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Desmodium tortuosum (Fabaceae), a non-indigenous legume species new to Singapore

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Abstract. *Desmodium tortuosum* is discovered as a new addition to Singapore's non-native flora. Although the only known population fruits profusely, its current known distribution in Singapore is still restricted. Thus, it is tentatively assessed as a 'casual' species in Singapore.

Key words. casual, Desmodieae, Leguminosae, new record, non-native, Papilionoideae

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INTRODUCTION

The genus *Desmodium* Desv., along with its recently segregated genera in the tribe Desmodieae, has recently been reviewed for Singapore (Ho et al., 2021). *Desmodium* and its related genera (hereafter, the *'Desmodium* group') is most easily distinguished by the fruit which typically breaks into one-seeded segments on maturity—a loment—and the presence of hooked hairs (Ohashi, 1973; 2004). In Singapore, the group is represented by members in the genera *Grona* Lour., *Dendrolobium* (Wight & Arn.) Benth., *Desmodium*, *Ohwia* H.Ohashi and *Pleurolobus* J.St.-Hil. (Ho et al., 2021).

Recently, a previously unrecorded non-native species belonging to the *Desmodium* group has been discovered in Singapore. The present paper describes the first occurrence of *Desmodium tortuosum* (Sw.) DC. as a second non-native species of the genus *Desmodium* sensu stricto for the flora of Singapore. A description and illustrations (Figs. 1, 2) based on the Singapore material are given. Voucher specimens are deposited in the herbarium of the Singapore Botanic Gardens (SING). Herbarium acronyms follow those of Thiers (2023).

TAXONOMY

Desmodium tortuosum (Sw.) DC., Prodr. 2: 332 (1825); Knaap-van Meeuwen, Reinwardtia 6(3): 260 (1962); Verdcourt, Man. New Guinea Legumes 408, fig. 94f (1979); Ohashi, J. Jap. Bot. 79: 138 (2004). – *Hedysarum tortuosum* Sw., Prodr.: 107 (1788). – *Meibomia tortuosa* (Sw.) Kuntze, Revis. Gen. Pl. 1: 198 (1891). – TYPE: Jamaica, Swartz s.n. (lectotype S [S10-14459], designated by Schubert (1971: 474); syntypes B [Herb. Willd. 13803], GH, S [S-R-2776]).

Description. Subshrub, stems single, erect standing, up to 1.8 m tall, branched almost exclusively in upper nodes close to the main shoot tip, first internode of branches often exceptionally long, reaching up to about 17 cm long, surface of stem and branches pubescent with tiny hooked hairs. **Leaves** alternate, unifoliolate when young, becoming trifoliolate; stipules ±persistent, deltoid, c. 5–12 × 3–5 mm, base often auriculate at the base only on the leaf-opposed margin, sometimes (larger ones) fused and clasping the stem, apex long-attenuate; petiole 2.4–10 cm long, minutely hooked-hairy intermixed with few straight hairs; rachis 1.2–3 cm long; stipels subulate, 2–9 mm long; terminal leaflet blade rhombic-ovate to elliptic, 5.9–12.6 × 2.6–4.8 cm, lateral ones c. 2/3 the size, base obtuse, apex obtuse with a mucron, both laminal surfaces sparsely hairy. **Inflorescences** racemose, terminal, and also axillary along upper shoots, up to c. 27 cm long; peduncle and rachis densely pubescent with mixture of short hooked-hairs and longer straight hairs with a swollen base, bracts lanceolate, 4.5 mm long, bracteole linear-lanceolate c. 2 mm long, both early caducous, flowering lax, 2–3-flowered at each node, often with one poorly developed; pedicels 5–6 mm long, becoming 12 mm at fruiting stage, with hooked hairs intermixed with spreading glandular hairs. **Calyx** campanulate, often persistent at fruiting stage, 2.5 mm, 4-lobed; upper lobes c. 2 mm long, slightly 2-toothed, teeth c. 1 mm long; lateral lobes long triangular, 2 mm long, lower lobe 2.5 mm long. **Corolla** pinkish-purple; standard broadly obovate, 6 × 4 mm, apex slightly emarginate; wings oblong, 5 × 2.5 mm, shortly clawed, claw 0.5 mm long; keel obovate, 3 × 2 mm, long-clawed, claw 2 mm. Stamens diadelphous, 5 mm long. Ovary linear, 5.5 mm. **Legume** a loment, moniliform, green becoming brown at

maturity, twisted, up to 24 × 3.5 mm at maturity, constricted deeply along both sutures between 4–8-jointed articles; articles elliptic-rhomboidal, 4–4.5 mm long, nearly as long as wide, densely hooked-hairy throughout. (Figs. 1, 2).

Etymology. The species epithet *tortuosum* in Latin means bending and turning in different directions, referring to the twisted fruit pods at maturity.

Common names. Florida beggar-weed, twisted tick trefoil. See Webster & Cardina (2004) for additional common names that have been used.

Distribution. Native of subtropical and tropical America, naturalised in Africa, Asia (including India, China, Taiwan, Philippines, Java), New Guinea, Australia and the Pacific islands (Knapp-van Meeuwen, 1962; Ohashi, 2004; Webster & Cardina, 2004). New to Singapore.

Ecology. *Desmodium tortuosum* was introduced both as a forage and a green-manure crop throughout the tropics. The species has subsequently been reported to escape from cultivation and is regarded as a weed in several cases (see Webster & Cardina, 2004). The population in Singapore was first observed when the hoarding of a construction site (Orchard MRT Station Exit 13), which had been standing on site for several years, was removed. Seeds of the species may have been introduced through soil brought in from either the construction or landscaping works. The plants, observed mostly within a three by one meter planting bed, were bearing numerous pods and flowering profusely. The pink flowers were visited by bees including a small female *Megachile* (subgenus *Eutricharaea*) leafcutter bee. The population was found to be cut within a week after its first observation, with numerous sections of the pods fallen into a nearby drain. Despite the observed regular cutting back of the horticultural landscape, the population of *Desmodium tortuosum*, albeit with lower density and smaller plant sizes, persists at the same site nine months after its first observation.

Local status. Currently, only one local population is known. It is tentatively assessed here as 'casual' for Singapore following the definition of non-indigenous plants given in Lindsay et al. (2022). However, it may later be found to be naturalising if more self-replacing populations are discovered in other parts of Singapore. Fallen seeds in the drain are possibly able to germinate and the species may establish elsewhere in Singapore following the drainage system. From historical photographs of the site along Orchard Boulevard via Google Maps, we infer that the landscaping work of that area probably started around 2021. This suggests that it takes about a year for the species to establish a robust population, as seen when the hoarding was taken down. The pods, which easily stick to clothing, can be carried to other localities by passers-by and workers maintaining the area. In fact, a single plant was recently found to suddenly appear at another location that one of the authors (MWSO) frequently visits. The individual was removed assuming that it has been unintentionally carried there, and was made into a specimen (SING2023-144).

Material examined. Singapore: Orchard Boulevard, vicinity of Orchard MRT Station Exit 13, 7 August 2022, M.W.S. Ong SING2022-847 (SING); Loc. Cit., 28 November 2022, B.C. Ho 22-366 (SING); Sembawang, Montreal Green Park, 14 May 2023, M.W.S. Ong SING2023-144 (SING).

Notes. The protologue of *Hedysarum tortuosum* mentioned only "Sloan. h. I. 184. t. 116. f. 2"]. India occidentalis". Schrire (1988) added that the "Swartz specimen has been chosen as the type (Schubert pers. comm. 1983) in preference to the Sloan[e] illustration: t. 116 f. 2 (Voy. Jamaica 1, 1707) [as '116, t. 9 (1696)'] …". The collection in the herbarium of the Swedish Museum of Natural History (S) listed by Schubert (1971), Pedley (1999) and Lima et al. (2014) as 'holotype' should be corrected to lectotype in conformity with ICN Art. 9.10 (Turland et al., 2018) and as advocated by McNeill (2014). However, two specimens (S10-14459, S-R-2776) in S are indicated as nomenclature types from Swartz with the original name *Hedysarum tortuosum*. Since S10-14459 has been annotated by both A.K. Schindler on 29 June 1914 and B.G. Schubert in August 1950, this is assumed to be the chosen lectotype.

DISCUSSION

With the addition of *Desmodium tortuosum* to the flora of Singapore, there are now nine species in the *Desmodium* group in Singapore. *Desmodium scorpiurus* (Sw.) Poir., *Ohwia caudata* (Thunb.) H.Ohashi. and *Pleurolobus gangeticus* (L.) J.St.-Hil. are the other members of the group that are considered non-indigenous to Singapore. *Dendrolobium umbellatum* (L.) Benth. is a native tree species. Three species and their infraspecific taxa considered native to Singapore which were previously placed in *Desmodium* have been transferred to the genus *Grona* (Ho et al., 2021), while a fourth species, *Grona ovalifolia* (Prain) H.Ohashi et al., was the result of the recent elevation of *Grona heterocarpos* subsp. *ovalifolia* (Prain) H.Ohashi & K.Ohashi, to the species level (Ohashi et al., 2021).

The twisted lomentaceous fruit and its long fruiting pedicels of over 10 mm long (Fig. 2b) can quickly set *Desmodium tortuosum* apart from other species in the *Desmodium* group occurring in Singapore. As reflected in the current species nomenclature, it is closest to *Desmodium scorpiurus* among the species recorded in Singapore. In habit, *Desmodium scorpiurus* is prostrate to ascending and at most weakly erect, whereas *Desmodium tortuosum* is a self-supporting erect

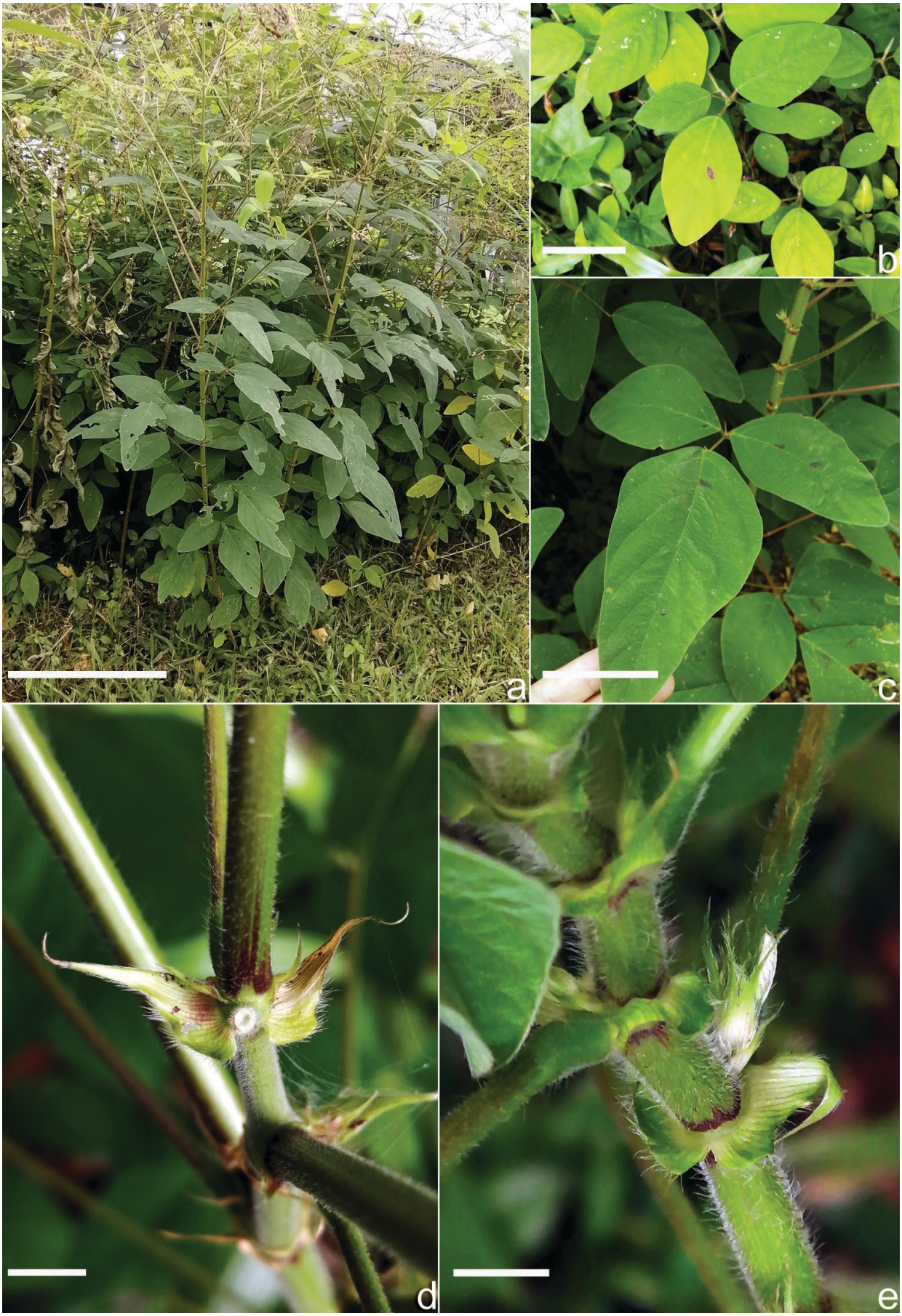

Fig. 1. *Desmodium tortuosum*. a, Erect standing habit, with terminal and subterminal inflorescences (scale bar = 30 cm); b, Young saplings with unifoliolate leaves (scale bar = 2 cm); c, A mature trifoliolate leaf with typical rhombic-ovate terminal leaflet (scale bar = 5 cm); d, A pair of typical free stipules (scale bar = 5 mm); e, Pairs of fused stipules (scale bar = 5 mm). All from M.W.S. ONG SING2022-847 (SING). (Photographs: Melissa W.S. Ong).

subshrub. Vegetative specimens may be confused especially when *Desmodium tortuosum* can sometimes have fused stipules that are clasping the stem (amplexicaul) (Fig. 1e) like those typical of *Desmodium scorpiurus*. Apart from the characters already mentioned above, the loment segments or articles of *Desmodium tortuosum* are nearly isodiametric, i.e., as long as wide, whereas those of *Desmodium scorpiurus* are linear, at least 10 times longer than wide.

Fig. 2. *Desmodium tortuosum*. a, Flowers with pinkish-purple corolla (scale bar = 1 cm); b, Mature inflorescence with twisted pods, each subtended by an elongated pedicel (scale bar = 2 cm). All from M.W.S. ONG SING2022-847 (SING). (Photographs: Melissa W.S. Ong).

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