

ASSESSING THE IMPACT OF ALIEN PLANT INVASIONS ON NATIVE BIODIVERSITY IN TELANGANA, INDIA

KANTEM VIDYADHARI

Botany

Dr. Krishan Pal

(Professor)

Glocal School Life & Applied Health Science

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Abstract

This study investigates the quantitative structure of invasive alien plant species that have been found on the grounds of Andhra University using a research design that is based on quantitative research. Through the utilization of previously collected data and the utilization of a methodical evaluation of the Importance Value Index (IVI), the purpose of this research is to determine the dominance and dispersion patterns of these invasive species. In addition to this, it provides a comparative analysis that sheds light on the role played by distinct geographical locations in the introduction of invasive species into their respective ecosystems. By pursuing this method, the research hopes to provide a full understanding of the invasive plant flora within the university campus, providing light on the potential applications of these species. This will be accomplished by undertaking this strategy. The collecting of data is primarily dependent on information that was previously gathered, such as information obtained from botanical surveys and research papers carried out at Andhra University. IVI data for particular invasive plant species are collected and analyzed in a methodical manner, while the geographical origins of these invasive plant species are extrapolated from records and literature that are currently available.

Keywords: alien plant, invasions, native biodiversity, Telangana, Indian Himalaya region (IHR), Value Index (IVI), Global Invasive Species Program (GISP), Invasive Alien Species (IAS), International Union for Conservation of Nature and Natural Resources (IUCN)

1. INTRODUCTION

The Telangana region is a land of natural enchantment, a place where the majesty of the world's highest mountains is reflected in the untamed beauty and distinctive culture of the people who live in their shadow. The Indian portion of Telangana encompasses an area of approximately 5 lakh km, which accounts for approximately 16.2% of the overall geographical area of the country, and it serves as the country's northern boundary. It stretches from latitude of 26 degrees 20 minutes to 35 degrees 40 minutes north and from a longitude of 74 degrees 50 minutes to 95 degrees 40 minutes east. The Indian Himalaya region (IHR) is expanding to include hill regions in ten states across the Indian Republic. These republics include Jammu and Kashmir, Himachal Pradesh, Uttaranchal, Sikkim, Arunachal Pradesh, Meghalaya, Nagaland, Manipur, Mizoram, and Tripura, as well as hill regions in Assam and West Bengal. The region encompasses over 95 districts of the country and accounts for approximately 16.2% of India's total geographical area. It begins in the foothills in the south, known as the Siwalik's, and reaches all the way to the Tibetan plateau in the north, known as trans-Telangana. The majority of the territory that makes up the IHR is made up of snow-capped peaks, glaciers in the higher Telangana, and deep forest cover in the middle of the Telangana region. It is believed that the IHR contains a total of 10,000 plant species, 3160 of which are indigenous to the region. There is no documentation of any invasive species being discovered in IHR.

Exotic organisms that live outside of their naturally adapted areas and have the potential to disperse further are known as alien species. A great number of non-native species are vital to the success of our agricultural and forestry practices. On the other hand, certain non-native species can become invasive if they are transported either on purpose or accidentally outside of their normal habitats and into new places where they have the potential to establish themselves, invade native species' habitats, and outcompete native species for resources. The International Union for the Conservation of Nature and Natural Resources (IUCN) defines an alien invasive species as an alien species that becomes established in natural or semi-natural ecosystems or habitats, is an agent of change, and threatens native biological diversity. In other words, an alien species that becomes established in natural or semi-natural ecosystems or habitats. These invasive species are widely

dispersed over the globe among all groups of living animals as well as all different sorts of environments.

The loss of biodiversity, including the extinction of species, as well as changes in hydrology and the function of ecosystems are caused by invasive species. The requirements, methods of resource acquisition, and consumption patterns of exotic plant species are distinct from those of native plant species. These differences can lead to shifts in soil structure, its profile, decomposition, nutrient content, and moisture levels, among other things. Because of this, severe negative effects on biodiversity and ecosystems are caused as a result. As a result, invasive species pose a significant challenge to efforts that aim to preserve biodiversity and make effective use of it. Biological invasions are currently taking place on a global scale, and their prevalence is expected to skyrocket in the near future as a result of the growing globalization of markets as well as increases in international trade, travel, and tourism. Because of this, having knowledge about the diversity of invasive species, as well as their life forms, habitats, and the ways in which they might be used, is absolutely necessary for efficient management of these species. In light of these considerations, the current research was chosen to list the alien species that have been found in the Indian Himalaya region, as well as its diversity, with an eye towards the region's potential long-term effects.

2. LITERATURE REVIEW

Prasad and Shivanna (2008) Invasive alien species are plant species that are not native to an ecosystem but have been introduced to that ecosystem. These species can pose a threat to the native biodiversity. The diversity of invasive alien species in India and the consequences such species have on India's native flora and fauna were probably explored in the study. It is critical to the success of conservation initiatives and ecological management that these implications be understood.

Reddy, Jha, and Dadhwal (2006). Even though this study does not focus specifically on invasive species, it is nonetheless pertinent to the understanding of changes in land use and land cover, both of which can be influenced by invasive species moving into natural environments. The monitoring

of the effect that invasive species have on native vegetation requires the assessment of changes that have been made to land usage.

Shanker and Reddy (2018) most likely gives a comprehensive summary of alien plant species that have become invasive in India. It could address topics such as their variety, distribution, and the ecological influence that they have on the natural biodiversity. Those who are interested in the topic can benefit greatly from making use of this extensive resource as a reference source.

Kishore and Pandit (2021) explicitly evaluate the influence that an invasive plant species known as *Lantana camara* has had on herbaceous communities in a semi-arid region of the Indian state of Telangana. It is possible that the study examines the ecological repercussions of this invasive species as well as the effects it has had on the local plant groups in the area.

The authors Reddy, Rao, and Dutta (2006) wrote an article that focuses on the mapping and monitoring of invasive alien species in the Indian state of Telangana. It is highly likely that it addresses the methods that are used to track and manage invasive species in the area, which is essential for comprehending the impact that these species have on native biodiversity and finding ways to mitigate it.

An analysis of the current situation regarding plant invasions in India may be found in Sukumaran and Sreejith's (2015) publication. This article is probably going to talk about the different regions of India and the influence that invasive alien plant species have had there as well as where they have been found. It is crucial for India's conservation and management initiatives to have a solid understanding of where India stands in terms of plant invasions.

Reddy, Singh, and Reddy (2012) provides a detailed record of more than 2400 foreign plant species that have become invasive in India. Researchers and everyone involved in policymaking can benefit greatly from using this database. It is possible that the essay addresses the scale of the problem of invasive species in India and emphasizes the requirement of an organized database in order to deal with the matter.

Rao and Annapurna (2011) concentrate on the particular instance of *Sida rhombifolia*, a kind of invasive plant that can be found throughout India. This paper most likely describes the history of this invasive plant as well as its current distribution, which will provide insight on the dynamics of each invasive species across the country.

Negi and Rajasekaran (2010) most likely focuses on the prevalence of alien invasive plants in the southern states of India. This research has the potential to shed light on regional disparities in the occurrence of invasive species as well as their influence on the ecosystems that are native to southern India.

In their 2016 study, Reddy and Prasad focus on the analysis of alien plant invasions in Telangana, India, and the effects those invasions have had on the local biodiversity. This study most likely investigates the ecological effects of invasive species in a particular region, providing insights into the ways in which native plant communities and ecosystems have been impacted locally as a result.

3. RESEARCH METHODOLOGY

3.1. Research Design

This study employs a quantitative research design to investigate the quantitative structure of invasive alien plant species at Andhra University. The study relies on existing data and a systematic analysis of the Importance Value Index (IVI) to assess the dominance and distribution of invasive species. Additionally, a comparative analysis is conducted to determine the contribution of various geographical regions to the nativity of invasive species. The research design facilitates a comprehensive understanding of the invasive flora within the university campus and the potential applications of these species.

3.2. Data Collection

Data for this study is primarily obtained from previously collected and documented sources, including botanical surveys and research reports conducted at Andhra University. The Importance Value Index (IVI) data for specific invasive plant species is collected and analyzed. Geographic

origins of invasive species are also extracted from available records and literature. Additionally, potential applications of these invasive species are explored through a review of relevant literature and traditional knowledge.

3.3. Ethical Consideration

Since this study relies on existing data and literature review, there are minimal ethical considerations. However, it is crucial to ensure that the sources of the data used are properly cited, and ethical guidelines related to academic research and publication are strictly adhered to. No human or animal subjects are involved in the study.

3.4. Limitations

The study's limitations include its reliance on previously collected data, which may be subject to biases or limitations inherent in the original research. Additionally, the research does not involve primary data collection or fieldwork, which may limit the depth of analysis. Furthermore, the study does not address the ecological impact of invasive species on native flora and ecosystems, as this was not within the scope of the research.

4. DATA ANALYSIS

Quantitative structure of Invasive alien plant species: The study shows a large number of IAS in Andhra University and *Antigonon leptopus* is the most hazardous one with the greatest Importance Value Index (table-1). This result is supported by the findings of a few other studies. In Hawaii, *A. leptopus* is widely cultivated and has recently begun to sporadically naturalise in disturbed areas, which has led to its increased prevalence. The fact that *Antigonon leptopus* is a vine is what allows it to have the greatest coverage and what allows it to influence the distribution of resources among the other species that are present. It is possible that it will maintain its dominant position in the areas where it has already been established based on the high levels of recruitment and the large number of seedlings that were observed in the research area.

Table 1: Andhra University's investigation of the quantitative structure of invasive alien plant species

S. No	Name of species	Common name	RD	RF	RC	IVI*
1	<i>Antigonon leptopus</i>	Mexican creeper	38.689	13.39	21.190	73.258
2	<i>Sida acuta</i>	Wire weed	22.312	11.973	15.588	49.88
3	<i>Cassia occidentalis</i>	Coffee senna	1.634	16.902	17.35	35.875
4	<i>Chromolaena odorata</i>	Siam weed	0.77	11.973	12.714	25.446
5	<i>Mimosa pudica</i>	Sensitive plant	8.427	6.339	4.336	19.098
6	<i>Calotropis gigantea</i>	Giant milkweed	0.338	11.269	6.504	18.109
7	<i>Cleome viscosa</i>	Dog mustard	9.3376	2.114	4.628	16.0776
8	<i>Dinebra retroflexa</i>	Viper grass	8.08	2.818	2.08	12.958
9	<i>Lantana retroflexa</i>	Lantana	0.196	4.226	5.115	9.535
10	<i>Lantana camara</i>	Wild spikenard	0.398	4.94	3.167	8.4996

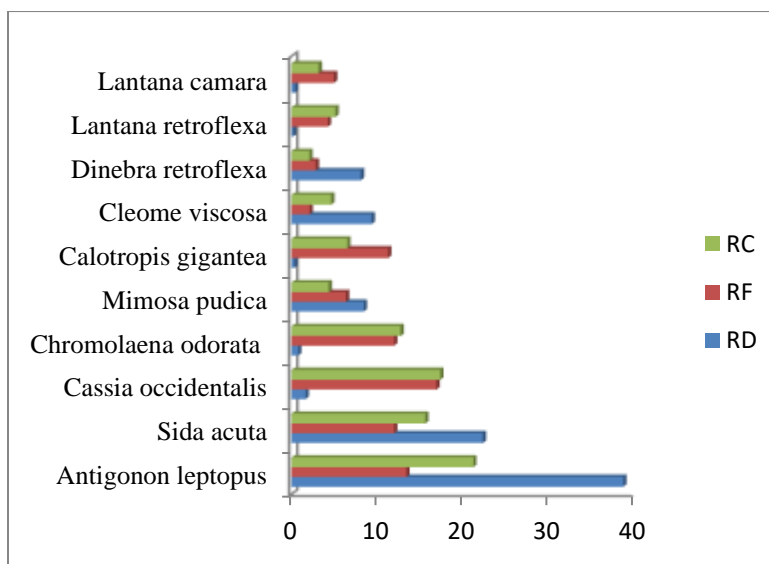


Figure 1: The Andhra University research on the quantitative structure of invasive alien plant species was carried out by

Figure 2 illustrates the contribution of various geographical locations in terms of nativity. Various geographical regions made a significant impact on the nativity. The contribution made by tropical America is notable, accounting for 62% of the total. 74% of India's problematic invasive plant species originated in tropical America. The majority of the poisonous invasive plants found in Uttar Pradesh¹⁰ and also in China were brought over from the American continent.

Distribution-wise, herbs make up 52% of the total (11 species), while shrubs make up 38% (eight species), and climbers make up 10% (two species). The habit-wise distribution of alien invading species showed that herbs predominated the distribution. Herbaceous species share 151 kinds of invasive alien species in India, according to a habit-wise analysis. The herbs having more vegetative and tolerance to hard environments could result in the preponderance of herb friends in India's flora.

Possible Applications of Extraterrestrial Flora: research has shown that a number of these species may have applications in a variety of contexts. This may be relevant for the sustainable management of these invasive plant species in their natural environments. In addition, local contact with regard to traditional applications of these exotic floras has the potential to offer vital knowledge regarding this facet (figure 3).

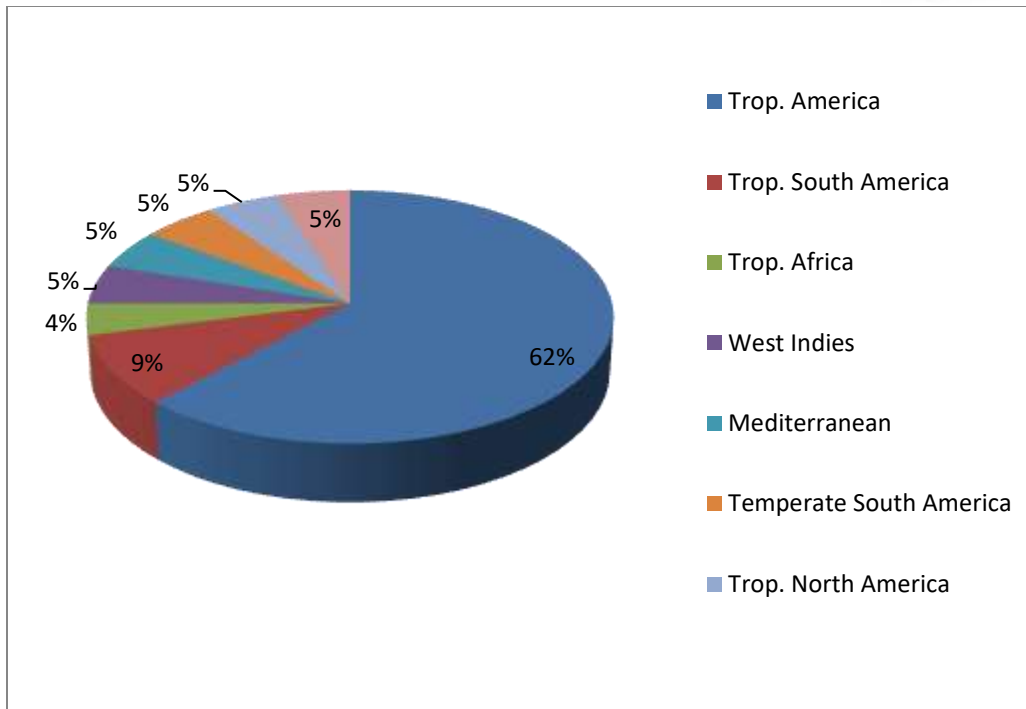


Figure 2: Andhra University's Invasive Flora and the Role Played by Various Geographical Regions in It

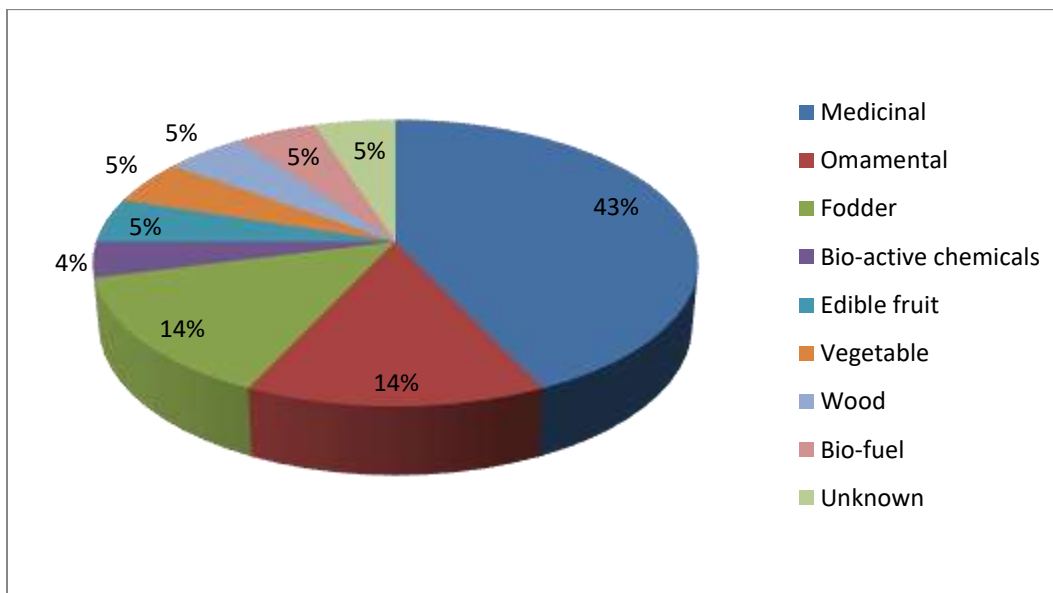


Figure 3: The Possible Applications of Andhra University's Non-Native Flora

In the Andhra University Campus, the most harmful noxious invasive plant species were determined to be *Antigonon leptopus*, *Lantana camara*, *Chromolaena odorata*, *Hyptis suaveolens*, *Cassia occidentalis*, *Calotropis gigantea*, and *Parthenium hysterophorus*. These species are considered to be very harmful because of their prolific seed production and their ability to spread quickly. They pose a threat to the health of people and domestic animals, as well as other plants, due to the allelopathic effect that they have on those other plants, which in turn creates a harsh environment for the local flora and crops. By blocking out the light and smothering other plants, *Antigonon leptopus* can cause them harm or even cause their death. In this regard, it can be particularly destructive in newly planted forests and nurseries with young trees. Additionally, it is a rival for water and nutrients.

However, the quantitative influence that these species have on the native flora and the ecosystems that they have invaded has not yet been studied. Studies are also required in order to understand the process that led to their introduction as well as their status in terms of whether or not they were only recently imported or if they are now firmly established, and in order to measure the severity of the invasion in various habitats.

Manual, mechanical, chemical, and biological methods are the four primary approaches that can be utilised in the process of eradicating or controlling invasive organisms. In many cases, the success of biological control programmes cannot be definitively determined because total control is only accomplished in some years and/or at the same locations. As a result, it is evident that there is a need for focused study on control strategies that are appropriate and friendly to the environment. Prevention, early identification, and eradication are the three primary management strategies that CAB International and the Global Invasive Species Programme (GISP) recommend.

5. CONCLUSION

A great number of invasive alien species have been purposefully released into their new environments. In spite of this, the introduction of new species is fraught with a significant amount of danger. The introduction of species such as *Lantana camara*, *Chromolaena odorata*, and

Antigonon leptopus, among others, has now become troublesome as a result of these species' invasion of natural areas as well as urban ecosystems such as the Andhra University Campus. Even biological control should only be implemented after a thorough assessment of the dangers that are potentially present. The bulk of IAS in India originates from Neotropical regions, particularly South America. This is comparable to Andhra University Campus, which has a contribution rate of 62% as the majority and has been offered in India through a variety of channels. There is a gap in our knowledge regarding the various IAS control choices. This has led to the emergence of a myriad of difficulties, the likes of which have not been seen before the invasion of alien species, and these difficulties do not appear to have an easy resolution.

Therefore, there is a need for better planning for early detection and reporting of infestations of spread of new and naturalized weeds by creation of plant detection network in each state by establishing communication links between taxonomists, ecologists, and land managers to monitor and control invasive alien species. This can be accomplished through better planning for early detection and reporting of infestations of spread of new and naturalized weeds.

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