Asian Jr. of Microbiol. Biotech. Env. Sc. Vol. 25, No. (2) : 2023 : 314-317

ISSN-0972-3005

DOI No.: http://doi.org/10.53550/AJMBES.2023.v25i02.020

MIMOSA DIPLOTRICHA: THE DOMINANT INVASIVE PLANT SPECIES IN THE PALAKKAD GAP OF THE WESTERN GHATS IN SOUTH INDIA

REHNA E.T*[1] AND MAYA V. MAHAJAN[2]

Centre for Sustainable Future, Amrita Vishwa Vidyapeetham, Coimbatore 641 112, Tamil Nadu, India

(Received 1 December, 2022; Accepted 14 January, 2023)

Key words: *Invasive alien plant species, Mimosa diplotricha, Biodiversity hotspot, Palakkad Gap, Western Ghats.*

Abstract–The ecological phenomenon of bio invasion captures attention in the introduction and establishment of a species beyond its natural range, where it shows massive spread. Ecological and socioeconomic impacts of some invasions are enormous, which have provided much impetus for the study into this area. When all species compete to survive, invasive alien plant species (IAPS) tend to have specific traits or their combinations which allow them to outcompete the native species. In certain cases, the competition is about rates of growth and reproduction. In other cases, they may interact with each other more directly. This study on *Mimosa diplotricha*, IAPS in the Palakkad Gap of the Western Ghats in South India is intended to trace its dominance and invasion in the region and also to conserve the Palakkad Gap, which is a biodiversity hotspot.

INTRODUCTION

With globalization, international trade, and tourism going high, the frequency of intentional and accidental introduction of non-native species is also soaring. Establishment of IAPS happen when repeated reproduction and survival of species result in a population capable of sustaining itself in the wild (Blackburn *et al*., 2011). Survival and reproduction are dependent on many abiotic and biotic factors.

The spread of an invasive species can best be described as an expansion phase where the range or area the species occupies increases. And the spread is dependent on a species' reproductive success, localized dispersal of propagules or offsprings. The long-distance dispersal is aided by humans. All species are with efficient natural dispersal mechanisms.

As IAPS are creating a concern to ecosystems, through ecological disturbances, this study is intended to find out their invasiveness in the Palakkad Gap-a biodiversity hotspot. Four out of 34 global biodiversity hotspots (the Western Ghats, the Nicobar Islands, the Himalayas and the North-east; Mittermeier *et al*., 2004) and 465 important bird areas (IBA) (Rahmani *et al*., 2016) are located in India.

In many respects, conservation is seen to be a local one. People usually care about the biodiversity of the place in which they thrive as they are dependent on these ecosystems the most – and, broadly speaking, they have the most control over these areas. As the climate of earth changes, the roles of species and ecosystems increase in their importance to humanity (Turner *et al*., 2009). Biodiversity, inclusive of genic diversity, species and ecosystems, plays a prime role in the regulated functioning of ecosystems and supply of ecosystem services that, in turn, ensure human needs-both material and non-material, are met (Myers, 1996).

The dominant IAPS of the Palakkad Gap is found to be *Mimosa diplotricha*, having sharp invasive attributes.

Mimosa diplotricha C. Wright ex Sauvalle var. diplotricha

Family Fabaceae: sub-family Mimosoideae

This species is mainly found in tropical and sub-tropical regions. It exhibits several different growth forms and develop into very dense thickets. Variation from being a relatively short-lived -

([1]Research Scholar, [2]Associate Professor)

annual, biennial or perennial shrub with upright-erect or ascending stems (2-3 m tall) are seen. It's branches, often scramble over other plants. Specifically, they are distinguished by four-angles, each of which has a line of sharp, hooked prickles. Leaves close up when disturbed or injured and at night. Numerous fruits and seeds are produced. This sensitive weed is regarded as an environmental weed.

In the Palakkad Gap it's seen in all habitats - roadsides, fallow lands, agricultural areas, forest lands and tend to flourish.

METHODOLOGY

Study area

The Palakkad Gap is rich with it's flora and is a low mountain pass of the Western Ghats, between Coimbatore in Tamil Nadu and Palakkad in Kerala. Average elevation of the Palakkad Gap is 140 metres. Location is in between the Nilgiri Hills to the north and Annamalai Hills to the south - (border of Palakkad and Tamil Nadu). Coordinates of Palakkad Gap - 10.1667° N, 77.0667° east. Total area is 1080 sq.km.

The mountain chain of the Western Ghats represents geomorphic features which are of

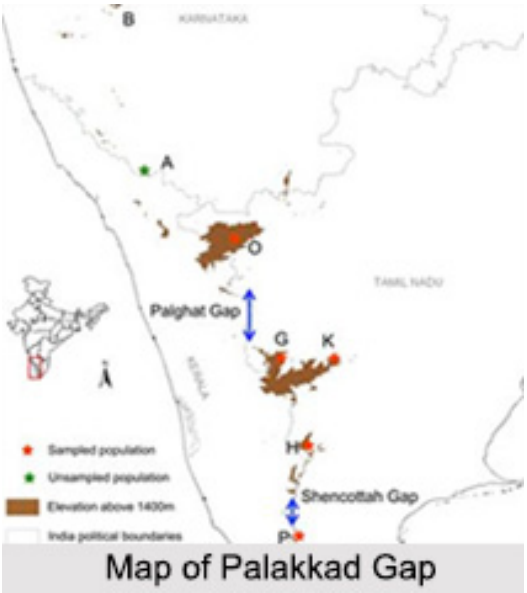

Fig. 1. The Palakkad Gap in the map of South India

immense importance with unique biophysical and ecological processes. The high montane forest ecosystems here, influence the Indian monsoon

Fig. 2. The Palakkad Gap with nearby areas in the map of South India

weather pattern and moderates the tropical climate of the region. It has an exceptionally high levels of species diversity and endemism and is recognized as one of the world's eight 'hottest hotspots' of biological diversity - a biologically rich but threatened region, and a UNESCO World Heritage Site.

Hence a deep interest has been developed to study the invasive species of Palakkad Gap.

Field Survey and data collection

Extensive survey of the Gap was carried out from January 2019 to December 2021 covering all three seasons and their natural habitats - roadsides, fallow lands, agricultural areas and forest lands.

To have the information/data, observation points were selected in the Gap. Each observation point was selected on the basis of visual observations; presence of plants and their characteristic invasive behaviour. These invasive were checked against the native ones.

Importance value index (IVI)(Curtis., 1959) was calculated based on community attributes - Density, frequency and abundance. GPS coordinates of the sampling area were taken.

Regional flora were used to identify the plant specimens' viz., Flora of British India (Hooker, 1876) and Flora of the presidency of Madras. Survey included primary and secondary data collections.

RESULT AND DISCUSSION

IVI calculated for 3 seasons-Winters, Summer and Monsoon, showed the following results.

Maximum invasiveness is for roadsides (Table 1), seasonally also it is the same. This clearly shows that disturbed sites are promoting the growth of IAPS through their adaptive features. Agricultural lands,

Fig. 3. Dense thickets of *M. dipoltricha*

Fig. 4. Seeds of *M. diplotricha*

being managed, the spread is less. In forest areas the value for IVI is less than fallow lands because of the canopy seen here.

Invasion of *M.diplotricha* lowers somewhat in summer in the Palakkad Gap.

M. diplotricha has become a spreading weed in the Palakkad Gap that has questioned the integrity of many ecosystems, leading to a decline in biodiversity. Dense thickets of *M. diplotricha* interfere with the communities ecosystems and constrain the movement of other species. Infestations by *M. diplotricha* hinder the regeneration, reproduction and growth of native species in infested areas and consequently result in the gradual loss of biodiversity. Seed production and dispersal are high for the species.

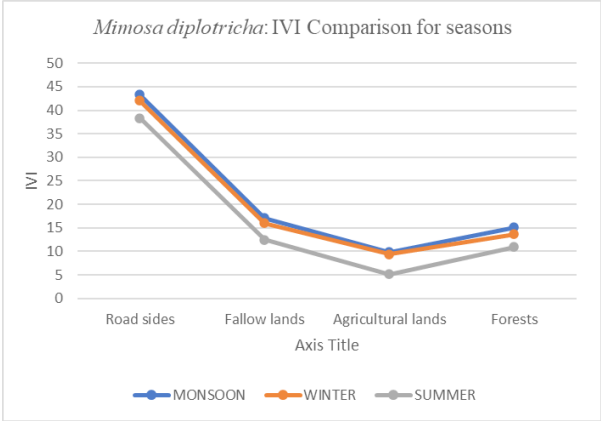

Table 2. *M. diplotricha*: IVI for 3 seasons

It is found to flourish well at disturbed sites of the Palakkad Gap (Fig. 2). As roadsides are prime areas, these could be in future responsible for deeper invasion by *M.diplotricha* to Agricultural lands. Agricultural lands are not much disturbed now. Road side inspections and campaigns can help in to reduce the spread of IAPS.

M. diplotricha, the continuous spread of, and invasion by, this weed in the Palakkad Gap is due to: (i) the increased human disturbances as a result of planning and infrastructural developments; (ii) absence of an integrated control and management

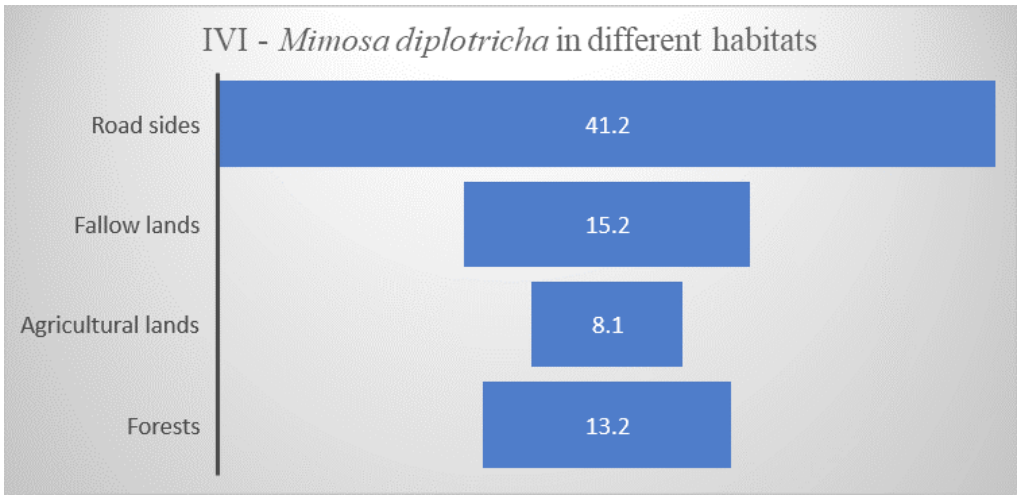

Table 1. Overall IVI of *M. diplotricha*

programme in disturbed sites, especially; (iii) absence of sustained biological control programme; and (iv) usage as a cover crop and green manure so as to improve the Edaphic factors.

M. diplotricha can attain a problematic status in agricultural lands, plantations and be a threat to biodiversity conservation in this area in future. Its competitiveness has to be reduced, in order to limit its menace to ecosystems. Conventional methods in agricultural areas in the Palakkad Gap seem to work, but may not be feasible in future. In that case several initiatives for control and management are needed, both national and local levels. These include: (i) effective biological control programme (ii) building of sustained public awareness (iii) the development of a coordinated and integrated control and management plan.

However, *M. diplotricha* also provides some benefits to it's invasive ranges. It is a nitrogen (N) fixer (Swarbrick, 1989) and in India, Sri Lanka, Indonesia and other Asian countries it is often used as a cover crop and as green manure. Also a soil renovator to give soil, nitrogen and organic matter and to reduce soil erosion.

CONCLUSION

Sustainable management of the *M. diplotricha* deserves much attention, as it thrives in a biodiversity hotspot. Being a fine N – fixer, it's role to soil fertility cannot be neglected. Prevention is the cornerstone of invasive species management, as it has been seen over and over again that, following the establishment by IAPS, eradication or control is costly and too difficult. Involving legislation to regulate or prohibit importation of unwanted species is highly essential to regulate or prohibit importation of unwanted species. Reduced diversity reduces resilience of ecosystems and the human communities that depend on them. As the climate of earth changes, the roles of species and ecosystems increase in their importance to humanity (Turner *et al*., 2009). Management actions on IAPS are to focus on the conservation and/or restoration of broad habitats and sites (Salafsky *et al*., 2008).

REFERENCES

Blackburn, T.M., Pyšek, P., Bacher, S., Carlton, J.T., Duncan, R.P., Jarošík, V., Wilson, J.R.U. and Richardson, D.M. 2011. A Proposed Unified Framework for Biological Invasions. *Trends in Ecology & Evolution*. 26: 333–339.

Curtis, J.T. 1959. *The Vegetation of Wisconsin, an Ordination of Plant Communities*, University Wisconsin Press, Madison, Wisconsin.

Gamble, J.S. and Fischer, C.E.C. 1915-1935. *Flora of the Presidency of Madras.* Adlord and Sons Ltd., London. 1-3.

Hooker, J.D. 1876. *Flora of British India*. L. Reeve and Company, Ashford, Kent, U.K. 1-7.

Mittermeier, R.A., Gil, P.R., Hoffmann, M., Pilgrim, J., Brooks, T., Mittermeier, C.G. and Da Fonseca, G.A.B. 2004. Hotspots Revisited: Earth's Biologically Richest and Most Threatened Ecoregions (Mexico: CEMEX).

Myers, N. 1996. Environmental services of biodiversity. *Proc. Natl Acad. Sci. USA*. 93: 2764–2769.

Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. 2016. Important bird and biodiversity areas in India: priority sites for conservation (revised and updated) Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and Bird Life International (UK).

Salafsky, N., Salzer, D., Stattersfield, A. J., Hilton Taylor, C.R.A.I.G., Neugarten, R., Butchart, S.H. and Wilkie, D. 2008. A standard lexicon for biodiversity conservation: unified classifications of threats and actions. *Conservation Biology.* 22(4): 897-911.

Sankaran, K.V., Suresh, T.V. and Sajeev, T.V. 2012. Handbook on Invasive Plants of Kerala, Kerala State Biodiversity Board.

Swarbrick, J.T. 1989. Major weeds of the tropical South *Pacific. Proceedings of the 12th Asian-Pacific Weed Science Society Conference, Seoul, Korea Republic*, No. 1. Taipei, Taiwan: Asian-Pacific Weed Science Society. p. 21–30.

Turner, W.R., Oppenheimer, M. and Wilcove, D.S. 2009. A force to ght global warming. *Nature.* 462 : 278-279.