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Review Article

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## Growing Concern and Threat of Invasive Alien Species on Natural Ecosystem and Native Species

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### ABSTRACT

Invasive alien species (IAS) are non native organism that cause, or have potential to cause harm to the environment, economics or human health. About 40% of Indian flora is alien, of which 25% is invasive. A number of invasive alien species colonized the Indian subcontinent have transformed the native landscape up to much more extent. Invasive species cause biodiversity loss, species extinction, hydrological changes and changes in ecosystem composition, structure and function. Invasive alien species have large detrimental economic impacts on human enterprises such as fisheries, agriculture, grazing and forestry. Differences between native and exotic plant species in their requirements and modes of resources acquisition and consumption may change the edaphic component (*i.e.* soil structure, profile, moisture availability, decomposition, soil nutrient content etc). Invasive species have posed a threat to conservation and sustainable use of biodiversity with impacts on ecosystem services. IAS are one of the most significant drivers of environmental change worldwide. Increasing globalization of market, rise in global trade, travel and tourism has given the global dimension to biological invasions. For effective management of invasive species, knowledge about their ecology, morphology, phenology, reproductive biology, physiology and phytochemistry is essential to trickle the IAS. Despite of recent recognition of the impact caused by invasive alien species, no concrete framework has been formulated to manage the invasive species. There is a dire need of urgent, integrated and coordinated invasive alien species management program. Present paper deals with the ecology of invasive species, impact of invasion on native plants and biodiversity and possible control measures.

**Keywords:** Invasive alien species (IAS), biodiversity, Convention on Biological Diversity

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## 1. Introduction

India's location is at junction point of three biographic realms *i.e.* Afro-tropical, Indo-Malayan and Paleo-arctic. The diverse physical features and tropical monsoon climate support rich biological diversity in different ecological habitats. India's rich vegetation wealth and diversity is due to the immense variety of the climatic and altitudinal variations coupled with varied ecological habitats. The main natural habitats in India are mountains, forests, grasslands, plains, rivers, wetlands, coastal and marsh areas and islands. (Mack and Lonsdale, 2001, Denslow and deWalt, 2008, Weber and Li, 2008). India, having only 2.4% of global area, exhibits 12.51% of floral diversity and 6.67% of faunal diversity and adobe about 9% of total species of the world (Venu, 1998; Hajra and Mudgal, 1997).

Since ancient days, it is the tendency of human beings to travel around the globe. During such long voyages, travelers collected and introduced several non native species in the new areas. Some of these species are presently the backbone of economy for specific countries such as wheat, potato, soybean, sugarcane etc. But alternatively some of these alien species were left uncontrolled in the new location became invasive in due course of time and are now slowly wiping out the indigenous species of the area. For a species to become IAS, it must arrive, survive and thrive. Biological invasion now operated at global level due to increasing globalization of markets, rise in global trade, travel and tourism (Sekar, 2012)

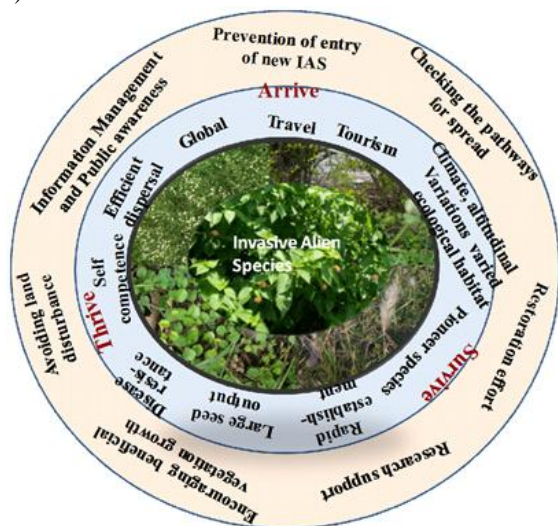
efficiency including production of a large number of seeds, efficient dispersal, vegetative and asexual reproduction, self compatible, rapid establishment, pioneer species and are strong competitor that help them to adapt to new habitats (Fig. 1). IAS has few natural predators, competitors, parasites or diseases (Sharma et al., 2005; Simberloff et al., 2005).

### Status of IAS

Despite of recognition of the impacts caused by IAS worldwide there are still many regions where basic information on naturalized plant taxa and plant invasions is only anecdotal or completely lacking *e.g.* Asia and neighboring regions (Corlett, 1988, Enmotto, 1999, Meyer, 2000). Worldwide there is a growing catalogue of the potential impacts of Invasive species on native species, wildlife habitats, disturbance regimes and ecosystem services (Pysek et. al., 2011; Foxcroft et al., 2014; Simberloff et al., 2013). Total 173 species belonging to 117 genera under 44 families were documented (Reddy, 2008). About 80% of the species were neotropics. Tropical America (74%) and Tropical Africa (11%) contribute maximum proportion to the IAS flora of India (Pandey et al., 2009). Among the IAS flora 151 are herbaceous followed by shrubs (14), climbers (5) and trees (3).

### Impact of IAS

The perceptible impacts of IAS are wide spread, encompassing community, population, ecosystems and above-all the economy of the nation. Invasive species are responsible for tremendous economic losses through loss in forest and agricultural productivity, spread of diseases that impact humans, among other impacts. IAS also adversely affect the fisheries, pasture productivity, soil chemistry, soil profile and decomposition, reduces the export, enhances flooding (water hyacinth), landslide (Nutria), wildfires (Cheatgrass) and loss of tourism (spotted Knapweed). Moreover, some of the IAS can even harm human livelihoods and exacerbate poverty by altering ecosystem services reducing sustainable uses of biodiversity and by replacing natural resources traditionally used by individuals and communities. Economic and public health may be harmed by IAS which can clog waterways, damage power lines and reduce energy production, decrease agricultural and timber output, depress tourism and spread disease to people, domestic animals and cultivated plants. This damage is aggravated by climate change, pollution, habitat loss and human induced disturbance. Various invasive plants are known to decrease local plant species.



**Fig. 1:** An outline of establishment causes and management of invasive alien species

## 2. Characteristics of invasive species

Invasive weed have faster growth rates and biomass production, high competitive ability, high reproductive

Natural, wild species can be threatened with extinction through genetic pollution. Genetic pollution is the uncontrolled hybridization and introgression which leads to homogenization or replacement of local genotypes as a result of either a numerical or fitness advantage of the

introduced species. Genetic pollution can bring about a form of extinction either through purposeful introduction or through habitat modification, bringing isolated species into contact. Some degree of gene flow may be normal, evolutionarily constructive process, and all constellations of genes and genotypes cannot be preserved. However, hybridization with or without introgression may, nevertheless, threaten a rare species existence.

### 3. Management of IAS

According to Convention on Biological Diversity (CBD) 1992, it is the second worst threat after habitat destruction. Article 8(h) of CBD states to prevent the introduction, control or even eradicate those alien species which threaten ecosystem, habitat or species. As per the CBD blue-print, the very first step is to create awareness among the masses for the invasive alien species. The awareness once created will help in checking the future spread of these species. The level of threat of IAS in an area needs to be assessed for chalking out the management plans. Prevention is the most effective method of dealing with IAS. Preventing the entry of new Invasive species, checking the pathways for spread in agricultural fields, encouraging the beneficial vegetation growth, avoiding disturbance as much as possible in the natural environment, restoration effort, research support, information management and public awareness are necessary for management of IAS (Fig. 1). Early detection and rapid response to eradicate before the establishment of species is the key to success. Identification and enlisting the IAS of national interest is also needed to save the environment from the horror effect of IAS.

### 4. Conclusion

With the changing global atmosphere, the importance of IAS may increase in the year to come. A better planning is needed for early detection and reporting of infestations of spread of new and naturalized weeds to monitor and control. It is now the high time to frame policies for the management of IAS. The management plans should be framed in conjunction with innovative technologies to control the IAS in such an economic way that the sustenance of the program is ensured.

### 5. Acknowledgements

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