

***Melochia umbellata* (Malvaceae subfam. Byttnerioideae), a new record for Singapore**

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ABSTRACT. A new distributional record to Singapore of *Melochia umbellata* (Houtt.) Stapf is described and illustrated. This name is lectotypified. Notes on distribution, ecology and conservation status are given. This species is assessed as critically endangered for Singapore. A key is given for the two *Melochia* L. species occurring in Singapore.

Keywords. Conservation assessment, Flora, lectotypification

Introduction

The genus *Melochia* L. has about 54 species mainly in the Americas, along with two species in Asia. Traditionally, *Melochia* has been placed in the family Sterculiaceae. However, phylogenetic analysis using both molecular and morphological data has led to the recognition of an expanded Malvaceae, composed of the traditionally recognised families Malvaceae, Tiliaceae, Bombacaceae and Sterculiaceae, and for the Malvaceae s.l. to be divided into nine sub-families (Alverson et al., 1999; Bayer et al., 1999; Bayer & Kubitzki, 2003). This classification was adopted by the Angiosperm Phylogeny Group (APG, 2009, 2016). Here we follow APG and consider *Melochia* in Malvaceae, subfamily Byttnerioideae Burnett.

Prior to this study, *Melochia* was represented in the Singapore flora by a single species, *Melochia corchorifolia* L., a shrubby weed of disturbed areas (Keng, 1991). Here a new distribution record of *Melochia umbellata* (Houtt.) Stapf for Singapore is presented. Specimens of this species were recently collected from riverine vegetation along an unnamed canal (1°19'11.7"N 103°43'30.7"E) that is a tributary of Sungei Jurong. *Melochia umbellata* is a small tree that has a wide distribution ranging from Mauritius, across Malesia to Papua New Guinea (Wilkie & Berhaman, 2011). It is common in Peninsular Malaysia and occurs as far south as Malacca. It is also found in Sumatra, Java and Borneo. Therefore, it is not surprising that this species has been found to occur in Singapore.

New species record for Singapore

Melochia umbellata (Houtt.) Stapf, Bull. Misc. Inform. Kew 1913: 317 (1913); Backer & Bakhuizen, Fl. Java (Spermatoph.) 1: 405 (1964); Goldberg, Contr. U.S. Natl. Herb. 34(5): 197 (1967); Kochummen, Tree Fl. Malaya 2: 366 (1973); Phengkklai, Fl. Thailand 7(3): 592 (2001); Bayer & Kubitzki, Fam. Gen. Vasc. Pl. 5: 247 (2003); Wilkie & Berhaman, Tree Fl. Sabah & Sarawak 7: 362 (2011). – *Visenia umbellata* Houtt., Handl. Pl.-Kruidk. 8: 309 (1777). – TYPE: East Indies [probably Java], t. 46 f. 3 in Houtt., Handl. Pl.-Kruidk. 8 (lectotype designated here). (Fig. 1–2)

Synonyms are listed in Wilkie & Berhaman (2011).

Tree up to 8 m tall, dbh 12–15 cm. Buttresses absent. **Bark** brown, generally smooth but prominently lenticillate. **Twigs** terete, densely pale tomentose when young, becoming glabrous, with conspicuous stipular scars. **Stipules** persistent in saplings, caducous in adults, broadly-elliptic, 0.4–0.8 × 0.6–1 cm (up to 0.9 × 1.3 cm in saplings), pale pubescent on both surfaces. **Leaves** alternate, spiral; petioles slender, 8–10.5 cm long (up to 17.5 cm long in saplings), densely pale tomentose; blade chartaceous, broadly-ovate, symmetric, 9–15.8 × 7.2–14 cm (up to 22 × 24 cm in saplings), base usually cordate, sometimes rounded, apex acute, margin prominently toothed, basal veins 4–6, lateral veins (excluding basal ones) 6–7 pairs, lower and upper surface pale pubescent. **Inflorescences** axillary, corymbose, 8.4–11(–14.8) cm long, densely pale tomentose. **Flowers** bisexual, radially symmetric. **Calyx** with 5 sepals fused at base, campanulate, outer surface pubescent, inner surface glabrous, yellowish-green when fresh; tube 3.5–4 mm long; lobes triangular, c. 2 mm long. **Corolla** with 5 free petals; petals narrowly-obovate to oblong, 5–6.5 mm long, glabrous, pink when fresh, paler towards the edges. **Stamens** 5, 7–8 mm long, glabrous, yellow; anthers 2-lobed, longitudinally dehiscent, extrorse, medifixed, 1–1.2 mm long. **Ovary** 1, ovoid, c. 2.5 mm long, 1.5–1.7 mm wide, hirsute; style 2–2.3 mm long, hirsute at base, glabrous distally, yellow; stigma clavate, c. 6 mm long, pustulate. **Fruit** a capsule, oblong-globose, deeply longitudinally 5-grooved, 7–8 × 5–6 mm, 5-locular, densely pale tomentose with simple hairs along the margins, dehiscent, pale green, ripening brown; calyx, corolla and styles persistent in fruit. **Seed** 1 in each locule, winged, 4.5–5.5 mm long; wing membranous, translucent, glabrous, light brown; seed body light-brown with dark-brown mottling, glabrous.

Distribution. Mauritius, across Malesia to Papua New Guinea, including in Peninsular Malaysia, Sumatra, Borneo and Java. In Singapore now known from one mature tree and several saplings along the banks of a tributary of Sungei Jurong.

Ecology. Generally found in disturbed areas and along riverbanks. In Singapore its habitat is riverine vegetation on a riverbank above the high tide mark at about 3 m from the water's edge. Saplings were observed to occur only in exposed areas near the vicinity of the mature tree and no regeneration was observed in shaded areas. This suggests that this species requires full sunlight for regeneration.



Fig. 1. Leaf base of *Melochia umbellata* (Houtt.) Stapf is often cordate with toothed margin (scale bar 10 cm). From *Lua SING2018-030*. (Photo: P.K.F Leong)

Vernacular names. *Tapu, Tampu, Chapa* or *Singeh* (Malay); *Meloch* (English).

Provisional IUCN conservation assessment. The global conservation status of *Melochia umbellata* has yet to be assessed. A provisional global assessment of this species is carried out here using the *IUCN Red List Categories and Criteria Version 3.1* (IUCN, 2012). Lack of data at the population level and extinction probability precludes the use of criteria A, C, D and E. Using cleaned Global Biodiversity Information Facility (GBIF) data, a provisional assessment is carried out here using criterion B. Using

GeoCAT (Bachman, 2001), the extent of occurrence (EOO) for this species is estimated at 17,000,000 km². The area of occupancy (AOO) is estimated at 560 km². However, this AOO may be an under-estimate due to low specimen numbers. Based on habitat, an AOO exceeding 2000 km² is suggested as more realistic. The EOO and AOO fall outside the threshold of Vulnerable (VU). This species is tolerant of disturbance and there are no major threats to its population. This species is therefore provisionally assessed globally at Least Concern (LC).

Only one mature specimen of *Melochia umbellata* has so far been found in the wild in Singapore. Nationally for Singapore, based on IUCN ver. 3.1 criteria as detailed in Davison et al. (2008), this species is assessed as Critically Endangered D. This is because there are fewer than 50 mature individuals in Singapore. The discrepancy between the global and national conservation status can be explained by the small physical size of Singapore which is likely to result in relatively smaller population sizes for native plant species. Also, the riverine habitats in Singapore have become much reduced in modern times due to the damming of most of Singapore's rivers. This is likely to have the effect of reducing the amount of riverine habitat available for *Melochia umbellata* resulting in a small population. Seeds have been collected from this tree and germination is being attempted at the National Parks Board Nursery at Pasir Panjang, Singapore. There are also plans to collect and relocate wildings. Based on site observations of *Melochia umbellata* in Singapore, this species appears to favour exposed areas and this should be taken into account in future cultivation and re-introduction in Singapore. These efforts can form part of a species recovery programme.

Specimens examined. SINGAPORE: **Jurong:** 1°19'11.7"N 103°43'30.7"E, 12 Jan 2018, *Lua SING 2018-030* (SING) (fl, fr); *ibid.*, 18 Jan 2018, *Ganesan, Ali Ibrahim & Lua SKG 341* (SING) (fl, fr); *ibid.*, 18 Jan 2018, *Ganesan, Ali Ibrahim & Lua SKG 342*(SING) (ster, sapling).

Notes. The protologue gives the type locality as East Indies. Goldberg (1967) narrowed this down to probably Java. We agree with this finding as it is known that plants collected from Java were forwarded to Houttuyn (Van Steenis-Kruseman, 1950, continuously updated). Checks with the herbarium in Leiden (L), where the author's specimens are said to be (Van Steenis-Kruseman, 1950, continuously updated), did not reveal any original physical material for this species. Previously, Wilkie & Berhaman (2011) were not able to trace the type. It is likely that original physical material of this species is not extant. Therefore, the illustration, t. 46, f. 3 in the protologue is designated as lectotype.

In addition to the specimens cited above there is a nineteenth century specimen, *Cantley s.n.* (SING), that is also this species. However, even though the label information states "Flora of Singapore" there is doubt as to whether the locality is correct. There is a question mark in pencil against the locality information, probably made by Ridley, and according to Ridley (1900) the location of some of Cantley's specimens as "Singapore" were erroneous and may be collections from other parts of the Malay Peninsula.



Fig 2. *Melochia umbellata* (Houtt.) Stapf. **A.** Flower with calyx united at base (scale bar 2 mm). **B.** Detail of flower with 5-lobed pink corolla (scale bar 2 mm). **C.** Oblong-globose capsule with persistent corolla, calyx and style (scale bar 5 mm). **D.** Winged seeds (scale bar 2 mm). A & B. from Ganesan *et al.* SKG 341; C & D from Lua SING2018-030. (Photos: S.K. Ganesan)

Melochia umbellata is heterostylous (Golberg, 1967). Based on the relative length of the styles and stamens, Goldberg (1967) distinguished the brevistylous form where the styles are shorter than the stamens, and a longistylous form where the styles are longer than the stamens. The Singapore material found so far is the brevistylous form.

Key to *Melochia* in Singapore

- 1a. Tree; leaves broadly-ovate; capsule deeply grooved *M. umbellata*
 1b. Herb or shrub; leaves ovate-lanceolate; capsule slightly to not grooved
 *M. corchorifolia*

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References

- Alverson, W.S., Whitlock, B.A., Nyffeler, R., Bayer, C. & Baum, D.A. (1999). Phylogeny of the core Malvales: Evidence from *ndhF* sequence data. *Amer. J. Bot.* 86: 1474–1486.
- APG (2009). An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III. *Bot. J. Linn. Soc.* 16: 105–121.
- APG (2016). An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. *Bot. J. Linn. Soc.* 181: 1–20.
- Bachman S.J., Moat, J., Hill, A.W., de la Torre, J. & Scott, B. (2011). Supporting Red List threat assessments with GeoCAT: geospatial conservation assessment tool. *ZooKeys* 150: 117–126.
- Bayer, C. & Kubitzki, K. (2003). Malvaceae. In: Kubitzki, K. & Bayer, C. (eds) *The Families and Genera of Vascular Plants*, vol. 5, pp. 225–311. Berlin: Springer Verlag.
- Bayer, C., Faye M.F., De Bruijn, A.Y., Savolainen, V., Morton C.M., Kubitzki, K., Alverson, W.S. & Chase, M.W. (1999). Support for an expanded family concept of Malvaceae within a recircumscribed order Malvales: A combined analysis of plastid *atpB* and *rbcL* DNA sequences. *Bot. J. Linn. Soc.* 129: 267–303.
- Davison, G.W.H. (2008). Criteria for determining category of threat. In: Davison, G.W.H., Ng, P.K.L. & Ho, H.C. (eds) *The Singapore Red Data Book*, 2nd ed., p. 268. Singapore: The Nature Society (Singapore).
- Goldberg, A. (1967). The genus *Melochia* L. (Sterculiaceae). *Contr. U.S. Natl. Herb.* 34(5): 191–363.
- IUCN (2012). *IUCN red list categories and criteria: Version 3.1*, 2nd ed. Gland, Switzerland and Cambridge, UK: IUCN.
- Keng, H. (1991). *The Concise Flora of Singapore*. Singapore: Singapore University Press.
- Ridley, H.N. (1900). Flora of Singapore. *J. Straits Branch Roy. Asiat. Soc.* 33: 27–196.

- Van Steenis-Kruseman, M.J. (1950, continuously updated). *Cyclopaedia of Malesian Collectors*. Online resource maintained and updated by P.C. van Welzen, Naturalis Biodiversity Center. <http://www.nationaalherbarium.nl/FMCollectors/Home.htm>. Accessed 8 Mar. 2018.
- Wilkie, P. & Berhaman, A. (2011). Sterculiaceae. In: Soepadmo, E., Saw, L.G., Chung, R.C.K. & Kiew, R. (eds) *Tree Flora of Sabah and Sarawak*, vol. 7, pp. 331–408. Malaysia: Forest Research Institute Malaysia (FRIM), Sabah Forestry Department & Sarawak Forestry Department.