

A taxonomic note on the genus *Mimosa* (Fabaceae) and the potential invasiveness of *M. diplotricha* in Sri Lanka (Giant sensitive plant)

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Invasiveness of *Mimosa diplotricha* has recently been manifested in Sri Lanka

Immediate attention of relevant authorities is drawn to control this invasive weed before it spreads into an uncontrollable level



Highlights

- The genus *Mimosa* in Sri Lanka consists of three species – *M. diplotricha*, *M. pigra* and *M. pudica*, all originated in tropical South America.
 - *M. diplotricha* (Giant sensitive plant) has been often erroneously known as *M. invisa*.
 - *M. diplotricha* is considered a noxious and troublesome invasive species impacting on agriculture, livestock, biodiversity, wildlife and natural ecosystems.
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SHORT COMMUNICATION

A taxonomic note on the genus *Mimosa* (Fabaceae) and the potential invasiveness of *M. diplotricha* in Sri Lanka (Giant sensitive plant)

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Abstract: *Mimosa diplotricha*, naturally a tropical American species, has now achieved the status of a noxious and invasive weed in the continental Africa and tropical Asia including the neighbouring India. It evidently impacts upon agriculture, pasture, forest ecosystems and wildlife. Although this species had been recorded several decades ago in Sri Lanka, its relatively extensive occurrence, rapid spread and invasive features have been manifested during recent past and therefore necessitate prompt attention of relevant authorities to control this troublesome invader. Furthermore, the recent addition of two more exotic species of *Mimosa* to the flora of Sri Lanka necessitates the updating of the taxonomy of the genus.

Keywords: Agricultural weeds; invasive species; *Mimosa diplotricha*; sensitive plant; taxonomic nomenclature.

INTRODUCTION

The recent spread of *Mimosa diplotricha* C. Wight ex Sauvalle in invasive proportions in some areas in Puttalam District was reported in recent newspapers (Bandara, 2021; Jayasuriya, 2021). Although this noxious invasive weed has been previously recorded in the Kandy District, six decades ago, it was identified as *M. invisita* Martius, a taxonomically illegitimate name (Kostermans, 1980). Further, its potential invasiveness in agricultural and other lands had not been previously observed or highlighted. In some instances, since the introduction of a potentially invasive species in a novel environment, such as a new territory or a country, the fact that its long-term unmanifested existence is followed by rapid explosion of its populations achieving invasive status is well known. Therefore, this paper intends to alert environmental and agricultural authorities and the general public about the potential danger of this alien invasive weed. Besides, this also provides an opportunity to summarily update the taxonomy of the genus *Mimosa* in Sri Lanka after over 40 years (Kostermans, 1980).

Global distribution of genus *Mimosa*

Mimosa L. is one of the largest genera in the legume family Fabaceae (Subfamily Mimosoideae) with over 500 species worldwide (Simon *et al.*, 2011). It is believed that the origin and major diversification have occurred in the neotropics as indicated by the description of 477 ascertained species in the tropical and subtropical Americas and the Caribbean (Barneby, 1991). Major concentrations of species diversity

and endemism are located in the Central Brazil, subtropical South America and Mexico, with secondary clusters of species diversity in the Andes and the Caribbean. Meanwhile in the Old World tropics, the occurrence of a secondary cluster with 32 endemic species in Madagascar (Lefevre and Labat, 2006), is considered as an interesting development which has been shown to form a monophyletic clade deeply nested within New World groups, indicating recent (6 - 10 mya) long-distance dispersal (Simon *et al.*, 2011). Further, the occurrence of few naturally existing species in the Continental Africa and South Asia indicates the pan-tropical distribution of the genus *Mimosa*.

Genus *Mimosa* in Sri Lanka

The Revised Flora of Ceylon (Kostermans, 1980) included two species, namely *M. pudica* L. and *M. invisita* Mart., as occurring in Sri Lanka. However, currently, the genus is represented by three species, all alien and introduced.

Key to the species

1. Erect, shrub to 5 m tall; branches terete; prickles to 10 mm long; pods to 4 – 12 cm long.....**2. *M. pigra*.**
1. Scrambling subshrubs or trailing to climbing herbs; branches terete or 4-ridged; prickles to 3 cm long; pods 1.5 – 3.5 cm long.
2. Scrambling subshrubs; branches 4-ridged, each ridge with a row of prickles; pinnae 4-9 jugate; peduncles 3.5 – 16 mm long; pods 2.5 – 3.2 mm long.....**1. *M. diplotricha*.**
2. Trailing to weakly climbing herbs; branches terete; prickles scattered; pinnae 1-2 jugate; peduncles 20–25 mm long; pods 1.5–1.8 mm long.....**3. *M. pudica*.**

1. ***Mimosa diplotricha*** C. Wright ex Sauvalle, Anales Acad. Ci. Méd. Habana 5: 405 (1869). *Syn. M. invisita* Martius, Rora 20 (2, Beibl. 8): 121.1837; Kostermans, Rev. Fl. Cey. 1: 464. 1980, nom. Illegit. non *M. invisita* Mart. ex Colla (1834). var. ***diplotricha*** Barneby, Mem. NY Bot. Gard. 65: 201 (1991). *Syn. Mimosa invisita* f. *inermis* Adelb., in A.J.G.H. Kostermans, Reinwartia 2: 359 (1953); *M. invisita* var. *inermis* (Adelb.) Verdc., Kew Bull. 43: 360 (1988).

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Scrambling subshrub with long hairs and recurved prickles to 3 mm long on ridges of 4-angled branches, and on leaf axes and peduncles, rarely glabrous and unarmed. Leaves: petiole c. as long as or longer than rachis; pinnae 4 – 9-jugate, not digitate; leaflets 17 – 28-jugate, linear, apiculate; median leaflets mostly 2.5 – 6 mm long, 0.6 – 1.2 mm wide, only ciliolate or also finely pubescent; leaves weakly sensitive to touch (compared to *M. pudica*); turn blue-green when mature. Inflorescence axillary, capitate, two or three per axil or heads in terminal raceme; peduncle 3.5 – 16 mm long. Flowers mostly 4-merous; calyx connate, minute; corolla 1 – 2.5 mm long. Pods c. 10 on each peduncle, narrowly oblong, compressed, 1 – 2.5 (–3.2) cm long, 3 – 5.5 mm wide, minutely villous; margins with prickles and setose over seeds. Seeds to 3 mm long and 2 mm wide, brown (Cowan, 1998).

Global distribution and invasiveness

M. diplotricha naturally occurs in many parts of South America, tropical Mexico and the West Indies; introduced, naturalized and considered a noxious invasive species in the continental Africa, tropical Asia (Malaysia, Indonesia, Thailand and India), Australia and the Pacific. Its earliest records outside of the Americas is in Java, Indonesia in 1900; Queensland, Australia in 1929; and Fiji in 1936. Since then, it has rapidly spread and naturalized throughout Southeast Asia, the Pacific Islands (including Hawaii), northern Australia, and parts of Africa in the latter half of the 20th century. The species is extremely invasive and rapidly colonizes disturbed sites, agricultural lands in particular. It is fast-growing and can tolerate a wide range of soil and climate conditions. Seeds are produced in large quantities at an early age and they can survive up to 50 years in dormant state, thus resulting in a persistent seed bank. It is extremely difficult to control effectively using mechanical or chemical means, however, biological control programmes have had a large degree of success (CABI, 2008).

Due to *M. diplotricha* invasion in some tropical Asian countries, heavy damage in crops like sugar cane, coconut, rubber, cassava, tea, pineapple and upland rice have been reported resulting in increased production costs, reduced crop yield, threats to biodiversity, soil degradation and reduced land value (APFISN, 2007). Left alone, its populations can form impenetrable thickets within a short period that can affect movement of both people and animals, as well as growth of planted crops. In forested habitats these thorny thickets become a formidable barrier to wild animals accessing food and other resources. Even trapping in a large thorny thicket can be fatal to wild animal (Debnath *et al.*, 2017). All parts of the plant produce mimosin, a non-protein amino acid, which is toxic to herbivores, particularly the livestock, and if ingested, it can cause vascular endothelial damage, necrosis of the heart and liver and anemia in cattle. It also acts as an alternative host for nematodes (APFISN, 2007). The rapid growth of the plant prevents the regeneration, reproduction and growth of indigenous flora in infested areas and therefore, its negative influences on the native biodiversity is evident.

It is also considered as a considerable threat to forest ecosystems and pastures.

There is little documentation of the ways in which *M. diplotricha* has been introduced, other than deliberately as a forage or ground cover, but it is widely believed to be result of the import of contaminated crop seeds. It is a declared noxious weed in Australia, Fiji and the USA (Hawaii).

Distribution and potential invasiveness in Sri Lanka

The earliest record of this species in Sri Lanka was in 1961, collected in Gundumalee, Kandy District. When the species was observed in 1970 at Gannoruwa, it was believed to have been introduced as a green manure (Kostermans, 1980). Subsequently, the author has noted it as a weedy scrambler in the vicinity of the University of Peradeniya. The disjunct occurrence was later indicated when the author recorded a herbarium specimen in 1991 from Mahaweli System B in the Polonnaruwa District. In January 2021 it was observed in the outskirts of Chilaw (Puttalam District) within an area of about one hectare consisting of open weedy habitats and roadsides, exhibiting invasive features. There was further evidence on its occurrence in Anamaduwa and Madurankuliya areas, also in the Puttalam District. Author's recent inquiries indicated that *M. diplotricha* also occurs in several places in the Polonnaruwa District, such as Dimbulagala and South of Kaudulla wewa. Therefore, it is clearly evident that the rampant spread of *M. diplotricha* in the near future in Sri Lanka is imminent. The fact that many countries have declared this plant as a noxious invasive species and its presence in the neighbouring India in invasive proportions, should strongly nudge Sri Lankan environmental and agricultural authorities to plan and activate prompt measures to control this invader.

Vernacular names

Giant sensitive plant; Creeping sensitive plant; Nila grass (Nila = blue) – presumably an allusion to the blue-green sheen of its mature leaves. In India (Kerala State): ‘Anathottawadi’ and ‘Padaincha’ (Malayalam), ‘Kattu-seekkai’ (Tamil). Sri Lanka: ‘Wel-nidikumba’, ‘Irisiyakatu’, ‘Hinguru’ (Sinhala).

Specimens examined

Polonnaruwa Dist. Mahaweli System B, Ellewewa, Feb. 1991. *A.H.M. Jayasuriya & M. Cauley 5613* (PDA). Puttalam District. Mugunuwatawana, 9 km E. of Chilaw, Ariyagama village, Jan. 2021, *A.H.M. Jayasuriya & A.R. Jayasuriya 10272* (PDA). Kandy District. University of Peradeniya, Circuit Bungalow area, Nov. 1967, *R.G. Cooray 67111307* (PDA). Badulla District. Canyon below Rest House, Ella, *F.R. Fosberg & M.H. Sachet 53182* (PDA) (Figure 1).

Taxonomic notes

The erroneous use of *M. invisa* Martius for *M. diplotricha* in Sri Lanka and elsewhere has been rectified by Barneby (1987) as follows: “*Mimosa invisa* C. Martius (1837) is not,



Figure 1: *Mimosa diplotricha* A) habit, wasteland near coconut plantation; B) roadside population, note – blue-green mature leaves below; C) flowering branches, note – 4-sided stem and each ridge with a row of re-curved spines; D) mature pods.

as long supposed, a superfluous duplication of *M. invisa* C. Martius ex Colla (1834), but a heterotypic posterior homonym and therefore illegitimate. Therefore, the correct name for *M. invisa* C. Martius is *M. diplotricha* C. Wright ex Sauvalle (1868)”. This further implies that *M. invisa* C. Martius ex Colla is a separate and legitimate species that does not occur outside the neotropics. The plant introduced and naturalized in the Old World, including Sri Lanka, has been identified by Barneby (1991) as *M. diplotricha* var. *diplotricha*.

2. *Mimosa pigra* L., Cent. Pl. 1: 13 (1755), nom. Cons.

Erect shrub to 5 m tall; branchlets terete, often with broadly based, recurved prickles to 12 mm long. Leaves (axes) to 30 cm long, with prickles 10 mm long; pinnae 12 – 15-jugate; leaflets 20 – 45-jugate, to 8.5 × 1 mm. Flower heads on peduncles to 7 cm long, pink, sub-globose to oblong, to 10 mm diam or to 14 mm long; Pods flat, linear, to 12 cm × 9 – 14 mm, straight to slightly curved, Seeds 14 – 25, oblong, 4.5 – 6 mm long, olivaceous (Cowan, 1998).

Global distribution and invasiveness

M. pigra is native to tropical South America. It is now widespread throughout the tropics and is a serious weed in Africa, India, South-East Asia and Australia and has been listed as one of the world’s 100 worst invasive species (IUCN, 2021). *Mimosa pigra* is a thorny shrub that infests wetlands and is also an agricultural weed in rice fields in many parts of the Old World tropics. In natural wetlands the shrub alters open grasslands into dense thorny thickets and negatively impacts on native biodiversity. It is regarded as one of the worst alien invasive weeds of wetlands of tropical Africa, Asia and Australia, and the cost of control is often high.

Distribution and invasiveness in Sri Lanka

In Sri Lanka it was first seen in 1996 along a one kilometer stretch of banks of the Mahaweli River near Kandy in the Central Province. From there it has spread further along the banks and flood plains of the Mahaweli River and the shores of the Victoria and Randenigala Dams. The seeds have spread by the river flow and by transport of sand mined from the river. It is now also found in abandoned paddy fields, other river and stream banks, and gardens in four districts in three provinces (Marambe *et al.*, 2004). The author has recently observed a small population on the bank of the Mahaweli River in Allai, E. of Kantale in the Trincomalee

District and noted reports of its occurrence at building sites in Badulla and Bandarawela (Badulla District) originated from seeds in river sand transported from Kandaketiya (Badulla District). The species was also recently observed in abandoned paddy fields in Geli Oya (Kandy District) and in a wetland in Ja-ela (Gampaha District). It is listed as an invasive plant in Sri Lanka (Wijesundara, 2010).

Vernacular names

Giant sensitive tree; Giant mimosa; Catclaw mimosa. “Yodanidikumba’ (Sinhala).

3. *Mimosa pudica* L. Sp. pl. 518.1753.

Refer Kostermans (1980) for description and other information.

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DECLARATION OF CONFLICT OF INTEREST

The author declares no conflict of interest.

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