



EXPLORATION AND IDENTIFICATION OF EXOTIC PLANTS SPECIES AND THEIR IMPACT ON THE ENVIRONMENT, ECOSYSTEM SERVICES, ECONOMY AND HEALTH IN BIHAR

Botany

Santosh Kumar

Research Scholar, University Department of Botany, B. R. A. Bihar University, Muzaffarpur, Bihar, (842001), India.

Ranjana Kumari

Professor, University Department of Botany, B. R. A. Bihar University, Muzaffarpur, Bihar, (842001), India.

ABSTRACT

The present research paper presents a comprehensive survey of exotic plant species in Vaishali district of Bihar. Focusing on their identification, distribution ecological impacts and potential economic uses. The study employed systematic field survey and community engagement to document a diverse array of exotic plant species. A total number of 65 species of exotic plant were recorded on the basis of morphological observations, field guide, herbarium collections and with the help of local botanist. The findings reveal significant adaptation of these exotic plants to local environments with implications for biodiversity and ecosystem dynamics. Some hazardous exotic invasive plants species were recorded as *Lantana camara*, *Argemone maxicana*, *Eichhornia crassipes*. A few exotic plant species used in ethnomedicine by native people as antioxidant, antimicrobial properties and healthcare services. This study aims to enhance awareness of the role of exotic plant species in Bihar's ecological landscape.

KEYWORDS

exotic, invasive plant ethnomedicine

INTRODUCTION

Vaishali district is situated in the northern part of Bihar within the Tirhut division. Its position between 25°41' N latitude and 85°13' E longitude. It lies in the fertile Ganga and Gandak River, along with fertile plains, contributes to good agricultural potential. This district is divided into 16 blocks. Agroforestry in Vaishali district, Bihar is a growing trend in sustainable agriculture. Duration of the present exploration conducted from 2020-2025. It is observed that the flora of this region is rich with several exotic species. Exotic plants defined as species introduced outside their native range, can have diverse effect on local ecosystems, including competition with native species and alteration in habitat dynamics (Jeschke *et al.*, 2014; Pagad *et al.*, 2022). The introduction of non- native species lead to ecological imbalances as some exotic plants may become invasive, outcompeting new flora and disrupting local ecosystem (Pandey *et al.*, 2019). These species have been introduced either intentionally by humans for their utility or by accident, continue to expand their range through natural vectors like water, wind and animals movement (Hulme *et al.*, 2016).

Previous Work Done On This Related Topics By Researcher:

Haines (1921–1924), The Botany of Bihar and Orissa ; (Chandra, 2022), Banka District Forests; Muzaffarpur (Heritage Campus), L. S. college; *Swietenia mahogany* (Mahogany) and *Phoenix dactylifera* (Date Palm); A., Naithani, H. B., Verma, P. K., Saxena, J. & Bhatia, R. (2022), Floristic Diversity, Banka District of Bihar; Patil, D. A. (2019). Scientific History of Some Alien Plants.

MATERIAL AND METHODOLOGY

The floristic field survey was conducted throughout the study period in different area of Vaishali district, Bihar in every season of the year. Field surveys were conducted using Random sampling and systematic sampling design (Maduekwe, E., & de Vries, W. T. 2019). The plant specimen collected during this survey were identified and preserved as herbarium sheet (Jain S. K. & Rao, R. R. 1977). Plant identification was conducted based on morphological observations, field guides, interaction with local people, vaidyas and Botanist (Jain, S. K. 1987).

RESULT AND DISCUSSION

A total of 65 species of exotic plants recorded in Vaishali district of Bihar in 16 block area. The introduced invasive exotic plant species by anthropogenic activity threatened the ecosystem and biodiversity. It replaced many economically unique native plant species and their by creating issues in agriculture and disturbing the vegetation dynamics and nutrient cycling (Kumari P. *et al* 2016). Introductions of alien plants by human in the local habitats were the major cause for drastic changes recorded within the indigenous native plant communities of the area. The presence of introduced or incidentally dispersed species such as *Eucalyptus citriodora*, *Lantana camara*, *Senna alata*, and *Acacia auriculiformis* served as evidence of the ongoing degradation within natural ecosystems (Ricci ardi *et al*). Natural dispersal agents, including wildlife, wind, and water facilitates the invasion of species

such as *Ageratum conyzoides* and *Parthenium hysterophorus*. Impact osaster of invasive species are complex and may permanently alter the vegetation and community structure. The invasion of aquatic species like *Eichhornia crassipes* a disaster for human welfare as it reduces fish growth and eco-tourism of the area. The removal of water hyacinth is labour and cost- intensive, Thus economic loss due to invaders was more pronounced in agriculture monetary loss. The spread of non-native plants is a recognized threat to local ecosystems, often leading to habitat loss for native species. They directly affect the germination and survival of local species, damage the quality of soil and affect ground water availability.



Figure 1. *Argemone maxicana*



Figure 2. *Eichhornia crassipes*



Figure 3. *Parthenium Hysterophorus*



Figure 4. *Lantana Camara*

Table1: List Of Invasive Exotic Plant Species Recorded In Vaishali District, Bihar.

1. Major Invasive Alien Species (High Ecological Threat):

Sr. No.	Botanical Name	Family	Origin	Impact
1	<i>Ageratina adenophora</i>	Asteraceae	Mexico	Toxic to horses.
2	<i>Ageratum conyzoides</i>	Asteraceae	Trop. America	Common agricultural weed; reduces crop yield.

3	<i>Chromolaena odorata</i>	Asteraceae	Trop. America	Suppresses regeneration of forest trees.
4	<i>Cytisus scoparius</i>	Fabaceae	Europe	Rapidly colonizes high-altitude meadows.
5	<i>Eichhornia crassipes</i>	Pontederiaceae	South America	Blocks waterways; depletes oxygen in lakes.
6	<i>Ipomoea carnea</i>	Convolvulaceae	Trop. America	Toxic to goats; clogs wetlands and canals.
7	<i>Lantana camara</i>	Verbenaceae	Trop. America	Displaces native forage; toxic to livestock.
8	<i>Mimosa diplotricha</i>	Fabaceae	Brazil	Thorns hinder movement; replaces native grass.
9	<i>Opuntia dillenii</i>	Cactaceae	South America	Invades arid lands; hinders livestock grazing.
10	<i>Parthenium hysterophorus</i>	Asteraceae	Trop. America	Causes skin allergies and asthma in humans.
11	<i>Prosopis juliflora</i>	Mimosaceae	Central America	Invades grasslands; depletes groundwater.
12	<i>Salvinia molesta</i>	Salviniaceae	Brazil	Forms thick mats on water; kills fish.
13	<i>Senna spectabilis</i>	Fabaceae	Trop. America	Spreads in wildlife sanctuaries; limits forage.
14	<i>Typha angustifolia</i>	Typhaceae	Europe/ America	Narrowleaf cattail; dominates wetlands.

2. Economic, Food, and Plantation Exotic Crops:

Sr. N.	Botanical Name	Family	Origin	Impact
1	<i>Anacardium occidentale</i>	Anacardiaceae	Brazil	Cashew; major economic crop in coastal areas.
2	<i>Ananas comosus</i>	Bromeliaceae	South America	Pineapple; significant in Northeast
3	<i>Capsicum annuum</i>	Solanaceae	Trop. America	Chilli; replaced black pepper in many dishes.
4	<i>Coffea Arabica</i>	Rubiaceae	Ethiopia	Major cash crop; disrupts forest understory.
5	<i>Gossypium hirsutum</i>	Malvaceae	Central America	Upland cotton; replaced native cotton species.

3. Ethnomedicinal Practices :

Sr. No.	Plant Name	Family	Origin	Medicinal Use
1	<i>Argemone mexicana</i>	Papaveraceae	Mexico	Skin diseases and eye infections
2	<i>Catharanthus roseus</i>	Apocynaceae	Madagascar	Diabetes and blood pressure

3	<i>Chenopodium album</i>	Amaranthaceae	Europe	Liver issues and parasites
4	<i>Croton bonplandianus</i>	Euphorbiaceae	South America	Stopping bleeding from cuts
5	<i>Cuscuta reflexa</i>	Convolvulaceae	Mediterranean	Skin itches and sores
6	<i>Eucalyptus globulus</i>	Myrtaceae	Australia	Respiratory and cold relief
7	<i>Euphorbia hirta</i>	Euphorbiaceae	Central America	Asthma and bronchial issues
8	<i>Ipomoea carnea</i>	Convolvulaceae	South America	Skin sores and inflammation
9	<i>Lantana camara</i>	Verbenaceae	Trop. Americas	Antiseptic for wounds
10	<i>Mentha arvensis</i>	Lamiaceae	Europe	Indigestion and stomach cooling
11	<i>Ricinus communis</i>	Euphorbiaceae	NE Africa	Purgative and headache relief

4. Common Environmental Weeds (Naturalized)

These are ubiquitous across the Indian landscape, often found in waste lands, roadsides, and abandoned fields.

Sr. no.	Botanical Name	Family	Origin	Impact
1	<i>Argemone Mexicana</i>	Papaveraceae	Mexico	Toxic seeds contaminate mustard oil.
2	<i>Bidens pilosa</i>	Asteraceae	Trop. America	Sticky seeds spread by animals; crop weed.
3	<i>Cassia uniflora</i>	Fabaceae	Trop. America	Outcompetes native species in waste lands.
4	<i>Catharanthus roseus</i>	Apocynaceae	Madagascar	Source of anti-cancer alkaloids; naturalized.
5	<i>Cuscuta reflexa</i>	Convolvulaceae	China	Parasitic weed; damages pulse crops.
6	<i>Datura stramonium</i>	Solanaceae	Trop. America	Highly toxic; invades waste areas.
7	<i>Ipomoea nil</i>	Convolvulaceae	Trop. America	Morning glory; weed of hedges and fields.
8	<i>Oxalis corniculata</i>	Oxalidaceae	Europe/Asia	Acidic weed; common in moist gardens.
9	<i>Pistia stratiotes</i>	Araceae	Trop. America	Water lettuce; clogs small ponds.

10	<i>Portulaca oleracea</i>	Portulacaceae	North Africa	Edible weed but resists drought and control.
11	<i>Sida acuta</i>	Malvaceae	Trop. America	Tough stems; major weed of grazing lands.
12	<i>Sonchus oleraceus</i>	Asteraceae	Europe	Wind-dispersed seeds; common urban weed.
13	<i>Argemone Mexicana</i>	Papaveraceae	Mexico	Toxic seeds contaminate mustard oil.
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21	<i>Sonchus oleraceus</i>	Asteraceae	Europe	Wind-dispersed seeds; common urban weed.
22	<i>Tridax procumbens</i>	Asteraceae	Trop. America	Ubiquitous weed; very high seed production.
23	<i>Xanthium strumarium</i>	Asteraceae	North America	Burns cling to wool and fur; toxic seeds.

5. Other Naturalized & Minor Species
These include medicinal plants, escapes, and localized weeds.

Sr. no	Botanical Name	Family	Origin	Impact
1	<i>Acacia farnesiana</i>	Mimosaceae	Trop. America	Invasive in dry scrub; used for perfume.
2	<i>Acanthospermum hispidum</i>	Asteraceae	Brazil	Weed of agricultural fields and pastures.
3	<i>Agave Americana</i>	Asparagaceae	Mexico	Used for fencing; alters soil chemistry.
4	<i>Antigonon leptopus</i>	Polygonaceae	Mexico	"Coral vine"; smothers native shrubs.
5	<i>Cleome viscosa</i>	Cleomaceae	Trop. Africa	Common weed in rainy season crops.
6	<i>Duranta erecta</i>	Verbenaceae	Trop. America	Aggressive hedge plant; toxic to pets.
7	<i>Eupatorium odoratum</i>	Asteraceae	Trop. America	Highly flammable; increases forest fire risks.
8	<i>Gomphrena celosioides</i>	Amaranthaceae	South America	Prostrate weed in lawns and gardens.
9	<i>Mirabilis jalapa</i>	Nyctaginaceae	Peru	"Four o'clock flower"; persists in ruins.
10	<i>Passiflora foetida</i>	Passifloraceae	Trop. America	Invasive climber; fruits edible but weed.
11	<i>Tecoma stans</i>	Bignoniaceae	Trop. America	Spreads rapidly in dry deciduous forests.
12	<i>Urena lobata</i>	Malvaceae	Trop. Africa	Yields fiber but invades forest trails.

Family Impact Breakdown Table

Family	Total Species	Primary Role
Asteraceae	12	Primarily high-threat invasive weeds.
Fabaceae	04	Timber, shade trees, and aggressive forest invaders.
Malvaceae	04	Fiber crops and common wasteland weeds.
Convolvulaceae	04	Toxic, oxygen depleting
Euphorbiaceae	03	Outcompeting, Allelopathic

Graphical Representation Of Data:

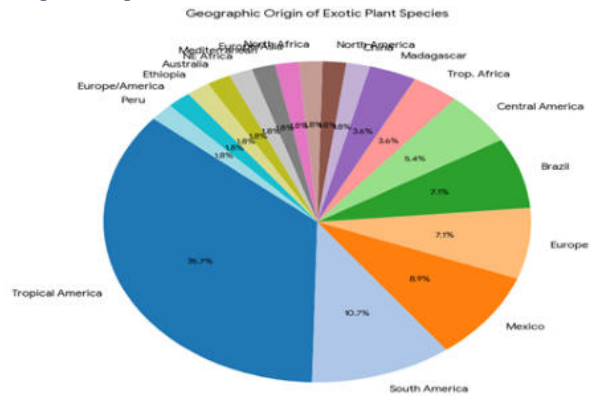


Figure 5. Origin/native place

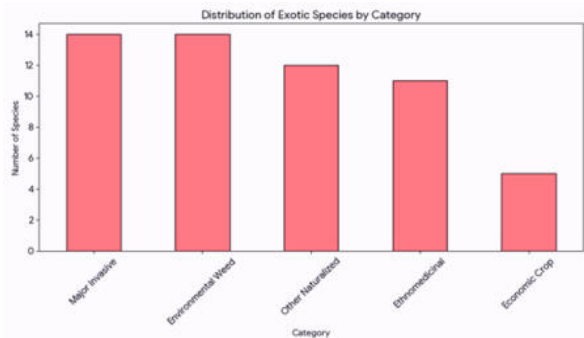


Figure 6. Distribution Of Exotic Plant

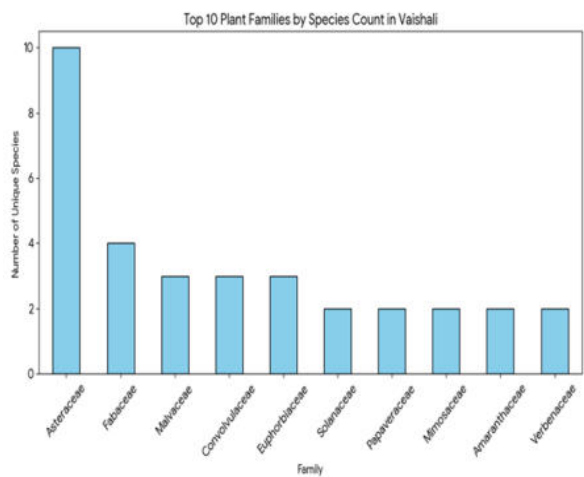


Figure 7. Family Distribution

Distribution Summary:

A. Most Common Families: Asteraceae and Fabaceae dominate the list, largely due to their high seed production and adaptability.

B. Primary Origin: The majority of India's invasive and naturalized exotic species hail from Tropical America and South America, sharing similar climatic conditions with the Indian subcontinent.

C. Species Distribution by Category:

Category	No. of Entries	Key Examples
Major Invasive (High Threat)	14	Lantana camara, Parthenium hysterophorus
Environmental Weeds	23	Argemone mexicana, Bidens pilosa
Other Naturalized Species	12	Agave americana, Tecoma stans
Ethnomedicinal Plants	11	Catharanthus roseus, Euphorbia hirta
Economic/Food Crops	5	Anacardium occidentale (Cashew), Coffea Arabica

CONCLUSION:

The present review finds out the commonly found alien plant species i.e. *Lantana camera* L, *Parthenium hysterophorus* L, *Nicotiana plumbaginifolia* Viv and *Ageratum conyzoides* L which adversely affect the local vegetation. Exploration and identification of exotic plant species in district- Vaishali, Bihar reveal significant ecological and economic implications. These plants, while offering benefits, pose threats the local villagers to native biodiversity, ecosystem services, and human health. Effective management is crucial to balance their utility and conservation of Bihar's ecological heritage .IUCN's (2003) clearly states that management of alien species is a priority issue and must be mainstreamed into all aspects of managements of forests and protected areas. Both positive as well as negative ecosystem services must be clearly identified to elucidate their cost benefit to guide the stakeholders and policy makers.

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