874. *Kopsia aegyptiaca* (Pers.) Caruel in Fl. Ital. 6: 358. 1885.O. *ramose* auct. non L. 1753; Hook. f. I. c. 4:

326. 1885; Sharma & Tiagi, Fl. N. E. Rajasthan 305. 1919. 'Margoja' (Hindi).

Root-parasites, 10-20 cm high, usually branching from the base. Leaves scaly, few, lanceolate, slightly hairy. Spikes lax; corolla tube ovate or lanceolate; Bract 6-7 mm long, bracteoles 7-8 mm long, filiform, shorter than calyx. Calyx campanulate, 4-toothed, pubescent; teeth equaling the tube, lanceolate, strongly nerved down the middle. Corolla-tube 2 cm long, blue, lilac or violet-whitish; upper lip 2-lobed; lower one 3-lobed; tube slightly curved above, constricted above the insertion of the stamens. Stamen filaments hairy at the base; anthers woolly along the suture. Style- 1.3-1.5 cm long. Capsules oblong, acuminate, glabrous. Seeds subglobose to broadly ovoid, reticulate, yellow, infinite, minute structure.

Fl. & Fr.: January – March.

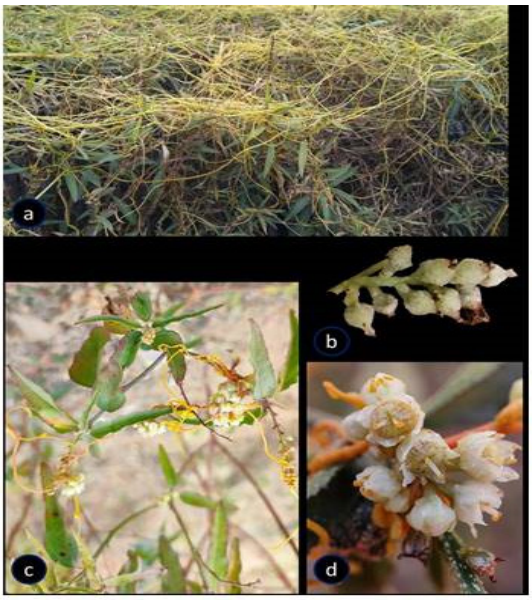


**Plate-1**


**Plate-2**

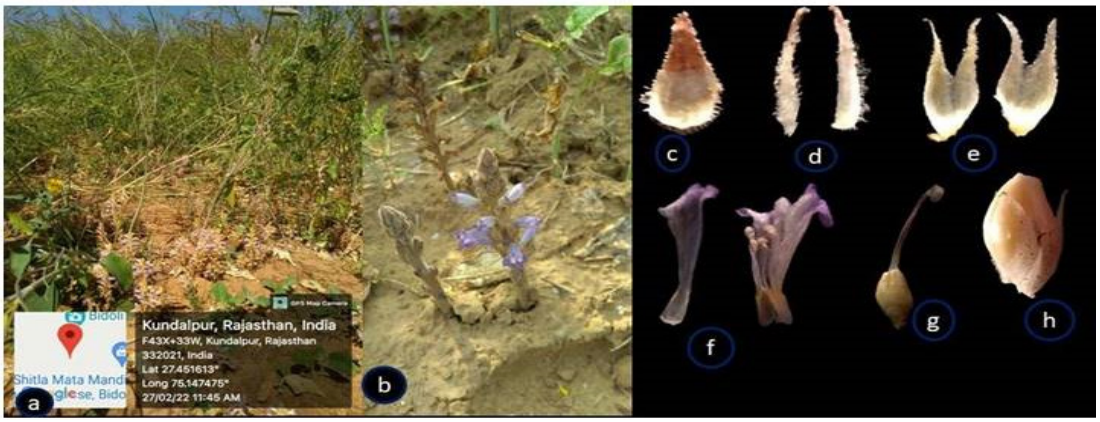


**Plate-3**

**Fig-2:- Plate 1. a & b *Cuscuta reflexa*** Roxb.; **c & d**. ***Cuscuta hyalina*** Heyne ex Roth.

**Plate 2. a. *Striga angustifolia*** (D. Don) Saldhana Habit, **b.** Leaf, **c.** Calyx, **d.** Corolla with epipetalous stames, **e.** Gynoecium, **f.** Fruit; **g. & h. *Striga gesnerioides*** var. ***gesnerioides*** (Willd.) Vatke Habit, **i.** Bract, **j.** Bracteoles, **k.** Calyx, **i.** Corolla with epipetalous stamens, **m.** Gynoecium, **n.** Fruit

**Plate 3. a & b. *Orobanche aegyptiaca*** Pers. Habit, **c.** Bract, **d.** Bracteole, **e.** Calyx, **f.** Corolla & Stamens **g.** Gynoecium, **h.** Fruit

## Discussion

In the present observation, emphasis was laid only on parasitic angiosperms. Five plant species have been recorded (Table-1). Proper scientific evaluation of these plants might lead to the discovery of some interesting and fruitful taxonomic information.

Bentham and Hooker's system (1862-1883) of classification has been followed, with present day delimination of certain families. Keys to families, genera and species are so constructed as to assist in the easy identification of the plants reported in this work. The genera within families and the species within genera are arranged in an alphabetical sequence according to the classification of Bentham and Hooker. For each species the valid name with citation is followed by the synonyms, wherever applicable. Local names in Hindi, as far as could be ascertained, are given after the citation of literature. Identification of the species is based on the flora of Shetty and Singh (1987-1993).

A brief description of each species and intraspecific category is given, stressing primarily on characters not reflected in the key. This is followed by flowering and fruiting periods, general habitat, distribution and identification notes. Voucher specimens have been prepared as herbaria for future reference (Jain & Rao, 1976). *Cuscuta* is found commonly throughout the state. Plants are parasite on crops like *Pennisetum* spp. (*S. angustifolia* (D. Don) Saldhana) and *Brassica campestris* Oeder.( *Orobanche aegyptiaca* Pers.) as well as on ornamental or medicinal plants like *Euphorbia caducifolia* Haines (*Striga gesnerioides* var. *gesnerioides* (Willd.) Vatke) and *Adhatoda zeylanica* Medic., *Acacia nilotica* (L.) Del., *Ziziphus nummularia* (Burm. F.) Wt. & Arn., *Z. mauritiana* Lam. *Thevetia peruviana* (Pers.) K.Schum., *Tecoma stans* Juss., *Withania somnifera* (L.) Dunal and *Bougainvillea* spp. (*Cuscuta reflexa* Roxb.) alongwith *Croton bonplandianum* Baill., *Cassia obtusifolia* L., *Dipteracanthus patulus* (Jacq.) Nees, *Trianthema portulacastrum* L., *Tribulus terrestris* L., *Amaranthus* species, *Sphagneticola trilobata* (L.) Pruski, and *Medicago sativa* L. (*C. hyalina* Heyne ex Roth.).

**Table- 1**

| Plant name | Season | Month and Year | Latitude | Longitude |
|---|---|---|---|---|
| *Cuscuta reflexa* Roxb. | Winter | 19 December 2021 | 27˚35′07″ | 75˚09′20″ |
| *Cuscuta hyalina* Heyne ex Roth. | Winter | 28 October 2022 | 27˚74′11″ | 75˚02′50″ |
| *Striga gesnerioides* var. *gesnerioides* (Willd.) Vatke | Winter | 5 December 2022 | 27˚48′92″ | 75˚18′75″ |
| *Striga angustifolia* (D. Don) Saldhana | Rainy | 8 September 2019 | 27˚76′50″ | 75˚25′97″ |
| *Orobanche aegyptiaca* Pers. | Winter | 27 February 2020 | 27˚45′16″ | 75˚14′74″ |

## Conclusion

During the field survey only three parasitic plant families were identified namely Cuscutaceae, Scrophulariaceae and Orobanchaceae. Among these three families only five plants species were identified to be parasitic in nature i.e. *Stiga angustifolia* (D. Don) Saldhana, *S. gesnerioides* var. *gesnerioides* (Willd.) Vatke, *Cuscuta hyalina* Heyne ex Roth, *C. reflexa* Roxb. and *Orobanche aegyptiaca* Pers.

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