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RECORD OF ALIEN PLANT SPECIES IN JAISAMAND WILDLIFE SANCTUARY, RAJASTHAN, INDIA

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The Jaisamand Wildlife Sanctuary, Rajasthan, India is widely affected by alien plant species. Some of them are listed among noxious invaders at global level. The current study focus upon preparing a compiled record of alien plant species present in the Jaisamand Wildlife Sanctuary along with their habit composition and native region.

The sanctuary is home to a total of 32 alien plant species constituting 14.47% of the total plant species in the sanctuary. The alien species belong to 17 families consisting of 06 trees, 07 shrubs, 02 climbers, 16 herbs and 01 grass. The largest family is Asteraceae represented by 07 species followed by Euphorbiaceae and Mimosaceae, represented by 05 and 04 species respectively. The recorded alien plants broadly belong to 5 geographical regions out of which 71.87% are of American origin, followed by African (18.75%), Australian, Afghan and Mediterranean region (each 3.12%) respectively.

The paper also includes description of certain alien plants on different landscapes in the sanctuary, factors responsible for the invasion of alien flora in Jaisamand Sanctuary and discussion on overall management needs.

Key Words: Alien, invasion, Jaisamand, management.

Many different words like 'alien', 'exotic', 'non-indigenous', 'non-native', 'foreign' etc are used to explain species occurring in ecosystems to which they are not indigenous. IUCN the World Conservation Union (2002) uses the term 'alien' enco mpassing all the above terms (Shine *et al.* 2000). The Convention on Biological Diversity (CBD 1992) in its '*Interim Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species*', defines alien species as "a species occurring outside its normal distribution". When alien species starts proliferating and spreading beyond its definite limits, it is said to be invasive. Important attributes that make an alien species invasive, include, its widespread geographical range, wide range of tolerance for temperature, precipitation and other weather extremes, ability to modify growth and development in response to changing environment, large reproductive output, short juvenile period, fast growth, capability of vegetative reproduction, fire resistance, better competitive ability, allelopathic nature, strong coppicing power, colonizing nature, various dispersal modes etc. Likewise, there are many attributes that make a habitat susceptible to invasion such as species poverty, poorly adapted native species, gaps created by disturbances, constant harvesting of indigenous vegetation for various purposes, presence of empty niches (Mantri *et al.* 2002). Invasion is usually noticed once the plant has already naturalized. As a result, the introduction of alien species has been recognised as one of the most serious threats to our ecological, social and economic well-being (Shine *et al.* 2000).

As in other parts of the world, a wide spectrum of plants has been introduced to India through international trade and travel. Of the total plant species recorded from India, about 40% have been identified as being alien (Saxena 1991). About 25% of the introduced species in India became invasive in a short period of time of 50-100 years (Murphy 2001).

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Lantana camara, *Ipomoea carnea* and *Casia tora* have established permanently as weeds in almost all parts of the country (Niraj 2005).

Prominent studies related to alien plants in India are contributed by Nair and Deshpande (1960), Jain (1960, 1963), Nair (1961), Maheshwari (1960, 1962), Sahni (1965), Mehra (1966), McMillan (1967), Rawat *et al.* (1994), Fensham *et al.* (1994), Prakash (2001), Kshirsagar and Patil (2002), Kshirsagar (2005), Singh and Chowdhary (2005), Sharma *et al.* (2005), Negi and Hajra (2007), Shah and Reshi (2007), Murthy *et al.* (2007), Srinivasan *et al.* (2007), Mathew and Habeeburrahman (2008), Raizada *et al.* (2008), Sahu and Singh (2008) and Reddy *et al.* (2008).

A comprehensive record of alien plants in Rajasthan was prepared earlier by Maheshwari (1977) and later on by Dubey (2008). Nativity of several plant species has also been mentioned in various floras of the state by Blatter and Hallberg (1918-1921), Puri *et al.* (1964), Bharucha and Meher-Homji (1965), Meher-Homji (1965), Bhandari (1978) and Tiagi and Aery (2007). The record of alien plant species in the state of Rajasthan is still deficient. Lack of baseline information about their regional occurrence has been major hindrance in their proper evaluation and devising control strategies, this is particularly in reference to protected areas.

The Jaisamand Wildlife Sanctuary is also affected by alien plant species and some of them are globally recorded noxious invaders. The sanctuary is situated 50 Km south of Udaipur, Rajasthan, India between 73^0 37' to 73^0 40' east longitude and $24^0$35' to $24^0$39' north latitude, with a total area of 52.342 Sq. Km (Fig.1). The area of Jaisamand Wild Life Sanctuary forms part of South Eastern Aravalli region of Mewar. The terrain of the sanctuary is highly undulating having continuous and broken ranges of hills ranging from 15 to 200 meters elevation from the surrounding countryside. The climate of Jaisamand area is sub-tropical type with hot summers and moderate winters. The average annual rainfall is about 658.7 mm with average 15-20 rainy days between the months of June to September. The average maximum and minimum temperature during summers is 45.5^o C and 31.5^o C and during winters 28.0^o C. and 7.0^o C. respectively. The humidity in the air remains nearly 20-25% throughout the year except the rainy season when it reaches up to 60-70%.

The present paper focus upon a compiled record of alien (invasive) plant species present in the Jaisamand Wildlife Sanctuary along with their habit composition and native region.

MATERIALS AND METHODS

Field surveys were conducted during different seasons from March, 2005 to February, 2010. The area was surveyed in two ways - (I) Walking on existing forest tracks and fire lines and recording the observed species and (II) Walking on the unknown tracks, off the tracks into the vegetation and recording the observed species.

Various floras [Hooker's Flora of British India (vol. 1-7) 1872-1897, Sharma and Tiagi 1979, Bhandari 1978, Shetty and Singh 1987, Shetty and Singh 1991, Shetty and Singh 1993, Tiagi and Aery 2007] were referred for identification and confirmation of plant species. Nativity of plant species was ascertained referring the international records of IUCN (2002), Global Invasive Species Program (2003) and other records (Reddy *et al.* 2008, Reddy 2008, Maheshwari 1977, Nayar and Sastry 1987-88; Negi and Hajra 2007, Mukul *et al.* 2006, Wagner *et al.* 1999 and Smith 2002).

OBSERVATIONS AND RESULTS

The record of alien plants present in Jaisamand Wildlife Sanctuary is given in **Table - 1**. A total of 32 alien plant species were identified which constitute 14.47% of the total record of species (221) present in the sanctuary. The alien species belong to 17 families

Table - 1: Record of Alien Plant Species Present in Jaisamand Wildlife Sanctuary, Udaipur, Rajasthan, India

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***** listed among the 100 world's worst invasive alien species (Lowe *et al.* 2000).

consisting of 06 trees, 07 shrubs, 02 climbers, 16 herbs and 01 grass. The largest family is Asteraceae which is represented by 07 species, all herbs. The second largest family is Euphorbiaceae represented by 05 species and the third largest family is Mimosaceae represented by 04 species of trees.

The recorded alien plants broadly belong to 5 geographical regions. It is demonstrated that 71.87% of the alien plants are of American origin, followed by African accounting for 18.75% whereas Australian, Afghan and Mediterranean each account for 3.12% respectively.

There are three plants in the sanctuary which are listed among the world's worst 100 alien invasive species. These are *Prosopis chilensis* (Molina) Stuntz., *Leucaena leucocephala* (Lam.) de Wit and *Lantana camara* L. (Lowe *et al.* 2000). *Prosopis chilensis* was introduced along the forest boundary to develop closure to prevent intrusion of people and cattle into the sanctuary and illicit grazing. But soon the mesquite spreaded quickly, uncontrollably and started out-competing the native species. It is the chief alien plant that has continuous distribution from periphery to interior most parts and across the sanctuary.

Lantana camara, also one of the 10 worst weeds of the world, is chiefly present along the southern parts of sanctuary boundary along the state highway.

There are characteristic site characters that have allured some other alien plants. Open areas in the periphery and hill slopes are occupied by *Pithecellobium dulce, Eucalyptus, Dichrostachys cinerea, Opuntia elation, Zinnia elegans, Ricinus communis, Jatropha curcas* and *Jatropha gossypifolia etc.* Whereas, open forest land under degradation is occupied by *Cassia tora, Acanthospermum hispidum, Parthenium hysterophorus* and *Tridax procumbens etc.* Moist places along water holes, streams and anicuts are preferred by *Cryptostegia grandiflora, Ageratum conyzoides,* and *Chrozophora rottleri* etc. *Sorghum halepense* is chiefly present near stream zones in the open interior parts of the sanctuary.

DISCUSSION AND CONCLUSION

It is obvious that half of the alien flora of the sanctuary consists of herbaceous species

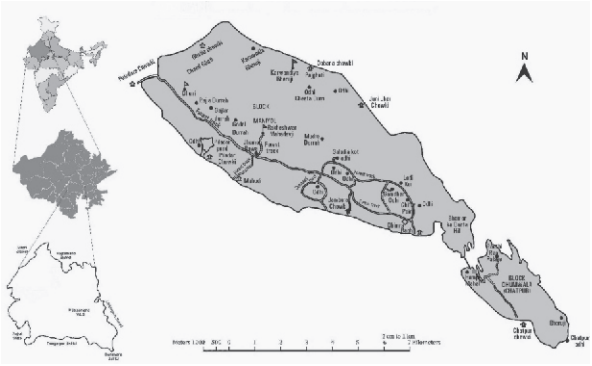

Figure 1 - Location Map of Jaisamand Wildlife Sanctuary, Udaipur, Rajasthan, India

but the major impact is caused by trees and shrubs since most of the herbs are seasonal whereas trees and shrubs are perennial hence more viable and influential.

The chief factor responsible for the invasion of alien flora in Jaisamand Sanctuary is anthropogenic activities like lopping for fuel and fodder and grazing inside the sanctuary area that lead to habitat destruction, forest fragmentation and introduction of alien species. The peripheral areas of the sanctuary are highly disturbed by the people of the vicinity. The geographical spread of the sanctuary is in the form of corridor having length about 15 km. (E-W) and width ranging from 6 km to 4 km (N-S). This provides easy accessibility up to the interiors of the sanctuary. Although it is clear that alien invasive species are more or less harmful, however some plants sometimes play beneficial role in socio-economic prospects, soil conservation, medicinal use, catering demand of fuel, fodder and timber etc. Sustainable exploitation of these species may help in socio-economic amelioration. *Pithecellobium dulce* is an excellent source of fodder and fuel wood. Fruits of *Pithecellobium dulce* and *Annona squamosa* are widely eaten by various animal species and human beings. Leaves, roots and fruits of *Annona* are used in indigenous medicines. *Ocimum americanum* leaves are used in indigenous medicines. *Jatropha curcas* is a known source of biodiesel and one of the most favoured plants for wasteland development. The seed oil of *Ricinus communis* is used as purgative and several other purposes like soap making, leather dying etc.

The actual concern for alien plants is about their management and purposeful use which needs to focussed upon in the future management plans of the sanctuary.

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