



Review on Invasive Alien Plant Species of Jaunpur District, Uttar Pradesh, India: Diversity, Distribution and Ecological Impact

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ARTICLE INFO	ABSTRACT
Article history: Received – 20 August 2026 Received in revised form – 28 August 2026 Accepted– 22 September 2026 Available online – 30 September 2026	Invasive alien plant species are increasingly recognized as a major threat to native biodiversity, ecosystem functioning and agricultural productivity. The present study was undertaken to document the diversity, distribution and ecological characteristics of invasive alien plant species occurring in Jaunpur District, Uttar Pradesh, India. Field surveys were conducted across different habitats of the district, including agricultural fields, roadsides, wastelands, riverbanks, residential areas and other disturbed habitats. Plant specimens were collected and identified using standard floristic literature and taxonomic resources. Information regarding habit, habitat, geographical origin, frequency, abundance and distribution pattern was recorded. The study revealed the occurrence of several invasive alien plant species belonging to different families, with species such as <i>Parthenium hysterophorus</i> L., <i>Ageratum houstonianum</i> Mill., <i>Lantana camara</i> L., <i>Eichhornia crassipes</i> (Mart.) Solms, <i>Chromolaena odorata</i> (L.) R.M.King & H.Rob., <i>Argemone mexicana</i> L., <i>Xanthium strumarium</i> L. and <i>Alternanthera philoxeroides</i> (Mart.) Griseb. being commonly associated with disturbed habitats. Their occurrence varied considerably among habitats depending on disturbance, soil conditions, moisture availability and human activities. Many of these species showed aggressive colonization and competition with native vegetation, thereby potentially altering plant community structure and ecosystem processes. The study highlights the increasing occurrence of invasive alien plants in Jaunpur District and emphasizes the need for systematic monitoring, ecological assessment and appropriate management strategies. The findings may provide useful baseline information for biodiversity conservation and sustainable management of invasive plant species in the region.
Keywords: Invasive alien plants, plant diversity, Phytosociology, Distribution, Biodiversity, Jaunpur, Uttar Pradesh, Ecological impact	

Introduction

Invasive Alien Plants Species (IAPS) also known as exotic, non-native species unintentionally are or intentionally introduced from one region to another by humans deliberately or else through human activity. It is considered a major threat to local biodiversity because it gradually dominates and successfully invades native plants [1]. IAPS is also considered a threat to biodiversity through habitat destruction. The spread and establishment of IAPS pose a threat to ecosystems, habitats, and other species. IAPS can invade the economy, environment, or ecosystem, causing negative impacts on human habitats and health. In particular, they compete for space as well as nutrients, moisture, and light, damaging the local. Ecosystem and functions of native species [2,3]. This causes greater changes in soil structure topography, nutrient environmental loss, and hydrology, and services agriculture, and triggers the spread of diseases [4]. It also blocks irrigation canals causing land degradation. The rapid spread of invasive species is driven by global changes, especially climate change and environmental pollution [5]. Therefore, sustainable management of invasive species is necessary to maintain their survival. In the district of Jaunpur, the study of invasive alien plant species is not conducted, so an extensive survey is conducted to prepare a list of IAPS of the area.

Materials and Methods

1.1. Study Site

Jaunpur district is located in the northwest of Varanasi division. Its area lies between latitude 24.240 and 26.120 North and longitude 82.70 and 83.50 East. Its elevation varies from 261 to 290 feet above M.S.L. (Mean Sea Level). Parts of this area are mostly plains and shallow valleys. Gomati and Sai rivers are the main rivers. There is also, Varuna, Basuhi and Pili. Mamur and Gangi River are small rivers. The Gomati and Basuhi rivers divide the land into four almost equal regions. The soil is mostly sandy, loamy and clayey. Jaunpur district is prone to floods. There is a lack of mineral resources in the district. Excavations in some areas reveal rocks that can be burned to make lime. Lime obtained from sand and gravel is used in construction. The minimum temperature in Jaunpur district is 43°C and the maximum is 44°C. The average rainfall in the region is 987mm. The total area of Jaunpur district is 4038 sq.km. The basis of regional development is agriculture. The district is influenced by the Gomti and Sai river systems and contains numerous water bodies and seasonally wet areas. A published botanical study described Jaunpur as having a monsoon-type climate and documented diverse wild vegetation across different habitats.

These landscape characteristics are significant from the perspective of biological invasion. Agricultural fields are regularly

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disturbed through ploughing, harvesting and irrigation. Road and railway margins are subjected to repeated physical disturbance, while ponds, canals and riverbanks can provide suitable habitats for aquatic and semi-aquatic invasive species [4,10] (Table.1)

Table -1
Major habitats potentially supporting invasive plants in Jaunpur

Habitat	Disturbance/characteristics	Potential invasive plants
Agricultural fields	Tillage, irrigation and fertilizer application	<i>Partheniumhysterophorus</i> , <i>Ageratum conyzoides</i> , <i>Argemonemexicana</i>
Fallow land	Reduced management and open space	<i>Parthenium</i> , <i>Ageratum</i> , <i>Prosopis</i>
Roadsides	Soil disturbance and transport corridors	<i>Parthenium</i> , <i>Ageratum</i> , <i>Lantana</i>
Railway margins	Repeated disturbance and propagule movement	<i>Parthenium</i> , <i>Ageratum</i> , <i>Argemone</i>
Village wastelands	Grazing and human disturbance	<i>Parthenium</i> , <i>Lantana</i> , <i>Ageratum</i>
Riverbanks	Moist soil and disturbance	<i>Ageratum</i> , <i>Eichhornia</i> , <i>Parthenium</i>
Ponds and wetlands	Standing freshwater	<i>Eichhorniacrassipes</i>
Woodland/plantation margins	Canopy openings and disturbance	<i>Lantana camara</i> , <i>Chromolaenaodorata</i>

1.2. Concept of Invasive Alien Plant Species:

An alien plant species is a plant occurring outside its natural geographical range as a result of intentional or unintentional human-mediated introduction. Not every alien species becomes invasive. Some remain restricted to cultivation, while others become naturalized and reproduce independently [1,2].

An invasive alien plant species generally possesses a combination of characteristics that facilitate establishment and spread, including:

- high reproductive capacity;
- rapid growth;
- efficient seed production;
- vegetative reproduction;
- effective dispersal mechanisms;
- broad ecological tolerance;
- resistance to environmental stress;
- ability to colonize disturbed habitats;
- competitive superiority under particular conditions; and
- Production of biochemical compounds that may inhibit competing plants.

The distinction between alien, naturalized and invasive species is therefore important. A plant should not automatically be categorized as invasive merely because it is non-native. The ILORA framework emphasizes the need to distinguish cultivated, naturalized and invasive taxa using ecological and biogeographically evidence. The present work follows a literature-based review approach. Information was compiled from published research articles, scientific reviews, databases and available literature dealing with invasive alien plants of India, Uttar Pradesh and eastern Uttar Pradesh, together with literature specifically referring to Jaunpur.

Particular attention was given to:

1. taxonomic identity;
2. family;
3. geographical origin;
4. growth habit;
5. habitat;
6. distribution;
7. reproductive characteristics;
8. ecological impacts;
9. agricultural significance; and
10. Management approaches.

Indian alien-flora databases are particularly useful because occurrence information in global databases can be incomplete for India. An occurrence dataset developed from literature and herbarium records contained 12,347 records covering 362 invasive and naturalized alien species, illustrating the importance of traceable occurrence data for invasive-plant research. Extensive field surveys have been conducted and studied to identify Invasive species that are abundant in a variety of habitats including agricultural lands, moors, protected areas, river-banks, canal crossings, roadsides, village streets, and grassland. IAPS collections were prepared, dried, and pressed. The IAPS present in various habitats were compiled based on surveys, field observations, and discussions with local residents. The collected IAPS were identified. Species were determined with the help of Flora Flora of Upper Gangetic Plain by John Firminger Duthie [4], The Flora of Madhya Pradesh by Mudgal V., Khanna [5], K.K. and Hajra, The Botany of Bihar and Orissa by Haines H.H. Flora of Bihar by N.P. Singh, Flora of British India by J.D. Hooker. These specimens were preserved using standard herbarium methods at the Department of Botany at T.D.P.G. College. A wide range of literature is available on invasive plant species, detailing the species' habitats, distribution, ecology, and impacts on nature.

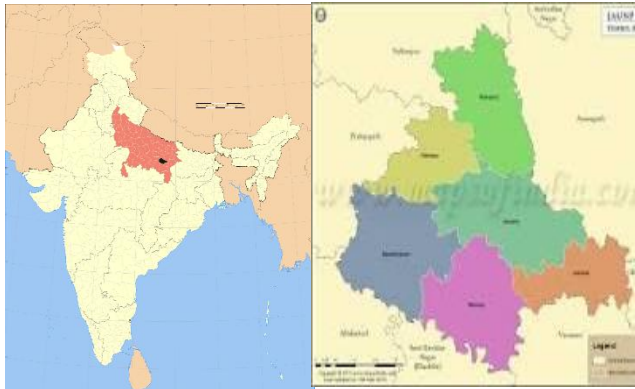


Fig.- District of Jaunpur.

1.3. Recommended Phytosociological Parameters

For future field investigations in Jaunpur, the following parameters are recommended.

Density

$$Density = \frac{\text{Total number of individuals of a species}}{\text{Total number of quadrats studied}}$$

Frequency

$$Frequency(\%) = \frac{\text{Number of quadrats in which species occurs}}{\text{Total number of quadrats}} \times 100$$

Abundance

$$Abundance = \frac{\text{Total number of individuals}}{\text{Number of quadrats in which species occurs}}$$

Relative Density

$$\text{Relative Density} = \frac{\text{Density of species}}{\text{Total density of all species}} \times 100$$

Relative Frequency

Relative Frequency

$$= \frac{\text{Frequency of species}}{\text{Total frequency of all species}} \times 100$$

Relative Dominance

Where appropriate, dominance can be estimated using basal area or percentage cover.

Importance Value Index

$$IVI = \text{Relative Density} + \text{Relative Frequency} + \text{Relative Dominance}$$

These measures would allow future researchers to quantitatively identify the most important invasive plants in different habitats of Jaunpur.

1.4. Diversity of Important Invasive Alien Plants Relevant to Jaunpur

The following species are among the important invasive or problematic alien plants relevant to the Jaunpur region based on available literature.

Table -2.

Important invasive alien plants relevant to Jaunpur and eastern Uttar Pradesh

S. No	Species	Family	Habit	Major origin	Important habitats
1	<i>Partheniumhy sterophorus</i> L.	Asteraceae	Herb	Tropical America	Roadsides, wastelands, fields
2	<i>Ageratum conyzoides</i> L.	Asteraceae	Herb	Tropical America	Fields, wastelands, moist sites
3	<i>Ageratum houstonianum</i> Mill.	Asteraceae	Herb	Tropical America	Disturbed sites
4	<i>Lantana camara</i> L.	Verbenaceae	Shrub	Tropical America	Wasteland, woodland margins
5	<i>Eichhorniacrassipes</i> (Mart.) Solms	Pontederiaceae	Aquatic herb	South America	Ponds, wetlands, waterways
6	<i>Argemonemexicana</i> L.	Papaveraceae	Herb	Tropical America	Wastelands, fields, roadsides
7	<i>Chromolaena odorata</i> (L.) R.M.King&H. Rob.	Asteraceae	Shrub	Tropical America	Open/disturbed vegetation
8	<i>Prosopisjuliflora</i> (Sw.) DC.	Fabaceae	Tree/shrub	Americas	Wasteland, disturbed land
9	<i>Alternanthera pungens</i> Kunth	Amaranthaceae	Herb	Tropical America	Roadsides and disturbed areas
10	<i>Mesospaerumsuaveolens</i> (L.) Kuntze	Lamiaceae	Herb/shrub	Tropical America	Wasteland and disturbed vegetation

The northeastern Uttar Pradesh inventory identified both *Ageratum conyzoides* and *A. houstonianum* as invasive alien plants and classified them according to their ecological effects [4]. A separate study of Varanasi District, geographically adjacent to Jaunpur,

recorded 120 important alien species, including *Ageratum conyzoides*, *A. houstonianum*, *Argemone mexicana*, *Eichhornia crassipes*, *Lantana camara* and *Partheniumhy sterophorus*(Table.2).

2. Ecological Impacts:

2.1. Reduction in Native Plant Diversity

One of the most important effects of invasive plants is displacement of native vegetation.

Dense populations can occupy available space, intercept light and consume soil moisture and nutrients. Species such as *Parthenium*, *Lantana* and *Chromolaena* can form dense populations that suppress native herbs and seedlings.

Studies from northeastern Uttar Pradesh have specifically emphasized the negative effects of invasive aliens on native biodiversity and agricultural vegetation.

2.2. Ecological Invasion and Climate Change

Climate change may influence biological invasions by modifying temperature, precipitation patterns, growing seasons and habitat suitability.

Recent modeling work on *Ageratum conyzoides* suggests that climate change could increase the climatic suitability for this species across parts of India, although predicted effects vary geographically and depend on climate scenario and model assumptions.

Similarly, modeling research on *Prosopis juliflora* has indicated potential increases in climatically suitable areas in Indian protected areas under future climate scenarios. For Jaunpur, these findings indicate the need for long-term monitoring rather than relying only on present-day distribution patterns.

3. Conclusion

Invasive alien plants represent an important ecological challenge for the agricultural and semi-natural landscapes of Jaunpur District. Available evidence from Jaunpur, eastern Uttar Pradesh and the wider Indian region indicate that several alien species have the potential to become ecologically dominant in disturbed terrestrial and aquatic habitats. *Parthenium hysterophorus*, *Ageratum conyzoides*, *Lantana camara*, *Eichhornia crassipes*, *Argemone mexicana*, *Ageratum houstonianum*, *Chromolaena odorata* and *Prosopis juliflora* deserve particular attention (6-10).

The ecological effects of these species include competition with native plants, suppression of regeneration, alteration of soil processes, interference with agriculture and degradation of freshwater habitats. Recent work from Jaunpur and surrounding agricultural landscapes further indicates that invasive plants may influence soil microbial communities and carbon cycling.

However, a major limitation remains the lack of a comprehensive, district-wide quantitative inventory specifically for Jaunpur. Consequently, future investigations should combine floristic surveys, herbarium documentation, phytosociological analysis, GIS mapping, soil analysis and ecological-impact assessment [6,7].

An effective management programme should emphasize early detection, prevention of new introductions, mechanical and biological control where appropriate, restoration of invaded habitats, community participation and long-term monitoring [11,12]. Developing a scientifically validated invasive alien plant database for Jaunpur would provide a valuable foundation for biodiversity conservation, sustainable agriculture and ecological management in eastern Uttar Pradesh.

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