

## Flora of Singapore precursors, 38: Additional new records of Euphorbiaceae for Singapore

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**ABSTRACT.** Three species of Euphorbiaceae are newly recorded for Singapore, two of which (*Euphorbia prostrata* Aiton and *Microstachys corniculata* (Vahl) A.Juss. ex Griseb.) are non-native, and one (*Croton erythrostachys* Hook.f.) is presumed native but nationally extinct. The record of *Microstachys corniculata* is supposedly new for the continent. A lectotype is designated for *Microstachys corniculata*.

**Keywords.** *Croton*, *Euphorbia*, *Microstachys*, neophytes

### Introduction

Ongoing studies for the *Flora of Singapore* have revealed numerous new records and rediscoveries for the country in recent years (e.g., Lim et al., 2018; Van Welzen et al., 2020), culminating in the recent publication of a detailed checklist of the native and introduced plant diversity of Singapore (Lindsay et al., 2022). Here three additional new records of Euphorbiaceae for Singapore are added.

### New records

**1. *Croton erythrostachys*** Hook.f., Fl. Brit. India 5: 391 (1887). – TYPE: [Malaysia], ‘Malacca’, s.d., *Cuming 2393* (lectotype K [K000253883], designated by Esser & Veldkamp (2008: 170)).

*Croton calcicola* Ridl., Bull. Misc. Inform. Kew 1923: 366 (1923). – TYPE: [Malaysia], Selangor, Kanching, December 1920, *Ridley s.n.* (lectotype K, designated by Esser & Veldkamp (2008: 170)).

Shrub to tree to 5 m tall (in Singapore), rarely described as larger elsewhere. **Indumentum** of stellate-dendritic trichomes (0.3–)0.6–0.7 mm diam., with 8–10 free radii, pale creamish with a slightly darker centre, appearing pale brownish hispid. **Stipules** c. 5 mm long, linear, soon caducous. **Leaves** alternate; petiole (1.5–)4–7 cm long, densely pubescent; blade elliptic to slightly ovate or obovate, 14–21 × 4–7.5 cm, base obtuse to rounded, margin serrulate to subentire, apex acute to acuminate, not

glaucous below, glabrous above, with distinct but not very dense trichomes below or glabrescent, appearing brownish when dry, surface clearly visible; basal glands cup-shaped, 0.7–1 mm diam., prominent and usually stipitate; venation triplinerved, side veins in 8–13 pairs. **Inflorescences** terminal, elongate thyrses, creamish in bud, 3–12 cm long, distinctly pubescent all over, bisexual; floral bracts 1–1.5 mm long, linear. **Pistillate flowers** at base, pedicel 3–4 mm long; sepals nearly as long as the ovary, 5, persistent, c. 4 mm long in fruit, free; further details not seen. **Staminate flowers** distal, not studied. **Fruits** several (e.g., 3) per infructescence; pedicel c. 5 mm long; capsular, 6–9 mm long, globose, quite smooth to rough, distinctly pubescent. **Seeds** brown, subglobose, c.  $7 \times 7$  mm, obviously ecarunculate.

**Distribution.** Myanmar, Thailand, Peninsular Malaysia and Borneo (Sabah, Sarawak) (Esser & Veldkamp, 2008).

**Ecology.** No details recorded for Singapore. It is often found over sandstone, also in heath forests, more rarely over limestone, from sea level to 800 m elevation.

**National conservation assessment.** Nationally Extinct (NEx). Globally not assessed but presumably not threatened.

**Specimen examined.** SINGAPORE: **Central Catchment Nature Reserve:** MacRitchie Reservoir, 1 Apr 1982, *Mhd Shah & Ali Ibrahim MS 4187* (SING [SING0045935]).

**Notes.** *Croton* L. is a large pantropical genus of 800 or more, often quite similar species, with slightly fewer than 100 species in Asia. Among superficially similar shrub or tree species in Singapore, such as *Croton laevifolius* Blume, *C. erythrostachys* can be recognised in particular by the serrulate leaves with an indumentum on the lower surface of scattered but distinct, notably large, stellate-dendritic trichomes up to 0.7 mm diam., giving the leaves a somewhat hispid-rough appearance, and by distinct cup-shaped glands at the blade base, up to 1 mm diam. The new record was described as a tree of 15 ft (approximately 4.5 m) in size.

**2. *Euphorbia prostrata*** Aiton, Hort. Kew. ed. 1, 2: 139 (1789). – *Chamaesyce prostrata* (Aiton) Small in Fl. S.E. U.S. 713 (1903). – TYPE: Native of the West Indies, cultivated in Kew Gardens, 1758, *Miller s.n.* (holotype BM).

Prostrate to partly erect annual herb, up to 15 cm tall, many-stemmed, in upper part with short axillary shoots; dark green to partly reddish. **Indumentum** consisting of simple, pale, erect trichomes, 0.1–0.2 mm long, on the stems often in a narrow band only. **Stipules** interpetiolar, persistent, united, 0.3–0.7 mm long, triangular and entire to apically bifid. **Leaves** opposite; petiole 0.5–1 mm long; blade broadly obovate-elliptic, the largest  $3.5\text{--}6 \times 2\text{--}5$  mm and quite homogeneous in size, base slightly oblique with one side subcordate, the other side obtuse, margin shallowly serrate

apically, apex rounded to submucronate, below greyish when alive, glabrous above, with erect trichomes only distally below, eglandular, venation very indistinct to invisible, triplinerved, side veins 4 or 5 pairs. **Inflorescences:** cyathia pinkish with purple glands, few (2–4) grouped in axillary dichasia, interspersed with distinct, leaf-like pairs of bracts each  $1-2 \times 0.7-1.2$  mm and apically hairy, glabrous or with rows of trichomes; involucre on a peduncle of c. 1 mm above the last pair of bracts, 0.7–0.8 mm long, glabrous or distally with scattered trichomes; glands 4, c. 0.1 mm wide, stalked, with minute appendages or not. **Pistillate flowers** shortly pedicellate; without sepals or petals; ovary distinctly pubescent, stigmas 0.2–0.3 mm long, divided for half or more of their length but not completely. **Fruits** with a pedicel of 0.5–1.2 mm; capsule  $1.1-1.2 \times 1.2-1.3$  mm, sulcate and sharply keeled, partly glabrous but with rows of erect trichomes on keels. **Seeds** c.  $0.9 \times 0.6$  mm, reddish, yellow- to pale brown, not papillate but with (4–)5 distinct, transverse grooves, ecarunculate.

**Distribution.** Originating from tropical America, it was described from seeds grown at Kew Gardens. It is now a widespread, naturalised weed in tropical, subtropical and Mediterranean regions around the world. In mainland Asia it has been recorded from Nepal to China and Thailand (Esser, 2005), and in Malesia from Sumatra, Java and eastwards, but apparently not from Peninsular Malaysia. It is also reported as a neophyte in several European countries (Carni, 1997).

**Ecology.** Not recorded in Singapore, but elsewhere known to be a weedy, anthropogenic herb.

**National conservation assessment.** Non-native former casual. Globally Least Concern (LC).

**Specimen examined.** SINGAPORE: **Pasir Panjang:** 1896, *Mat s.n.* (SING [SING0231892]).

**Notes.** This is one of several small weedy and often prostrate *Euphorbia* L. species, formerly separated as *Chamaesyce* S.F.Gray. The species is superficially similar to *Euphorbia thymifolia* L., but differs, e.g., by pedicellate fruits pubescent only in three rows along the keels, while *E. thymifolia* has sessile fruits ripening within the cyathial cup and being pubescent on their whole surface. These three rows of trichomes on the fruits are very characteristic for *Euphorbia prostrata*. While *Euphorbia thymifolia* can be found in places with heavy disturbance, even in cracks in the road, and is common in Singapore (Lindsay et al., 2022), *E. prostrata* seems to prefer path edges, gardens and open places in cultivated areas with patchy herbaceous vegetation but without heavy disturbance (see also Carni, 1997). It is easily possible that the species has been confused with *Euphorbia thymifolia* and, therefore, may have been overlooked and undercollected, being perhaps more common than the only known, historical collection suggests. It may be worthwhile to look at these tiny prostrate species of *Euphorbia* again.

**3. *Microstachys corniculata*** (Vahl) A.Juss. ex Griseb., Fl. Brit. W. Ind. 49 (1859). – *Tragia corniculata* Vahl, Eclog. Amer. 2: 55, tab. 19 (1798). – *Microstachys polymorpha* Müll.Arg., Linnaea 32: 91 (1863), *nom. illeg.* – *Sebastiania corniculata* (Vahl) Müll.Arg. in De Candolle, Prodr. 15(2): 1168 (1866). – TYPE: Trinidad, s.d., *Ryan 17* (lectotype C [C10011351], designated here; possible isolectotypes C, P-JU Cat. 16560). (Fig. 1)

Annual herb or woody subshrub 0.3–1 m tall, erect to decumbent, branches glabrous to pubescent. **Trichomes** 0.1–1 mm long, appressed or not. **Stipules** quite persistent, 0.3–0.5 × 0.5–0.6 mm, divided into several cilia. **Leaves** alternate; petiole 0.2–25 mm long, hirsute to glabrous; blade ovate to elliptic, sometimes with small basal lobes, 1.5–6.5 × (0.2–)1–3 cm, base obtuse to cordate, margin closely serrulate with enlarged tips, apex acute to subacuminate, not glaucous below, hirsute to glabrous on both surfaces, with 1–3 pairs of crateriform glands below near base, venation not triplinerved, often indistinct, side veins 8–16 pairs. **Inflorescences** axillary, greenish, consisting of an elongate staminate thyse and a solitary pistillate flower at base often separated from it, staminate part 1–5 × c. 0.5 cm, glabrous or with few trichomes; bracts orbicular, 0.3–0.5 × 0.4–0.5 mm, glandular. **Staminate flowers** 1 or 2 per bract; pedicel 0.2–0.3 mm long; sepals 3, free; stamens yellow, 3, free. **Pistillate flowers** subsessile, pedicel to 0.2 mm long; sepals 3, nearly free, persistent; petals absent; ovary with 6 rows of appendages, glabrous to hirsute, stigmas 0.4–0.6 mm long, linear, undivided. **Fruits** solitary; pedicel < 1 mm long; capsular, globose to oblongoid, 4–6 × 4–5 mm, sulcate, glabrous or with few trichomes, with 6 longitudinal rows of (1–)2–4 appendages, usually only at apex and base. **Seeds** oblongoid, 2.5–4 × 1.5–2 mm, dark brown to blackish grey mottled, carunculate.

**Distribution.** Native to the Neotropics from Mexico and the Antilles to Bolivia (and introduced into the southern USA).

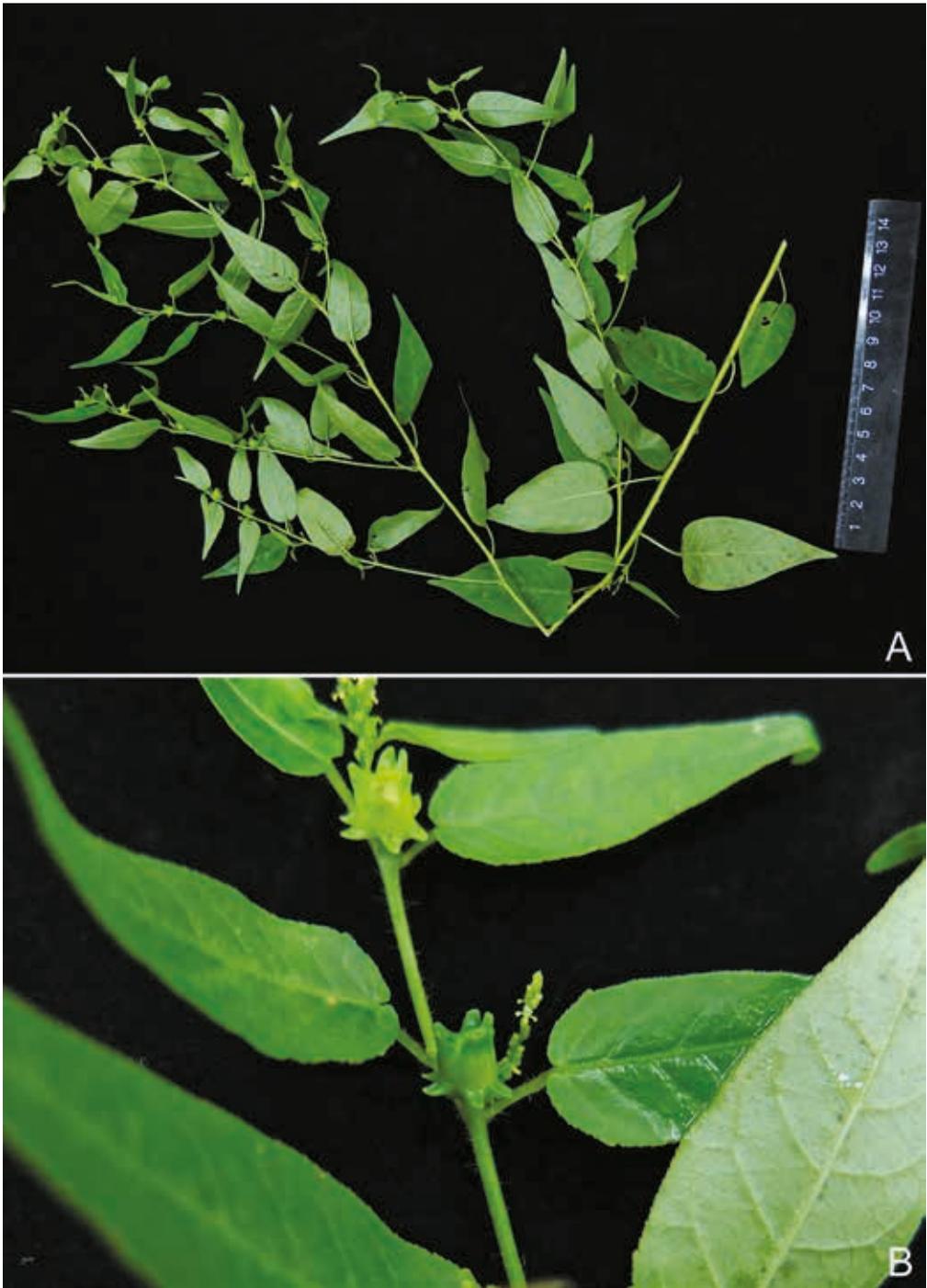
**Ecology.** In the Neotropics, *Microstachys corniculata* occurs in savannas, grasslands, secondary vegetation along roads or in plantations, usually exposed to full sun and mostly in sandy soil, also in wet places, close to sea level. In Singapore it was found locally abundant below *Casuarina* trees in a shaded area. In Malaysia it has been found in ‘belukar’ vegetation along an old logging road.

**National conservation assessment.** Non-native, naturalised. Globally Least Concern (LC).

**Specimens examined.** SINGAPORE: **Changi East:** Tanah Merah Coast Road, 2 Sep 2021, *Jong SING2021-654* (SING [SING0346254]).

MALAYSIA: **Selangor:** Bukit Belata Tambahan FR, 13 Apr 2016, *Chew FRI 73051* (KEP).

**Notes.** *Ryan 17* (C) was annotated as lectotype by McVaugh in 1994 (in schedae), but a published lectotypification could not be traced. It is, therefore, published here.



**Fig. 1.** *Microstachys corniculata* (Vahl) A.Juss. ex Griseb. **A.** Fresh specimen. **B.** Branch with inflorescences and fruits. From *Jong SING2021-654*. (Photos: S.M.L. Lee)

*Microstachys* A.Juss. is a genus of herbs and subshrubs with around 20–25 species, easy to recognise by its small elongate staminate inflorescences and solitary, spiny fruits. Most of the species are endemic to South America from Mexico to Bolivia, with its main diversity in Brazil. *Microstachys corniculata* is the most widespread species, covering the whole range of the genus (Pscheidt, 2015; Govaerts et al., 2000). In Africa there are four or five species. In Asia, only a single widespread species, *Microstachys chamaelea* (L.) Müll.Arg., is known. It occurs from India to China and Australia (Esser, 1999), including Singapore (Lindsay et al., 2022). This new record is therefore the second species known from Asia, seemingly a new record even for the continent. Very recently the species has also been found in Peninsular Malaysia, and this record is added here. In Singapore, although it has so far only been recorded from a single population, but which was richly fruiting, it is presumably naturalised already.

The two species found in Asia can be distinguished as follows:

- 1a. Leaves with the petiole 0.1–0.25 mm long, blade elliptic to lanceolate, 0.3–0.8 (–1.2) cm wide, base acute to obtuse, apex rounded to mucronate; fruits with 6 rows of c. 6 appendages along the whole fruit length ..... *M. chamaelea*
- 1b. Leaves with the petiole 0.2–25 mm long, blade ovate to elliptic, (0.2–)1–3 cm wide, base obtuse to cordate, apex acute to subacuminate; fruits with 6 rows of (1–)2–4 appendages, usually only at apex and base ..... *M. corniculata*

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