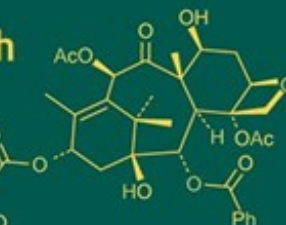


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Assessment of species composition, dominance and diversity across different study sites in urban green spaces of Rewa, Madhya Pradesh, India

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ABSTRACT

The present study assessed and compared species composition, dominance and diversity of tree vegetation across four urban green spaces of Rewa, Madhya Pradesh, India, namely APS University Campus, Laxmanbagh, Civil Line Area and Government Forest Nursery. Considerable variation in species richness and diversity was observed among the study sites. APS University Campus recorded the highest species richness with 70 tree species, followed by Laxmanbagh (61 species), Civil Line Area (58 species) and Government Forest Nursery (50 species). The Shannon diversity index (H') was also highest at APS University Campus (2.16), followed by Laxmanbagh (2.10), Civil Line Area (1.95) and Government Forest Nursery (1.72), indicating differences in both species richness and the distribution of individuals among species. The reported Simpson index values were highest at Laxmanbagh (0.98), followed by APS University Campus (0.96) and Government Forest Nursery (0.95), while Civil Line Area recorded 0.31, reflecting substantial differences in species dominance and relative abundance among sites. Overall, the findings demonstrate that urban green spaces within the same city can exhibit considerable variation in species composition, richness, abundance and diversity. The comparatively high diversity of APS University Campus and Laxmanbagh may be associated with greater habitat heterogeneity and the coexistence of planted and naturally regenerated vegetation, whereas the lower diversity at Government Forest Nursery may reflect comparatively uniform vegetation composition and management. The study highlights the importance of site-specific assessment and conservation of diverse urban vegetation for maintaining biodiversity and ecological functions within urban landscapes.

Keywords: Species Composition, Dominance and Diversity, Urban Green Spaces etc.

Introduction

Urbanization is one of the most prominent forms of contemporary land-use transformation and has substantially altered the structure, composition and functioning of terrestrial ecosystems. The expansion of urban settlements involves the conversion and fragmentation of natural and semi-natural habitats into residential areas, roads, institutional complexes, commercial infrastructure and other built-up land uses. These changes can reduce the extent and continuity of natural vegetation and alter environmental conditions such as soil properties, temperature, moisture availability and resource distribution. Nevertheless, urban landscapes retain a considerable proportion of vegetation in the form of parks, institutional campuses, roadside plantations, gardens, recreational areas, vacant lands and other green spaces. Collectively, these areas constitute important components of urban ecological infrastructure and can provide habitat and resources for a wide range of plant and animal species (Aronson *et al.*, 2014; Lepczyk *et al.*, 2017) [1, 2]. Urban green spaces (UGS) have increasingly been recognized not merely as recreational or aesthetic components of cities but also as important ecological assets. Vegetation within urban areas contributes to several ecosystem functions, including carbon storage and sequestration, modification of local microclimates, air-quality improvement, soil stabilization, water regulation and provision of habitat for biodiversity. Urban trees and other vegetation also represent measurable structural resources whose abundance, species composition, size distribution and spatial arrangement influence the ecological functioning of urban landscapes (Nowak *et al.*, 2002) [3]. Consequently, assessment of vegetation structure and diversity is essential for understanding the ecological condition of individual green spaces and for developing appropriate strategies for their conservation and management.

Plant species composition is a fundamental attribute of vegetation communities because it describes the identity and relative occurrence of species within a particular habitat. Differences in species composition among sites may arise from variation in site history, habitat characteristics, management practices, disturbance intensity, soil conditions, availability of water, planting preferences and patterns of natural regeneration. In urban environments, these factors often operate simultaneously, producing considerable heterogeneity

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ity even among green spaces located within the same city. Therefore, studying individual sites rather than considering the entire urban vegetation as a homogeneous unit can provide a more realistic understanding of intra-urban ecological variation. Species abundance alone, however, does not adequately describe the ecological structure of a plant community. Dominance provides information about the relative ecological importance of individual species and helps identify species that exert a greater influence on community structure. Species diversity provides an integrated measure of community organization by considering both the number of species and their relative abundance. Diversity indices such as the Shannon–Wiener index, Simpson's index and measures of evenness are therefore widely used to compare vegetation communities and to characterize differences in species distribution among habitats. Importantly, biodiversity is not distributed uniformly within cities. A global assessment of plant and bird diversity demonstrated that urbanization can substantially alter species densities and that anthropogenic characteristics of cities, including land-cover conditions and city development history, are important determinants of urban biodiversity (Aronson *et al.*, 2014) [1]. Similarly, intra-urban studies have shown that substantial differences in species richness and diversity may occur among green spaces within the same urban area, emphasizing the importance of local-scale habitat characteristics and management conditions.

In the Indian context, urban green spaces are particularly important because rapid urban expansion is accompanied by increasing pressure on available land and natural vegetation. Cities contain a mosaic of parks, institutional areas, roadside vegetation, residential gardens and other managed or semi-natural habitats, each of which may support distinct plant communities. However, information on the composition and structural characteristics of vegetation at individual urban sites remains comparatively limited for many medium-sized cities. Site-specific assessments are therefore necessary to document existing plant resources, identify dominant species, quantify species diversity and understand variation in vegetation structure within urban landscapes. Rewa, located in the Vindhyan region of Madhya Pradesh, represents an important urban landscape in which different categories of green spaces occur within a rapidly developing city environment. The presence of institutional campuses, parks, residential and recreational green spaces and other vegetated areas provides an opportunity to examine variations in plant community structure at the intra-urban scale. Despite the ecological importance of these green spaces, systematic information on their species composition, dominance and diversity is limited. Comparative assessment of different sites can therefore provide baseline information for understanding the existing urban vegetation resource and identifying differences in community characteristics among sites. Present study was undertaken to assess and compare species composition, dominance and diversity across different urban green spaces of Rewa, Madhya Pradesh, India. The study focuses on documenting the plant species occurring at selected sites and evaluating their relative abundance, dominance and diversity using quantitative vegetation parameters. The findings are expected to contribute to a better understanding of intra-urban variation in plant communities and provide baseline information useful for biodiversity conservation, ecological planning, restoration and sustainable management of urban green spaces in Rewa.

2. Materials and Methods

Study area

The present study was conducted in Rewa city, Madhya Pradesh, India, an important urban centre located in the northeastern part of the state within the Vindhyan landscape. The city lies approximately at 24°32' N latitude and 81°15' E longitude, at an elevation of about 316 m above mean sea level, and serves as the administrative headquarters of Rewa district. Geographically, the region forms part of the Vindhyan Plateau and the Baghelkhand region and is characterized by diverse physiographic features, including plains, hills, ravines and river valleys. The climate is subtropical, with hot summers and rela-

tively cool winters, while the area falls under the Kymore Plateau and Satpura Hills agroclimatic zone of Madhya Pradesh. The diverse environmental conditions and heterogeneous urban landscape provide a suitable setting for assessing vegetation composition and diversity. For the present investigation, ten representative sampling sites were selected from two major urban green spaces of Rewa city, namely Laxmanbagh and the Awadhesh Pratap Singh University (APS University) Campus. The sites were identified through preliminary reconnaissance surveys and systematic field visits to ensure adequate representation of the existing vegetation and to encompass spatially distinct green patches exhibiting variation in species composition, abundance and stand structure. Vegetation sampling was carried out using a random sampling approach, with 132 quadrats of 20 m × 20 m (400 m²) established across the selected sites. Plant species encountered during field surveys were identified based on morphological characteristics using standard taxonomic literature, regional floras and relevant botanical references, with authenticated botanical resources consulted where necessary. The nomenclature of recorded species was subsequently standardized for consistency in analysis. The vegetation data were used to characterize species composition, occurrence, abundance and dominance, with particular emphasis on species contributions to density, frequency, basal area and overall ecological importance across the selected urban green spaces.

Phytosociological analysis

Biodiversity analysis

Species diversity of different urban green spaces was assessed using widely accepted ecological indices.

Simpson's concentration of dominance

The concentration of dominance was estimated following Simpson (1949).

$$C_d = \sum \left(\frac{n_i}{N} \right)^2$$

where,

n_i = Number of individuals of the i th species

N = Total number of individuals of all species

Shannon–Wiener diversity index

Species diversity was estimated using the Shannon–Wiener Index (Shannon and Weaver, 1963).

$$H' = - \sum P_i \ln P_i$$

where,

$$P_i = n_i/N$$

Simpson's diversity index

Species richness and diversity were further evaluated using Simpson's Diversity Index.

$$D = \frac{1}{\sum P_i^2}$$

3. Results & Discussion

Species composition, dominance and diversity across different study sites

The comparative analysis of species richness and diversity revealed considerable variation among the four study sites presented in table 1 and figure 1. APS University Campus recorded the highest species richness, with 70 tree species, followed by Laxmanbagh with 61 species, Civil Line Area with 58 species, and Government Forest Nursery with 50 species. Thus, APS University Campus supported the

greatest number of tree species, whereas Government Forest Nursery had the lowest species richness. Such variation in woody species richness among urban green spaces has also been reported from Indian cities. Muthulingam *et al.* (2012) [4] observed considerable differences in woody plant density, richness and diversity among urban green spaces of Chennai, demonstrating that individual green spaces can differ substantially in their vegetation characteristics. Similarly, Nagendra *et al.* (2011) [5] reported considerable variation in tree diversity, distribution and composition among urban parks in Bangalore, which was associated with differences in park history and vegetation characteristics. These studies support the observed site-level differences in species richness in the present investigation.

The Shannon diversity index (H') followed a pattern broadly similar to species richness. The highest value was recorded at APS University Campus ($H' = 2.16$), followed by Laxmanbagh ($H' = 2.10$), Civil Line Area ($H' = 1.95$) and Government Forest Nursery ($H' = 1.72$). The relatively high Shannon diversity at APS University Campus indicates a combination of greater species richness and comparatively balanced distribution of individuals among the recorded species. In contrast, the lower Shannon value at Government Forest Nursery suggests comparatively lower diversity and/or less even distribution of individuals among species. Similar variation in diversity among urban vegetation sites has been documented by Muthulingam *et al.* (2012) [4], who demonstrated differences in density, richness and diversity of woody plants among urban green spaces. Nagendra *et al.* (2011) [5] also found substantial differences in tree diversity and composition among urban parks in Bangalore. Such findings indicate that urban green spaces within the same city should not necessarily be regarded as homogeneous vegetation units. The comparatively high diversity recorded at APS University Campus may be related to greater habitat heterogeneity and the coexistence of planted and naturally regenerated tree species. Institutional green spaces may contain a mixture of avenue trees, ornamental species, shade trees, fruit trees and naturally established vegetation, thereby increasing the number of available ecological niches. Nagendra *et al.* (2010) [6], in their study of street trees in Bangalore, demonstrated considerable variation in tree density, diversity and species composition across the urban landscape. Similarly, Nagendra *et al.* (2011) [5] reported that the history and development of urban parks influenced their tree composition and diversity. These observations provide support for the relatively heterogeneous tree assemblage observed at APS University Campus in the present study.

Laxmanbagh, despite supporting fewer species than APS University Campus, recorded a relatively high Shannon diversity ($H' = 2.10$). This suggests that the distribution of individuals among species was comparatively balanced. The result further demonstrates that species richness alone does not determine the overall diversity of a plant community. A site with fewer species may exhibit relatively high diversity when individuals are distributed more evenly among species, whereas a species-rich site may show lower diversity when a few species dom-

inate the community. Muthulingam *et al.* (2012) [4] similarly emphasized the importance of both species richness and abundance in characterizing woody vegetation in urban green spaces. The Simpson index (D) varied considerably among the study sites. Laxmanbagh recorded the highest reported value (0.98), followed by APS University Campus (0.96) and Government Forest Nursery (0.95), whereas Civil Line Area recorded a substantially lower value (0.31). Differences in dominance and relative abundance are important components of urban tree-community structure, as demonstrated by studies of urban parks and street trees in Bangalore (Nagendra & Gopal, 2010, 2011) [6].

An important finding of the present study is that species richness alone did not completely explain the observed diversity pattern. Civil Line Area supported 58 species, which was higher than the 50 species recorded at Government Forest Nursery, but the two sites showed different diversity characteristics. This indicates that the relative abundance and distribution of individuals among species contributed substantially to the calculated diversity values. Similar observations have been reported in urban vegetation studies, where differences in abundance and dominance can result in contrasting diversity values even when species richness is relatively similar (Muthulingam *et al.*, 2012) [4]. Thus, the incorporation of density, frequency, abundance, basal area and diversity indices provides a more comprehensive understanding of urban plant-community structure than species counts alone. The comparatively high species richness and Shannon diversity observed at APS University Campus and Laxmanbagh may also reflect differences in vegetation management, site history, stand development and habitat heterogeneity. Conversely, the comparatively lower richness and Shannon diversity at Government Forest Nursery may be associated with relatively uniform vegetation composition and more intensive management. Such differences in urban vegetation are important because green spaces can simultaneously provide biodiversity habitat and ecosystem services. Vailshery *et al.* (2013) [7] highlighted the ecological and social significance of urban forests in Bangalore, while Nagendra *et al.* (2014) [8] emphasized the contribution of urban tree diversity to ecosystem services. More recently, Tolangay *et al.* (2026) [9] demonstrated the importance of tree stands in urban green spaces of Kolkata for carbon storage and sequestration, further highlighting the ecological significance of maintaining diverse urban tree communities. The present findings are also consistent with observations from Nagpur, where urban green spaces exhibited differences in vegetation structure, species composition and ecological characteristics among sites (Joshi *et al.*, 2020) [10]. Such site-specific differences indicate that the ecological contribution of an urban green space depends not only on its size but also on the composition, structure and distribution of its vegetation. Consequently, maintaining a heterogeneous network of urban green spaces containing diverse tree assemblages may contribute to the overall ecological functioning of cities.

Table 1. Species, Dominance and Diversity of different study sites.

S. N	Name of site	Total no. of species reported	Shannon Evenness (H)	Simpson Index (D)
1	Laxmanbagh,	61	2.10	0.98
2	APS University Campus,	70	2.16	0.96
3	Civil Line Area,	58	1.95	0.31
4	Govt Forest Nursery	50	1.72	0.95

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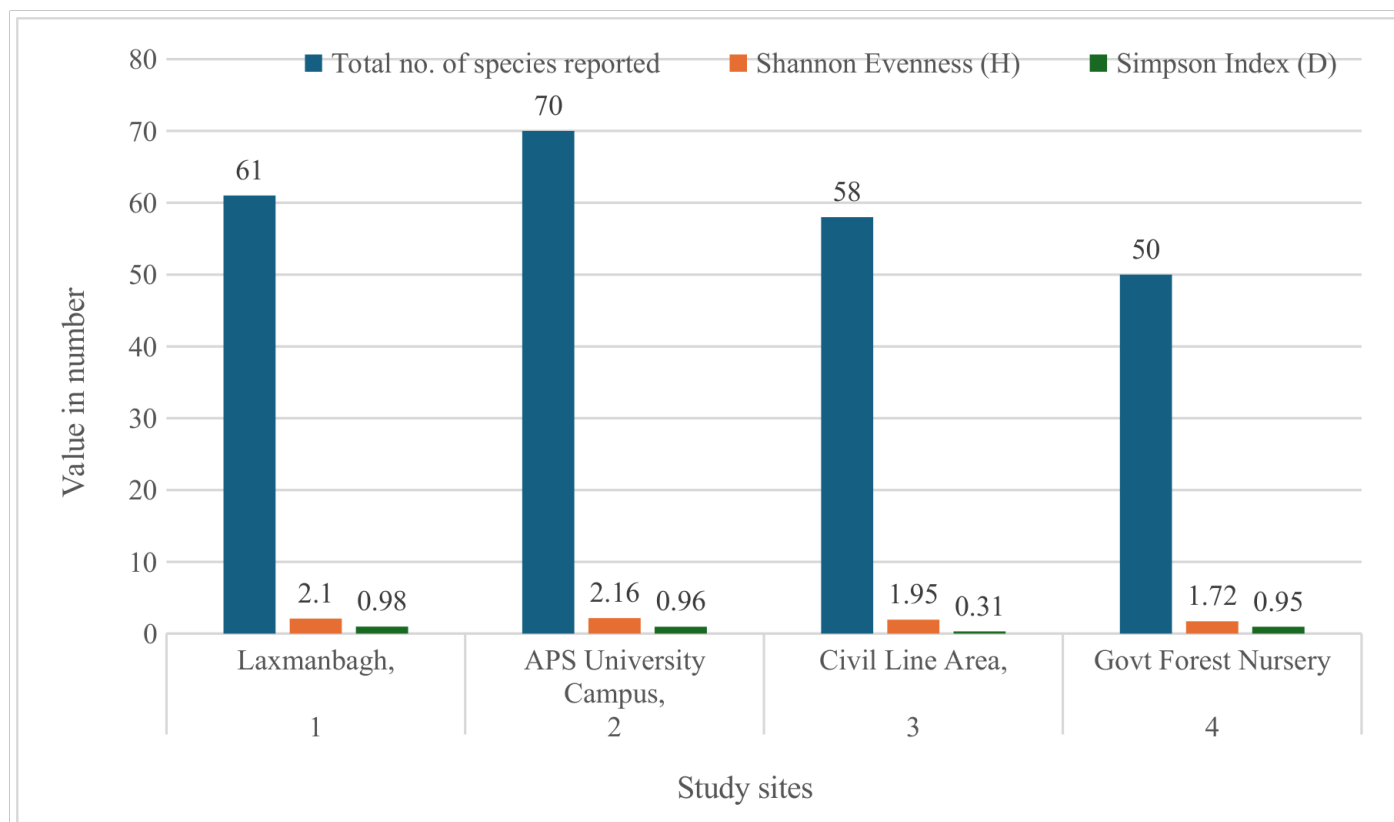


Figure 1. Shannon & Simpson Index of different study sites.

Conclusion

The present study demonstrated considerable variation in species composition, richness, dominance and diversity among the four urban green spaces of Rewa. APS University Campus supported the highest number of tree species (70) and recorded the highest Shannon diversity ($H' = 2.16$), followed by Laxmanbagh, Civil Line Area and Government Forest Nursery. The results indicate that species richness alone does not fully explain community diversity, as the relative abundance, distribution and dominance of individual species also substantially influence diversity indices. The comparatively diverse vegetation at APS University Campus and Laxmanbagh suggests the importance of heterogeneous urban green spaces containing a mixture of planted and naturally established tree species. In contrast, the lower species richness and Shannon diversity observed at Government Forest Nursery indicate the need for greater consideration of species diversity in vegetation management. Overall, the findings emphasize that urban green spaces should be managed as ecologically distinct vegetation units, with emphasis on maintaining species-rich and structurally diverse tree communities. Such management can contribute to urban biodiversity conservation, ecological stability and the sustained provision of ecosystem services in Rewa city.

References

1. Aronson MFJ, La Sorte FA, Nilon CH, Katti M, Goddard MA, Lepczyk CA, Warren PS, Williams NSG, Cilliers S, Clarkson B, Dobbs C, Dolan R, Hedblom M, Klotz S, Louwe Kooijmans J, Kühn I, MacGregor-Fors I, McDonnell M, Mörtberg U, Pyšek P, Siebert S, Sushinsky J, Werner P, Winter M. A global analysis of the impacts of urbanization on bird and plant diversity reveals key anthropogenic drivers. *Proceedings of the Royal Society B: Biological Sciences*. 2014;281(1780):20133330.
2. Lepczyk CA, Aronson MFJ, Evans KL, Goddard MA, Lerman SB, MacIvor JS. Biodiversity in the city: Fundamental questions for understanding the ecology of urban green spaces for biodiversity conservation. *BioScience*. 2017;67(9):799–807.
3. Nowak DJ, Crane DE, Walton JT, Twardus DB, Dwyer JF. Understanding and quantifying urban forest structure, functions, and value. In *Proceedings of the 5th Canadian Urban Forest Conference*. Urban Forest Council; 2002:27-1–27-9.
4. Muthulingam U, Sekar T. Density, diversity and richness of woody plants in urban green spaces: A case study in Chennai metropolitan city. *Urban Forestry & Urban Greening*. 2012;11(4):450–459.
5. Nagendra H, Gopal D. Tree diversity, distribution, history and change in urban parks: Studies in Bangalore, India. *Urban Ecosystems*. 2011;14:211–223.
6. Nagendra H, Gopal D. Street trees in Bangalore: Density, diversity, composition and distribution. *Urban Forestry & Urban Greening*. 2010;9(2):129–137.
7. Vailshery LS, Nagendra H, Setty S. Experiencing urban forests in Bangalore: Patterns of use and perceptions of public spaces. *Environmental Monitoring and Assessment*. 2013;185:3243–3253.
8. Nagendra H, Gopal D. Urban tree diversity and ecosystem services: A case study of Bangalore, India. *Urban Forestry & Urban Greening*. 2014.
9. Tolangay D, Hossain SS, Moktan S. Carbon storage and sequestration potential of tree stands in urban green spaces of Kolkata, India. *Forestist*. 2026;76:1–10.
10. Joshi R, Ghosh S. Vegetation structure, species composition, and carbon sink potential of urban green spaces in Nagpur City, India. *Land*. 2020;9(4):107.
11. Aronson MFJ, Lepczyk CA, Evans KL, Goddard MA, Lerman SB, MacIvor JS, Nilon CH, Vargo T. Biodiversity in the city: Key challenges for urban green space management. *Frontiers in Ecology and the Environment*. 2017;15(4):189–196.
12. Chaurasia S, Kumar H. Analysis of growing stock and species distribution of Sal dominated Kushmi forest, Gorakhpur, Uttar Pradesh, India. *Journal of Pharmacognosy and Phytochemistry*. 2019;8(3):6560–6564.

13. Chaurasia S, Kumar H, Dubey K, Agarwal YK. Assessment of growing stock, above-ground biomass and sequestered carbon in Sal dominated Kushmi forest, Gorakhpur. *Indian Forester*. 2020;146(11):1041–1045.
14. Keduolhouvonuo, Kumar H. Variation in wood specific gravity of selected tree species of Kohima district of Nagaland, northeastern parts of India. *Journal of Pharmacognosy and Phytochemistry*. 2017;6(6):70–74.
15. Khesoh P, Kumar H. Species diversity and community structure of trees and shrubs of Japfü Mountain, Kohima, Nagaland. *International Journal of Forestry and Crop Improvement*. 2017;8(2):97–105.
16. Mishra GS, James A, Paliwal HB, Kumar H. Physico-chemical, biological properties and biodiversity of aquatic plant species in Macpherson Lake, Allahabad, U.P., India. *Current World Environment*. 2017;12(3):630–634.
17. Mishra K, Kumar H, Mishra NN. Ethno-botanical study of medicinal plants in urban spaces of city Prayagraj, India. *Research Journal of Chemical and Environmental Sciences*. 2021;9(6):10–16.
18. Mishra K, Kumar H, Mishra NN, Chaurasia S. Plant species diversity and composition in urban green spaces of city Prayagraj, India. *Research Journal of Chemical and Environmental Sciences*. 2021;9(4):21–27.
19. Mishra K, Kumar H, Mishra NN, Keshewani B. Tree species composition, biomass and carbon stocks in urban green spaces of Prayagraj. *Ecology, Environment & Conservation*. 2022;28(4):1912–1919.
20. Nowak DJ, Crane DE. Carbon storage and sequestration by urban trees in the USA. *Environmental Pollution*. 2002;116(3):381–389.

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