

Status and distribution of *Dodonaea viscosa* Jacq. in Singapore

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Abstract. This paper seeks to clarify the status of *Dodonaea viscosa* Jacq. (Sapindaceae) in Singapore, which was assessed to be nationally Extinct by the 2008 Singapore Red Data Book. A flowering and fruiting population was discovered in the western part of Singapore. After comparison with the Sapindaceae revision in ‘Flora of Peninsular Malaysia’ Volume 6, as well as previously vouchered specimens in the herbaria of the Singapore Botanic Gardens and the National University of Singapore, *Dodonaea viscosa* is confirmed to be extant in Singapore and assessed to be nationally Critically Endangered.

Key words. *Dodonaea viscosa*, Sapindaceae, Singapore, Tuas

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INTRODUCTION

Dodonaea viscosa Jacq. (Sapindaceae) is a highly variable species with many subspecies and varieties found throughout the tropics. It is a shrub to small tree of up to 8 metres in height, usually found in coastal vegetation and along sandy beaches. One of the unusual genera with simple leaves in the generally compound-leaved Sapindaceae family, *Dodonaea viscosa* has leaves that are alternately arranged, elliptic to obovate, about 5–15 cm long including the petiole, 1.5–4 cm wide, and thinly chartaceous and glabrous. The inflorescences are terminal racemes, 3–3.5 cm long with 12–15 flowers. The insect-pollinated flowers are bisexual with 5–7 stamens, 3–5 sepals, the ovary flattened-ellipsoid and glabrous with columnar style about 2–3 mm long, the stigma 2–3 locular. The fruits are winged septifragal capsules, the shape resembling a pair of kidneys, each 8–12 mm long and 11–16 mm wide, ripening from light green to yellow and finally golden brown. Each fruit contains 3–4 black seeds which are globular and about 2.5 mm wide. The fruits may be wind-dispersed with secondary water dispersal (van Welzen, 2017; Fig. 1).

DODONAEA VISCOSA IN SINGAPORE

Dodonaea viscosa was not recorded in Singapore by any earlier published floral accounts (e.g., Ridley, 1900, 1922; Keng, 1990; Turner, 1993). An individual of the species was thought to have been found on Pulau Semakau in the 1990s by A. B. H. Loo and E. Seah, but no herbarium specimens or photographic records were collected (H. T. W. Tan, pers. comm.). In 2008, this species was included in the 2nd Edition of the Singapore Red Data Book, wherein it was published as native to Singapore and assessed to be nationally Extinct (Tan et al., 2008). This status was subsequently adopted by Chong et al. (2009) in their checklist of Singapore’s vascular plant flora.

In a paper on the flora of Pulau Semakau, Teo et al. (2011) reiterated the purported observation of the species by A. B. H. Loo and E. Seah in the 1990s. Teo et al. (2011) concluded that the plant could no longer be found on Pulau Semakau and reaffirmed that the species is nationally Extinct in Singapore.

In April 2019, a population of more than 10 individuals of the species was encountered by the third author (C. M. Boo) during her survey at a reclaimed site in Tuas, located in western mainland Singapore. The individuals were about 1.5 m tall and were flowering and fruiting. The main population was growing on fully exposed, raised, reclaimed ground composed largely of sand and located within several metres of the coastline, protected by a rock bund seawall (Fig. 2A). Ground cover is sparse due to the absence of topsoil. Other coastal species such as *Sesuvium portulacastrum* (L.) L. and *Guilandina bonduc* L. were observed in the vicinity. Another lone individual was also found about 500 m from this population (Fig. 2B). A fertile specimen was collected and submitted to the Singapore Botanic Gardens Herbarium (SING; SING barcode: SING 2019-1414; Collector: CM Boo), where it was compared to previously vouchered specimens and the Sapindaceae revision in ‘Flora of Peninsular Malaysia’ Volume 6 (van Welzen, 2017) and confirmed to be *Dodonaea viscosa*. Subsequently, another site visit was made on 2 March 2020 by the co-authors and a second specimen with flowers

and fruits was collected and deposited (SING barcode: SING 2020-358; Collectors: HK Lua, XY Ng & CM Boo). Propagation material such as seeds, seedlings and cuttings were also collected (Figs. 3, 5) and brought back to the Native Plant Centre of the National Parks Board Singapore for propagation work.

In May 2020, an enquiry was sent to the Herbarium of the National University of Singapore (SINU) at the Lee Kong Chian Natural History Museum to verify if any vouchers of the species had been collected from Pulau Semakau by A. B. H. Loo and E. Seah in the 1990s. A single voucher of *Dodonaea viscosa* collected from Pulau Semakau on 5 August 1999 was located in SINU, but the collectors were T. Morgany and C. P. Lim (SINU barcode: M242; Fig. 4). No other locality or habitat details were available on the herbarium sheet. There were no other specimens of *Dodonaea viscosa* found in SING.

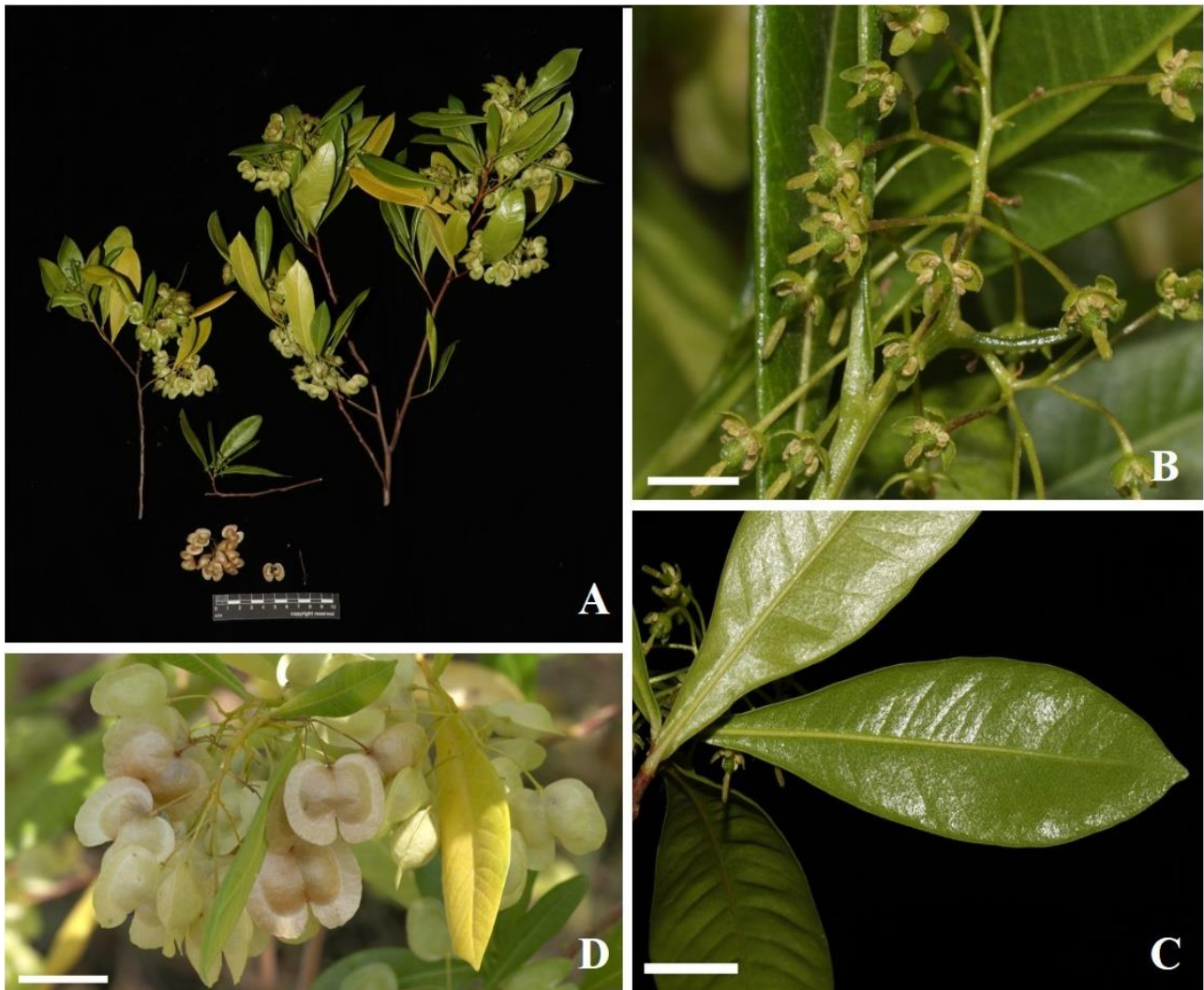


Fig. 1. *Dodonaea viscosa*. A, fruiting branches; B, developing flowers, scale bar = 2.5 cm; C, lower lamina of the leaves, scale bar = 2 cm; D, fruit capsules maturing from light green to golden brown, scale bar = 2 cm. (Photographs by: X. Y. Ng).



Fig. 2. *Dodonaea viscosa*. A, population in close proximity to the sea; B, a lone individual. (Photographs by: X. Y. Ng).



Fig. 3. *Dodonaea viscosa*. A, mature fruits and seeds, scale bar = 1.5 cm; B, seedlings beneath the mature fertile trees. (Photographs by: X. Y. Ng).



Fig. 4. SINU specimen of *Dodonaea viscosa* (M242) collected by T. Morgany and C. P. Lim on Pulau Semakau. (Photograph by: K. S. Chua).



Fig. 5. *Dodonaea viscosa*. A, germinated seedlings; B, rooted cuttings with new growth after one month. (Photographs by: X. Y. Ng).

PROPAGATION OF *DODONAEA VISCOSA*

Dodonaea viscosa can tolerate harsh conditions such as salt spray (PROSEA, 2016); the current population was found just beside the sea wall in full sun with constant salt spray. A coastal species, *Dodonaea viscosa* grows best in full-sun conditions and is grown in well-drained media at the Native Plant Centre. It can be propagated by seeds as well as stem cuttings (Fig. 5). Cuttings collected from the original site were able to root in pure sand as well as a mixture of sand and cocopeat. Growing trials were conducted to compare rooting ability between young twigs and semi-woody twigs, and it was observed that semi-woody twigs have a higher percentage of rooting. Seeds were germinated in various media: pure sand, mixture of sand and cocopeat, and vermiculite. The seeds are known to be orthodox (Royal Botanic Gardens Kew, 2021), which indicates their ability to tolerate desiccation. The germination trials conducted showed no obvious difference in results from the different germination media used. More than 10,000 seeds have been banked in the Singapore Botanic Gardens Seed Bank as an additional measure to ensure the long-term sustainability and conservation of this species' population in Singapore.

CONCLUSIONS

Dodonaea viscosa was first collected on Pulau Semakau in 1999 and had not been recorded or collected in Singapore since then. The single locality from which the species is currently known is a reclaimed site slated for future development. In view of the species being present only at a single location with fewer than 50 mature individuals, we propose a conservation status of Critically Endangered for the species in Singapore, and recommend that *Dodonaea viscosa* is added to the Species Recovery Programme of the National Parks Board, Singapore. This is to enable the assisted propagation of the species for reintroduction to other suitable coastal sites in Singapore, and to safeguard the future of the species here.

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