

NSB

ZYGOPHYLLACEAE

Kallstroemia affinis

NSB

ZYGOPHYLLACEAE

Kallstroemia angustifolia

NED

ZYGOPHYLLACEAE

Kallstroemia bicolor

NIS

24 GONYPHIACEAE

Kallstroemia curvicaulis

NIB

kallstroemia
pentandra

Kallstroemia
platyptera

253

ZYGOPHYLLACEAE

Kallstroemia solandri

1. TRIBULUS, Linn.

(*Tribulopsis*, R. Br.)

ZYGOPHYLLACEA

Sepals 5, rarely 6. Petals as many, flat. Disk annular, 10-lobed or sinuate, with a gland at the base of each of the inner stamens, alternating with the petals. Stamens twice as many as petals, the filaments filiform, without appendages. Ovary of 5 or sometimes more cells, with 1 or 2 to 5 superposed ovules in each cell. Fruit separating into as many cocci as carpels, hard, indehiscent, and each usually bearing 2 or more prickles or tubercles. —Herbs, usually prostrate or divaricate and hairy. Leaves abruptly pinnate, opposite, with one of each pair smaller than the other, or sometimes abortive or all alternate. Stipules small, lanceolate, or falcate. Pedicels solitary in the axil of the smaller leaf of each pair, or opposed to the leaf when alternate. Flowers white or yellow.

The genus is dispersed over the greater part of the tropical and warm regions of the globe, extending into Europe and N. America. Of the Australian species, one is abundant in Asia, Africa, and S. Europe, another is most common in tropical America, less so in Asia and Africa, and the other 9 are all endemic.

Leaves, at least the upper ones, opposite. Glands of the disk not very prominent. Ovules 2 or more in each cell. (*Tribulus* proper.)

Cocci rounded at the back, without angular or winged edges.

Cocci with 2 or 4 prickles, rarely minute or deficient.

Leaves almost all opposite. Ovules 3 or 4 in each cell.

Annual. Flowers small. Petals about $\frac{1}{4}$ in. 1. *T. terrestris*.

Perennial. Flowers large. Petals about $\frac{1}{2}$ in. 2. *T. cistoides*.

Lower leaves alternate. Ovules 2 in each cell. Flowers large 3. *T. ranunculiflorus*.

Cocci covered with numerous nearly equal prickles 4. *T. hystrix*.

Cocci with prominent almost winged angles, and 2 prickles on the back between them 5. *T. macrocarpus*.

Cocci broadly winged at the angles, without prickles. Plant glabrous except the inside of the sepals. Cocci smooth 6. *T. platypterus*.

Plant hirsute. Cocci strongly reticulate on the back and sides 7. *T. hirsutus*.

Leaves (except *T. minutus*) all alternate. Glands of the disk prominent. Ovules solitary. Fruit pyramidal, the cocci with 2 or 4 tubercles or small prickles below the middle. (*Tribulopsis*, R. Br.)

Leaflets 2 pairs, the lowest much smaller. Perfect stamens usually 5 8. *T. pentandrus*.

Leaflets about 3 pairs, ovate, the lowest not far from the stem. Anthers 5 short, 5 oblong or linear 9. *T. bicolor*.

Leaflets about 3 pairs, ovate or lanceolate, the lowest distant from the stem. Anthers 10, nearly similar. Flowers small 10. *T. Solandri*.

Leaflets 4 to 6 pairs, linear. Anthers 10, similar. Flowers large 11. *T. angustifolius*.

Leaflets 3 to 6 pairs, small ovate or lanceolate. Leaves mostly opposite. Anthers 10, similar. Flowers very small 12. *T. minutus*.

NIB

ZYGOPHYLLACEAE

Tribulus astrocarpus

2. **T. cistoides**, Linn.; DC. *Prod.* i. 703. A perennial, forming at length a thick rootstock. Branches procumbent or ascending, attaining 1 to 2 ft. Indumentum more silky than in *T. terrestris*. Larger leaf of each pair with frequently 7 or 8 pairs of leaflets. Flowers large, on longer peduncles than in *T. terrestris*; the sepals 3 or 4 lines long, very acute, silky-hairy; the petals obovate, at least $\frac{3}{4}$ in. long. Anthers usually (perhaps not always) oblong or linear. Fruit like that of *T. terrestris* or rather larger, with 2 or very rarely 4 prickles to each coccus.—A. Gray, Ill. Gen. N. Am. t. 145.

N. Australia. Gulf of Carpentaria, *R. Brown*; Port Essington, *Armstrong*; Albert river and Swears Island, *Henne*.

Queensland. Northumberland Island, *R. Brown*; Port Curtis and Port Mølle, *M'Gillivray*; Lord Howick's group, *F. Mueller*; Port Denison, *Fitzalan*.

N. S. Wales. Liverpool plains, *Leichhardt*.

The species is frequent in the West Indies and many parts of tropical America, and in the Pacific islands, rare in tropical Asia and Africa.

4. **T. hystrix**, R. Br. in App. Sturt. Exped. 6. A diffuse or prostrate perennial or undershrub, the branches densely tomentose-hirsute or woolly. Lower leaves (at least in some specimens) alternate, upper ones opposite, the larger one of each pair with 6 to 8 or even more pairs of leaflets, rather broad and softly silky-hairy. Flowers smaller than in *T. cistoides*, but much larger than in *T. terrestris*, the petals generally about $\frac{1}{2}$ in. long. Ovary very hirsute, with 3 or 4 ovules in each cell. Cocci very villous, covered all over with hairy prickles, either subulate from the base or more or less thickened and conical.—*T. occidentalis*, R. Br. l. c. (from the short diagnosis given).

N. Australia. N.W. coast, *A. Cunningham*; on sandy soil, in the interior from Nichol Bay, *F. Gregory*.

S. Australia. Towards Spencer's Gulf, *Warburton*.

The specimens I have seen are most of them very incomplete, and those described by R. Brown unfortunately mislaid. The few fruits on Gregory's specimens show, however, that the character relied on by R. Brown for the distinction of *T. hystrix* and *T. occidentalis*, the subulate or conical prickles of the fruit, does not hold good. In M'Donnell Stuart's collection is a fragmentary specimen from Fink river, with a much larger flower, which may possibly be a variety of the same species, but is indeterminable without the fruit.

5. **T. macrocarpus**, *F. Muell. Herb.* Foliage and flowers unknown. Cocci quite glabrous, nearly $\frac{3}{4}$ in. long, the edges bordered by narrow, vertical, hard, slightly denticulate wings, with 2 straight, horizontal, conical prickles on the back about halfway up and a vertical prominent rib between them, the sides smooth.

N. Australia. In the interior, from Nichol Bay, *F. Gregory*.

NIP

ZYGOPHYLLACEAE

Tribulus occidentalis

1. **T. terrestris**, Linn.; DC. *Prod.* i. 703. A prostrate annual or biennial, more or less hirsute or silky-hairy, especially the young shoots, the stems extending often to 1 or 2 ft. Leaves opposite, unequal; leaflets of the larger one usually 5 to 7 pairs, obliquely oblong, 3 to 5 lines long. Pedicels shorter than the opposite larger leaf. Flowers small, the sepals rarely attaining 2 lines and often much less, the petals rather longer, but very rarely nearly twice as long. Anthers 10, all small and perfect. Ovules 3 or 4 in each cell. Cocci 5, hard, 2 to 3 lines long, glabrous or hairy, rounded on the back, with 2 marginal, divaricate, horizontal, subulate or conical prickles about halfway up, and often 2 smaller reflexed ones lower down, the rest of the surface usually tuberculate or shortly muricate. Seeds 2 to 4 in each coccus, horizontal and separated by transverse partitions.—Reichb. Ic. Fl. Germ. v. t. 161; F. Muell. Pl. Vict. i. 99; *T. lanuginosus*, Linn.; DC. *Prod.* i. 704; Wight, Ic. t. 98; *T. acanthococcus*, F. Muell. in Trans. Phil. Soc. Vict. i. 9.

N. Australia. Sturt's Creek, F. Mueller.

Queensland. Gilbert river, F. Mueller.

N. S. Wales. Darling river, Dallachy.

Victoria. At the junction of the Murray and Murrumbidgee, F. Mueller.

S. Australia. N. of Lake Torrens, M'Douall Stuart's Expedition.

The species is a common weed in S. Europe, temperate Africa, and S. Asia.

3. ZYGOPHYLLUM, Linn.

ZYGOPHYLLACEAE

Sepals 4 or 5. Petals as many, flat, contracted into a short claw. Disk concave, angular or cup-shaped. Stamens twice as many as petals, inserted at the base of the disk; filaments filiform, with an adnate scale or wing-like appendage at the base, which however is wanting in some of the Australian species. Ovary sessile, 4- or 5-angled, narrowed at the top into an angular style, 4- or 5-celled, with 2 or more superposed ovules in each cell. Fruit capsular, with 4 or 5 angles or vertical wings, indehiscent or separating into cocci or opening loculicidally, the endocarp sometimes separating. Seeds 1 or more in each cell, pendulous; albumen scanty.—Shrubs or undershrubs, often prostrate. Leaves opposite, with 2 distinct leaflets or rarely 2-lobed, frequently fleshy. Stipules small. Peduncles 1-flowered, axillary, solitary or rarely 2 together. Flowers white or yellow.

A considerable and widely-spread genus, though confined, with one exception, to the Old World, and chiefly numerous in the desert or saline regions of central and western Asia, North and South Africa. The Australian species are all endemic.

Filaments winged at the base. Capsule angular, loculicidal.

Capsule broad and truncate at the top, the angles usually produced into short appendages. Flowers mostly 5-merous . . . 1. *Z. apiculatum*.

Capsule equally rounded at the top and the base.

Capsule 4 to 8 lines long, the cells 2- to 4-seeded. Wings of the filaments toothed. Flowers usually 4-merous . . . 2. *Z. glaucescens*.

Capsule 2 to 3 lines long, the cells 1-seeded. Wings of the filaments small and entire. Flowers usually 5-merous . . . 3. *Z. iodocarpum*.

Capsule oblong, the angles produced at the top into erect appendages . . . 4. *Z. prismatothecum*.

Filaments subulate, not winged.

Capsule angular, loculicidal, broad and truncate at the top, narrow at the base . . . 5. *Z. Billardieri*.

Capsule indehiscent, the angles produced into broad membranous wings . . . 6. *Z. fruticosum*.

Varieties with leaves 2-lobed instead of 2-foliolate occur in *Z. iodocarpum*, *Z. prismatothecum*, *Z. Billardieri*, and *Z. fruticosum*; with lobed or crenate leaflets in *Z. glaucescens* and *Z. iodocarpum*; and forms or states with minute flowers in several of the species.

3. **Z. iodocarpum**, *F. Muell. in Linnæa*, xxv. 372, and *Pl. Vict.* i. 105. A small, much-branched, diffuse annual. Leaflets oblong-cuneate or almost linear, very obtuse, rarely $\frac{1}{2}$ in. long, the petiole often 2-winged, especially towards the top. Flowers very small, usually 5-merous, the petals not 2 lines long. Filaments dilated at the base into short, narrow, entire wings, entirely adnate or very shortly free. Capsule 2 or rarely 3 lines long, loculicidal, the angles equally rounded at the top and the base. Seeds solitary in each cell.

N. S. Wales. Between the Darling and the Lachlan rivers, *Burkitt*.

Victoria. On the Murray river below the Murrumbidgee, *F. Mueller*.

S. Australia. Flinders Range and near Lake Torrens, *F. Mueller*.

Var. *lobulatum*. Leaflets irregularly 2- or 3-lobed or toothed.

W. Australia. Champion Bay, *Oldfield*.

Var. *bilobum*. Leaflets continuous with the petiole, as in *Z. prismatolhecum*. Capsule rather longer than in the other varieties. W. Australia, *Drummond*.