

A SYNOPSIS OF THE GENUS *TRIBULUS* LINN. (ZYGOPHYLLACEAE)
IN INDIA

M. P. NAYAR AND G. S. GIRI

Botanical Survey of India, Howrah

ABSTRACT

A synoptic review of the genus *Tribulus* in India is presented with key. The identity of *Tribulus terrestris* and *T. lanuginosus* is also discussed.

INTRODUCTION

Linnaeus (1753) adopted the genus *Tribulus* based on *Tribulus* Tournef. (1700) a *nom. nud.* (Type sp. *T. terrestris* L.). It is an old world genus with about 25 species distributed in the warmer dry regions. The genus is characterised by pinnately compound leaves, leaflets with markedly unequal bases, presence of intrastaminal glands and the fruit being a capsule which at maturity separates into 5 bony, spiny, tubercled or winged mericarps. It is very closely allied to the genus *Kallstroemia* with which it is often confused. But *Kallstroemia* is distinguished by the absence of intrastaminal glands and the capsules are 8-12 angled without large spines and separate at maturity leaving a persistent central axis.

Schweikerdt (1937) for the first time indicated the usefulness of the intrastaminal glands as an important and distinct character in the species delimitation of the genus *Tribulus*. Two types of glands occur in *Tribulus* i.e., extrastaminal and intrastaminal, the latter are useful for specific delimitation. Intrastaminal glands are sometimes free and sometimes united into a 5-lobed ring. These characters are specific to each species. Several workers (Launert 1963; Schreiber 1966; Porter 1967, 1969, 1971) have

stressed the importance of the intrastaminal glands for identification of species in the genus *Tribulus*.

Linnaeus (1753) described *T. lanuginosus* along with *T. terrestris*. The nature of habit and the presence of 5 or 6 pairs of leaflets in *T. lanuginosus* and *T. terrestris* are not diagnostic characters for specific differentiation. Hence there was confusion regarding the specific identity of *T. lanuginosus* and *T. terrestris*. However, Boissier (1867) for the first time mentioned that the styles of *T. lanuginosus* are elongated and fruits sparsely tubercled, in addition to the above mentioned characters. The long style nature is also clearly shown in Wt., Ic. tab. 98.

Later Shukla (1971) studied the *Tribulus terrestris* complex noting its variation in different habitats and considered two distinct forms in it. One form he considered as the long styled and the other as the short styled form. Apart from the small differences in the vegetative characters mentioned by Shukla (1971) the flowers of short styled plants are smaller with small pedicels and the long styled form are larger with long pedicels. Shukla (1971) recorded these observations after field studies. He also collected the seeds of both the forms and the seeds were sown separately and were examined by him upto the third generation.

He noted that the observations recorded from these plants upto the F_3 generation support the field observations and thus concluded that the variations are genetically maintained. The present authors also examined a good number of Indian specimens in different habitats and conclude that long-styled form is *T. lanuginosus* and the short-styled form is *T. terrestris*. This agrees with the diagnosis of Boissier (1867).

Tribulus Linn., Sp. Pl. 386. 1753, Gen. Pl. 5: 183. 1754; DC., Prodr. 1: 703. 1824;

Walp., Rep. II. 822. 1843; Benth. & Hook. f., Gen. Pl. 1: 264. 1862; Edgew. & Hook. f. in Hook. f., Fl. Brit. Ind. 1: 423. 1874; Engler in Engl. & Prantl, Pflanzenfam. ed. 2, 19a. 174; f. 84 E-Y. 1931; van Steenis in Bull. Jard. Bot. Buitenz. III. 13: 104. 1933; Hutch. & Dalz., Fl. W. T. A. 1: 362. 1958; Hutch., Gen. Fl. Pl. 2: 618. 1967; Porter in Ann. Miss. Bot. Gard. 56: 5. 1969; Porter in Journ. Arn. Arb. 53(4): 541. 1972; Hadidi, Fl. Iran. 98: 12. 1972.

KEY TO THE SPECIES

- 1a. Mericarp winged, not spiny
 - 2a. Wings of mericarps 2-4 mm broad, margin much dentate .. 3. *T. longipetalus*
 - 2b. Wings of mericarps 5-8 mm broad, margin shortly few dentate .. Subsp. *longipetalus*
- 1b. Mericarps spiny, not winged:
 - 3a. Flowers smaller, 7-15 mm diameter:
 - 4a. Mericarps with 2 lateral and two basal spines:
 - 5a. Style inconspicuous or hardly 0.5 mm long, leaflets oblong .. 6. *T. terrestris*
 - 5b. Style 1.5-2.5 mm long, leaflets ovate-oblong or ovate-orbicular:
 - 6a. Style glabrous, intrastaminal glands free not ciliated .. 2. *T. lanuginosus*
 - 7a. Mericarps pilose throughout, spines densely puberulous .. var. *lanuginosus*
 - 7b. Mericarps sparsely pilose on back only, spines glabrous, shiny .. var. *orientalis*
 - 6b. Style puberulous, intrastaminal glands connate and ciliated .. 5. *T. subrahanyamii*
 - 4b. Mericarps with two lateral spines and 20-25 unequal spines spreading throughout .. 4. *T. rajasthanensis*
 - 3b. Flowers larger, 25-40 mm diameter .. 1. *T. cistoides*

1. ***T. cistoides*** Linn., Sp. Pl. 387. 1753; DC., Prodr. 703. 1824; Cham. in Linnaea 5: 44. 1830; Edgew. & Hook. f. in Hook. f., Fl. Brit. Ind. 1: 423. 1874; Prain, Beng. Pl. 1: 293. 1903 (Rep. ed. 1: 201. 1963); R. Rama Rao, Flowering Pl. Trav. 57. 1914; van Steenis in Bull. Jard. Bot. Buitenz. III. 13: 105. 1933; Merr. & Perry in Journ. Arn. Arb. 21: 511. 1940; Backer & van Den Brink, Fl. Java 1: 242. 1963; Porter in Journ. Arn. Arb. 53: 543. 1979.

Type: *T. cistoides* (Linnean Herbarium, London. Microfich No. 547. 5).

Distrib.: Throughout the tropics.

INDIA: W. Bengal, Tamilnadu, Kerala.

2. ***T. lanuginosus*** Linn., Sp. Pl. 387. 1753; DC., Prodr. 1: 704. 1824; Wt. & Arn., Prodr. 145. 1834; Royle, Ill. Bot. Him. Mount. 1: 153. 1839; Wt., Ic. 98. 1840; Boiss., Fl. Orient. 1: 902. 1867; Stewart,

Punjab Pl. 37. 1869; Edgew. & Hook. f. in Hook. f., Fl. Brit. Ind. 1: 423. 1874 (in part); Prain, Beng. Pl. 1: 293. 1903, in part (Rep. ed. 1: 201. 1963); Duthie, Fl. Upper Gang. Pl. 1: 127. 1903, in part (Rep. ed. 1: 119. 1960); Gandhi in Fl. Hassan Dist. 397. 1976 (in part).

var. *lanuginosus*

Type: *T. lanuginosus*, Zeyl. 168 (BM).

Distrib.: Throughout India in the dry warmer regions upto an altitude of 3000 m along with *T. terrestris*.

var. ***orientalis*** (Kerner) Nayar et Giri, comb. nov.

T. orientalis Kerner, Ber. Naturwiss.-Med. Vereins Innsbruck 3. 1872. *T. terrestris* var. *orientalis* (Kerner) G. Beck, Fl. Niedr.-Osterr. 575. 1892; Hadidi, Fl. Iran. 98: 15. 1972. *T. saharae* A. Chev., Expl. Bot. Afr. Occ. Franc. 1: 96. 1920.



Plate I : *T. lanuginosus* var. *orientalis* (Kerner) Nayar et Giri

Figs. A-E : A. Habit. B. Flower. C. Flower, petals taken out. D. Mericarp, dorsal view. E. Mericarp, ventral view.

Type: Hungaria, A. Kerner (WU).

Kerner (1872) described *T. orientalis* a species with more or less glabrous mericarps, which was reduced by G. Beck (1892) to a variety under *T. terrestris*. The present work reveals that all the vegetative and floral characters of *T. orientalis* match well with the long styled *T. lanuginosus* and only differ by the nature of mericarp. But due to its long styled character and nature of mericarp it is being considered a variety under *T. lanuginosus*.

Specimens examined: INDIA: Tamil Nadu: Cuddalore, South Arcot, 25 Aug. 1899,

Barber 695; Karikili, Chingleput Dist., ± 120 m, 27.1.1976, Henry 47078; Chidambaram Park, Coimbatore Dist., 467 m, 4.10.1964, Chandrabose 28572; Sivaganga, Okkur forest, Ramnad Dist., 100 m, 19.8.1964, Ramamurthy 20973; Ambasamudram, Tinnevely, 27 May 1899, Barber 321; Sivanaperi, Tinnevely Dist., 225 m, 13.11.1962, Joseph 15297; Sayibaba Colony, Coimbatore Dist., 469 m, 22.11.1964, Chandrabose 28621; Manimuthar, Singampatti, Tinnevely Dist., 66 m, 2.3.1959, Sebastine 5479; Coimbatore, 425 m, 20.12.1915, Fischer 3848. Kerala: Trivandrum beach, 20.6.1971, Rao 8008. Andhra Pradesh: Wattan Sandy coast, 24.9.69, Rao 7115.

3. *T. longipetalus* Viv., Pl. Egypt. Dec. 10. tab. 2. f. 5. 1831; Hadidi, Fl. Iran. 98: 13. 1972; *T. alatus* Del., Fl. Aeg., 2. Ill. 62. 1813, nom. nud.; DC., Prodr. 1: 703. 1824; Boiss., Fl. Orient. 1: 902. 1867; Stewart, Punjab Pl. 37. 1869; Edgew. & Hook. f. in Hook. f., Fl. Brit. Ind. 1: 423. 1874; Cooke, Fl. Bombay 1: 160. 1901 (Rep. ed. 1: 170. 1958); Nair, in Rec. Bot. Surv. Ind. 11(1): 49. 1978. *T. mollis* Ehrenberg in Schweinf., Beitr. Fl. Aethiouv. 1: 29. 1867.

subsp. *longipetalus*

Type: Pr. Kahirum, Viviani (M).

Distrib.: INDIA: Punjab, Rajasthan.

subsp. *macropterus* (Boiss.) Maire ex Ozenda & Quezel, Trav. l'Inst. Recherches Sahariennes 14: 73. 1956; Hadidi, Fl. Iran. 98: 13. 1972; *T. macropterus* Boiss. Diagn. Pl. Or. Nov. Ser. 1, 1: 61. 1842 et Fl. Orient. 1: 903. 1867; *T. persicus* Kralik, Ann. Soc. Nat. Ser. 3: XI. 31. 1849.

Type: Aucher-Eloy 803-bis (G).

Distrib.: INDIA: Punjab, Rajasthan.

4. *T. rajasthanensis* Bhandari et Sharma in Bot. Not. 129. 367. 1976; Bhandari, Fl. Indian Desert 88. 1978.

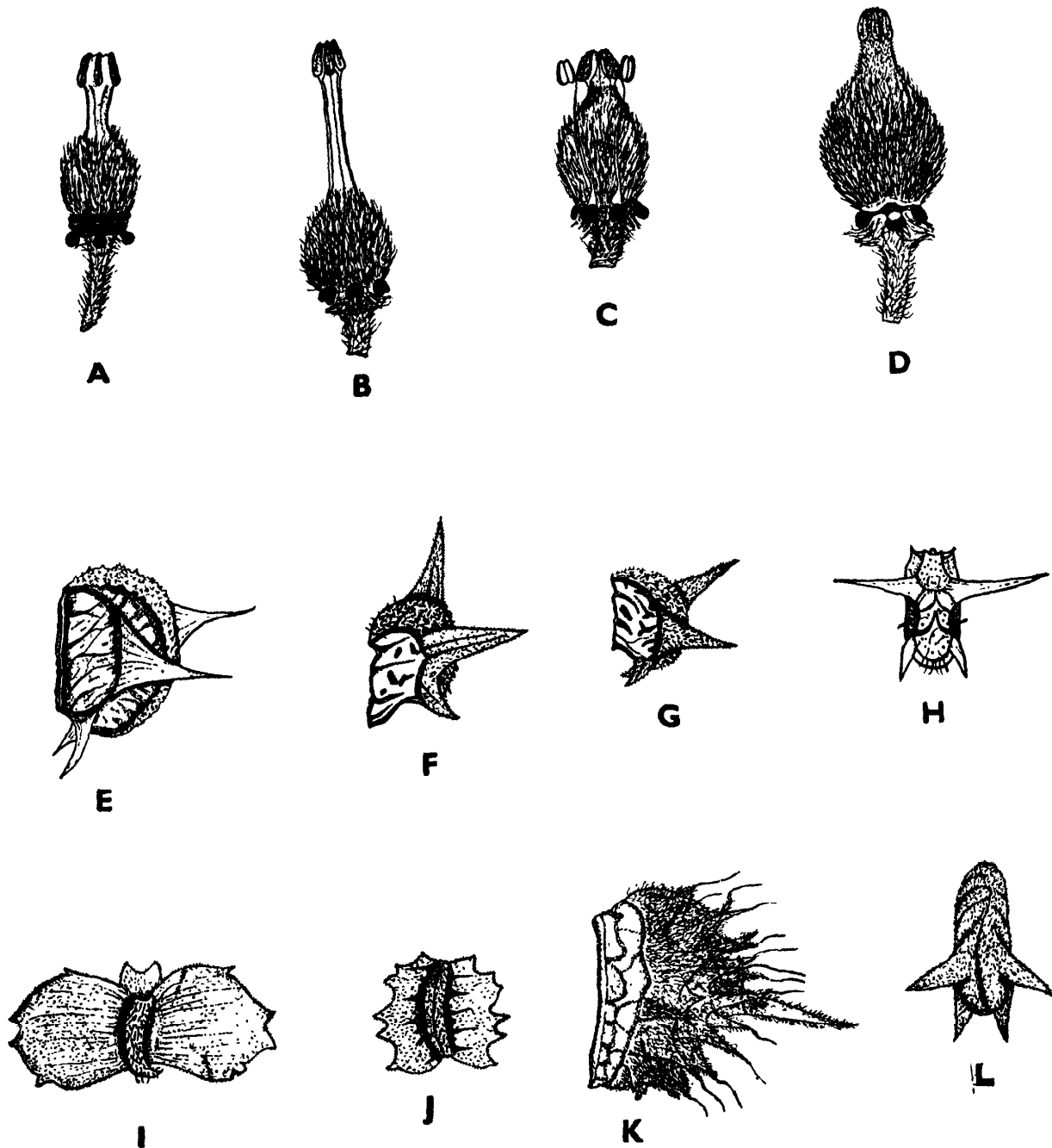


Plate II : Figs. A-D : Gynoecium : A. *T. cistoides*. B. *T. lanuginosus*. C. *T. terrestris*. D. *T. subramanyamii*. Figs. E-L: Mericarp : E. *T. cistoides*. F. *T. lanuginosus* var. *lanuginosus*. G. *T. terrestris*. H. *T. lanuginosus* var. *orientalis*. I. *T. longipetalus* subsp. *macropterus*. J. *T. longipetalus* subsp. *longipetalus*. K. *T. rajasthanensis*. L. *T. subramanyamii*.

Type: Jodhpur Dist. Common on the rocky plateau of Mussurie, 3.10.1959, *Bhandari* 537 (CAL, K).

Distrib.: INDIA: Rajasthan.

5. *T. subramanyamii* P. Singh, Giri et V. Singh in ed.

Type: On the way to Varapalayam, Coimbatore, 666 m, 25.7.1956, K. *Subramanyam* 390. Holotype (CAL); Isotype (CAL, MH).

Distrib.: INDIA: Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu.

6. ***T. terrestris*** Linn., Sp. Pl. 387. 1753; DC., Prodr. 1: 703. 1824; Dalz. & Gibs., Bombay Fl. 45. 1861; Boiss., Fl. Orient. 1: 902. 1867; Stewart, Punjab Pl. 37. 1869; Edgew. & Hook. f. in Hook. f., Fl. Brit. Ind. 1: 423. 1874, in part; Cooke, Fl. Bombay 1: 160. 1901, in part (Rep. ed. 1: 170. 1958); Prain, Beng. Pl. 1: 292. 1903, in part (Rep. ed. 1: 201. 1963); Duthie, Fl. Upper Gang. Pl. 1: 127. 1903, in part (Rep. ed. 1: 119. 1960); Gamble, Fl. Pres. Madr. 1: 130. 1915 (Rep. ed. 1: 92. 1957); Haines, Bot. B. & O. II. 153. 1921 (Rep. ed. 1: 159. 1961); Engler in Engl. & Prantl, Pflanzenfam. ed. 2, 19a. 176. 1931; Kashyap, Lahore Dist. Fl. 56. 1936; Hadidi, Fl. Iran 98: 15. 1972; Srivastava, Fl. Gorakhpurensis 63. 1976; Babu, Herbaceous Fl. Dehra Dun 100: 1977; Nair, Punjab Plains in Rec. Bot. Surv. Ind. 11(1): 49. 1978; Bhandari, Fl. Indian Desert 89. 1978.

Type: *T. terrestris* (Linnean Herbarium, London. Microfich no. 547. 4).

Distrib.: INDIA: Well distributed throughout India particularly in the dry warmer regions with *T. lanuginosus*.

REFERENCES

- LAUNERT, E. Zygophyllaceae pp. 125-130 in A. W. Exell *et al.* (Editors), Flora Zambesiaca. 2(1). London. 1963.
- NAIR, N. C. AND K. S. NAITHAWAT. Vascular anatomy of the flowers of some species of Zygophyllaceae. *Journ. Indian Bot. Soc.* 37: 172-180. 1958.
- PORTER, D. M. Another *Tribulus* adventive in the New world. *Rhodora* 69: 455-456. 1967.
- Flora of Panama. Zygophyllaceae in *Ann. Miss. Bot. Gard.* 56(1): 1-7. 1969.
- Notes on the Floral glands in *Tribulus* (Zygophyllaceae) in *Ann. Miss. Bot. Gard.* 58(1): 1-5. 1971.
- SCHREIBER, A. Zygophyllaceae pp. 1-19 in *Prodromus einer Flora von Sudwest afrika* 4(65). 1966.
- SCHWEIKERDT, H. G. An account of the South African species of *Tribulus* Tourn. ex Linn. *Bothalia* 3: 159-178. 1937.
- SHUKLA, S. P. Intraspecific variants in *Tribulus terrestris* Linn. *Indian Forester* 97(4): 226-228. 1971.