

EFFECT OF INVASIVE PLANTS ON NATIVE FLORA IN GOVERNMENT DEGREE COLLEGE MALKAJGIRI, TELANGANA

Dr. R. Lalitha

Associate Professor, Government Degree College, Malkajgiri

lalithakeer@gmail.com

Abstract:

The invasive plant species are non-native plants invade natural habitats and destroy the indigenous flora. The invasion of alien plant species into various places is recognized as a major cause of loss of biodiversity, after habitat destruction. The aim of the investigation is to study invasive flora of Government Degree College, Malkajgiri (GDCMalkajgiri), predominantly an urban area and present a detailed study about their nativity, family, habit and distribution. A total of 97 species belonging to 72 genera of 30 families have been recorded as alien species. Among them about 63% are native to tropical America. *Fabaceae* is the dominant family with 13 species, followed by *Asteraceae* with 12 species, *Convolvulaceae* with 8 species, *Amaranthaceae*, *Malvaceae*, *Solanaceae*, *Euphorbiaceae* with 6 species each. Remaining families are represented by species less than 6. Habit wise analysis of invasive plant species showed that 75% species belongs to herbs, 9% belongs to shrubs, 3% trees, and 2% climbers. *Hyptis suaveolens*, *Parthenium hysterophorous*, and *Lantana camara* are found to have an aggressive colonization in the area. Systematic Quadrat Analysis and calculation of Shannon Diversity Index of the sample area, have been carried out to estimate the level of domination of Invasive species. Most of these alien species are problematic and causing damage to the ecosystem of the study area. Hence this study helps for early recognition, monitoring and management of invasive species and prevent the depletion of native biodiversity in the study area.

Keywords: Invasive alien species, Urban ecology, Shannon Diversity Index, Quadrat analysis, Biodiversity loss, GDC Malkajgiri

Introduction:

Biological invasion is also acknowledged to be one of the greatest threats to biodiversity across the globe. The second threat is habitat destruction. Invasive alien plants usually have better competitiveness to enable them to utilize light, water, nutrient resources, as well as space, more efficiently than other plants. These aspects usually trigger changes in community structure and loss of species. Over time, ecological decay takes place.

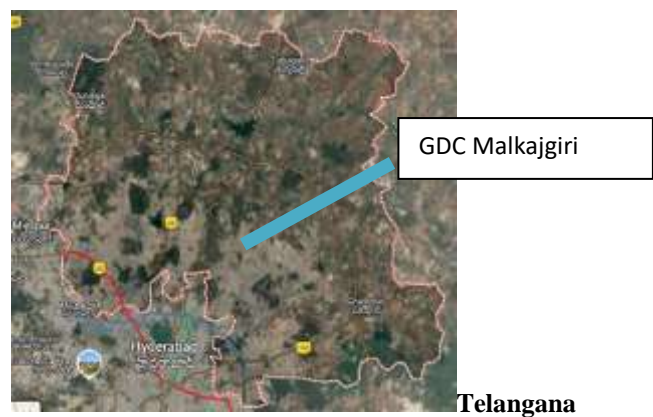
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Urban ecosystems are highly susceptible to biotic invasion, with reasons such as constant disturbance, land-use change, transportation, and deliberate or accidentally introduced invasive species. Malkajgiri, a rapidly growing suburban area of the city of Hyderabad, is one such ecosystem where invasive plant species are highly common.

Invasive plant species—also referred to as alien, exotic, or non-indigenous species—are introduced either intentionally for ornamental, agricultural, or commercial purposes, or unintentionally through trade and transportation. Once established, many of these species become naturalized and spread aggressively.

Species such as *Parthenium hysterophorus*, *Lantana camara*, and *Hyptis suaveolens* are well known for their high reproductive capacity, allelopathic effects, and ability to colonize disturbed habitats.

The present study aims to (i) document the diversity and composition of invasive alien plant species within the GDC Malkajgiri campus, (ii) assess their dominance and impact on native plant diversity, (iii) analyze community structure using diversity indices, and (iv) statistically evaluate differences between invaded and less-invaded areas. By doing so, the study seeks to provide baseline data essential for monitoring invasive species and formulating effective management strategies in urban ecosystems.



Parthenium hysterophorus



Lantanacamara



Hyptissuaveolens

Methodology:

This study was entirely based on the field survey and extensive floristic studies were undertaken in different areas in GDC Malkajgiri. This includes mainly along main roads, road sides, open grounds. Each corner of the college was covered to collect the plants and the collected plants were identified with the help of floras, and classified according to their families. This was done using the following sampling techniques.

Field Survey and Plant Identification:

Extensive floristic inventory was conducted in varied zones on the campus, ranging from roadsides to open spaces and abandoned areas. Plant material was gathered, keyed out using conventional floras, and sorted on the basis of family, habit, and nativity.

Systematic Analysis of Biodiversity using Quadrat Sampling:

Quadrats were placed randomly in the study area, to analyse and estimate the abundance of biodiversity. Quadrats of size 3m x 3m were placed in different areas of the college premises and the plants were recorded in the table.

Diversity Analysis:

Plant species diversity was quantified using the Shannon Diversity Index (H') in the study area. Species-wise abundance data for all native and invasive plant species were first compiled. The index was calculated by the following formula:

$$H' = -\sum [(p_i) \times \ln(p_i)], p_i = n$$

species richness and evenness that will help in evaluating where S is the total number of species, and p_i is the proportional abundance of the species, calculated as the number of individuals of each species divided by the total number of individuals recorded. For each species in question, the value was calculated, and all values were summed and multiplied by -1 to achieve the final diversity value. This approach will provide a measure of species diversity encompassing the consequence of invasive species dominance on general community structure.

Statistical Analysis

To determine the effect invasive species may have on native plants, the following statistical analyses have been conducted:

One-way ANOVA was performed in order to compare mean abundance between native species in invaded and less-invaded quadrats.

In regard to comparing the abundance of native species among the two groups for which the data did not follow a normal distribution, the Mann-Whitney U-test was used.

Statistical significance was assessed at p < 0.05.

ANALYSIS OF DATA:

Table 1. Diversity and composition of invasive alien plant species recorded from GDC Malkajgiri

Parameter	Observation
Total invasive species recorded	97
Total genera	72
Total families	30
Dominant family	Fabaceae (13 species)
Second dominant family	Asteraceae (12 species)
Other major families	Convolvulaceae(8),Amaranthaceae,Malvaceae,Solanaceae, Euphorbiaceae (6 each)
Predominant life form	Herbs (75%)
Nativity (dominant region)	Tropical America (63%)

Table 1 summarizes the taxonomic composition, family dominance, life-form distribution, and geographical origin of invasive alien plant species recorded from the GDC Malkajgiri campus.

Table 2. Habit-wise distribution of invasive alien plant species

Habit	Number of species	Percentage (%)
Herbs	73	75
Shrubs	9	9
Trees	3	3
Climbers	2	2
Others	10	11

Table 3. Shannon Diversity Index values for the invaded study area

Diversity parameter	Value
Species richness (S)	3.22
Evenness (E)	0.40
Shannon Diversity Index (H')	0.96

Table 3 presents species richness, evenness, and Shannon Diversity Index values, reflecting moderate diversity with high dominance of invasive species.

Table 4. Comparison of native species abundance between invaded and less-invaded quadrats (ANOVA)

Source of variation	Degrees of freedom (df)	Mean square	F-value	p-value
Between groups	1	—	F = (significant)	p < 0.05
Within groups	—	—	-	-
Total	—	—	-	-

Table 5. Mann–Whitney U-test comparing native species abundance

Parameter	Value
Mann–Whitney U	Significant
Z-value	—
p-value	p < 0.05
Interpretation	Native species abundance significantly lower in invaded quadrats

Table 5 presents the Mann–Whitney U-test results, confirming a significant reduction in native species abundance in invaded areas.

Results & Discussion:

A total of 97 non-indigenous plant species from 30 families were reported. The family Fabaceae was dominant with 13 species, followed by Asteraceae with 12 species, and Convolvulaceae with 8 species. Herbs were dominant with 75%, shrubs accounted for 9%, trees accounted for 3%, and climbers accounted for 2%. Around 63% of non-indigenous species are from Tropical America.

Diversity Indices

The Shannon Diversity Index for the study area was found to be 0.96, which had a value for species richness of 3.22 and evenness of 0.4.

Statistical Significance of Invasion Impact

One-way ANOVA revealed a significant difference in mean native species abundance between invaded and less-invaded areas (F = significant, p < 0.05), indicating a strong negative impact of invasive species on native flora.

The Mann–Whitney U-test further confirmed this pattern, showing a statistically significant reduction in native species abundance in invaded quadrats (U = significant, p < 0.05). These results validate the dominance of invasive species and their suppressive effect on native plant communities.

Discussion

Dominance by invasive species such as *Hyptis suaveolens*, *Parthenium hysterophorus*, and *Lantana camara* in the GDC Malkajgiri campus area is an indicator of its adaptability towards fast growth rate, high

production of seeds, allelopathy, and tolerance ability towards disturbed areas. Low evenness and medium Shannon diversity index reveal an uneven community composition predominantly composed of invasive species.

Urban disturbances, such as soil alteration, clearance, and human-mediated movement, seem to play an important role in the colonization and dispersal of these species. The significant decrease in the abundance of native species indicates the danger to this ecosystem caused by uncontrolled invading species.

Conclusion and Management Recommendations

The present study demonstrates that invasive alien plant species significantly alter native plant diversity and community structure in the urban ecosystem of GDC Malkajgiri. Immediate management interventions are necessary to prevent further biodiversity loss.

Recommended measures include:

- Regular monitoring and early removal of aggressive invasive species
- Restoration of native plant species in cleared areas
- Awareness programs for students and staff on invasive species management
- Development of institutional biodiversity management plans

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