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Floristic Composition and Diversity Patterns in an Urban Biodiversity Heritage Site : A Case Study from GKVK Campus, UAS, Bangalore

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Abstract

The present study was conducted at the Biodiversity Heritage Site of GKVK Campus, UAS, Bangalore, to assess the species composition and diversity of the plant community. It was conducted with the objective of developing baseline data for resource management and conservation strategies for the floristically rich ecosystem on the campus. The study area was divided into three patches: Scrub Forest, Botanical Garden, and Plantation and Orchards, which were further subdivided into 14 areas. In total, 104 random sampling plots were laid across the 14 areas and a total of 198 plant species were documented belonging to 49 families. Species richness was highest among tree species (n=96) followed by herbs (n=62). Fabaceae was the most dominant family among trees (33.03%) and climbers (20.20%), while Poaceae (19.40%) and Phyllanthaceae (25%) were dominant among herbs and shrubs, respectively. The Shannon-Wiener Diversity Index (*H'*), Simpson's Diversity Index (1-D) and Evenness index (J') of the entire study area were 4.12, 0.97 and 0.78, respectively, indicating high species diversity with moderate species evenness in the study area. According to the β-diversity 52, 39 and 56 per cent of similarity in species composition was found between areas E5 & E1 and E4 & C for the entire flora, trees and herbs, respectively. Though the species in the study area were less evenly distributed but they share a greater similarity among them. A total of twelve species were found to be common across all three patches of the Heritage Site. The study area exhibits high biodiversity and warrants continued conservation efforts.

Keywords : Species composition, Diversity indices, Biodiversity heritage site

India is one of the 17 mega-diverse countries, harbouring four biodiversity hotspots and 47 Biodiversity Heritage Sites (BHSs). Under Section 37 of the Biological Diversity Act, 2002, the State Government, in consultation with local bodies, may notify areas of biodiversity importance as Biodiversity Heritage Sites (BHS). BHSs are well-defined areas that are unique, ecologically fragile ecosystems - including terrestrial, coastal and inland water and marine systems, characterized by high biological richness. In the of state Karnataka, there are currently four Biodiversity Heritage Sites and the University of Agricultural Sciences, GKVK, Bangalore is one such site with significant floristic richness (Karnataka Biodiversity Board notification, 2009). This heritage site is spread across 167 hectares,

which has been divided into three patches (scrub forest, botanical garden and plantation & orchards) and further subdivided into 14 areas. The campus is home to 113 species of mammals, 10 species of reptiles, 165 species of birds and 530 plant species (Sumanth and Prasanna, 2022).

Floristic composition or species composition refers to the complete assemblage of plant species present within a specific geographical area, It essentially describes the diversity and distribution of plants within that region, encompassing both cultivated and wild species. Understanding floristic composition is crucial for identifying, classifying and conserving plant diversity and also for analysing environmental factors and the ecosystem services they support. Floristic composition and diversity are core elements of any ecosystem. Their assessment helps in understanding both anthropogenic influences as well as environmental factors that affect vegetation patterns, tree population dynamics, regeneration and overall biodiversity - thereby informing conservation priorities and reserve management practices. Species composition and dynamics provide critical context for ecosystem management planning, sustainable development strategies and the interpretation of long-term ecological research. Regular assessment and monitoring of plant diversity are essential for understanding changes in population structure, offering valuable data for biodiversity conservation and ecosystem management. Such studies also help to identify patterns of regional disturbance and to understand how key biotic components respond to different types of environmental stressors. Accordingly, the present study was undertaken to assess the plant species composition within the Biodiversity Heritage Site at GKVK.

Material and Methods

Study Area

The study was conducted in the Biodiversity Heritage Site at University of University of Agricultural Sciences, GKVK, Bengaluru, Karnataka. It is located at 13.0801° North Latitude and 77.5785° East Longitude with an altitude of 924 m (above mean sea level). The average annual rainfall of the campus is 920 mm and the mean maximum air temperature ranges from 26.3 to 33.8 °C. The Heritage Site was divided into 14 areas *viz.*, A, B, C, D, E1, E2, E3, E4, E5, E6, E7, E8, E9 and E10 (Plate 1). The entire GKVK is spread over

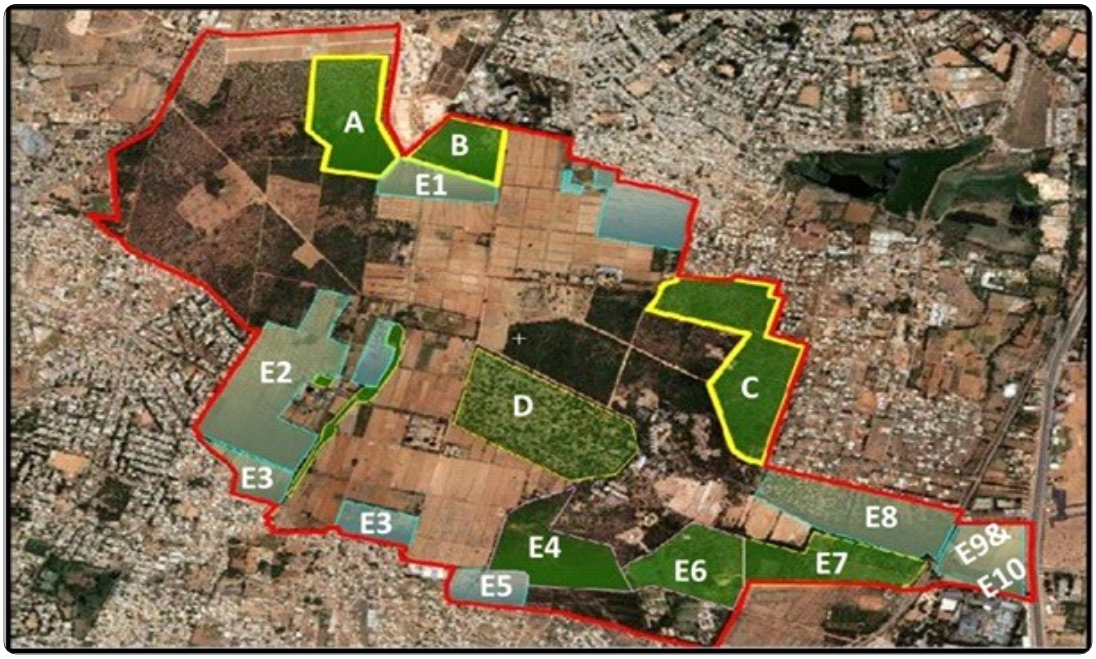


Plate 1: Map showing different areas of Biodiversity Heritage Site, GKVK

559 hectares, of which 167 hectares constitute the study area. These areas were further grouped into three patches *i.e*., Scrub Forest (natural) (Areas - A, B & C), Botanical Garden (Area-D) and Plantation and Orchards (Areas-E1 to E10). Among the areas E1 to E10, areas *viz.,* E4, E6 and E7 (*i.e.,* tree arboretum of the campus) fall under plantations, where as E1, E2, E3, E5, E8, E9 and E10 were categorized as fruit orchards.

Sampling Design and Plot Layout

The random quadrat sampling method was used to study the species composition and diversity. A total of 104 quadrats, each size of 20 x 20 m, were laid randomly across all the 14 areas, covering 2.5 per cent of the total study area (Roy *et al.,* 2015). Specifically, 4, 4, 6, 11, 7, 13, 6, 9, 6, 7, 11, 12, 2 and 6 quadrats were laid in areas A, B, C, D, E1, E2, E3, E4, E5, E6, E7, E8, E9 and E10 respectively. In each quadrat, all woody plant species were identified. Individually with a girth at breast height (GBH) ≥ 30 cm were measured for GBH and total height using a measuring tape and altimeter, respectively. Within each quadrat, a 5 m x 5 m nested quadrat was laid at one corner to collect data on the shrubs (GBH < 30 cm and height > 1m) and four 1m x 1m nested quadrats were placed at the four corners of the main quadrat to record data on herbs (height < 1m) (Fig. 1). Species identification was carried out with the assistance of a taxonomist from the Mahatma Gandhi Botanical Garden, UAS, GKVK, Bengaluru.

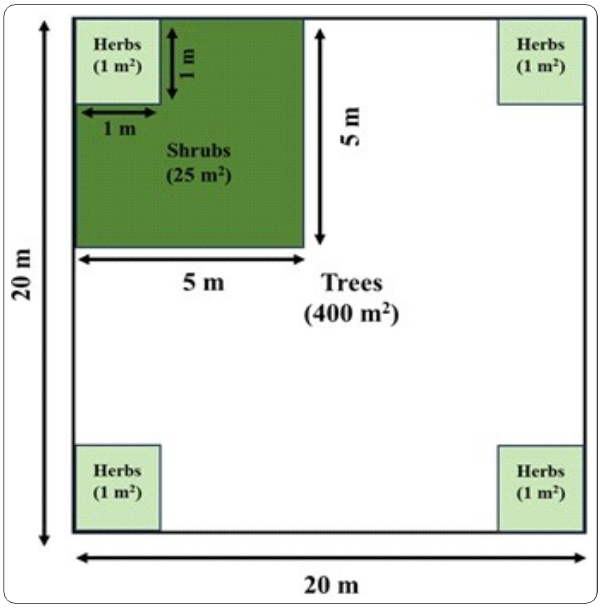


Fig. 1 : Layout of sampling quadrat with nested quadrats

Data Analysis

Species composition and diversity were analysed by computing various diversity indices such as species richness, Shannon-Wiener Diversity Index (*H'*), Simpson's Diversity Index (1-D), Evenness index (J'). The similarity between different areas of the Biodiversity Heritage Site was assessed by using Jaccard's Index of Similarity.

Species Richness (S)

Species richness refers to the number of different species present in a community, population, landscape or region. It simply counts the number of species in a given area, without considering the abundance or relative distribution of individuals (Colwell and Robert, 2009).

Shannon-Wiener Diversity Index (*H'*)

The Shannon-Wiener index is a measure of the average degree of uncertainty in predicting the species identity of an individual randomly selected from a dataset comprising 'S' species and 'N' individuals (Magurran, 2003). This uncertainty increases as both the number of species increases and the distribution of individuals among species becomes more even. Thus, *H'*=0 when there is only one or when all individuals belong to the same In contrast, the H' value is [highest] when species are evenly distributed. Therefore, the H' value reflects both the number of species and the equitability of species distribution in the community. It was estimated by using the formula given below.

$$H' = -\sum_{i=1}^{s}[(\frac{ni}{N})\ln(\frac{ni}{N})]$$

Where,

ni = Number of individuals belonging to the i^{th} species

N = Total number of all the individuals in the population

ln = Natural logarithm

S = Number of species

Simpson Diversity Index (1-D)

The Simpson Index (Simpson, 1949) is commonly used to measure the evenness of distribution or degree of concentration. It takes into account both species richness and the [relative abundance] of each species (Magurran, 2003). It is calculated as,

$$\lambda = \sum_{i=1}^{n} Pi^2$$

Where,

Pi = Proportion of individuals of i^{th} species relative to the total number of species

n = Total no of species.

Simpson's Diversity Index is a measure of diversity. It is often used to quantify the biodiversity of a habitat. It takes into account the number of species present, as well as the abundance of each species (Magurran, 2003). It can also be estimated through the following formula:

Simpson's index of diversity = 1- D (Simpson dominance index)

Evenness Index (J')

The evenness index is a function of some diversity measure and the number of individuals in a species sample, called species richness. It is given by,

$$J' = \frac{H'}{H' \max}$$

$$H' \max = \ln S$$

Where, S = Total number of species

Shannon's formula is used because of the assumption that the population to be indefinitely large. For a given number of species, the diversity of a sample is a maximum when the individuals are distributed among the species as evenly as possible. Conversely, if only a few of the species contain a large majority of the individuals, the diversity is low. J' occurs between 0 and 1. The lower J' is the less evenness in communities between the species (and the presence of a dominant species). And vice versa. As an estimate of the evenness with which the individuals are divided among the species in any sample, we may take the ratio of the observed diversity to the maximum possible for the same number of species (Pielou, 1966).

Jaccard's Index of Similarity or β-Diversity

To assess the species turnover between different land-use types or habitats, [Jaccard's Index of Similarity] was calculated. This index provides a [quantitative comparison] of species shared between two sites or communities (Real and Vargas, 1996). It is calculated as:

$$C_j = \frac{j}{(a+b-j)}$$

Where,

j = Number of species found in both sites

a = Number of species in site A

b = Number of species in site B

Results and Discussion

Species Richness

The GKVK campus is one of the greenest places in the city of Bengaluru and supports a high diversity of plant species. A total of 198 species belonging to 49 families (Table 1) were documented across the 14 areas of the Heritage site. Of these, 96 were trees species, 62 herbs, 20 shrubs and 20 climbers representing 27, 8, 21 and 10 families, respectively, (Table 2). Similar results indicating a higher number of tree species were reported by Priya *et al*. (2020), who documented 80 tree species from 34 families in the District Science Centre Campus, Tirunelveli, Tamil Nadu. Mouna *et al*. (2021) also recorded 98 tree species from 33 families at the Dharwad campus, Karnataka. The family Fabaceae emerged as the most dominant family among the entire flora

TABLE 1

Total number of trees, shrubs, herbs and climbers belonging to different families at Biodiversity Heritage Site

Family name	No. of Species				
	Trees	Shrubs	Herbs	Climbers	Total
Acanthaceae	-	-	1	-	1
Amaranthaceae	-	-	3	-	3
Anacardiaceae	5	-	-	-	5
Annonaceae	4	-	-	-	4
Apocynaceae	-	3	-	3	6
Asparagaceae	-	-	-	1	1
Asteraceae	-	-	11	-	11
Bignoniaceae	2	-	-	-	2
Boraginaceae	-	-	1	-	1
Calophyllaceae	1	-	-	-	1
Celastraceae	1	-	-	1	2
Clusiaceae	3	-	-	-	3
Combretaceae	6	-	-	-	6
Commelinaceae	-	-	1	-	1
Convolvulaceae	-	-	1	3	4
Cucurbitaceae	-	-	-	2	2
Cyperaceae	-	-	2	-	2
Ebenaceae	1	-	-	-	1
Erythroxylaceae	1	1	-	-	2
Euphorbiaceae	-	1	2	1	4
Fabaceae	32	-	9	4	45
Lamiaceae	2	-	1	-	3
Lauraceae	1	-	-	-	1
Loranthaceae	-	-	1	-	1
Lythraceae	1	-	-	-	1
Magnoliaceae	2	-	-	-	2
Malvaceae	3	-	8	-	11
Meliaceae	5	-	-	-	5
Menispermaceae	-	-	-	2	2
Moraceae	8	-	1	-	9
Myrtaceae	3	-	-	-	3
Oxalidaceae	-	-	1	-	1
Passifloraceae	-	-	-	2	2
Phyllanthaceae	-	5	2	-	7
Poaceae	1	-	12	-	13
Polygonaceae	-	-	1	-	1
Portulacaceae	-	-	1	-	1
Proteaceae	1	-	-	-	1
Putranjivaceae	1	-	-	-	1
Rhamnaceae	-	3	-	-	3
Rhizophoraceae	1	-	-	-	1
Rubiaceae	1	3	1	-	5
Rutaceae	2	-	1	-	3
Santalaceae	1	-	-	-	1
Sapotaceae	4	-	-	-	4
Simaroubaceae	3	-	-	-	3
Solanaceae	-	3	-	-	3
Verbenaceae	-	1	1	-	2
Vitaceae	-	-	-	1	1

Continued....

TABLE 1 Continued....

(22.70%) and specifically among trees (33.30%) and climbers (20.20%). In contrast, Poaceae (19.40%) and Phyllanthaceae (25%) were dominant families among herbs and shrubs, respectively. Sringeswara and Vishwanath (2024) also documented the dominance of family Fabaceae, reporting 102 species within the Botanical Garden (Area D), of the GKVK Heritage Site.

The results further indicate that the highest tree species richness was recorded in area D (69 species), followed by area E7 (27 species) This may be attributed to the conservation efforts and species maintained in the Botanical Garden (area D) and tree arboretum (area E7), respectively., Lower tree species richness was recorded in areas such as E1, E5, E8, E9 and E10, likely due to the presence of monoculture of horticultural systems (*e.g.*, Mango orchards). A total of 71 species were recorded in the scrub forests areas (Areas A, B and C). These three areas are the last remained natural fragments of the campus area after the land use changes for the campus development, so these areas should be taken care with great management strategies. The species richness in these scrub forests is comparatively

TABLE 2

Species Richness and family representation of trees, shrubs, herbs and climbers in different areas of BHS, GKVK

Area	Trees		Shrubs		Herbs		Climbers		Total Flora	
	Species	Family	Species	Family	Species	Family	Species	Family	Species	Family*
A	6	4	6	4	16	8	4	4	32	16
B	4	3	7	5	4	3	0	0	15	11
C	15	5	3	3	5	4	1	1	24	13
D	69	20	3	2	2	2	7	5	81	25
E1	3	3	5	4	14	8	3	3	25	15
E2	6	4	6	5	29	13	8	6	49	24
E3	13	10	8	5	18	9	9	5	48	25
E4	10	4	7	6	16	6	8	7	41	22
E5	1	1	3	3	14	7	4	4	22	13
E6	9	5	7	5	13	6	2	2	31	16
E7	27	11	5	4	8	4	2	2	42	18
E8	1	1	2	2	17	7	0	0	20	10
E9	2	2	1	1	7	6	3	3	13	12
E10	1	1	2	2	20	12	4	3	27	18
Overall	96	27	20	8	62	21	20	10	198	49

Note : *Overlapping of families across the habits

higher than that of other scrub forest areas in Karnataka, as reported by Devagiri *et al*. (2012), which recorded 19 to 34 species in similar habitats

Shannon-Wiener Index (*H'*)

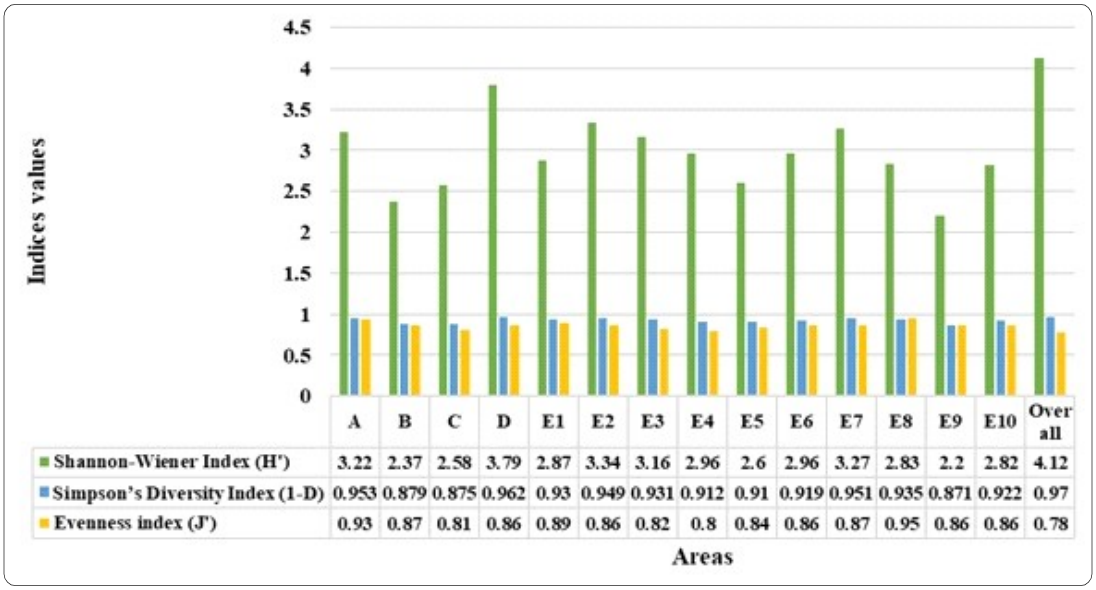
The Shannon-Wiener Index indicated that the overall species diversity of the Heritage Site was high, with a value of 4.12 for the entire flora (Fig. 2). The index values were 3.32, 2.41, 3.31 and 2.41 for trees, shrubs, herbs and climbers, respectively, across the entire study site (Table 3). These results are in line with the findings of Panda *et al*. (2020), where the index values for shrubs and herbs in a tropical deciduous forest in Ranchi ranged from 1.53-1.65 and 3.30-3.39, respectively. This suggests that our study supports greater diversity of shrubs and herbs, possibly due to the presence of a healthy and stable ecosystem.

The highest diversity was obseved in area D (3.79) (Botanical Garden), followed by E2 (3.34) and E7

TABLE 3

Shannon-Wiener Index (H') of trees, shrubs, herbs and climbers in different areas of BHS, GKVK

Areas	Trees	Shrubs	Herbs	Climbers
A	1.53	1.72	2.61	1.19
B	0.76	1.91	1.29	0
C	1.84	1.08	1.45	0
D	3.82	0.99	0.68	1.75
E1	0.77	1.31	2.41	1.09
E2	1.65	1.54	2.92	1.69
E3	2.31	1.99	2.45	2.09
E4	1.58	1.48	2.25	1.45
E5	0	0.94	2.34	1.02
E6	1.19	1.89	2.48	0.68
E7	2.65	1.58	1.94	0.67
E8	0	0.69	2.72	0
E9	0.21	0	1.85	1.01
E10	0	0.64	2.63	1.20
Overall	3.32	2.41	3.31	2.41



	A	B	C	D	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	Over all
Shannon-Wiener Index (H')	3.22	2.37	2.58	3.79	2.87	3.34	3.16	2.96	2.6	2.96	3.27	2.83	2.2	2.82	4.12
Simpson's Diversity Index (1-D)	0.953	0.879	0.875	0.962	0.93	0.949	0.931	0.912	0.91	0.919	0.951	0.935	0.871	0.922	0.97
Evenness index (J')	0.93	0.87	0.81	0.86	0.89	0.86	0.82	0.8	0.84	0.86	0.87	0.95	0.86	0.86	0.78

Fig. 2: Diversity indices for different areas of the heritage site, GKVK

(3.27) (Fig. 2), indicating that these areas support a more diversified plant community. Praveen Kumar *et al.* (2024) also reported a similar trend, with the Botanical Garden (Area D) exhibiting the highest diversity values of 5.52. Area D (3.82), E3 (1.99), E2 (2.92) and E3 (2.09) showed the highest tree, shrub, herb and climber diversity, respectively. The diversity for the tree layer was 0 in the areas of E1, E5, E8, E9 and E10 because these areas are under Mango cultivation. The Shannon-Wiener Index values reported by Sharma and Kant (2014) for trees (3.07) and shrubs (2.52) in subtropical scrub forests were higher than those observed in the present scrub forest patches (A, B and C), indicating relatively lower species diversity in these zones of our study area.

Simpson's Diversity Index (1-D)

Simpson's Diversity Index showed that the diversity of the heritage site was comparatively high with a value of 0.97 (Fig. 2). Sumanth and Prasanna (2022) also assessed the diversity of the Heritage Site, GKVK and reported a similar index value of 0.95 for the entire study area. The diversity values for trees, shrubs, herbs and climbers were 0.93, 0.88, 0.94 and 0.89, respectively, across the entire biodiversity heritage site (Table 4). The Simpson's diversity values were comparable to those of the Shannon diversity index with area D (0.962), E3 (0.852), E2 (0.929) and E3 (0.864) (Fig. 2) showed the highest diversity for trees, shrubs, herb and climber species,

TABLE 4

Simpson's Diversity Index (1-D) of trees, shrubs, herbs and climbers in different areas of Biodiversity Heritage Site, GKVK

Areas	Trees	Shrubs	Herbs	Climbers
A	0.755	0.809	0.918	0.643
B	0.409	0.848	0.702	0.000
C	0.711	0.655	0.743	0.000
D	0.962	0.599	0.488	0.796
E1	0.504	0.675	0.894	0.660
E2	0.781	0.733	0.929	0.758
E3	0.881	0.852	0.884	0.864
E4	0.680	0.708	0.842	0.658
E5	0.000	0.568	0.892	0.590
E6	0.545	0.841	0.911	0.490
E7	0.902	0.790	0.839	0.480
E8	0.000	0.496	0.929	0.000
E9	0.105	0.000	0.829	0.611
E10	0.000	0.444	0.909	0.639
Overall	0.93	0.88	0.94	0.89

respectively. Area D (Botanical Garden) exhibited the highest overall floral diversity (0.962), followed by area A (0.953) and area E7 (0.951). Naidu and Kumar (2016) also reported similar Simpson diversity values in the Eastern Ghats region, where the index value ranged from 0.96 to 0.97. Bharathi and Prasad (2016) recorded comparable results in the sacred grooves of Kushalnagara, Karnataka, where the overall index value across four sacred grooves was 0.87. Similar findings were reported by Gopalakrishna *et al*. (2015) in the scrub forest of Bannerghatta National Park with an index value of 0.90. Interestingly, the Simpson's Index Value for area E2 (0.949) was lower than those of areas A, D and E7, despite showing greater Shannon diversity values., This may be attributed to the less even distribution of species in area E2.

Evenness Index (J')

The overall Evenness Index value was 0.78 (Fig. 2), indicating that the species distribution across the heritage site was moderately even, despite high diversity values. Compared to tree species (0.73), shrubs (0.81), herbs (0.80) and climbers (0.81) were more evenly distributed in the study area (Table 5).

Table 5

Evenness index (J') of trees, shrubs, herbs and climbers in different areas of BHS, GKVK

Areas	Trees	Shrubs	Herbs	Climbers
A	0.85	0.96	0.94	0.86
B	0.55	0.98	0.93	NA
C	0.68	0.98	0.90	NA
D	0.90	0.90	0.98	0.90
E1	0.70	0.81	0.91	0.99
E2	0.92	0.86	0.87	0.81
E3	0.90	0.96	0.85	0.95
E4	0.68	0.76	0.81	0.70
E5	NA	0.85	0.89	0.73
E6	0.54	0.97	0.97	0.99
E7	0.80	0.98	0.93	0.97
E8	NA	0.99	0.96	NA
E9	0.31	NA	0.95	0.92
E10	NA	0.92	0.88	0.86
Overall	0.73	0.81	0.80	0.81

Area A recorded the highest eveness value of 0.93 (Fig. 2), suggesting a more uniform species distribution in this area. For individual plant groups, trees, shrubs, herbs and climbers were more evenly distributed in areas E2 (0.92), E8 (0.99), D (0.98) and E1 (0.99), respectively. The natural scrub forest areas (areas A, B and C) exhibited higher evenness index values when compared to the findings of Sharma and Kant (2014) in the Himalayan subtropical scrub forest, where the values were 0.81 for trees and 0.79 for shrubs. This suggests that species were more evenly distributed in the current study site. The overall evenness index value of 0.78 for the GKVK Heritage Site was higher than that reported by Nandal *et al.* (2023) for the Maharshi Dayanand University campus, Rohtak, which had a value of 0.59.

Jaccard's Index of Similarity or β-Diversity

Among the entire flora, areas E5 and E1showed the highest similarity, with (52%) similarity (Table 6), followed by E5 and E2 (34%) and E2 and E3 (33%), This higher similarity is likely due to the presence of a greater number of common herb species in these areas (E1, E2, E3 and E5), which are all mango orchards. Among the tree species, areas E4 and C (0.39) (Table 6) showed greater similarity, followed by E6 and E4 (0.36). For herbs, E5 and E1 again exhibited the highest similarity (0.56) followed by E5 and E3 (0.45). Behera and Misra (2006) reported higher similarity values of 77.40 per cent and 74.20 per cent between 2 and 6 year-old and 2 and 4 year-old recovering forest stands, respectively, while a lower similarity of (62.30%) was observed

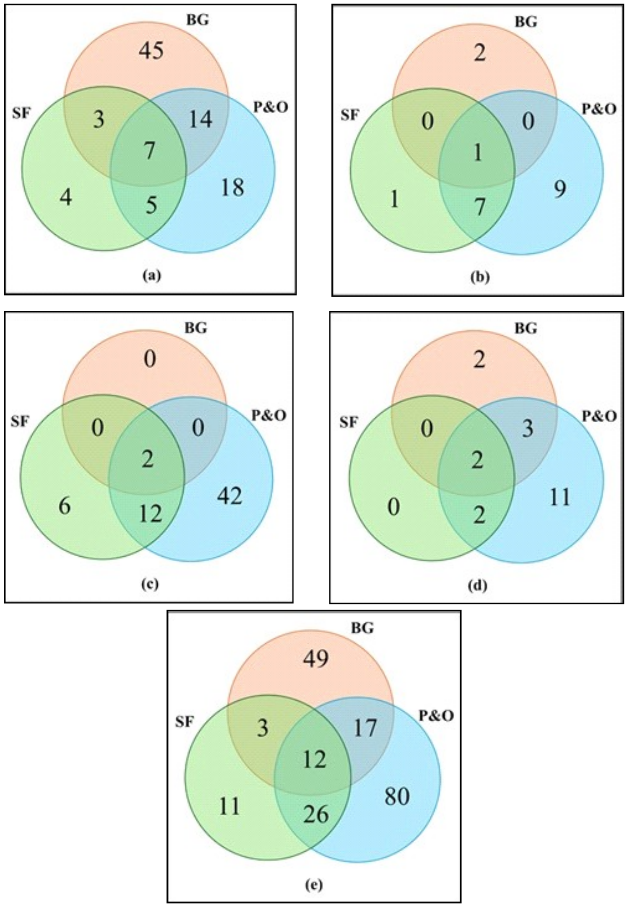
Table 6

Jaccard's index of similarity or β-diversity of trees, herbs and total flora among different areas of BHS, GKVK

Jaccard's similarity index (%) between areas	Trees	Herbs	Total flora
E5 & E1		56	52
E4 & C	39		

between 4 and 10 year-old stands for the herbaceous vegetation in four recovering forest stands in the Eastern Ghats. Similarly, Subashree *et al*. (2021) reported a β diversity of 0.396 among seven study sites in the Kanyakumari Wildlife Sanctuary, Western Ghats. Reddy *et al*. (2011) observed similarity indices of (44%, 33% and 50%) Sukkumamidi (Site-1), Maredumilli (Site-2) and Lankapakala (Site-3) in the Eastern Ghats.

A total of seven tree species were common across all three patches of the heritage site [Fig. 3 (a)] *viz., Albizia lebbeck, Azadirachta indica, Delonix regia, Eucalyptus globulus, Grevillea robusta, Pongamia pinnata* and *Tamarindus indica*. Three tree species



[SF=Scrub Forest, BG=Botanical Garden, P&O=Plantations and Orchards]

Fig. 3 : Overlapping of species distribution among three patches of Biodiversity Heritage site, GKVK depicted using Venn diagram; (a)-Trees, (b)-Shrubs, (c)-Herbs, (d)-Climbers and (e)-Total flora

(*Hardwickia binata, Santalum album* and *Senna siamea*) were found only in between garden and scrub forest patches. Five species (*Acacia auriculiformis, Bambusa vulgaris, Leucaena leucocephala, Senna spectabilis* and *Swietenia macrophylla*) were shared between plantations and scrub forest patches and 14 species were found between [the tree arboretum (Area E7) and the Botanical Garden, including *Ailanthus triphysa,, Anacardium occidentale, Aphanamixis polystachya, Artocarpus hirsutus, Cassia fistula, Dalbergia sissoo, Kingiodendron pinnatum, Peltophorum pterocarpum, Psidium guajava, Pterocarpus marsupium, Syzygium cumini, Terminalia arjuna* and *Terminalia bellirica* A total of 4, 45 and 18 tree species were found exclusively in the patches of scrub forest, Botanical Garden and plantations and orchards, respectively.

Among shrubs, *Carissa spinarum* was common to all three patches, while seven shrub species (*Canthium coromandelica, Flueggealeu copyrus, Lantana camara, Phyllanthus lawii, Scutia myrtina*, *Ziziphus marutiana* and *Ziziphus oenopolia*) were common between the scrub forest and plantations and orchards (Fig. 3 (b)). A total of 1, 2 and 9 shrub species were found exclusively in the scrub forest, Botanical Garden and plantations and orchards, respectively. A total of two herb and climber species were found common across all three patches of Heritage Site (Fig. 3 c & d) *viz., Chromolaena odorata*, *Sida cordata*, *Cocculus hirsutus* and *Passiflora foetida*. Additionally, twelve herb species (*Ageratum conyzoides, Alternanthera ficoidea, Bidens Pilosa, Blepharis maderaspatensis, Crotalaria pallida, Heteropgon contartus, Mimosa pudica, Panicum repens, Paspalum dilatatum, Pavonia zeylanica, Stachytarpheta indica* and *Stylosanthes hamata*) and two climber species (*Diplocyclos palmatus* and *Macropteliumatro purpureum*) were found common between the scrub forest and plantation and orchard patches. In total, twelve species (entire flora) were found common among all three patches of the Heritage Site (Fig. 3 (e)). Six and forty-two herb species were found exclusively in the scrub forest and plantation and orchard patches, respectively. Similarly, two and eleven climber species were found only in the

Botanical Garden and plantations and orchards, respectively. No shrub, herb or climber species were found to be common between the Botanical Garden and the scrub forest patches (Fig. 3be).

The results indicate that the study area has a greater diversity of trees, shrubs, herbs and climbers with a relatively uneven distribution of species. The Scrub Forest patch should be properly conserved and scientifically managed for future reference, as it represents the last remaining natural fragment within the campus. As biodiversity conservation and management are increasingly challenging in the present context, periodic assessments of species composition and diversity are necessary for understanding the ecological structure and function of the ecosystem. The present study provides a baseline dataset for the long-term monitoring and conservation of plant species on the campus.

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