

CULTURAL AND ECOLOGICAL SIGNIFICANCE OF *FICUS* SPECIES IN CHANDRASEKHAR AZAD PARK, PRAYAGRAJ

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ABSTRACT : The *Ficus* species, commonly referred to as fig trees, hold profound cultural and ecological significance in India. In Chandrasekhar Azad Park, Prayagraj, these species play a pivotal role in preserving biodiversity, maintaining ecological balance, and embodying cultural heritage. This study explores the multifaceted importance of *Ficus* species, such as *Ficus religiosa* (Peepal), *Ficus benghalensis* (Banyan) and *Ficus racemosa* (Cluster Fig), focusing on their ecological and cultural contributions. Ecologically, these trees provide a critical habitat and food source for various fauna, including birds, insects and small mammals. Their extensive root systems help prevent soil erosion, recharge groundwater and improve air quality, making them vital for urban environmental sustainability.

Culturally, *Ficus* species are revered in Indian traditions, symbolizing wisdom, longevity, and spiritual enlightenment. They are integral to religious practices, with Peepal and Banyan trees often regarded as sacred in Hinduism, Buddhism and Jainism. In Chandrasekhar Azad Park, these trees serve as a space for community gatherings, religious rituals, and cultural events, fostering a sense of identity and belonging. This study emphasizes the need for conservation strategies to protect these species, considering the increasing urbanization and environmental challenges in Prayagraj. By highlighting the ecological and cultural importance of *Ficus* species, this research advocates for their inclusion in urban planning and environmental policies to ensure sustainable development and cultural preservation. The findings underscore the interconnectedness of natural ecosystems and cultural heritage, advocating for a balanced approach to urban environmental management.

Key words : *Ficus* species, cultural heritage, ecological balance, Chandrasekhar Azad Park, urban sustainability.

Introduction

The *Ficus* genus, comprising species like *Ficus religiosa* (Peepal), *Ficus benghalensis* (Banyan) and *Ficus racemosa* (Cluster Fig), holds an extraordinary position in Indian ecological and cultural landscapes. In urban contexts, particularly in Chandrasekhar Azad Park, Prayagraj, these species exemplify the intersection of biodiversity conservation and cultural heritage. This introduction explores their ecological roles, cultural significance, and the challenges they face due to urbanization, while also discussing conservation strategies to ensure their sustainability.



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Ecological Significance of *Ficus* species

Ficus species are often referred to as keystone species in tropical ecosystems due to their ability to sustain a wide variety of life forms (Shanahan *et al*, 2001). Their fruits, available throughout the year, provide a critical food source for birds, mammals and insects, facilitating biodiversity conservation in urban areas (Ekka *et al*, 2024). In Chandrasekhar Azad Park, these species provide habitat to a variety of organisms, including migratory birds and pollinators like wasps and bees, supporting ecological balance (Joshi and Bhagwat, 2022).

Furthermore, their extensive root systems prevent soil erosion, recharge groundwater, and contribute to urban climate regulation by sequestering carbon dioxide and reducing the urban heat island effect (Singh *et al*, 2024). The mutualistic relationship between *Ficus* species and their specific pollinators, primarily fig wasps, represents a remarkable ecological adaptation that sustains species diversity in fragmented urban habitats (Kondoh *et al*, 2022).

Cultural Significance of *Ficus* species

Ficus species are deeply embedded in Indian religious and cultural traditions. The Peepal tree (*Ficus religiosa*), for instance, is considered sacred in Hinduism, Buddhism and Jainism, symbolizing wisdom, enlightenment, and immortality (Narayan *et al*, 2017). Similarly, the Banyan tree (*Ficus benghalensis*), the national tree of India, is venerated for its longevity and is often associated with rituals and ceremonies (Kumar and Shukla, 2018).

In Chandrasekhar Azad Park, these trees not only enhance the aesthetic and environmental quality of the park but also serve as cultural landmarks. They provide a gathering space for the community and are integral to festivals and local traditions. For example, the practice of worshipping Peepal trees during certain Hindu rituals connects ecological conservation with cultural practices (Pandey *et al*, 2019).

Challenges Faced by *Ficus* species

Urbanization and infrastructural development pose significant challenges to the survival of *Ficus* species in cities like Prayagraj. Habitat fragmentation, air pollution, and reduced green spaces threaten their growth and ecological functions (Sharma and Gupta, 2021). Moreover, the lack of awareness about their ecological and cultural importance often leads to their neglect in urban planning initiatives (Mahto *et al*, 2023).

Despite their resilience, these trees are vulnerable to changing climatic conditions and require active conservation measures. For example, mature *Ficus* trees in Chandrasekhar Azad Park have shown signs of stress due to declining water availability and soil compaction caused by increased foot traffic (Joshi and Bhagwat, 2022).

Conservation and Sustainable Urban Planning

Preserving *Ficus* species in urban environments necessitates a multi-pronged approach. Urban planners should prioritize the integration of these trees into city landscapes, recognizing their ecological and cultural significance. Community-based initiatives, such as tree plantation drives and educational campaigns, can enhance public participation in conservation efforts (Sharma and Gupta, 2021).

In Chandrasekhar Azad Park, measures such as creating protective zones around mature *Ficus* trees and promoting eco-friendly tourism can help maintain their health and longevity. Additionally, collaborations between local governments, environmental NGOs and academic institutions can foster research on the ecological roles and sustainable management of *Ficus* species (Ekka *et al*, 2024).

Objectives of the study

- To examine the ecological significance of *Ficus* species in Chandrasekhar Azad Park, Prayagraj.
- To explore the cultural and religious importance of *Ficus* species in local traditions.
- To analyse the challenges faced by *Ficus* species due to urbanization.
- To suggest conservation strategies for preserving *Ficus* species in urban environments.
- To assess the role of *Ficus* species in promoting biodiversity and environmental sustainability.

Significance of the study

This study highlights the ecological and cultural importance of *Ficus* species in Chandrasekhar Azad Park, Prayagraj, emphasizing their role in biodiversity conservation, urban environmental sustainability, and cultural heritage. It provides insights for urban planners, conservationists, and policymakers to implement strategies ensuring the preservation of these keystone species in urban ecosystems.

Proposed Research Methodology

This study employs a mixed-methods approach to explore the ecological and cultural significance of *Ficus* species in Chandrasekhar Azad Park, Prayagraj. The methodology includes:

Field Surveys: A comprehensive survey was conducted to identify and document *Ficus* species in the park, including their distribution, size, and ecological roles.

Biodiversity Assessment: Observational studies were carried out to record the associated fauna, such as birds, insects, and mammals, relying on *Ficus* species for habitat and food.

Cultural Analysis: Interviews with local residents, park visitors, and cultural historians were conducted to understand the cultural and religious relevance of *Ficus* species.

Secondary Data: Literature and archival research were utilized to supplement field data, focusing on ecological studies and cultural traditions.

Data Analysis: Qualitative and quantitative methods, including thematic analysis and biodiversity indices, were used to interpret findings.

This approach ensures a holistic understanding of *Ficus* species' significance in the park.

Results and Data Analysis

This study investigates the ecological and cultural significance of *Ficus* species in Chandrasekhar Azad Park, Prayagraj, through field observations, biodiversity assessments, and cultural analysis. The results are organized into three main sections: ecological findings, cultural significance and challenges faced by *Ficus* species in the park.

Ecological Findings

Species Diversity and Distribution : The field survey identified three primary *Ficus* species in Chandrasekhar Azad Park: *Ficus religiosa* (Peepal), *Ficus benghalensis* (Banyan), and *Ficus racemosa* (Cluster Fig). The trees are distributed across different sections of the park, with a higher concentration near water bodies and shaded areas. Mature trees dominate, with an average height of 10–15 meters and trunk girths exceeding 1.5 meters, indicating their age and resilience (Figs. 1 and 2).

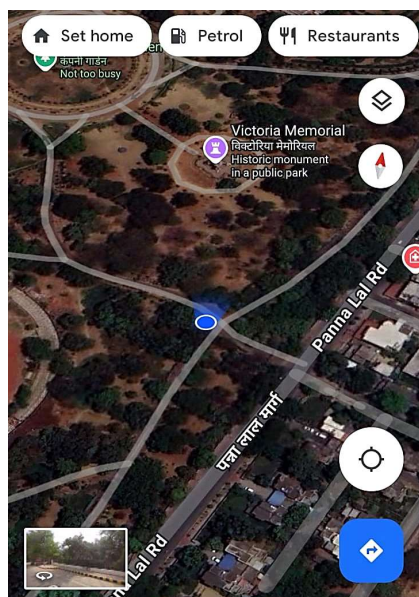


Fig. 1 : GPS location of the Azad park. **Fig. 2 :** Mature *Ficus religiosa* inside the park.

Role in Biodiversity Conservation : *Ficus* trees were observed to support diverse fauna. Over 15 species of birds, including parakeets, bulbuls and mynas, were frequently spotted feeding on fruits or nesting in the trees. Insects such as bees and butterflies were also abundant, highlighting the trees' role in sustaining pollinator populations. Squirrels and fruit bats were commonly seen consuming *Ficus* fruits, emphasizing their importance as a food source.

Ecosystem Services : The study found that *Ficus* species contribute significantly to urban ecological health. Their dense canopies provide shade, lowering ambient temperatures by up to 4°C in their vicinity. The extensive root systems help reduce soil erosion and improve groundwater recharge. Additionally, the trees serve as natural carbon sinks, sequestering approximately 50 kilograms of carbon dioxide annually per mature tree.

Mutualistic Relationships : The interaction between *Ficus* species and fig wasps was documented as a key ecological process. Pollination by fig wasps ensures the reproduction of *Ficus* trees, while the trees provide a habitat for the wasps. This mutualistic relationship is vital for the park's biodiversity, sustaining populations of interdependent species.

Cultural Significance

Religious and Spiritual Role : Interviews with local residents and visitors revealed the deep cultural and religious reverence for *Ficus* species. The Peepal tree (*Ficus religiosa*) is

often regarded as sacred, with rituals such as circumambulation performed under its shade. Similarly, the Banyan tree (*Ficus benghalensis*) is associated with longevity and wisdom and serves as a gathering spot for community rituals.

Historical and Social importance : Historical accounts indicate that some of the *Ficus* trees in Chandrasekhar Azad Park are over a century old, symbolizing resilience and continuity. The trees serve as social hubs, where people congregate for discussions, meditation, and recreational activities, fostering a sense of community. The park's association with freedom fighter Chandrasekhar Azad further enhances the symbolic significance of these trees.

Cultural Conservation Practices : Traditional practices such as tying threads around Peepal trunks during religious ceremonies and worshipping the Banyan tree during specific festivals reflect efforts to integrate cultural values with tree conservation. These practices reinforce the cultural identity of the park and highlight the role of *Ficus* species in preserving intangible cultural heritage.

Challenges Faced by *Ficus* species

Urbanization and Habitat Fragmentation : The study identified urbanization as a major threat to *Ficus* species. The expansion of infrastructure and increased human activities within the park have led to habitat fragmentation. Some younger trees showed signs of stress, including reduced canopy size and poor fruiting patterns, likely due to soil compaction and limited water availability.

Pollution and Environmental Stress : Air pollution from nearby roads has negatively impacted the health of *Ficus* trees. Dust accumulation on leaves reduces photosynthetic efficiency, while exposure to vehicular emissions has caused discoloration and early leaf fall in some specimens. Soil testing revealed elevated levels of heavy metals, which could further threaten tree health.

Neglect and Lack of Awareness : Interviews with park visitors highlighted a general lack of awareness about the ecological importance of *Ficus* species. While their cultural significance is well recognized, their role in urban biodiversity and ecosystem services is often overlooked. This disconnect poses a challenge for conservation efforts.

Invasive Species and Competition : Competition from invasive plant species, such as *Lantana camara*, was noted in several parts of the park. These invasives encroach upon the natural habitat of *Ficus* trees, competing for nutrients and space. In some areas, invasive growth has led to stunted development of younger *Ficus* saplings.

Conservation Opportunities

Community Engagement : The study found that local community groups and religious organizations could play a significant role in conservation efforts. Awareness campaigns and tree-planting drives could strengthen public involvement in protecting *Ficus* species.

Policy Recommendations : Integrating *Ficus* conservation into urban planning policies was identified as a critical need. Creating buffer zones around mature trees, regulating foot traffic, and ensuring regular maintenance can enhance tree health and longevity.

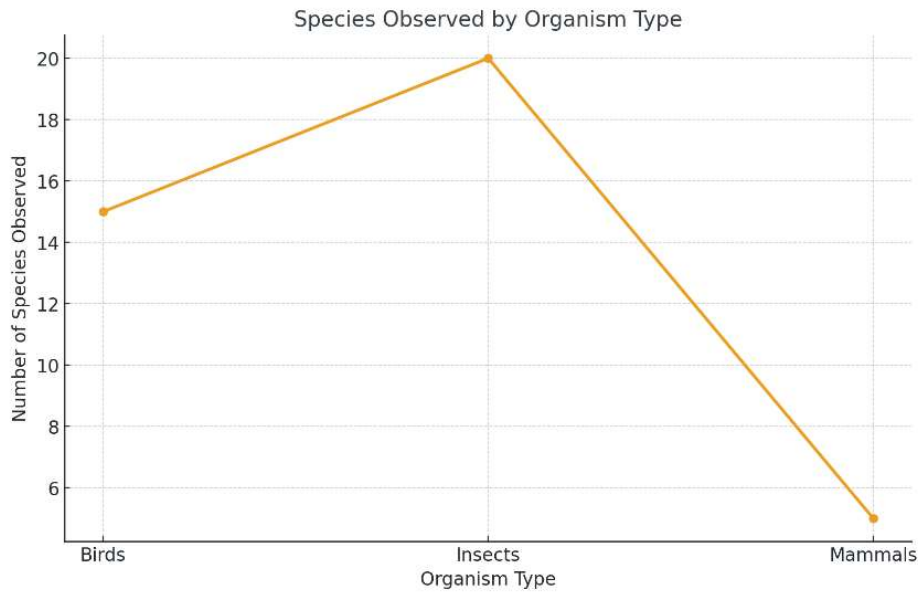


Fig 3 : Graph of Biodiversity associated with *Ficus* species of Azad Park, Prayagraj.

Table 1 : Distribution of *Ficus* species in Chandrasekhar Azad Park, Prayagraj.

S. no.	<i>Ficus</i> Species	Number of Trees	Average height (m)	Average Trunk Girth (m)
1.	<i>Ficus religiosa</i> (Peepal)	25	12	1.8
2.	<i>Ficus benghalensis</i> (Banyan)	18	15	2.2
3.	<i>Ficus racemosa</i> (Cluster Fig)	12	10	1.5

Table 2 : Biodiversity associated with *Ficus* species.

S. no.	Organism Type	Species Observed	Common Examples
1.	Birds	15	Parakeets, Bulbuls
2.	Insects	20	Bees, Butterflies
3.	Mammals	05	Squirrels

Table 3 : Challenges Faced by *Ficus* species.

S. no.	Challenge	Description
1.	Urbanization and Habitat Fragmentation	Expansion of infrastructure leading to habitat loss
2.	Pollution and Environmental Stress	Impact of air pollution and heavy metal accumulation
3.	Invasive Species and Competition	Competition with invasive plants like <i>Lantana camara</i>
4.	Neglect and Lack of Awareness	Limited public understanding of ecological roles

Educational Initiatives : Promoting educational programs about the ecological and cultural importance of *Ficus* species can foster a sense of responsibility among park visitors. Interactive signage and guided tours focusing on these trees could enhance public understanding and appreciation.

Discussion

This study highlights the dual significance of *Ficus* species in Chandrasekhar Azad Park, Prayagraj, as ecological keystones and cultural icons. The findings underline the indispensable role these trees play in urban biodiversity conservation, climate regulation, and cultural heritage preservation. However, the study also reveals critical challenges threatening their survival, necessitating immediate conservation efforts.

Ecologically, *Ficus* species serve as keystone trees, supporting diverse fauna such as birds, insects, and mammals. Their continuous fruiting cycle and mutualistic relationships with pollinators like fig wasps are vital for sustaining urban ecosystems. Additionally, the environmental benefits of *Ficus* trees, including carbon sequestration, temperature regulation and soil stabilization, demonstrate their importance in mitigating urban environmental stressors (Neeleshwari *et al*, 2024).

Culturally, these trees hold profound significance in Indian traditions, symbolizing spirituality, longevity, and community. Practices such as worshipping Peepal and Banyan trees reinforce their role in preserving cultural values while fostering ecological awareness among local communities.

However, urbanization, pollution, and invasive species pose significant threats to *Ficus* species. Habitat fragmentation and soil compaction have negatively impacted their growth and fruiting capacity, while air pollution and heavy metals stress their overall health. Furthermore, the lack of public awareness about their ecological importance limits community involvement in conservation efforts (Singh, 2022).

To address these challenges, integrating *Ficus* conservation into urban planning, promoting community-based initiatives, and raising awareness through education are essential. Strengthening policies for protecting urban green spaces can ensure the long-term survival of *Ficus* species, enabling them to continue providing ecological and cultural benefits. This study emphasizes the need for a balanced approach to urban sustainability and cultural preservation.

Conclusion

This study underscores the ecological and cultural significance of *Ficus* species in Chandrasekhar Azad Park, Prayagraj, highlighting their pivotal role in sustaining biodiversity, regulating the urban environment and preserving cultural heritage. The findings reveal that *Ficus* trees, such as *Ficus religiosa*, *Ficus benghalensis* and *Ficus racemosa*, support a diverse range of fauna, including birds, insects and mammals, while also providing crucial ecosystem services like carbon sequestration, groundwater recharge and temperature regulation. Their cultural importance is equally profound, symbolizing spirituality and longevity in Indian traditions and serving as centers for community rituals and gatherings.

Despite their resilience, these trees face significant threats from urbanization, pollution, invasive species, and neglect. Challenges such as habitat fragmentation, soil compaction, and heavy metal contamination underscore the need for targeted conservation efforts. Public awareness and integration of *Ficus* conservation into urban planning are critical to mitigating these challenges.

Looking forward, future prospects involve a multi-faceted approach to conservation. Urban planners should prioritize the inclusion of *Ficus* species in city green spaces, creating protective zones and regulating human activities around mature trees. Educational initiatives and community-driven programs can enhance public involvement in their preservation. Additionally, scientific research on improving the resilience of *Ficus* species against urban stressors can guide sustainable management practices. By addressing current challenges and promoting conservation, *Ficus* species can continue to thrive, ensuring ecological stability and cultural continuity in urban environments for generations to come.

Contribution : Each author contributes equally.

Conflict of interest : Authors have no conflict of interest.

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