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FLORISTIC DIVERSITY AND PHYTOSOCIOLOGICAL STUDIES OF SELECTED AREAS OF RADHANAGARI TAHSIL, MAHARASHTRA

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Abstract:

The present study was carried out in the Sarawade area of More College Campus, Radhanagari taluka, Kolhapur district, Maharashtra, in the Western Ghats, with the aim of describing the phytosociological status of the campus flora in relation to species composition, dominance and diversity under continuous human use. Phytosociological surveys were conducted from November to December 2025 at seven sites that differed in their physical and biotic features, using 7 quadrats of 2 m × 2 m laid randomly within the campus. In total, 54 plant species and 28 different family, including herbs, grasses, shrubs, climbers and trees, were recorded and analysed using standard quantitative parameters such as density, frequency, abundance, basal area, relative density, relative frequency, relative dominance and importance value index (IVI). Cynodon dactylon, Parthenium hysterophorus, Setaria verticillata, Chromolaena odorata, Bidens pilosa, Alternanthera sessilis and other ruderal species attained high values of density and IVI, showing clear dominance in disturbed ground-level habitats. Woody species such as Mangifera indica, Cocos nucifera, Monoon longifolium, Juniperus virginiana, Ricinus communis and Hibiscus rosa-sinensis contributed most of the basal area and relative dominance and thus played a key structural role in the community. Overall, the campus vegetation appears as a mixture of planted ornamentals and a dense cover of common weeds, and the strong presence of invasive and ruderal species reflects considerable anthropogenic pressure and underlines the need for suitable management and conservation action.

Keywords: *Biodiversity; Phytosociology, Frequency, Density, Abundance, RD, RF, IVI Western Ghats.*

Introduction

Biodiversity refers to the variety of life at genetic, species and ecosystem levels, and it supports essential ecosystem services such as clean air, water, soil fertility and climate regulation [1]. Human activities including

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deforestation, habitat fragmentation, overgrazing, pollution and rapid land use change have greatly increased the rate of biodiversity loss and disturbed normal ecosystem functioning [4]. To understand how plant communities respond to such pressures, phytosociology uses quantitative vegetation analysis to describe floristic composition, structure, dominance and diversity through parameters like density, frequency, basal area and importance value index (IVI) [5, 6, 7]. The concept of phytosociology was proposed by Józef Paczoski in 1896 and has since been widely applied in forests, grasslands, alpine meadows, wetlands and urban green spaces to study species diversity patterns and guide conservation planning [3,] . College campuses, such as the More College Campus at Sarawade in the Western Ghats, represent semi-natural habitats where native species, ornamentals, fruit trees, weeds and invasive plants coexist, making them useful sites for applying these methods to assess local biodiversity under strong human influence. More College Campus lies near 16.4109782° N and 74.0953746° E at about 568–569 m above sea level. In this setting, the present study aims (i) to document the floristic composition of the campus, (ii) to analyse community structure using standard phytosociological parameters and (iii) to identify dominant and co-dominant species through their importance value index (IVI) in relation to human disturbance.

Materials and Methods

Study area

More College Campus is located in Sarawade village, Radhanagari taluka, Kolhapur district, Maharashtra, within the Western Ghats region known for high biological diversity and endemism. The campus includes academic buildings, playgrounds, internal roads, lawns, ornamental gardens and open fields that are regularly affected by grazing, trampling, vehicle movement and routine maintenance activities such as mowing and cleaning. The area has a tropical monsoon climate, with heavy rainfall during the southwest monsoon followed by a cooler, relatively dry season, and the terrain in and around the campus is gently undulating at an elevation of about 568–569 m above mean sea level.

Data collection

Phytosociological surveys were carried out during November and December 2025, when most herbaceous species show maximum growth and can be identified easily. Seven sampling sites representing different microhabitats and disturbance levels within the campus were selected, and at each site quadrats of 5 m × 5 m (25 m^2) were laid randomly, giving a total of 7 quadrats and a sampled area of 175 m^2 for detailed quantitative observations [6, 8]. In every quadrat, all individuals of each plant species (herbs, grasses, shrubs, climbers and trees) were counted, and for each species the number of quadrats in which it occurred was noted; for woody species, stem diameter was measured and converted to radius to estimate basal area for dominance calculations.

Quantitative analysis

Quantitative analysis of the vegetation followed the approach of Curtis and McIntosh [7] and other standard texts on vegetation study [5, 6, 8, 9]. For each species, density, frequency and abundance were calculated using standard formulae.

Where, r is the stem radius derived from measured diameter; for woody species, basal area was taken at breast height, while for herbaceous plants it was considered close to ground level [8]. Relative density, relative frequency and relative dominance were then worked out by expressing each of these parameters as a percentage of the corresponding total for all species in the community [7].

Importance Value Index (IVI)

The ecological importance of each species in the community was evaluated using the importance value index (IVI) [7, 11]. For every species, relative density and relative dominance were calculated using standard formulae.

Relative frequency was obtained in a similar way by using the frequency values. The IVI for each species was then calculated as the sum of relative density, relative frequency and relative dominance, giving a single integrated measure of its overall role in the community [7, 11].

Results

Floristic composition

The phytosociological survey recorded a total of 54 plant species from the 7 quadrats laid in More College Campus, comprising herbs, grasses, sedges, shrubs, climbers, and trees. The ground layer was dominated by herbaceous and grassy species, including several common weeds and ruderals, while the upper strata consisted largely of planted ornamentals and fruit trees interspersed with a few native woody species.

Quantitative analysis

Frequency indicates the distribution uniformity of species within the study area. In the present investigation, maximum frequency was recorded for *Cocos nucifera, Rayjacksonia phyllocephala, Phyllanthus myrtifolius, and Hibiscus rosa-sinensis* (86%) followed by *Erigeron canadensis, Triumfetta rhomboidea, Catharanthus roseus, Rosa 'Peace', Murraya paniculata, Ricinus communis, and Mangifera indica* (71%). *Medium frequencies* (57%) were observed for *Artemisia dracunculus, Pennisetum pedicellatum, Emilia sonchifolia, Ficus racemosa,* and others. The lowest frequency (29%) was recorded for *Celosia argentea, Crassocephalum crepidioides, Chromolaena odorata, Cynodon dactylon, Parthenium hysterophorus*, and related species. Density represents the numerical strength of species per unit area. Maximum density was recorded by *Cynodon dactylon* (12.7) followed by *Parthenium hysterophorus* (10.3), *Chromolaena odorata* (9.6), *Setaria verticillata* (9.4, 9.0), *Bidens pilosa* (8.0), *Muhlenbergia schreberi* (7.9), *Erigeron canadensis* (6.9), *Crassocephalum crepidioides* (5.7), *Euphorbia hirta* (5.7), and *Phyllanthus niruri* (5.7). Abundance represents the number of individuals per occupied quadrat. The highest abundance was recorded by *Cynodon dactylon* (44.50) followed by *Parthenium hysterophorus* (36.00), *Chromolaena odorata* (33.50), *Setaria verticillata* (22.00), *Crassocephalum crepidioides* (20.00), *Bidens pilosa* (18.67), *Muhlenbergia schreberi* (18.33), and *Setaria verticillata* (15.75).

Importance Value Index

The IVI provides a comprehensive measure of ecological dominance and species success. IVI values ranged from 1.89 to 16.94. The dominant species were *Cocos nucifera* (16.94), *Mangifera indica* (13.37), *Ficus racemosa* (9.90), *Cynodon dactylon* (9.42), *Chromolaena odorata* (8.47), *Ficus benjamina* (8.36), *Setaria verticillata* (8.14, 7.89), *Parthenium hysterophorus* (8.00), *Monoon longifolium* (7.85), *Ricinus communis* (7.79), and *Dypsis lutescens* (7.52) (Fig. 2). The vegetation exhibited a mixed composition with tree species dominating through higher basal area values despite lower densities, while herbaceous species showed higher density and frequency, indicating widespread distribution across the study area.

Table1: Phytosociology studies of More college campus Plant Species

Sr. No	Species Name	Density	Frequency	Abundance	Relative Density	Relative Dominance	Importance Value Index (IVI)
1	*Erigeron canadensis*	6.9	71	9.60	4.44	0.36	7.47
2	*Artemisia dracunculus*	2.1	57	3.75	1.39	0.45	3.98
3	*Brickellia longifolia*	1.4	43	3.33	0.92	0.61	3.13
4	*Pennisetum pedicellatum*	4.3	57	7.50	2.77	0.24	5.15
5	*Setaria verticillata*	9.4	43	22.00	6.10	0.18	7.89
6	*Triumfetta rhomboidea*	2.6	71	3.60	1.66	0.55	4.88
7	*Emilia sonchifolia*	4.9	57	8.50	3.14	0.30	5.58
8	*Celosia argentea*	1.1	29	4.00	0.74	0.45	2.26
9	*Ficus racemosa*	0.3	57	0.50	0.18	7.58	9.90
10	*Rayjacksonia phyllocephala*	2.9	86	3.33	1.85	1.06	6.12
11	*Acmella radicans*	3.6	43	8.33	2.31	0.27	4.19
12	*Crassocephalum crepidioides*	5.7	29	20.00	3.70	0.36	5.13
13	*Muhlenbergia schreberi*	7.9	43	18.33	5.08	0.15	6.84
14	*Galax procumbens*	0.4	29	1.50	0.28	0.55	1.89
15	*Chromolaena odorata*	9.6	29	33.50	6.19	1.21	8.47
16	*Bidens pilosa*	8.0	43	18.67	5.18	0.33	7.11
17	*Setaria verticillata*	9.0	57	15.75	5.82	0.18	8.14
18	*Eleutheranthera ruderalis*	2.9	29	10.00	1.85	0.39	3.31
19	*Persicaria maculosa*	1.7	43	4.00	1.11	0.24	2.96
20	*Cynodon dactylon*	12.7	29	44.50	8.23	0.12	9.42
21	*Dypsis lutescens*	0.7	43	1.67	0.46	5.45	7.52
22	*Blumea lacera*	3.6	57	6.25	2.31	0.67	5.12
23	*Ocimum tenuiflorum*	2.0	43	4.67	1.29	0.91	3.81
24	*Cordyline fruticosa*	0.9	29	3.00	0.55	2.42	4.05
25	*Tephrosia uniflora*	1.4	57	2.50	0.92	0.76	3.82
26	*Euphorbia hirta*	5.7	43	13.33	3.70	0.21	5.51
27	*Ficus benjamina*	0.1	43	0.33	0.09	6.67	8.36
28	*Clerodendrum thomsoniae*	1.0	29	3.50	0.65	1.67	3.38

29	*Duranta erecta*	0.7	57	1.25	0.46	1.82	4.42
30	*Bougainvillea spectabilis*	0.7	29	2.50	0.46	3.64	5.17
31	*Catharanthus roseus*	1.7	71	2.40	1.11	0.42	4.21
32	*Phyllanthus niruri*	5.7	43	13.33	3.70	0.15	5.45
33	*Piper betle*	0.3	57	0.50	0.18	0.85	3.17
34	*Rosa sinesis*	0.1	71	0.20	0.09	1.36	4.13
35	*Zephyranthes candida*	0.6	43	1.33	0.37	0.30	2.28
36	*Solidago sempervirens*	2.1	57	3.75	1.39	0.48	4.01
37	*Tradescantia spathacea*	1.3	29	4.50	0.83	0.97	2.87
38	*Pyrostegia venusta*	0.1	29	0.50	0.09	2.12	3.28
39	*Jasminum multiflorum*	1.0	43	2.33	0.65	1.45	3.71
40	*Photinia × fraseri*	0.4	43	1.00	0.28	3.03	4.91
41	*Codiaeum variegatum*	0.7	29	2.50	0.46	1.97	3.50
42	*Murraya paniculata*	0.7	71	1.00	0.46	2.73	5.86
43	*Ixora coccinea*	0.6	43	1.33	0.37	1.52	3.49
44	*Phyllanthus myrtifolius*	1.7	86	2.00	1.11	0.36	4.68
45	*Pteris vittata*	1.4	57	2.50	0.92	0.61	3.67
46	*Eragrostis japonica*	3.6	43	8.33	2.31	0.18	4.10
47	*Ricinus communis*	2.3	71	3.20	1.48	3.64	7.79
48	*Hibiscus rosa-sinensis*	0.4	86	0.50	0.28	2.58	6.06
49	*Alternanthera sessilis*	4.3	43	10.00	2.77	0.33	4.71
50	*Parthenium hysterophorus*	10.3	29	36.00	6.65	0.27	8.00
51	*Mangifera indica*	0.1	71	0.20	0.09	10.61	13.37
52	*Monoon longifolium*	0.3	43	0.67	0.18	6.06	7.85
53	*Cocos nucifera*	0.1	86	0.17	0.09	13.64	16.94
54	*Juniperus virginiana*	0.4	57	0.75	0.28	4.55	6.96

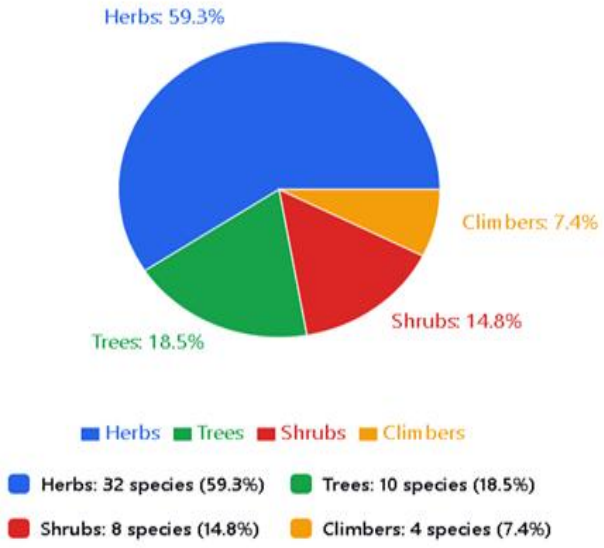

Figure 1: Distribution of plant life forms

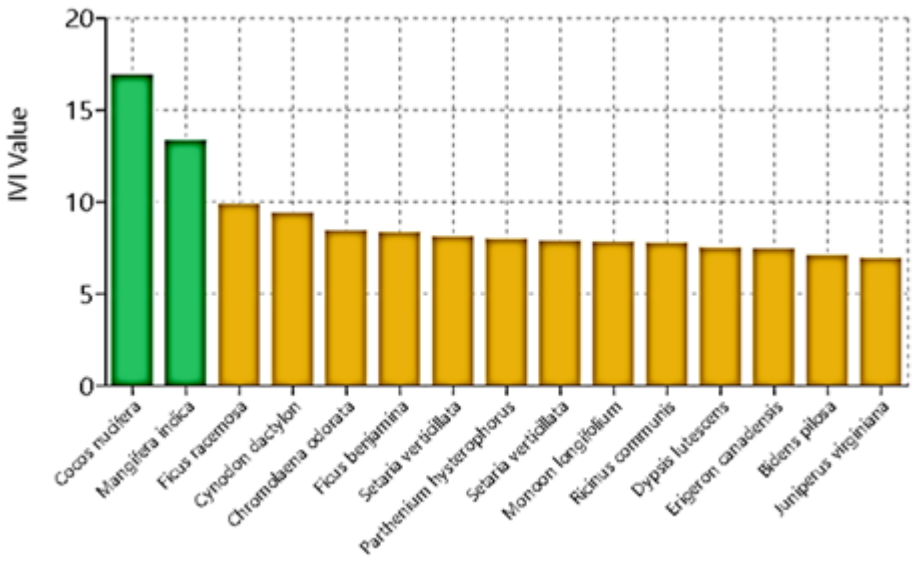

Figure 2: Importance Value Index (IVI) of the top 15 dominant species in the study area

Conclusion

The phytosociological survey of More College Campus shows a diverse floristic composition with 54 plant species, reflecting a mix of native and introduced species across different life forms. The dominance of herbaceous and grassy species in the ground layer, coupled with planted ornamental and fruit trees in the upper strata, highlights the anthropogenic influence on campus vegetation. *Cocos nucifera*, *Mangifera indica*, and *Cynodon dactylon* emerged as the most ecologically significant species, as indicated by their high frequency, density, abundance, and

Importance Value Index (IVI). The high IVI of tree species like *Cocos nucifera* and *Mangifera indica*, despite their lower density, suggests their dominance in terms of basal area and ecological impact. In contrast, herbaceous weeds such as *Cynodon dactylon*, *Parthenium hysterophorus*, and Chromolaena odorata exhibited high density and frequency, indicating their adaptability and widespread distribution. This mixed vegetation pattern reflects the campus's role as a habitat for both cultivated and ruderal species, with implications for biodiversity conservation and campus landscaping strategies.

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