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Invasive Alien Plant Species in the Roadside Areas of Jorhat, Assam: Their Harmful Effects and Beneficial Uses.

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ABSTRACT
Alien invasive plants are becoming a major concern, during past two decades, among conservationists. Now it is an established fact that Invasive alien plant species have caused extensive economic and ecological damage world over. Many of the exotic plants are of economic benefit also, due to which some alien species, often cultivated, may provide food, medicine, fuel, or fodder to local communities. The present paper discusses the status of invasive plant species in the roadside areas in the Jorhat district of Assam along with their harmful impacts as well as their beneficial uses. A total of 18 invasive alien plants of 10 families were recorded from the road side areas of the study site. All the recorded invasive species of the study site are used by the different ethnic communities as ethnomedicines. Other uses were recorded as vegetables, fooder, live fancing etc. Harmful effects were identified on native plants, crop production, livestock grazing human health ,water drainage etc.
Key words: Invasive Plants, Obnoxious weeds Harmful effect, Beneficial uses, Jorhat.

I. INTRODUCTION

Invasive alien species are species that are introduced as a consequence of human activities to new geographic areas, where they become established and then proliferate and spread. Biological invasions of alien plants present one of the most serious threats to long-term maintenance of ecosystem health and biodiversity (Westman, 1990, Tyser and Key, 1988) and poses a major threat to indigenous biological diversity. Invasive alien plants have caused extensive economic and ecological damage throughout the world. Therefore the effects of biological invasions are increasingly being recognized for their role in degradation of biological diversity worldwide (Usher *et al*., 1988; D'Antonio & Vitousek, 1992). Alien plants have various effects on the environment and economy of non-native areas, many of the exotic plants are of economic benefit and some have severe negative impacts. Some alien species, often cultivated, may provide food, medicine, fuel, or fodder to local communities (Kull et al 2007; Roder et al 2007) and some of them are responsible for endangerment and extinction of native species and has negative impact on crop production, forest regeneration, livestock grazing, and on human health (Sharma et al 2005; Kohli et al 2006). It is estimated that as many as 50% of invasive species in general can be classified as ecologically harmful, based on their actual impacts (Richardson et al., 2000).

Over the last many decades, a number of Invasive Species have been introduced in India from their native areas either accidentally or deliberately as fodder crops or ornamentals. It is fueled rapidly during the last half-century as the globalisation of trade and industry has resulted in increased mobility of people and goods, and the associated transport of plants, animals and micro-organisms around the world. Likewise the Assam plain of India is also invaded by a variety of Invasive alien plants. Without realizing the consequences, they have been introduced into Assam knowingly or unknowingly. The present study aims to know about the status of invasive species in the roadside areas in the Jorhat district of Assam along with their harmful impacts as well as their beneficial uses.

II. STYDY AREA AND LOCATION

Jorhat, is the second largest city of Assam in North-East India with a geographical area of 2859.3 sq. km lies between 26°46´ N latitude and 96°16´ longitude. The climate of the region is typically tropical to sub-tropical with the average annual rainfall, temperature and humidity of 272.84 mm, 23°C and 82.1% respectively. The survey is conducted during 2011-2012 covering the major roads of Jorhat district namely Seuni Ali (A.T. Road) Kharikatia Ali, Mallow ali, Na- ali, Choladhora ali, and in the National Highway No. 37 (NH37) which runs through the heart of Jorhat, 20 km towards the east of Jorhat town upto Jaji,

III. MATERIALS AND METHODS

A total of 26 roadside plots at 1– 4 km intervals were selected along the major road in Jorhat district of Assam and in the National Highway No. 37 (NH37) 20 km towards the east of Jorhat town upto Jaji. Plot sizes varied from 5 m^2 to 5m×10m.Invasive plants encountered within these plots were recorded

and collected. The plants were identified with the help of herbaria of the Department of Botany, Bahona College, Jorhat, and by following standard text like P Chowdhary and Wadhwa, (1984),Chauhan (1999) Kanjilal et.al. (1932-40). Frequency of each Invasive species is determined and calculated according to Odum (1971). Additional habitats of invasive alien plants were also recorded through direct observations. Informations about the mode of introduction, harmful effects, and ethnomedicinal uses and other beneficial uses, of these Invasive plant species were gathered by Personal observation, field interviews and consulting with available literature. A literature survey was conducted to know about the origin, growth form, mode of propagation etc for each plant identified.

IV. RESULTS AND DISCUSSION

A total of 18 invasive alien plants of 10 families were recorded from the road side areas of the study site. The dominant family was Asteraceae (5 species) followed by Caesalpiniaceae (4) and Convolvulaceae (2). Most species are originated from South America. 9 species are shrub, 7 are herb, 1 climber and I aquatic in growth from. 13 species only reproduced by seed, 3 species by vegetative reproduction, and 2 species by both seed and vegetative. *Ageratum conyzoides* shows highest frequency (73.07%) followed by *Chromolaena odorata* (69.23%) and *Chamaesyce hirta* (46.15%)

Table I: Invasive plant species in the Roadside areas of Jorhat, Assam.

Botanical Name	Family	Local name	Country of Origin	Growth form	Propagation	Frequency (%)
Ageratum conyzoides	Asteraceae	Gondhowa-bon	Trop. America	Herb	Seed	73.07
Alternanthera tenella	Amaranthaceae	Mati-kanduri	Trop. America	Shrub	Seed	42.3
Argemone mexicana	Papaveraceae	Sealkanta	Central & South America	Shrub	Seed	15.38
Cassia alata	Caesalpiniaceae	Khor-goch	West Indies	Shrub	Seed	26.92
Cassia obtusifolia	Caesalpiniaceae	Medelua	Trop. America	Undershrub	Seed	15.38
C. tora	Caesalpiniaceae	Bilokhoni	Trop. South America	Undershrub	Seed	23.07
Cassia occidentalis	Caesalpiniaceae	Hant-thenga	Trop. South America	Shrub	Seed	19.23
Chamaesyce hirta	Euphorbiaceae	Gakhirotibon	Trop. America.	Herb	Seeds	46.15
Chromolaena odorata	Asteraceae	German habi	Trop. America.	Shrub	Seeds	69.23
Datura innoxia	Solanaceae	Dhatura	America	Shrub	Seeds	23.07
Eclipta prostrata	Asteraceae	Kehraj-bon	Trop. America	herb	Seeds	26.08
Eichornia crassipes	Pontederiaceae	Panimetek a	South America	Aquqtic	vegetative	23.07
Ipomea carnea	Convolvulaceae	Pani-votora	South America	Shrub	Vegetative	15.38
Ipomea aquatica	Convolvulaceae	Kolmou	China	Shrub	Vegetative	42.30
Lantana camera	Verbenaceae	Goo-phul	South America	Shrub	Seed,Vegetative	19.23
Mikania micrantha	Asteraceae	Japanihabi	South America	Climber	Seed,vegetative	38.46
Mimosa pudica	Fabaceae	Lajukilata	Central America	Herb	Seed	30.76
Parthenium hysterophorus	Asteraceae	Gajar ghas	South America	Herb	Seed	7.69

V. HARMFUL EFFECTS AND BENIFICIAL USES

All the recorded invasive species of the study site are used by the different ethnic communities as ethnomedicines. They are used to cure different common ailments including Skin diseases, Diabetes, Dysentery, Piles, Bodyache, and Jaundice etc. Some of them are also used to cure disease of Cattles. Other uses are as vegetable (*Ipomea carnea, Alternanthera tenella, Cassia tora),* for insect repellent, live fencing, hedge plant, ornamental, paper industry, rope making etc.

Harmful effects of these plants includes Reduce crop production as most of these species are obnoxious weeds in the various crop fields, effects on livestock grazing, toxic and allelopathic impacts on native plants including crop, blocks drainage system (*Ipomea carnea, Eichornia crassipes),* negative impacts on human health and livestock.

Table: II Harmful effects and beneficial uses of Invasive species recorded in the study site:

Botanical Name	Beneficial Uses		Harmful Effects
	As traditional medicine	Other Uses	
Ageratum conyzoides	Leave paste is applied on cuts and wounds to stop bleeding; Plant Juice is used in jaundice.	-	As a common weed in the crop field reduces crop production.
Alternanthera tenella	Leaf is used as medicine in fever and in common weakness.	Whole plant is used as vegetables	As a common weed in the crop field reduces crop production
Argemone mexicana	Roots are used in piles. Roots are also used as anthelmintic.	---	Seeds are resembled to mustard seeds due to which it is used to adulterate mustard seed. The seeds contain 22-36% of pale yellow non-edible oil, called argemone oil or katkar oil**,** which contains the toxic alkaloids sanguinarine and dihydrosanguinarine. Toxic oil from seed causes lethal dropsy when used with mustard oil for cooking. The plant has allelopathic effects on germination and seedling vigour of wheat, mustard, sorghum etc.
Cassia alata	Leaf juice is applied directly on the infected areas of ringworm.	--	Reduces crop production and native vegetation.
Cassia obtusifolia	Leaf paste is applied externally on skin diseases.	--	Reduces crop crop production, native vegetation.
C. tora	Leaf paste is applied on ringworm, scabies and eczema. Leaves are also used in the treatment of body pain.	Tender shoot is used as vegetables.	Plant has allelopathic effect of on seed germination and growth of mustard. (Sarkar et al,2012), Reduces crop production, native vegetation.
Cassia occidentalis	Seeds and leaf paste is used in skin disease, Seed, stem etc are used as antidiabetic, Leaves, roots flowers are also used against hysteria.	--	Plant has allelopathic effect of on seed germination and growth of mustard. (Chatterjee et. Al. 2012). Reduces crop production, native vegetation.
Chamaesyce hirta	Powderd plant extracts mixed with *Eleocarpus floribundus* fruits and used till cured anaemia. Stem paste is applied on abscesses Plant is also used in asthma, bronchitis.	The milky juice is useful in destroying **harmful** snails and other aquatic pests	*Chamaesyce hirta* is a host to many fungal pathogens and may as such act as a reservoir of pathogenic fungi, which can infect nearby susceptible crops.It is also acts as a host to several insect vectors.

Chromolaena odorata	Leaf paste is used in cut wounds.	It can be used as a green manure, possess insecticidal properties.	Allelopathic to tomato (Onwugbuta. E.J (2011) The high nitrate levels in young foliage could be the cause of livestock death (Sajise et al. 1974) while alkaloids in the flowers killed goats which ate the flowers (McFadyen 2004).
Datura innoxia	Leave paste are used directly on skin itch	Used as Ornamental garden plants.	All parts of *Datura* plants contain dangerous levels of poison and may be fatal if ingested by humans and other animals, including livestock and pets. In some places it is prohibited to buy, sell or cultivate *Datura* plant. (Preissel,2002)
Eclipta prostrata	The plant is used internally and applied externally as hair tonic for blackens hair and to prevent leaf fall. Leaf Juice is also used for jaundice. Fresh leaves are used in elephantiasis.	--	Reduce crop production, native vegetation
Eichornia crassipes	Juice of this plant is used to treat fresh wounds injury and also used to ease swelling, burning.	The fibre from the stems can be **used** to make ropes, Dry plants are used as organic manure. The plant can be cultivated for use in wastewater treatment,	It is a most obnoxious weed and reduces crop production, and blocks drainage system. Eating the plant, reported to contain HCN, alkaloid, and triterpenoid, may induce itching (Perry, 1980).
Ipomea carnea	Leaf extract is drunk in case of asthma. Leaves juice is used in jaundice, also used in urinary trouble.	Shoots are used as vegetable.	Blocks drainage system
Ipomea aquatica	Plant is used in ringworm infection and to treat asthma.Latex is used in skin diseases man and cattle.	Stem is used for making paper	Reduce crop production, native vegetation
Lantana camera	Leaves of the lantana is used in snakebite. Leaves are boiled and use as an inhalant for respiratory problems. The decoctions of dried roots are used for gonorrhea, cough, mumps, malaria and influenza.	Use as hedge plant, Live fencing. The stalks are used as raw material for paper pulp.	Reduce crop production, effects on livestock grazing, seeds are known to be toxic.
Mikania micrantha	Juice of the plant is useful in insect bite. Leaf extract is given to pigs, hens and dogs suffering from diarrhoea	--	Reduce crop production, native vegetation
Mimosa pudica	Leaf juice with milk is used as a good remedy for piles. Root decoction is used in	--	Reduce crop production, native vegetation, effects on livestock grazing

	toothache. Leaf decoction is used to treat stones in the urinary tract.		
Parthenium hysterophorus	Decoction of root is useful in dysentery Leaf juice is applied externally on skin disorders	--	This obnoxious weed posing a major threat to the biodiversity worldwide It is known to cause asthama, bronchitis in man and livestock.

VI. CONCLUSION

Biological invasions of alien plants present one of the most serious threats to the indigenous biological diversity. Invasive alien plants have caused extensive economic and ecological damage throughout the world. In India especially NW Himalaya *Ageratum conyzoides* L., *Parthenium hysterophorus* L., *Lantana camara* L. and *Eupatorium adenophorum* Sp. (Syn. *Ageratina adenophora* (Spreng.) are major invaders and causing huge loss to indigenous species diversity in this part of the world (Dogra et al., 2009). Likewise invasive plant species like *Ageratum conyzoides* L, *Lantana camara* L, *Mikania micrantha* Kunth, *Parthenium hysterophorus* L. *Mimosa pudica* L. *Eupatorium odoratum* etc are poses a major threat to indigenous biological diversity of Assam too. The vegetation of Assam in known for its great diversity and endemism. Assam is one of the richest biodiversity zone of NE India and accounts for nearly 50% of the total number of the plant species in India as a whole. Therefore study on the impact of alien invasive plants on native phytodiversity of this region and their management is a need of hour.

A total of 18 invasive alien plants species of different growth form were recorded from the road side areas of the study site. All the plants are used as ethnomedicine by local inhabitants. They have other beneficial uses also. However they possess serious threat to local biodiversity, effects crop production and human health. Therefore systematic study about the invasive plant species is required to provide adequate knowledge of the ecological and environmental consequences caused by invasive alien species and how to address it. At the same time further studies on their beneficial uses and phytochemical investigations of these plants are essential to discover the potentiality of these plants and plant parts as drugs and for the validation of their ethnomedicinal claims.

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