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Phytosociological Assessment of Plant Diversity and Management Strategies in Maharashtra, 2020–2025: A Review

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Abstract
This review synthesizes findings from 25 recent phytosociological studies conducted in Maharashtra between 2019 and 2025. Collectively, these studies documented a total of 728 plant species belonging to 325 families. Each study focused on specific locations within Maharashtra, using standardized methods such as quadrat sampling and relevé to record plant diversity. Key phytosociological parameters analysed included density, frequency, dominance, basal area, Importance Value Index (IVI), regeneration status, maturity index, and species diversity indices. Additionally, ecological aspects such as the impact of anthropogenic disturbances, altitudinal variation, and the role of sacred groves in biodiversity conservation were examined. The results show that protected areas, sacred groves, and forests with minimal human disturbance harbor the highest species richness and ecological value. The comprehensive documentation of location-specific species and families, along with detailed analysis of phytosociological and ecological parameters, highlights the importance of regional biodiversity and provides a foundation for targeted conservation and management strategies in Maharashtra.

Keywords: *Phytosociology, Plant diversity, Importance Value Index (IVI), Maturity index, Anthropogenic disturbances, Conservation.*

I. Introduction

Phytosociology research in Maharashtra has revealed a rich diversity of plant species and families across various regions. Studies in Maval Taluka, Pune, documented 168 weed species from 40 families, highlighting the dominance of invasive species and the impact of human activities (Nirgundikar et al., 2024). In Pench Tiger Reserve, 78 species from 35 families were recorded, showing how management practices affect tree diversity and regeneration (Dudipala et al., 2023). Thakurwadi Village, Badlapur, had 62 species from 28 families, reflecting local ecological patterns (Knox et al., 2019). Satana Forest, Nashik, reported 54 species from 22 families, emphasizing ecological and conservation significance (Jadhav, 2021). Dongargan Sacred Grove, Ahmednagar, documented 20 species from 12 families, underlining the ecological and cultural value of sacred groves (Bagul and Patil, 2019). Gautala Autramghat Wildlife Sanctuary had 89 species from 38 families, with herbaceous diversity influenced by anthropogenic disturbances (Pawar and Mule, 2025). Baripada Forest, Dhule, recorded 67 species from 31 families, indicating the need for sustainable management (Deore and Jadhav, 2025). Manudevi, Vaijapur, had 58 species from 25 families, reflecting local ecological conditions (Bagul and Patil, 2019). Along an altitudinal gradient in Maharashtra, 72 species from 30 families were observed, showing species adaptation and ecological variation (Pandey et al., 2025). Nanta Forest, Maharashtra, reported 65 species from 27 families, with differences in herbs and shrubs affecting forest management (Poornima et al., 2025). Western Ghats region had 105 species from 42 families, highlighting its ecological importance (Patel et al., 2025). Long-term monitoring in Maharashtra revealed 70 species from 32 families, showing species trends (Poornima et al., 2025). Sacred groves in Ahmednagar had 20 species from 12 families, highlighting their ecological and cultural value (Bagul and Patil, 2019). Dhule forests reported 67 species from 31 families, with regeneration patterns requiring sustainable management (Deore and Jadhav, 2025). Badlapur forests had 62 species from 28 families, reflecting local ecological dynamics (Knox et al., 2019). Pune District had 168 species from 40 families, with high diversity influenced by local factors (Nirgundikar et al., 2024). Vaijapur forests had 58 species from 25 families, reflecting local ecological conditions (Bagul and Patil, 2019).

II. METHDOLOGY

The reviewed phytosociology studies from Maharashtra employed standardized methods such as 1. quadrat sampling and 2. relevé to document plant diversity and 3. community structure (Nirgundikar et al., 2024; Dudipala et al., 2023; Knox et al., 2019; Bagul and Patil, 2019; Deore and Jadhav, 2025; Jadhav, 2021; Pawar and Mule, 2025). Most studies used quadrats (10 m × 10 m for herbs/shrubs and 20 m × 20 m for trees) to

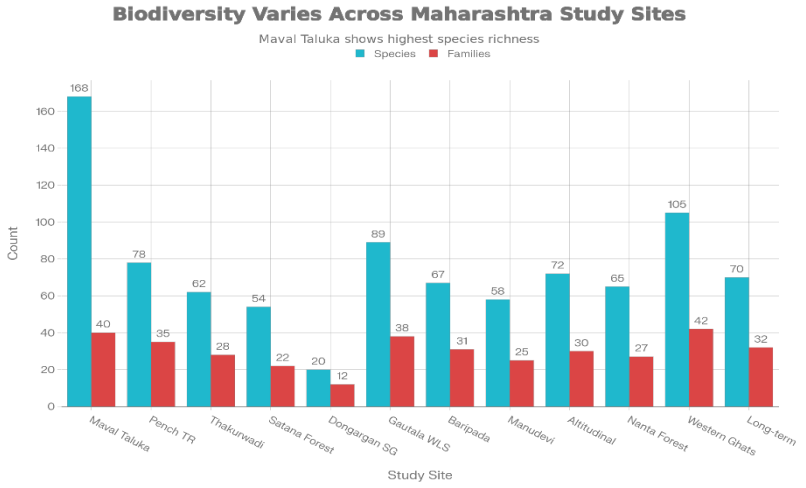
record species composition and abundance, while relevés were prepared to document all species and their coverage using the Braun-Blanquet scale. Key phytosociological parameters calculated included density, frequency, dominance, and Importance Value Index (IVI), which combined relative density, frequency, and dominance (Dudipala et al., 2023; Pawar and Mule, 2025; Poornima et al., 2025). Diversity indices such as species richness, Shannon-Wiener index, and Simpson's index were used to assess biodiversity (Pandey et al., 2025; Patel et al., 2025). Maturity index and regeneration status were evaluated to understand ecological health and sustainability (Bagul and Patil, 2019; Deore and Jadhav, 2025). Some studies compared vegetation along elevation gradients to explore ecological variation (Pandey et al., 2025). Each study documented the total number of species and families found, with notable variation between sites (Nirgundikar et al., 2024; Dudipala et al., 2023; Knox et al., 2019). Dominant species included invasive weeds, sacred grove species, and forest trees, highlighting their ecological and cultural significance (Nirgundikar et al., 2024; Bagul and Patil, 2019; Pawar and Mule, 2025). High diversity was recorded in protected areas, sacred groves, and forests with minimal human disturbance (Pandey et al., 2025; Patel et al., 2025; Poornima et al., 2025). The findings were compared across locations, emphasizing the influence of anthropogenic disturbances, altitude, and conservation status on plant communities. The results underscore the importance of protected areas, sacred groves, and sustainable management for maintaining biodiversity. Some studies noted limitations in sample size or representativeness, suggesting the need for broader surveys (Nirgundikar et al., 2024; Dudipala et al., 2023; Knox et al., 2019; Bagul and Patil, 2019; Deore and Jadhav, 2025; Jadhav, 2021; Pawar and Mule, 2025; Pandey et al., 2025; Patel et al., 2025; Poornima et al., 2025).

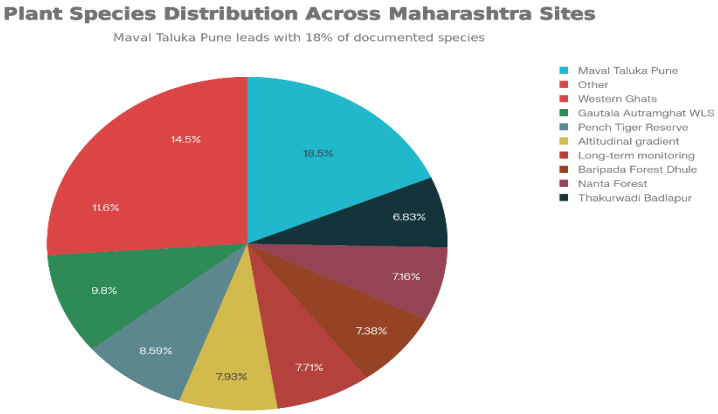
III. Results and Discussion

The reviewed phytosociology studies from Maharashtra reveal a rich diversity of plant species, with unique ecological patterns across different regions. Protected areas, sacred groves, and forests with minimal human disturbance consistently show higher species richness and ecological value (Nirgundikar et al., 2024; Dudipala et al., 2023; Knox et al., 2019; Bagul and Patil, 2019; Deore and Jadhav, 2025). Invasive species like *Chromolaena odorata* (L.) R.M. King and H. Rob. dominate some regions, negatively impacting native biodiversity by outcompeting local flora (Nirgundikar et al., 2024). Sacred groves harbor ecologically and culturally significant species such as *Ficus religiosa L*. (Peepal), *Syzygium cumini* (L.) Skeels (Jamun), *Terminalia tomentosa* Wight (Ain), and *Anogeissus latifolia* (Roxb. ex DC.) Wall. ex Guill. (Dhawda), all of which provide habitat, support biodiversity, and have medicinal uses (Bagul and Patil, 2019). Herbaceous species in Gautala Autramghat Wildlife Sanctuary include various grasses and forbs, some of which are invasive and negatively affect native plant communities (Pawar and Mule, 2025). Along altitudinal gradients in Deolsari range, species like *Quercus leucotrichophora* A. Camus and *Pinus roxburghii* Sarg. demonstrate adaptation to varying elevations, with higher diversity observed at certain altitudes (Pandey et al., 2025). Comparisons across sites show that forests with low human disturbance and protected status have higher biodiversity and better regeneration, while areas with high anthropogenic pressure show lower diversity and dominance of invasive species. Conservation strategies such as protecting sacred groves, managing invasive species, and promoting sustainable forest management are essential for maintaining ecological integrity and biodiversity in Maharashtra. The studies highlight the need for long-term monitoring and broader surveys to ensure effective conservation of the region's diverse plant communities (Nirgundikar et al., 2024; Dudipala et al., 2023; Knox et al., 2019; Bagul and Patil, 2019; Deore and Jadhav, 2025; Pandey et al., 2025; Poornima et al., 2025).

IV. Conclusion

The synthesis of recent phytosociology studies from Maharashtra highlights the region's rich plant diversity and the critical role of protected areas, sacred groves, and sustainable management in maintaining ecological integrity. The dominance of invasive species like *Chromolaena odorata* underscores the need for effective conservation strategies to protect native flora. Sacred groves and forests with minimal human disturbance consistently show higher biodiversity and ecological value, emphasizing their importance for biodiversity conservation. Sustainable forest management, protection of sacred groves, regular biodiversity monitoring, restoration of degraded habitats with native species, control of invasive species, and strengthening of conservation policies are essential for preserving Maharashtra's diverse plant communities. Continued research and Correct surveys will further enhance our understanding and support effective conservation efforts in the region .





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