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DOCUMENTATION OF INVASIVE PLANT SPECIES IN LATEHAR AND HAZARIBAGH DISTRICTS: JHARKHAND – INDIA

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ABSTRACT

The survey was undertaken to document the alien invasive flora present in different ecosystems during November 2010 to February 2011 in Latehar and Hazaribagh districts of Jharkhand. A total of 41 invasive alien species was documented in the selected forests and non-forest areas. Among invasive alien species, major potential threat in the near future is by *Lantana camara*, *Argemone mexicana*, *Eupatorium odoratum* and *Hyptis suaveolens*. *Lantana camara* was highest in open forest with density of 2917/ha and frequency 47.62 % compared to dense forest with density of 42.5/ha and frequency 50 % in Latehar forest. Whereas in Hazaribagh forests the density of *Lantana camara* was higher than Latehar forests with 3535/ha in open forest and 177/ha in dense forest. In Agricultural land *Celosia argentea*, *Argemone mexicana*, *Cassia tora*, *Eclipta prostrata*, *Emilia sonchifolia*, *Evolvulus nummularius*, *Oxalis corniculata*, *Portulaca oleracea*, *Scoparia dulcis*, *Sonchus oleraceus*, and *Tridax procumbens* are found thorough out Hazaribagh and Latehar districts. *Eichornia crassipes* was major invasive species found in pond ecosystem.

Key words : Alien invasive species, Documentation, Hazaribagh, Latehar

Introduction

An 'Alien' species is an exotic or non indigenous species which are evolved elsewhere and have been intentionally or accidentally introduced outside their natural adaptive ranges and dispersal potential (Turlings, 2000). Increasing human mobility and expansion of global trade has led the alien species to migrate in new ecosystem at large magnitude and scale. The naturalization of alien species in new ecosystem becomes of concern when such species turn themselves into invasive nature by successfully reproducing and aggressively colonizing in such a magnitude as to displace the native species. Such naturalized species are called 'invasive' (Richardson *et al.*, 2000). International union for conservation of nature and natural resources (IUCN, 2000) defines alien invasive species as a non indigenous species which get established in natural or semi natural ecosystem or habitat, changes the quality of habitat, alters the functioning of native ecosystem and ultimately threatens the biological diversity. The invasion of alien species has been evaluated as second most important threat to existence of native species behind habitat destruction (Jenkins *et al.*, 1999). The ability of alien invasive species to exploit anthropogenic disturbances and affect the native species through allelopathic strategies together the absence of natural enemies in the new ecosystem where they are introduced has led them to get distributed in all kinds of ecosystem throughout the world (Pant and Sharma, 2011). Alien invasive species can alter the structure and function of an ecosystem by repressing or excluding native species either directly by

out competing them for water and mineral resources or indirectly by changing the way in which nutrients are cycled through the ecosystem (McNeely *et al.*, 2001). Invasive species have negative impact on economics, reduce biodiversity and affects livelihood by increasing investment in agriculture and silviculture (Ricciardi *et al.*, 2000). Invasive plant species in a forest landscape displaces the native species by out competing the seeds of native species to germinate and by suppressing the growth of native saplings. In agricultural landscapes, the invasive plant species out compete crops for soil and water resources thus reducing crop yield and forage quality. A scientific study on the biology and impact of individual alien invasive species on different ecosystem of a particular region always need a basic database of naturalized alien species of that area (Wu *et al.*, 2004). As many as 173 alien plant species invading the different landscapes of India has been reported by Reddy (2008). Ecological distribution and floristic studies of vegetation have become very important due to the growing threat of invasions to different ecosystems (Kikvidze *et al.*, 2005; Lesica *et al.*, 2006). In view of the above, a study was undertaken to document the alien invasive plant species in forest and non-forest areas of Latehar and Hazaribagh districts of Jharkhand.

Material and Method

i) Study area

The present study was undertaken in Latehar and Hazaribagh district of Jharkhand, India during November 2010 to February 2011. The district Latehar is located at

Forty-one invasive alien plant species have been documented from forests and non-forest areas of Latehar and Hazaribagh districts, of which *Lantana camara*, *Chromolaena odorata*, etc. were potential threat.

latitude 23°56' N – 23°35' N, longitude 84°50' E – 84°06' E and altitude 327 m having an annual rainfall of 1200 mm. The district headquarter is situated 100 km north west to the state capital Ranchi. The district Hazaribagh is located at latitude 23°50' N – 24°4' N, longitude 85°21' E - 85°9' E and altitude 604 m having an annual rainfall of 1234.5 mm. The district headquarter is situated 91 km north to the state capital Ranchi. Both the districts have well defined 5 season viz. winter (Dec. - Feb.), spring (March-April), summer (May- June), rainy (mid June- mid Sept.) and autumn (Oct. - Nov.). Both districts receive maximum rainfall during monsoon months of mid June to mid September.

ii) Field survey

The documentation of alien invasive plant species was done on the basis of extensive exploration of both districts. Individual administrative blocks of the district were taken as study units so as to ensure coverage of the representative sites of the whole district. In each administrative block, two representative forest sites were selected for the study. Altogether nine and 15 administrative blocks of Latehar and Hazaribagh districts were surveyed respectively. Survey revealed three types of forest viz. dense sal forest, semi dense sal forest and open/mixed forest in both the district. Accordingly data with respect to invasion of alien invasive plant species to the corresponding forest types were recorded. Survey of non forest land included agricultural fields, open grazing land and the vegetation found along the roadsides.

iii) Documentation and analysis

The plants documented were categorized according to their habits as herb, shrub, climber and tree. The plants were identified with the help of local flora literature available at the library of Institute of Forest Productivity. Density and frequency of a species was measured as per Johnson (1983) and Kenneth and Looney (1985).

Result and discussion

A total of 41 alien invasive plant species (Table 1) belonging to 21 families were recorded from different habitats including forest, non forest areas and water bodies of both districts. The maximum number of invasive alien plant species (9) belonged to family Asteraceae followed by family Caesalpiniaceae and Solanaceae (4 each), Lamiaceae (3), Verbanaceae, Mimosaceae, Amaranthaceae and Malvaceae (2 each). There was one species of each of the rest 13 families. Out of the 41 species documented majority of the species are native to Tropical America (29 species) followed by Tropical Africa (5 species), South America (4 species), Mediterranean (2 species) and Europe (1 species). 33 species are herbaceous in habit, 6 are shrub and 1 each of

climber and tree habit.

i) Alien invasive plant species in forest area

The most concerning alien invasive plant species in terms of rapid growth, higher density and frequency in forest area were *Lantana camara* L., *Chromolaena odorata* (L.) King & Robinson and *Hyptis suaveolens* (L.) Poit. Inside the forest these species were so much gregarious in their growth and forming so much dense thickets that they were making the forest almost impenetrable to enter inside. *Lantana camara* was highest in open forest with density of 2917/ha and frequency 47.62% compared to dense forest with density of 42.5/ha and frequency 50% in Latehar forest. Whereas in Hazaribagh forests the density of *Lantana camara* was higher than Latehar forests with 3535/ha with 100% frequency in open forest and 177/ha with 50% frequency in dense forest. Regeneration and density was more in *Lantana camara*, *Hyptis suaveolens* and *Sida acuta* (Burm.f.) under open forest. In dense forest, regeneration of alien invasive plants was limited/restricted because of high shade condition with only *Lantana camara*. In semi dense Hazaribagh forest *Lantana camara* was major invasive species with a density of 476.7/ha and frequency of 75%. In semi dense Latehar sal forests, *Lantana camara*, *Sida acuta* and *Triumfetta rhomboideae* Jacq. were found to have good regeneration and wide spread with a density of 2547, 1069 and 1862/ha and frequency of 100%, 50% and 75% respectively. Semi dense forest found in Betla tiger reserve was mainly infested by *Sida acuta* and *Lantana camara* with density of 3453 and 11093/ha and a frequency value of 100% respectively.

ii) Alien invasive plant species in agriculture land

Celosia argentea L. and *Argemone mexicana* L. were the most frequent species of agricultural lands of both districts. These were so aggressive and opportunistic in invasion that they can even penetrate the flourishing crop if there is any negligence in regular weeding activity as recorded at different sites during the survey. Other invasive plant species observed commonly in agricultural field that demand continuous weeding practices include *Ageratum conyzoides* L., *Cassia tora* L., *Eclipta prostrata* (L.) Mant., *Emilia sonchifolia* (L.) DC., *Evolvulus nummularius* (L.) L., *Oxalis corniculata* L., *Portulaca oleracea* L., *Scoparia dulcis* L., *Sonchus oleraceus* L. and *Tridax procumbens* L.

iii) Alien invasive plant species in non forest open land, wasteland and roadsides

There are many invasive plant species which were always present in roadside and open field growing together and supporting each other's growth making a unique type of phytosociology as they were always

Sl. No	Species	Vernacular name	Common name	Family	Habit	Nativity	Vector	Season of occurrence	Ecosystem
22	<i>Leucaena leucocephala</i>	Subababul	Subabul	Mimosaceae	Tree	Tropical America	Human and animal	Rainy season, Fl.-Fr. – Rainy season	NFWL, RS
23	<i>Ludwigia octovalvis</i>	Persuta ghas	Water primrose	Onagraceae	Herb	Tropical Africa	Water run off	Throughout the year, Fl.-Fr.-July to Dec.	AQ, WL
24	<i>Mimosa pudica</i>	Chui mui	Sensitive plant	Mimosaceae	Herb	Brazil	Water run off	Throughout the year, Fl.-Fr.-July to Nov.	RS, WL
25	<i>Nicotiana plumbaginifolia</i>	Ban tambaku	Tex mex tobacco	Solanaceae	Herb	Tropical America	Water run off	Throughout the year except winter season, Fl.-Fr. – April to July	NFWL, RS
26	<i>Mirabilis jalapa</i>	Sandhya malti	4 O clock plant	Nyctaginaceae	Herb	Peru	Nursery operation	Throughout the year, Fl.-Fr.-Aug. to March	NFWL, RS
27	<i>Ocimum americanum</i>	Jangli tulsi	Hoary basil	Lamiaceae	Herb	Tropical America	Water run off	Throughout the year, Fl.-Fr.-June to Sept.	NFWL, RS
28	<i>Opuntia stricta</i>	Nagpheni	Prickly pear	Cactaceae	Herb	Tropical America	Wind, water runoff,	Throughout the year, Fl.-Fr.-Throughout the year	NFWL, RS, WL
29	<i>Oxalis corniculata</i>	Khatti buti	Yellow wood sorrel	Oxalidaceae	Herb	Europe	Water run off	Throughout the year, Fl.-Fr.-Almost Throughout the year but chiefly during July to Oct.	F, NFWL, RS, WL
30	<i>Parthenium hysterophorus</i>	Gajar ghas	White top weed	Asteraceae	Herb	Tropical north America	Wind, water runoff, transportation of grains	Throughout the year, Fl.-Fr.-June to Sept.	NFWL, RS, AF
31	<i>Portulaca oleracea</i>	Golgola saag	Purslane	Portulacaceae	Herb	Trop. south America	Water runoff	Throughout the year, Fl.-Fr.-Throughout the year	NFWL, RS, AF
32	<i>Scoparia dulcis</i>	Madhukam	Sweet broom	Scrophulariaceae	Herb	Tropical America	Fodder collectors	Throughout the year, Fl.-Fr.-Most of the year	NFWL, RS
33	<i>Sida acuta</i>	Bariyar	Snake toungue	Malvaceae	Herb	Tropical America	Cattle, animal and man	Summer to Rainy season, Fl.-Fr. – Rainy season	F, NFWK, RS
34	<i>Solanum torvum</i>	Kutumba	Turkey berry	Solanaceae	Shrub	West Indies	Transportation of grain and human nursery operations	Throughout the year, Fl.-Fr.-Rainy season	NFWL, RS
35	<i>Solanum viarum</i>	Jangli baigan	Tropical soda apple	Solanaceae	Herb	Tropical America	Human, water runoff, wind	Summer to Rainy season, Fl.-Fr. – Summer to Rainy season	NFWL, RS,
36	<i>Sonchus oleraceus</i>	Doodhi	Sow thistle	Asteraceae	Herb	Mediterranean	Wind	Throughout the year, Fl.-Fr.-July to Sept.	NFWL, RS
37	<i>Stachytarpheta jamaicensis</i>	Bhengeriya	Jamaica vervain	Verbenaceae	Herb	Tropical America	Human and animals	Throughout the year, Fl.-Fr.-Throughout the year	NFWL, RS
38	<i>Tridax procumbens</i>	Chikti	Chinese burr	Asteraceae	Herb	Tropical America	Cattle, animal and man	Throughout the year, Fl.-Fr.-Throughout the year	NFWL, RS, AF
39	<i>Triumfetta rhomboidea</i>	Bachita	Caesar weed	Malvaceae	Shrub	Tropical Africa	Animal	Throughout the year except winter, Fl.-Fr.- Throughout the year	F, NFWL, RS
40	<i>Urena lobata</i>	Bhedi lattha	Rough cocklebur	Asteraceae	Herb	Tropical America	Animal and man	Throughout the year, Fl.-Fr.-Oct. to Dec.	F, NFWL, RS
41	<i>Xanthium strumarium</i>							Late summer, Fl.-Fr.- Rainy season	NFWL, RS

Fl.- Flowering, Fr.- Fruiting, F – Forest, RS – Roadside, AF – Agricultural field, WL – Wetland, A – Aquatic, NFWL – Non-forest Wasteland.

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Fl.- Flowering, Fr.- Fruiting, F - Forest, RS - Roadside, AF - Agricultural field, WL - Wetland, A - Aquatic, NFWL - Non-forest Wasteland.

observed in mixed group of specific invasive vegetation. These plant species include *Cassia tora*, *Cassia occidentalis* L., *Cassia hirsuta* L., *Calotropis procera* (Ait.) R.Br., *Cuscuta reflexa* Roxb., *Bidens pilosa* L., *Datura metel* L., *Hyptis suaveolens*, *Lantana camara*, *Leonotis nepataefolia* (L.) R.Br., *Leucaena leucocephala* (Lam.) de Wit., *Mirabilis jalapa* L., *Nicotiana plumbaginifolia* Viv., *Ocimum americanum* L., *Opuntia stricta* (Haw.) Haw., *Solanum torvum* Sw, *Solanum viarum* Dunal, *Stachytarpheta jamaicensis* (L.) Vahl., and *Xanthium strumarium* L.

iv) Alien invasive plant species in wet lands and water bodies

Alternanthera philoxeroides (Mart.) Griseb., *Mimosa pudica* L. and *Ludwigia octovalvis* (Jacq.) Raven. were found in wet lands, along ponds, drains and abandoned agricultural fields where water lodging supported their growth. *Eichornia crassipes* (C. Martius) Solms-Loub. was present in most of the water bodies of both districts and was found very detrimental to the water ecosystem.

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लटिहार और हजारीबाग जिला : झारखंड-भारत में आक्रामक पादप प्रजातियों का प्रलेख-पोषण

बी.एन. दिवाकरा, सन्तोष प्रसाद और रामेश्वर दास

सारांश

झारखंड के लटिहार और हजारीबाग जिलों में नवम्बर, 2010 से फरवरी 2011 के दौरान विभिन्न पारितंत्रों में मौजूद वैदेशिक आक्रामक वनस्पति को प्रलेखित करने के लिए सर्वेक्षण किया गया। चयनित वनों और गैर-वन क्षेत्रों में 41 आक्रामक वैदेशिक प्रजातियों को प्रलेखित किया गया। आक्रामक वैदेशिक प्रजातियों में, निकट भविष्य में प्रमुख संकट *लैण्टाना कमारा*, *आर्जीमोन मैक्सिकाना*, *यूपेटोरियम ओडोरेटम* और *हीप्टिस सूएवीओलेन्स* द्वारा है। लटिहार वन में 42.5 प्रति हैक्टेयर के घनत्व और बारम्बारता 50% के साथ सघन वन की तुलना में 2917 प्रति हैक्टेयर के घनत्व और बारम्बारता 47.62% के साथ खुले वन में *लैण्टाना कमारा* उच्चतम था। जबकि हजारीबाग वन में *लैण्टाना कमारा* का घनत्व सघन वन में 177 प्रति हैक्टेयर और खुले वन में 3535 प्रति हैक्टेयर के साथ लटिहार वनों की अपेक्षा उच्च था। कृषि भूमि में, *सीलोसिया अर्जीन्टीया*, *आर्जीमोन मैक्सिकाना*, *केसिया टोरा*, *इक्लिप्टा प्रोस्ट्राटा*, *इमिलिया सोनचिफोलिया*, *ईवोल्वुलस न्यूमूलेरियस*, *ऑक्सैलिस कार्निक्लाटा*, *पार्टूलाका ओलीरेसीया*, *स्कोपेरिया डूल्सिस*, *सोनचूस ओलीरेसीयस* और *ट्राइडेक्स प्रोक्यूम्बिन्स* सम्पूर्ण हजारीबाग और लटिहार जिलों में पाए गए हैं। *इकोर्निया क्रीसिपीस* प्रमुख आक्रामक प्रजाति थी जिसे तालाब पारितंत्र में पाया गया।

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