

Invasive Plants of Assam with Special Reference to Dimoria Block, Kamrup Metropolitan District: Ecological Significance, Utilization, and Toxicological Perspectives

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ABSTRACT

Invasive alien plants constitute an important component of the changing vegetation of Assam and have considerable effects on native plant communities, agricultural landscapes, soil processes and human livelihoods. At the same time, several invasive plants possess medicinal, agricultural, ecological and industrial values that have received increasing scientific attention. The present paper reviews invasive plant species of Assam with particular reference to Dimoria Block of Kamrup Metropolitan district, emphasizing both their ecological impacts and their positive utilization potential. Particular attention is given to *Chromolaena odorata*, *Lantana camara*, *Mikania micrantha*, *Mimosa pudica*, *Ageratum conyzoides* and *Parthenium hysterophorus*, which were quantitatively documented in the Dimoria Tribal Belt along National Highway 37. Among these, *Chromolaena odorata* showed the highest density, abundance and frequency in the Dimoria study area. The paper also considers *Eichhornia crassipes*, which has been documented throughout the year in wetlands of the Dimoria region, and *Alternanthera philoxeroides*, which has recently been investigated ethnobotanically and ecologically in nearby Panikhaiti, Kamrup Metropolitan. Documented positive uses include wound healing, antimicrobial activity, medicinal applications, bioremediation, wastewater treatment, biomass production, biofertilizer potential, bioenergy, insect control and other value-added products. However, several species also possess important toxicological properties. *Lantana camara* contains lantadenes associated with hepatotoxicity and photosensitization in livestock, *Ageratum conyzoides* contains pyrrolizidine alkaloids associated with hepatotoxic effects in experimental studies, and *Parthenium hysterophorus* contains parthenin, a biologically active sesquiterpene lactone associated with dermatitis and toxicological effects. Conversely, experimental studies have reported relatively low acute toxicity for particular preparations of *Mikania micrantha* and *Eichhornia crassipes*. The study argues that invasive plants should be viewed through a balanced socio-ecological framework in which ecological risks are recognized while scientifically validated opportunities for biomass utilization, medicinal research, environmental remediation and community-based resource management are explored.

Keywords: *invasive alien plants, Assam, Dimoria, Kamrup Metropolitan, Chromolaena odorata, Lantana camara, Mikania micrantha, toxicity, ethnobotany, biomass utilization*

1. Introduction

Biological invasions are among the major ecological processes contributing to changes in terrestrial and aquatic ecosystems. Invasive alien plants can establish, reproduce and spread outside their native geographical ranges and may alter native plant communities, ecosystem processes, agricultural productivity and human livelihoods. Assam is particularly important in this context because its tropical and subtropical climate, high rainfall, extensive riverine systems, wetlands, agricultural landscapes and proximity to the Indo-Burma biodiversity region provide favourable conditions for the establishment and spread of numerous non-native plant species.

The problem of invasive vegetation has been documented from different parts of Assam. Studies have reported invasive plants in roadside habitats, agricultural landscapes, fallow lands, wetlands and forest margins. Sharma and Paul (2020) conducted a field investigation specifically in the Dimoria Tribal Belt of Assam and recorded six invasive plant species from fallow lands along National Highway 37. The recorded species were *Chromolaena odorata*, *Lantana camara*, *Mikania micrantha*, *Mimosa pudica*, *Ageratum conyzoides* and *Parthenium hysterophorus*. Their study demonstrated that invasive species had become prominent components of fallow roadside vegetation and that soil-quality indicators under invaded sites were generally lower than those of the nearby forest control. Among the species recorded in Dimoria, *Chromolaena odorata* was particularly dominant. Paul and Sharma (2019) examined the effects of *C. odorata* invasion on soil quality in the Dimoria Tribal Belt and found that most investigated soil-quality parameters differed from those recorded in the nearby natural forest. Their study was conducted around Khetri Tiniali within the Dimoria area and therefore provides geographically direct evidence for the ecological importance of invasive plants in the study region. However, the ecological significance of invasive plants should not be interpreted exclusively in terms of damage. Several invasive species possess useful biochemical compounds, medicinal properties, biomass-production potential and applications in environmental management. For example, *Mikania micrantha* has demonstrated wound-healing activity in experimental models, *Eichhornia crassipes* has potential for wastewater treatment and biomass utilization, and *Alternanthera philoxeroides* is associated with traditional food and medicinal knowledge in Kamrup Metropolitan. The coexistence of ecological problems and potential benefits creates an important scientific question: can invasive plants be managed in a manner that reduces their ecological impacts while simultaneously investigating their potential economic, medicinal and environmental applications? The present paper addresses this question in the context of Assam, with particular emphasis on Dimoria Block.

2. Study Area: Dimoria Block, Kamrup Metropolitan District

Dimoria is situated in the south-eastern part of Kamrup Metropolitan district of Assam. The Dimoria Tribal Belt extends across a landscape characterized by agricultural fields, fallow lands, roadside vegetation, forest patches, hillocks and settlements. Paul and Sharma (2019) described the Dimoria area as lying approximately between 26°00' and 26°14' N latitude and 91°51' and 92°10' E longitude. The area experiences a subtropical monsoon climate, with substantial annual rainfall and vegetation characteristics resembling the foothills of Meghalaya. The ecological heterogeneity of Dimoria creates multiple opportunities for invasive plants to establish. Roads and highway margins facilitate the movement of propagules, while fallow agricultural lands provide open habitats with reduced competition from established native vegetation. Wetlands and shallow water bodies provide suitable conditions for aquatic invasive species such as *Eichhornia crassipes*. The importance of wetlands is demonstrated by the study of aquatic macrophytes in the Dimoria region of Kamrup Metropolitan district. Investigations of floodplain wetlands reported *Eichhornia crassipes* throughout the year in several wetlands, including Jalikhora, Duani and Etila beels. The location of Dimoria within a rapidly developing metropolitan landscape is also significant. Expansion of roads, settlements, agriculture and other human activities can create disturbed habitats where invasive plants frequently establish. Consequently, Dimoria represents a suitable natural laboratory for studying the relationship between biological invasion, land-use change, traditional plant utilization and ecosystem management.

3. Objectives

The primary objective of this paper is to review invasive plant species occurring in Assam with particular reference to Dimoria Block and to examine their ecological, medicinal, agricultural and environmental significance. The study also aims to assess documented positive uses of invasive plants, summarize available evidence concerning their toxicity and identify opportunities for their sustainable utilization without encouraging their uncontrolled propagation. A further objective is to emphasize the importance of distinguishing between ecological invasion and biological usefulness. A species may simultaneously be ecologically invasive and contain biologically valuable compounds. Such dual characteristics require management approaches that recognize both environmental risks and opportunities for scientific utilization.

4. Materials and Methods

The present work is a literature-based synthesis using published research papers, with priority given to original field studies and experimental investigations. Particular emphasis was placed on research conducted in Dimoria, Kamrup Metropolitan and Assam.

The principal geographical source was Sharma and Paul (2020), who conducted phytosociological investigations of invasive plants in fallow lands along National Highway 37 in the Dimoria Tribal Belt. Their study used 3×3 m quadrats and recorded density, abundance and frequency of invasive species. Six invasive species belonging to three families were documented. Paul and Sharma (2019) were used as the principal source for the soil-related effects of *Chromolaena odorata* in Dimoria. Their investigation examined soil temperature, texture, bulk density, moisture, pH, organic matter, nitrate, phosphorus and potassium at invaded sites and compared them with nearby natural forest vegetation. The recent original research of Sharma and Das (2025) was used to incorporate *Alternanthera philoxeroides* from Panikhaiti in Kamrup Metropolitan. The study combined quadrat-based ecological measurements with ethnobotanical interviews involving 45 local informants. Experimental studies were consulted to assess medicinal properties and toxicological evidence. These included research on *Ageratum conyzoides*, *Lantana camara*, *Mikania micrantha*, *Eichhornia crassipes* and *Parthenium hysterophorus*. Where the available evidence concerns an extract, isolated compound, animal model or particular preparation, this limitation is explicitly stated.

5. Invasive Plant Diversity in the Dimoria Region

Sharma and Paul (2020) recorded six invasive species in fallow lands of the Dimoria Tribal Belt. The species represented three botanical families, with Asteraceae being the most prominent family. *Chromolaena odorata* exhibited the highest density and abundance, with a density of 93.4 m^{-2} and frequency of 100%. *Mikania micrantha* also showed a frequency of 100%, whereas *Lantana camara*, *Mimosa pudica*, *Ageratum conyzoides* and *Parthenium hysterophorus* occurred at lower densities and frequencies. These findings demonstrate that invasive plants were not merely occasional components of the Dimoria vegetation but formed substantial populations in disturbed and fallow habitats. The dominance of *C. odorata* is particularly important because the species can form dense stands and produce substantial biomass. The presence of aquatic invasive vegetation adds another dimension to the problem. *Eichhornia crassipes* has been documented throughout the year in wetlands of the Dimoria region, indicating that aquatic habitats provide persistent environments for invasive macrophytes.

6. Major Invasive Plants and Their Positive Significance:

Table 1. Invasive plants relevant to Assam and Dimoria: uses, toxicity and positive significance

Sl No.	Scientific Name	Common Name	Significance / Uses	Safety Concerns	Research source
1	<i>Chromolaena odorata</i>	Siam weed	Wound healing, antimicrobial potential, organic matter	Not safe for consumption; medicinal safety uncertain	Sharma & Paul (2019, 2020); Magar et al. (2023)
2	<i>Lantana camara</i>	Wild sage	Traditional medicine, insecticidal potential, biomass products	Toxic to livestock; may cause liver damage	Sharma & Paul (2020); Dash et al. (2023); Negi et al. (2019)
3	<i>Mikania micrantha</i>	Mile-a-minute weed	Wound healing, antimicrobial potential, biomass use	Toxicity data are limited	Sharma & Paul (2020); Sahu et al. (2019); Das et al. (2023)
4	<i>Mimosa pudica</i>	Touch-me-not	Traditional medicine, antioxidant and wound-healing potential	Safety data remain limited	Sharma & Paul (2020); Sajem & Gosai (2006)

5	<i>Ageratum conyzoides</i>	Goat weed	Traditional medicine, antimicrobial potential, essential oils	Some compounds may damage the liver	Sharma & Paul (2020); Nweze et al. (2014); Palmer et al. (2019)
6	<i>Parthenium hysterophorus</i>	Congress grass	Antimicrobial research and potential biotechnological uses	May cause dermatitis and other toxic effects	Sharma & Paul (2020); Kaur et al. (2021)
7	<i>Eichhornia crassipes</i>	Water hyacinth (Meteka)	Wastewater treatment, biofertilizer, biogas and biomass	May accumulate pollutants from water	Aquatic macrophyte study in Dimoria; Lalitha et al. (2012); Jayanthi et al. (2012)
8	<i>Alternanthera philoxeroides</i>	Alligator weed	Traditional food and medicine; bioremediation potential	May harm livestock; invasive species	Sharma & Das (2025)
9	<i>Pistia stratiotes</i>	Water lettuce (Bor puni)	Wastewater treatment, nutrient removal and composting	May accumulate water pollutants	Regional Assam aquatic-plant literature
10	<i>Ipomoea carnea</i>	Bush morning glory	Biomass, fibre and bioenergy potential	Toxic to livestock; unsuitable for uncontrolled fodder use	Assam invasive-plant literature



Figure 1 : Showing some images of invasive plants from Dimoria region

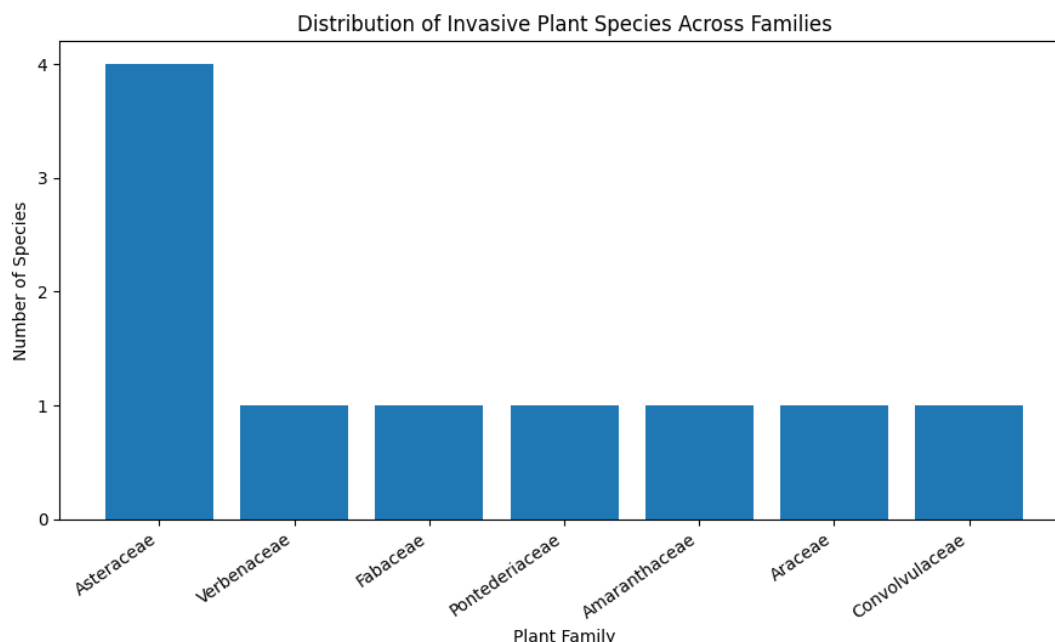


Figure 2. Family-wise Distribution of Invasive Plant Species in the Dimoria Region, Assam.

The graph represents 10 invasive plant species belonging to 7 families recorded in the study area of Dimoria/Kamrup, Assam. Asteraceae is the dominant family with 4 species (40%), followed by Verbenaceae, Fabaceae, Pontederiaceae, Amaranthaceae, Araceae, and Convolvulaceae, each represented by one species (10%). The recorded species include *Chromolaena odorata*, *Lantana camara*, *Mikania micrantha*, *Mimosa pudica*, *Ageratum conyzoides*, *Parthenium hysterophorus*, *Eichhornia crassipes*, *Alternanthera philoxeroides*, *Pistia stratiotes*, and *Ipomoea carnea*. These findings indicate the greater representation of Asteraceae among the selected invasive plants.

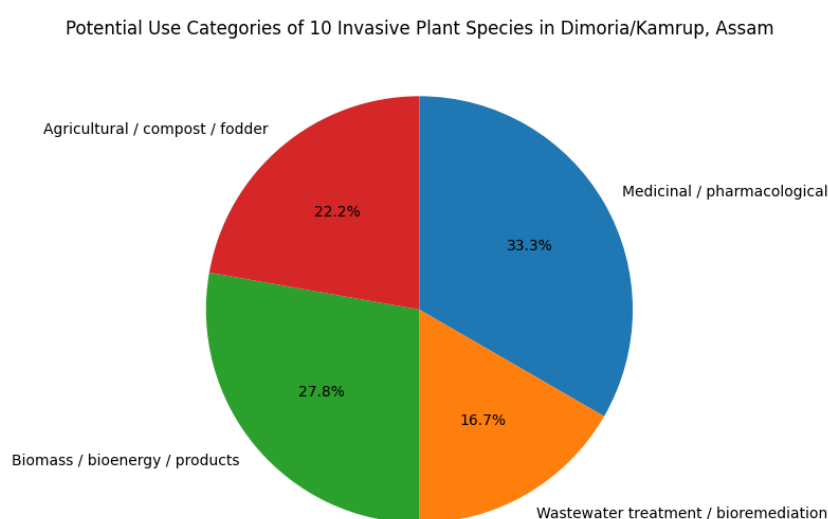


Figure 3. Potential Use Categories of Invasive Plant Species in Dimoria/Kamrup, Assam

The pie chart illustrates the potential uses of the 10 invasive plant species documented in the table. Medicinal and pharmacological applications account for the largest share (33.3%), followed by biomass, bioenergy and value-added products (27.8%). Agricultural applications, including composting and fodder, represent 22.2%, while wastewater treatment and bioremediation account for 16.7%. These findings highlight the potential for beneficial utilization of invasive plant biomass. However, the categories overlap because a single species may have multiple uses. The percentages represent use-category mentions, not the proportion of species, and the chart is an illustrative classification based on the listed uses rather than a quantitative field assessment. Toxicity, contamination and ecological risks must be considered before practical application.

a. *Chromolaena odorata*: Dominant Invasive Plant of Dimoria

Chromolaena odorata is one of the most important invasive plants of Dimoria. Sharma and Paul (2020) recorded the species with a density of 93.4 plants m⁻², abundance of 93.4 and frequency of 100% in the surveyed fallow lands along National Highway 37. These values indicate a high degree of dominance within the investigated roadside habitat. The dominance of *C. odorata* is associated with its rapid growth, prolific reproduction and capacity to form dense stands. Paul and Sharma (2019) specifically investigated its influence on soil properties in the Dimoria Tribal Belt. The authors reported that most soil-quality parameters under *C. odorata*-dominated areas were lower than those in the nearby natural forest. They also discussed the capacity of the species to produce substantial biomass and its possible contribution to organic matter accumulation under certain fallow conditions. The positive significance of *C. odorata* should therefore be understood in terms of its biochemical and biomass potential rather than by encouraging its spread. Research has demonstrated antimicrobial, antioxidant, wound-healing and other biological activities in extracts of the species. Magar et al. (2023) investigated aqueous and methanolic extracts and reported phytochemical and biological activities, while emphasizing the need for further toxicological and pharmacological investigation. Consequently, *C. odorata* represents a potential source of bioactive compounds, but scientific utilization should occur through controlled harvesting of existing populations rather than deliberate cultivation.

b. *Lantana camara*: Toxicity Accompanied by Multiple Utilization Possibilities

Lantana camara was recorded in the Dimoria Tribal Belt by Sharma and Paul (2020). The species occurred at lower density than *C. odorata* but was present in 60% of the sampling quadrats.

The species is notable because it combines substantial ecological invasiveness with a broad range of possible uses. Negi et al. (2019) reviewed the ecology and uses of *L. camara* in India and described applications associated with herbal medicine, phytochemistry, insecticidal properties, biomass and other economic uses. The authors also emphasized that the species possesses considerable biomass and that its utilization could potentially be integrated with management strategies.

The toxicological properties of *L. camara*, however, require particular attention. Lantadenes, especially pentacyclic triterpenoids, are associated with hepatotoxicity and secondary photosensitization in grazing animals. Experimental and veterinary literature has documented poisoning in cattle, buffalo, sheep and goats.

Interestingly, toxicity is preparation-dependent. Dash et al. (2023), in an original experimental study, investigated n-hexane and chloroform extracts of *L. camara* in Wistar rats and did not observe significant toxicological effects in the investigated hematological, biochemical or histopathological parameters.

This apparent contrast is scientifically important. It demonstrates that the statement “the plant is toxic” cannot automatically be applied to every extract or preparation. At the same time, the absence of toxicity in a specific experimental extract should not be interpreted as evidence that the whole plant is safe for livestock or humans.

c. *Mikania micrantha*: From Invasive Climber to Research Resource

Mikania micrantha is a rapidly growing invasive climber that was recorded in Dimoria by Sharma and Paul (2020). It occurred with a frequency of 100%, making it one of the consistently distributed invasive species in the studied roadside fallow habitats.

The species is particularly interesting because it possesses documented medicinal potential. Sahu et al. (2019) experimentally evaluated an ointment prepared from whole-plant juice of *M. micrantha* in rats. The preparation accelerated wound contraction, and the study found no observable acute dermal toxicity or skin irritation during the experimental period.

More recent experimental work by Das et al. (2023) investigated the mechanism of wound healing using methanolic extracts. The researchers observed increased fibroblast proliferation and migration, enhanced angiogenesis and improved wound contraction in experimental rats. The study associated the wound-healing effect with modulation of the FAK/Akt/mTOR signalling pathway.

These results provide a scientifically interesting positive perspective on an invasive plant. Rather than treating *M. micrantha* exclusively as waste biomass, controlled removal from invaded sites could potentially supply raw material for research into wound-healing compounds. However, this does not justify cultivating the plant because uncontrolled propagation would intensify the ecological problem.

d. *Mimosa pudica*: Medicinal Potential of a Common Invader

Mimosa pudica was another species documented in the Dimoria Tribal Belt. Although commonly recognized as a sensitive roadside herb, it has considerable ethnomedicinal significance.

Ethnobotanical research from Assam has documented traditional medicinal uses of *M. pudica*. Sajem and Gosai (2006), for example, recorded its use among the Jaintia community of Assam for several traditional healthcare applications.

Experimental research has also investigated antioxidant, antimicrobial, wound-healing, anti-inflammatory and other biological properties. Available toxicity information suggests that some extracts may have relatively low toxicity in preliminary assays, although the safety of different preparations cannot be generalized.

Its significance in Dimoria therefore lies in the possibility of converting a commonly removed plant into a subject of pharmacological research while simultaneously reducing invasive biomass. Such utilization should be accompanied by standardized collection and taxonomic verification.

e. *Ageratum conyzoides*: Medicinal Potential and Toxicological Caution

Ageratum conyzoides was recorded in the Dimoria Tribal Belt by Sharma and Paul (2020). The species is common in disturbed habitats and agricultural landscapes and has a long history of ethnomedicinal use.

Research has demonstrated anti-inflammatory and other biological properties in experimental systems. However, the toxicological profile is complex because the plant may contain pyrrolizidine alkaloids.

Nweze et al. (2014) conducted a 90-day toxicological investigation of a hydroalcoholic leaf extract in rats. Administration of 500 and 1000 mg/kg was associated with changes in liver, kidney and hematological parameters, and the authors attributed these effects partly to the presence of pyrrolizidine alkaloids.

In contrast, Palmer et al. (2019) evaluated an alkaloid-free extract and found no evidence of mutagenicity, clastogenicity or genotoxicity in the tested systems; the NOAEL was 2000 mg/kg body weight/day, the highest dose tested.

These contrasting findings emphasize the importance of chemical standardization. The toxicity of *A. conyzoides* cannot be discussed without specifying the extract, chemical composition and dose. Its positive significance therefore lies primarily in controlled phytochemical and pharmacological research rather than unrestricted medicinal consumption.

f. *Parthenium hysterophorus*: A Noxious Plant with Biochemical Potential

Parthenium hysterophorus was recorded in the Dimoria Tribal Belt, although at relatively low density and frequency compared with *C. odorata*.

The species is widely recognized for its effects on agriculture and human health. Its principal bioactive compound, parthenin, belongs to the sesquiterpene lactone group. Experimental research has demonstrated biological activity of parthenin, including cytotoxic and genotoxic effects at sufficiently high concentrations.

At the same time, the biological activity responsible for its harmful effects also provides a scientific basis for research into antimicrobial, anti-inflammatory, insecticidal and other applications. Kaur et al. (2021) reviewed the available evidence and reported multiple biological activities while emphasizing that clinical and toxicological evidence remains insufficient for therapeutic application.

The positive approach to *P. hysterophorus* should therefore involve research into safe value-added utilization, particularly biomass processing and phytochemical investigation, rather than direct medicinal use of crude plant material.

g. *Eichhornia crassipes*: Aquatic Invasion and Environmental Utility

Eichhornia crassipes, commonly known as water hyacinth and locally known in Assam as Meteka, is among the world's most problematic aquatic invasive plants. Its occurrence throughout the year has been recorded in wetlands of the Dimoria region, including Jalikhora, Duani and Etila beels.

The species can obstruct waterways, reduce light penetration, alter oxygen conditions and interfere with aquatic ecosystem functioning. Nevertheless, the plant produces large quantities of biomass and has therefore attracted research attention as a potential resource.

The plant has been investigated for wastewater treatment, heavy-metal absorption, biofertilizer production, animal-feed applications, bioenergy and other biomass-based uses. Its tissues contain flavonoids, phenolics, alkaloids, tannins and other secondary metabolites associated with biological activity.

Jayanthi et al. (2012) demonstrated that extracts of *E. crassipes* possessed larvicidal and pupicidal activity against *Culex quinquefasciatus*. Ethanol fractions were particularly active against mosquito larvae, indicating potential for investigation of plant-derived vector-management products.

Toxicological research has also produced encouraging findings for certain preparations. Lalitha et al. (2012) reported no mortality in experimental animals following oral administration of tested *E. crassipes* extracts at up to 2000 mg/kg, although such results apply only to the investigated preparations and cannot be generalized to plants harvested from contaminated wetlands.

This final point is especially important for Assam. Because water hyacinth is an efficient accumulator of pollutants, biomass collected from contaminated water bodies should not automatically be converted into food, medicine or animal feed. Chemical and heavy-metal analysis should precede any value-added application.

h. *Alternanthera philoxeroides*: Invasive Species with Local Cultural Significance

Alternanthera philoxeroides, commonly called alligator weed, provides a particularly useful example of the dual nature of invasive plants in Assam.

Sharma and Das (2025) conducted original ecological and ethnobotanical research in Panikhaiti village of Kamrup Metropolitan district. Their field survey used 45 quadrats across three sites and found that *A. philoxeroides* possessed high ecological importance, with Importance Value Index values of 125.5, 91.8 and 107.7 across the three sites.

The same research demonstrated that the plant also possesses cultural value. Local respondents reported culinary and medicinal applications involving leaves, young shoots, stems and the whole plant. Traditional uses included applications for stomach problems, diarrhoea, dysentery, loss of appetite, asthma and acute cough.

The ecological and cultural significance of *A. philoxeroides* should therefore be considered together. Its presence may create ecological problems, but its biomass and traditional uses may provide opportunities for research and controlled utilization.

At the same time, livestock safety requires attention. The literature cited by Sharma and Das (2025) associates ingestion with photosensitization and liver damage in livestock.

Thus, its positive significance is better considered in terms of ethnobotanical documentation, phytochemical research, biomass utilization and environmental applications rather than unrestricted livestock feeding.

7. Positive Significance of Invasive Plants

The presence of invasive plants in Assam should not be considered entirely synonymous with ecological uselessness. Their rapid growth, abundant biomass and ability to tolerate disturbed environments provide characteristics that can potentially be converted into useful resources.

One important possibility is **biomass utilization**. Species such as *Lantana camara*, *Chromolaena odorata*, *Mikania micrantha* and *Eichhornia crassipes* produce large quantities of vegetative material. If harvested as part of an organized control program, this biomass could potentially be investigated for compost, biochar, briquettes, biogas, fibre products and other value-added applications.

A second possibility is **phytochemical research**. Several invasive species contain biologically active secondary metabolites. *Mikania micrantha* contains compounds associated with wound-healing and antimicrobial activities, while *C. odorata*, *Lantana camara* and *Parthenium hysterophorus* contain chemically diverse compounds with pharmacological or pesticidal potential.

A third area is **environmental remediation**. Water hyacinth has demonstrated the ability to absorb nutrients and certain contaminants from water, making it a potential phytoremediation resource. The major challenge is that harvested biomass must then be handled safely to prevent re-release of contaminants.

A fourth positive significance is **biological pest management**. Extracts of *Eichhornia crassipes*, for example, have demonstrated larvicidal activity against mosquito vectors.

These possibilities suggest that invasive-plant management could be integrated with controlled utilization. However, utilization should always follow containment rather than encourage propagation.

8. Toxicological Significance

Toxicity is an important consideration when evaluating invasive plants for beneficial use. The presence of biologically active compounds can simultaneously produce therapeutic and toxic effects.

The most important example in the Dimoria context is *Lantana camara*. Lantadenes can produce severe liver injury and photosensitization in livestock. Consequently, the species should not be considered a conventional fodder plant.

Ageratum conyzoides provides another example. Pyrrolizidine alkaloids can produce hepatotoxic effects, and experimental long-term exposure has produced liver, kidney and hematological changes.

Parthenium hysterophorus presents a different toxicological problem. Contact with the plant can cause dermatitis, while parthenin possesses cytotoxic and genotoxic activity under experimental conditions.

The toxicological situation of *Mikania micrantha* and *Eichhornia crassipes* is more preparation-dependent. Particular topical preparations of *M. micrantha* have shown no acute dermal toxicity in rats, whereas particular extracts of *E. crassipes* have shown low acute toxicity in animal experiments.

These findings demonstrate that “toxicity” should be assessed scientifically rather than simply assigning an entire species a binary category of toxic or non-toxic. Toxicity depends upon species, plant part, chemical constituents, extraction method, dose, route of administration and duration of exposure.

9. Ecological Significance in Dimoria

The ecological significance of invasive plants in Dimoria is particularly evident from the phytosociological and soil studies.

The high density and frequency of *Chromolaena odorata* indicate that the species can dominate open fallow habitats. Similarly, the 100% frequency of *Mikania micrantha* demonstrates its ability to establish extensively along disturbed roadside environments.

Paul and Sharma (2019) found differences in several soil-quality parameters between *C. odorata*-dominated sites and nearby natural forest. This indicates that invasive plants can be associated with changes in soil conditions and potentially influence subsequent vegetation development.

The positive interpretation of this finding is not that invasion improves ecosystems, but that invasive biomass represents a readily available resource for controlled removal. If harvested biomass can be safely converted into compost, biochar, energy or other products, ecological management and resource recovery could potentially be linked.

10. Invasive Plants as Sources of Medicinal and Pharmaceutical Research

Several invasive plants of Assam deserve further pharmacological investigation.

Mikania micrantha is particularly promising because experimental research has already demonstrated wound-healing activity. Das et al. (2023) demonstrated effects on fibroblast proliferation, angiogenesis and wound contraction, while Sahu et al. (2019) demonstrated wound healing and absence of acute dermal toxicity in a topical ointment formulation.

Chromolaena odorata is another candidate because of its wound-healing, antimicrobial and antioxidant properties. However, the absence of adequate clinical evidence means that it should remain a research candidate rather than a clinically established medicine.

The pharmaceutical significance of *Parthenium hysterophorus* is more complicated because the same chemistry responsible for biological activity can produce toxicity. Future research should therefore focus on isolating useful compounds, determining safe concentrations and developing standardized preparations rather than using crude plant material.

11. Community-Based Utilization and Management

Dimoria has considerable potential for community-based invasive plant management because many invasive plants occur close to roads, agricultural fields and settlements.

A practical management model could involve the systematic removal of invasive plants from priority ecological sites followed by controlled processing of harvested biomass. Species with toxic constituents should be handled separately from potentially usable biomass.

For example, *Lantana camara* biomass could be investigated for non-food applications such as briquettes, compost after appropriate processing, or other material products. *Eichhornia crassipes* could be considered for biogas, compost or wastewater-related applications, provided contaminant analysis is conducted before final utilization.

Medicinally promising species such as *Mikania micrantha* and *Chromolaena odorata* should be collected only from controlled removal operations and subjected to botanical authentication and chemical standardization before laboratory use.

Such a system would transform invasive-plant removal from a purely disposal-oriented activity into a potential resource-management strategy.

12. Conservation Considerations

Utilization must not become a justification for the deliberate cultivation or propagation of invasive plants.

The central principle should be “**utilize existing invasive biomass while preventing further spread.**” This is particularly important for species capable of vegetative propagation, including aquatic invasive plants.

Harvesting should be carried out before seed maturation where appropriate, and plant fragments should not be transported without containment. Equipment used in wetlands should be cleaned to prevent movement of propagules between water bodies.

For Dimoria, roadside and fallow-land management should be combined with restoration using appropriate native species. Simply removing invasive plants without restoring the habitat may create conditions suitable for reinvasion.

13. Research Gaps

Although substantial research has been conducted on invasive plants in Assam, several knowledge gaps remain. First, the available Dimoria studies are geographically limited. Sharma and Paul (2020) investigated fallow lands near National Highway 37, but a comprehensive inventory of invasive plants across agricultural fields, forests, wetlands, roadsides and village settlements of the entire Dimoria Block is still required. Second, the positive utilization potential of invasive plants has not been adequately evaluated under Assam-specific conditions. Biomass production, seasonal chemical variation, nutrient composition and contaminant accumulation should be investigated locally. Third, toxicological research needs to be species- and preparation-specific. The contrasting results for *Ageratum conyzoides*, *Lantana camara*, *Mikania micrantha* and *Eichhornia crassipes* demonstrate that crude statements about plant toxicity may be scientifically misleading. Fourth, more work is required to connect ethnobotanical knowledge with laboratory research. The recent Panikhaiti study provides a valuable model because ecological data and indigenous knowledge were investigated together.

14. Conclusion

Invasive plants constitute an important ecological issue in Assam, and Dimoria Block represents a significant landscape for studying their distribution, dominance and interaction with human-modified environments. Original research conducted in the Dimoria Tribal Belt has demonstrated the presence of *Chromolaena odorata*, *Lantana camara*, *Mikania micrantha*, *Mimosa pudica*, *Ageratum conyzoides* and *Parthenium hysterophorus*, with *C. odorata* showing particularly high density and frequency. The ecological problems associated with these plants are substantial, but their biological characteristics also create opportunities for scientific research and controlled utilization. Their biomass can potentially be investigated for bioenergy, compost, biochar and other value-added products, while their phytochemicals provide opportunities for pharmacological, antimicrobial, pesticidal and wound-healing research. *Mikania micrantha* is an especially interesting example because experimental research has demonstrated wound-healing activity and relatively low acute dermal toxicity for specific topical preparations. *Eichhornia crassipes* provides another example in which an ecologically problematic aquatic plant has potential applications in wastewater treatment, biomass production and vector control. *Alternanthera philoxeroides*, investigated recently in Kamrup Metropolitan, demonstrates that invasive plants may also retain important indigenous food and medicinal knowledge. At the same time, positive utilization must never obscure toxicological and ecological risks. *Lantana camara*, *Ageratum conyzoides* and *Parthenium hysterophorus* possess significant toxicity concerns, while contaminated aquatic biomass may represent a separate environmental-health hazard. The most appropriate approach for Dimoria is therefore neither complete rejection nor uncontrolled utilization of invasive plants. Instead, an integrated strategy should combine **early detection, ecological control, safe biomass removal, scientific evaluation, toxicological screening, restoration of invaded habitats and carefully regulated value addition**. Such an approach could reduce the ecological burden of invasive plants while transforming selected invasive biomass into scientifically and economically useful resources

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