

FACTORS AFFECTING THE SPREAD OF ALIEN INVASIVE PLANTS IN SRI LANKA

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SUMMARY

Alien plants have been reported to spread at an alarming rate threatening the biodiversity of natural and agricultural ecosystems of Sri Lanka. The importance of understanding the factors affecting their spread in order to identify the possible methods of control has been felt recently. The biological and ecological factors, and social and political factors that influence the invasiveness of alien plants in Sri Lanka are discussed.

INTRODUCTION

There is a growing international concern on the invasive behaviour of alien plants, as their impact on the ecosystems is immense and usually irreversible. Alien invasive plants/weeds severely threaten biodiversity, habitat quality, and functions of the ecosystem, and are able to survive under a wide range of climatic and soil conditions, reproduce and spread at alarming rates. The global impact of the alien invasive plant species has been recognized in the Convention on Biological Diversity (CBD), which calls for the control and monitoring of alien species that threaten ecosystems, habitats and species. It is important to note that the problem of alien invasive plants has been more acute in island nations, especially in small island countries.

The importance of understanding the impact of alien invasive plants in Sri Lanka, a small island in the Indian Ocean, has been felt recently. Several alien plants have been reported to spread at an alarming rate threatening the biodiversity of ecosystems of Sri Lanka. Some of these invasive plant species, which are of significant importance to Sri Lanka at present as weeds (year 1999) and have attracted the attention of scientists include, *Salvinia molesta*, *Eichhorina crassipes*, *Lantana camara*, *Mimosa pigra* and *Myroxylon balsamum*. *Salvinia molesta* has been introduced to Sri Lanka in 1939 for

scientific interests, but currently has become a major aquatic weed in Sri Lanka choking the irrigation canals and water bodies, and also invading rice fields. *Eichhornia crassipes*, an introduction Sri Lanka in 1905 is another major aquatic weed that has caused a significant impact on the water bodies of the country. *Lantana camara*, introduced to Sri Lanka in 1820s has spread across the island to a significant extent. *Mimosa pigra*, believed to have introduced to Sri Lanka in early 1980's (Amarasinghe and Marambe 1997), is growing luxuriantly in the riverbanks of Mahaweli and also in other areas in the central province, spreading at an alarming rate. The Mahaweli river is the major source of irrigation water that supports the agricultural crops in Sri Lanka, thus, there is a high risk that the weed spreads to a large extent via irrigation water. *Myroxylon balsamum*, introduced to Sri Lanka in 1870, has recently been identified colonizing in natural and semi-natural habitats in the central province of the country.

Several factors have contributed to the spread of alien invasive plants in Sri Lanka. These factors can be broadly categorized as biological/ecological, and social/political factors.

Biological/Ecological Factors affecting the Spread of Alien Invasive Plants in Sri Lanka

(i) *Absence of Natural Enemies*: This is one of the major ecological theories behind the successful invasive nature of alien plants. There is enough evidence that alien invasive plants are released from the pressure of the insect predators and pathogens, which would normally have their growth under checked conditions back in their homelands. An army of insect predators and pathogens, which are found in a natural habitat attacks the native species. Therefore, it is very natural that alien plants become invasive, as there is no natural control and easily dominate the introduced ecosystems over native species.

(ii) *Intrinsic Growth and Reproduction*: In general, the rapid invasion of alien invasive plants has been made possible due to their characteristic growth habit and reproductive potential. During the early stages of growth, most of the alien invasive plants found in natural or semi-natural ecosystems shows a remarkably slow growth rate, immensely assisting them to go unnoticed. However, during a latter period, the plants show a rapid growth rate and the invasion becomes visible resulting in destruction of native flora.

(iii) *Efficiency of seed dispersal*: Every species have their way of spreading its own species. Most alien species become invasive due to the availability of different mechanisms of spread. Water, birds, wind, animals and human beings can easily carry the seeds or propagules of the invasives away to new locations or ecological regions. Dispersal of seeds by wind is supported by low weight of seeds.

The animal-dispersed seeds could be carried away to longer distances, and could be critical in determining the success of spread of the alien invasive species. Water has been identified as the most important carrier for majority of the alien invasive plants in Sri Lanka such as *S. molesta*, *E. crassipes*, and *M. pigra*. In Sri Lanka, use of irrigation water contaminated with propagules of these invasive plants has helped in their distribution. In addition river sand is extensively used in building construction in Sri Lanka and thus, has become a major carrier of seeds of *M. pigra*. The fruits of *Lantana camara*, a major alien invasive plant in Sri Lanka has been found to carried from one location to another with the help of birds such as common bulbuls (U. Ekanayake - Personal Communication). This plant has also adopted it self to attract birds with beautiful flowers and thus, facilitate the process of distribution.

(iv) *Deep root systems*: The root system of the majority of tree species is located in the first 0.5 m below the soil surface. The remaining portion of the roots (sinker roots) penetrate in to lower soil layers and may play a crucial role in a plant's survival during the period of drought. Alien plants, in general, grow rapidly and establish deep sinker roots while being young. The roots of *Acacia spp.* and *Prosopis spp.*, alien plants found in Sri Lanka, could reach the soil depths of 20 m. Presence of a deep root system has resulted in the better survival of alien invasive plants under drought and low soil moisture environments.

Apart from these aspects, the non-availability of well-adapted native species to a given environment, presence of an empty-niche, and gaps produced by the disturbances to environment are also major biological/ecological factors that affects the spread of alien invasive plants in Sri Lanka.

Social/Political Factors affecting the Spread of Alien Invasive Plants in Sri Lanka

(i) *Deliberate introduction*: Sri Lanka has experienced several instances where deliberate introduction of alien plants has finally resulted in them becoming

invasive. Most of these species appeared to be non-invasive when their populations were small or only found in habitats influenced by people. For example, in Sri Lanka, *Salvinia molesta* has been introduced for scientific interest, *Eichhornia crassipes* for its horticultural values, *Myroxylon balsamum* as a wind break (Dr. D.K.N.G. Pushpakumara - Personal Communication) and *Leucaena leucocephala* as a multipurpose tree species. *Anredera cordifolia*, a perennial vine, has been identified recently as an invasive weed in tea plantations of Sri Lanka. The species is considered to be an introduction to tea plantation as the tubers of this plant are edible (Dr. S.L. Ranamukarachchi, Personal Communication).

Exchange of seed material between countries, especially through botanical gardens of respective countries, has been one of the major modes of introduction of alien plant species into a country or an ecosystem. Over-introduction is one of the common features of this activity.

(ii) *Transport of organic matter and soil, and agricultural machinery contaminated with seeds*: This has been identified as a major mechanism by which alien invasive plants are introduced un-intentionally to a new environment. In Sri Lanka, *Mimosa pigra* seeds have moved into highlands from riverbanks with river sand transported for construction purposes. In many other countries, the same species have spread into new areas with the help of agricultural machinery contaminated with seeds.

(iii) *Lack of awareness*: This is one of the major constraints in most of the nations that suffer from the negative effects of alien invasive species. Effective management of alien invasive plants requires sound knowledge of the current occurrences, and their rates and directions of spread. Poor understanding of the danger of invasive species would result in introduction of the species into different ecosystems of the country thus, assisting their distribution. In addition, management of alien invasive plants is an integral part of overall land management. However, this needs understanding and support of the Sri Lankan community, which is currently lacking.

(iv) *Lapses in legislation*: Absence of an Action Plan (or act) to control alien invasive species is a major deficiency to provide the legislative basis for their control in Sri Lanka. Development and implementation of such an action plan, strengthening the currently existing Plant Protection Ordinance of the Sri Lankan Government, would support the strategic objectives of

preventing introduction and spread of alien invasive plants and integrating alien plant management into all land management actions.

Alien invasive plants are a huge problem of many parts of the world, which comes at a considerable cost to the economy and environment. Thus, it is important to create awareness among the Sri Lankans to avoid the long-term detrimental effects of alien invasive plants to the ecosystem and economy of this island nation. No single organisation, industry, or public agency has all the information or resources to meet the national goals in controlling alien invasive plants in Sri Lanka. Partnerships to pool resources for effective and coordinated action, education to improve the public's awareness of invasive plants, expand support and compliance with invasive plant control activities, and research to overcome information gaps and provide new techniques in the management of invasive plants would result in an effective management of alien invasive plants in Sri Lanka.

REFERENCE

- Amarasinghe, L. and Marambe, B. (1997): *Mimosa pigra* L.: A new weed in aquatic habitats of Sri Lanka. Sri Lankan Journal of Agricultural Sciences, 34: 123-137.