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Threatened Plant Species of Amritsar, Punjab: Conservation Challenges and Future Directions

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ABSTRACT

Amritsar, Punjab's vulnerable plant species are in serious decline as a result of unsustainable agricultural methods, habitat degradation, urbanisation, and climate change. This review looks at important species that were once overly prevalent in the area and have ecological, medicinal, and cultural significance, such as Dalbergia sissoo (State Tree of Punjab), Acacia nilotica, Ficus religiosa, Saraca asoca, and Azadirachta indica. We will examine their conservation status, the causes of their decline, and current preservation efforts through a thorough examination. In addition, the report emphasises the importance of government initiatives, community involvement, and creative conservation techniques including in-situ and ex-situ conservation in preventing the extinction of these species. The results highlight the need for coordinated action to manage biodiversity sustainably in Amritsar, a region already experiencing a decline in biodiversity.

1. INTRODUCTION

Rich and varied plant species have long been found in the Punjabi district of Amritsar. Over time, however, a number of native plant species have experienced a major reduction due to factors such as increasing urbanisation, agricultural expansion, and environmental deterioration. Not only does this decline pose a threat to biodiversity, but many of these plants are essential to local culture, traditional medicine, and ecosystems, which makes them all cause for concern (Gowthami et al., 2021).

The endangered species of Amritsar, such as *Dalbergia sissoo* (Tahli), *Saraca asoca* (Asok), *Azadirachta indica* (Neem), *Ficus religiosa* (Pipal), and *Acacia nilotica* (Kikar), are the main subjects of this review. These species have great medical and cultural value in addition to being valuable for their ecological responsibilities. This review's main goals are to analyse current conservation initiatives in Amritsar and to throw light on the circumstances that have contributed to their decline. We want to underline here how crucial it is to protect these plants for upcoming generations.

2. OVERVIEW OF AMRITSAR'S FLORA

2.1 General Flora of Amritsar

Amritsar's flora is varied, with a wide variety of species ranging from therapeutic plants to agricultural crops. This diversity helps the ecosystem perform a number of tasks, including as stabilising the soil, storing carbon, and giving species habitat. Fabaceae, Euphorbiaceae, Asteraceae, and many other notable native plant families comprise various species that are important to the environment and economy (Kaur, G. et al., 2013; Kaur, N. 2013; Gajarmal et al., 2020).

2.2 Threatened Plant Species

Even with this abundance of biodiversity, a number of plant species are at risk of extinction. Important

species include *Ficus religiosa* (ਪਿੱਪਲ), *Acacia nilotica* (ਕਿੱਕਰ), *Azadirachta indica* (ਨਿੰਮ), *Dalbergia sissoo* (ਟਾਹਲੀ), and *Saraca asoca* (ਅਸੋਕ). The need for the protection of these species is highlighted by their ecological, cultural, and medicinal significance (Kuljinder, K. et al., 2017; Manhas et al., 2010; Kaur, Rajbir 2022).

3. KEY THREATENED SPECIES

3.1 Dalbergia sissoo (Tahli)

The native hardwood tree *Dalbergia sissoo,* also referred to as Sheesham, has been severely declining as a result of increased agricultural production and climate change. This species is vital for preventing erosion and preserving soil health in addition to being necessary for the production of lumber. (Shrivastava et al., 2023; Agri, J. et al., 2017; Naqvi et al., 2019) have observed the ecological decrease of *Dalbergia sissoo i*n Northern India Subcontinent, including Amritsar. They have identified fungal diseases and unsustainable logging methods as the key reasons of this reduction.

3.2 Saraca asoca (Asok)

In Indian culture, the Ashoka tree, or *Sarraca asoca,* is revered and has important therapeutic uses, especially in Ayurvedic medicine. The degradation of its habitat and overharvesting pose hazards to the revered tree in spite of traditional beliefs. (Patwardhan et al., 2014; Murthy et al., 2008; Sharma et al., 2023) have described conservation measures, including as seed banking and restricted cultivation, that are intended to restore populations of *Saraca asoca.* Still, a great deal more work has to be done to guarantee its survival in the wild.

3.3 Azadirachta indica (Neem)

Due to its many medical applications, neem (Azadirachta indica), sometimes known as the "village pharmacy," has been harmed by environmental changes and deforestation. (Haji et al., 2023; Princewill et al., 2011; Oli et al., 2022) examined the difficulties *Azadirachta indica* faces, pointing out that the plant's populations in urban and semi-urban areas have significantly decreased due to urbanisation and overexploitation of its therapeutic characteristics.

3.4 Ficus religiosa (Pipal)

Urbanisation is causing the Peepal tree *(Ficus religiosa),* another plant with strong cultural ties in India, to lose its natural habitat. Due to a shortage of room to develop in increasingly urbanised settings, this species—which is vital to the ecological support of many animals, including birds and insects—is experiencing a decline in population (Sharma et al. 2020; Angrish & Rajiv 2010; Sitaramam et al., 2009).

3.5 Acacia nilotica (Kikar)

For dry and semi-arid areas to remain ecologically balanced, this species is essential. But habitat loss and overgrazing are to blame for its decline. Restoration initiatives should include the development of protected areas and community engagement in conservation activities (Abbas et al., 2013).

3.6 Other Threatened Flora

Together with the important vulnerable species including *Acacia nilotica, Ficus religiosa, Saraca asoca, Azadirachta indica, and Dalbergia sissoo.* Many other susceptible plants can be found in Punjab. The loss of habitat, excessive grazing, and environmental changes are the main causes of hazard to species like those listed in the table [Table Fig. 1]. (Arora, J. K., & Singh, G. 2022). An integrated strategy to protect Punjab's primary and lesser-known flora is needed to address the conservation demands of these species.

TABLE Fig. 1: Table showing threatened flora of Punjab, India.

	Threatened Plant Species	Family Name	References
1	*Tecomella undulata*	Bignoniaceae	Arora, J. K., & Singh, G. (2022)
2	*Anogeissus sericea*	Combretaceae	Arora, J. K., & Singh, G. (2022)
3	*Alysicarpus bupleurifolius*	Fabaceae	Arora, J. K., & Singh, G. (2022)
4	*Ceropegia bulbosa*	Apocynaceae	Arora, J. K., & Singh, G. (2022)
5	*Withania coagulans*	Solanaceae	Arora, J. K., & Singh, G. (2022)
6	*Hibiscus hoshiarpurensis*	Malvaceae	Arora, J. K., & Singh, G. (2022)
7	*Ophioglossum polyphyllum*	Ophioglossaceae	Arora, J. K., & Singh, G. (2022)
8	*Ophioglossum gramineum*	Ophioglossaceae	Arora, J. K., & Singh, G. (2022)
9	*Grus antigone*	Gruidae	Arora, J. K., & Singh, G. (2022)
10	*Platanista gangetica*	Platnistidae	Arora, J. K., & Singh, G. (2022)
11	*Gyps bengalensis*	Accipitridae	Arora, J. K., & Singh, G. (2022)
12	*Python molurus*	Pythonidae	Arora, J. K., & Singh, G. (2022)
13	*Kachuga tecta*	Geoemydidae	Arora, J. K., & Singh, G. (2022)

7. FACTORS CONTRIBUTING TO PLANT ENDANGERMENT

Numerous factors, such as Punjab's fast industrialisation and urbanisation (Bera et al., 2023), which fragment ecosystems and displacing native species, contribute to plant endangerment. Monoculture-focused agricultural methods have reduced the biodiversity of the area (Harnowo, D. et al., 2021), and the increased water stress brought on by climate change has made species like *Dalbergia sissoo* more vulnerable (Shah et al., 2021). Furthermore, overharvesting of medicinal plants like *Saraca asoca* has drastically decreased their wild populations, underscoring the critical need for conservation initiatives. (Patwardhan et al., 2014; Reddy et al., 2022).

1. **Urbanization:** Amritsar's fast urbanisation has resulted in the degradation of natural habitats, as it has in many other Indian towns. There are less natural habitats available for native species as cities grow and green spaces decrease (Bera et al., 2023).
2. **Climate Change:** The growth cycles and regeneration of numerous native species in Amritsar have been adversely affected by rising temperatures and shifting patterns of precipitation. *Dalbergia sissoo,*

for instance, has demonstrated a notable susceptibility to elevated temperatures and fungal diseases that are made worse by changes in the environment (Shah et al., 2021).

3. **Agricultural Practices:** The demise of native plant species has been attributed in part to the Green Revolution, which changed Punjab's agricultural environment. There was little space left for native plants to flourish after high-yield crops were introduced because they cleared forests and reduced biodiversity (Harnowo, D. et al., 2021).
4. **Overexploitation:** Due to overharvesting for their medicinal qualities, many plants, including *Saraca asoca* and *Azadirachta indica,* are on the verge of extinction in some regions (Patwardhan et al., 2014; Reddy et al., 2022).

8. CONSERVATION EFFORTS

8.1 In-Situ Conservation

The goal of in-situ conservation is to protect species in their native environments. Native flora in Punjab has been preserved thanks to initiatives like the creation of wildlife sanctuaries and protected areas. To address the underlying reasons of these species' decline and to include more vulnerable species, these efforts must be broadened. For instance, because of ongoing urban expansion, efforts to conserve native flora and numerous endangered plants—which were made possible by protected areas—have had varying degrees of success (Rajpurohit et al., 2015).

8.2 Ex-Situ Conservation

Preserving species away from their natural environments—in botanical gardens or seed banks, for example—is known as ex-situ conservation. One promising strategy for the conservation of *Saraca asoca* and *Azadirachta indica* has been the adoption of seed banking (Patwardhan et al., 2014; Haji et al., 2023). In order to re-establish these plants' populations, nurseries and controlled growing techniques have also been devised.

8.3 Community Involvement

According to Mehra et al. (2024), community-led initiatives play a crucial role in protecting and nurturing native flora, and community involvement has been identified as a significant factor in the successful conservation of threatened species. These efforts highlight the role of local communities in the protection of species like *Ficus religiosa.* Educational initiatives and awareness campaigns are also crucial in establishing a sense of responsibility toward protecting local biodiversity.

9. CHALLENGES IN CONSERVATION

There are still a number of obstacles standing in the way of Amritsar's vulnerable species protection efforts. One of the main hurdles is the lack of collaboration between governmental institutions, NGOs, and local communities. Furthermore, long-term sustainable urban planning receives less attention since the quick speed of urbanisation continues to outpace conservation initiatives (Nanjunda & Devajana, 2008).

10. FUTURE DIRECTIONS

A multifaceted strategy is needed to guarantee the survival of these imperilled species. To assess the health and population levels of vulnerable species, more effective monitoring mechanisms should be developed, as well as stronger legal frameworks for plant protection and increased community engagement. In addition, more focus needs to be on fusing traditional knowledge with cutting-edge conservation methods

to create culturally aware conservation plans (Malaika P. et al., 2023)

CONCLUSION

Due to a mix of urbanisation, climate change, and overexploitation, many of the vulnerable plant species of Amritsar, such as *Dalbergia sissoo, Saraca asoca, Azadirachta indica, Ficus religiosa, Acacia nilotica,* and many more, face a dangerous future. Despite the fact that there are several conservation initiatives in place, they are insufficient given the mounting environmental constraints. For the unique biodiversity of Amritsar to be preserved, increased cooperation between local people, NGOs, and governments is necessary. It is not only culturally and medically essential, but also ecologically necessary for these species to survive.

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