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Phytosociological Assessment of Vegetation at Indira Gandhi National Open University (IGNOU) Campus at New Delhi.

Evaluación fitosociológica de la vegetación en el campus de la Universidad Nacional Abierta Indira Gandhi (IGNOU) en Nueva Delhi.

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ABSTRACT

The paper aims to investigate the phytosociological attributes the vegetation of the managed campus area of Indira Gandhi National Open University (IGNOU) situated at New Delhi in India. The purpose of the study was to understand the diversity pattern of vegetation for its characterization. The vegetation sampling and data analysis were undertaken by adopting universally standard procedures. Findings of the study demonstrated that the study area had a total of 116 species of plants which belonged to 28 different families. Out of which 55 species of trees, 29 species of shrubs and 32 species of herbs were taken on record. The most common plant species based on importance value in tree, shrub and herb layers were found to be *Azadirachta indica* (IVI-66.87), *Matricaria chamomilla* (RVI-51.89) and *Cynodon dactylon* (RVI- 68.87), respectively. Amongst families, Fabaceae was found to be the most dominant. Results reflect dominance of higher trees over ground floras. This study provides baseline information for future studies on the managed and natural forest patches exiting in the campus, and suggests that suitable conservation and management of biodiversity can improve the natural floral and faunal value of institutional campus.

Keywords: Biodiversity, Campus, Dominance, Phytosociology, Species richness.

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RESUMEN

El artículo tiene como objetivo investigar los atributos fitosociológicos de la vegetación del área del campus administrado de la Universidad Nacional Abierta Indira Gandhi (IGNOU) ubicada en Nueva Delhi en India. El propósito del estudio fue comprender el patrón de diversidad de la vegetación para su caracterización. El muestreo de vegetación y el análisis de datos se llevaron a cabo mediante la adopción de procedimientos estándar universales. Los hallazgos del estudio demostraron que el área de estudio tenía un total de 116 especies de plantas que pertenecían a 28 familias diferentes. De las cuales se registraron 55 especies de árboles, 29 especies de arbustos y 32 especies de hierbas. Las especies de plantas más comunes según el valor de importancia en las capas de árboles, arbustos y hierbas fueron Azadirachta indica (IVI-66.87), Matricaria chamomilla (RVI-51.89) y Cynodon dactylon (RVI-68.87), respectivamente. Entre las familias, se encontró que Fabaceae era la más dominante. Los resultados reflejan el dominio de los árboles más altos sobre las floras del suelo. Este estudio proporciona información de referencia para futuros estudios sobre los parches de bosques naturales y gestionados que existen en el campus, y sugiere que la conservación y gestión adecuadas de la biodiversidad pueden mejorar el valor natural de la flora y la fauna del campus institucional.

Palabras clave: Biodiversidad, Campus, Dominancia, Fitosociología, Riqueza de especies.

INTRODUCTION

Biodiversity is continuously on the wane due to activities of humans (Krishnamurthy et al., 2010). Plant species diversity is complex in nature and its structure and composition differ from place to place because of varying climatic condition and topography (Raturi, 2012). Even with a national policy aimed at conserving and improving nature, biodiversity is still decreasing. In addition the nature's diverse impacts like eutrophication, acidification and desiccation; habitat destruction, deforestation, human settlements, globalization, agricultural expansion, and other infrastructure related to development over the last century have accelerated the rapid decline of tropical forests throughout the world, which in turn bring about negative impacts on biodiversity, climate change, ecological services, soil productivity and the livelihoods of forest dwelling as well as rural people (Howe, 2014; Kant & Anjali, 2020; Raghubanshi & Tripathi, 2009). In this scenario, phytosociology is the tool to study the characteristics, classification, relationship and distribution of plant communities and thus useful to collect significant data to describe the population dynamics of every species studied and evaluate the relationship with the other species in the same community. The prime aim of phytosociology is to achieve a sufficient empirical model of vegetation

using combinations of plant species (or subspecies, i.e. taxa) that characterize discrete vegetation units. Species richness in ecosystem are important in terms of patterns and role related with land-use and climate change (Iyagin & Adekunle, 2017). Species richness is measured by a many abiotic and biotic parameters (Konatowska & Rutkowski, 2019).

Plants are necessary for social communities in terms of its role in maintaining the natural ecosystem (Corlett, 2016). However, the investigations concerning different types of forests or similar forests located in different areas have given no concrete conclusion for pinpointing the vegetation effect since site condition are changed and it is often impossible to separate the cause from the effect. Phytosociology is useful to describe the population dynamics of each plant species occurring in a particular community and to understand how they relate to the other species in the same community (Narayana et al., 2017). Phyto-sociological studies are essential for protecting the natural plant communities and biodiversity as well as understanding the changes experienced in the past and continuing on in to the future. The plant diversity at any site is influenced by species distribution and abundance patterns. Floristic diversity means floristic variety of plant forms rich diversity suggests a great many kinds of plants species and conversely poor diversity indicates flower types of living species. The Main Purpose of the phytosociological analysis is to understand floristic vegetation characteristics, to estimate the species richness and diversity which is subsist in the study area. And as we know that managed area like university campuses have rich and varied resource of flora and fauna. So, it is mandatory to document and analysis its vegetation and put it on record for further research and management. and conserve its biodiversity (Parthasarathy, 2010). Further these activities also encourage to understand the consequences of loss of habitat, fragmentation, pollution and disturbance in the forests. The above said issues culminate into the gradual decrease or disappearance of specific native plant species the opportunistic species. Thus, loss of biodiversity (specifically extinction of rare species) and gene pool occurs which would be much more useful in the future (Rao et al., 2015). The Pondicherry university has good green cover along with several large and very old trees, huge patches of forest still exist. The campus Flora has been well documented by Parthasarathy (2010). Biomass and carbon stock assessments of woody vegetation in the University campus have been done by (Sundarapandian et al., 2014a). Recently, many educational institutes in the western world have assessed their ecological footprint as biodiversity and carbon footprints. Sundarapandian et al. (2014b) posit that at present, the institutes also take steps to green their campuses and assess their phytosociological studies. At this crucial time, baseline data of ecological footprints as well as carbon stocks of the campus are main parameters behind campus greenery initiatives

along with conserve ecological biodiversity. Regarding this, the present study is conducted to investigate the plant diversity, and its documentation has been made to evaluate the structure of plant communities, its composition and diversity structure in terms of trees, shrubs and herbs and highlights its botanical significance of Indira Gandhi National Open University (IGNOU), New Delhi India.

MATERIALS AND METHODS

Study Area: The Indira Gandhi National Open University, IGNOU, is a central university under Ministry of Education, Government of India. IGNOU, with its Pan-India presence through its Regional Centres across the country, has its headquarters' campus spanning in around 150 acres at Maidan Garhi situated in the southern part of the Indian national capital i.e. New Delhi. The landscaping as well as the development of greenery including lawns & gardens in this sprawling campus spread over almost 120 acres are maintained by a designated Horticulture Cell (Anjali et al., 2022; IGNOU, 2020; Nayak et al., 2020). Not only the campus but the entire neighbouring areas are largely benefitted by the natural availability of the advantages of the green campus. Campus comes under sub-urban setting with good vegetation cover including lawns, gardens, green roofs, internal planting etc. covering more than 40% of its total area and around 34% is covered with forest landscape. In addition, many patches of natural forest are being maintained in the campus in their natural set-up which add immensely to the biodiversity of the campus. A dedicated Horticulture Cell designs and maintains the greenery in the sprawling campus of the University spread over 120 acres. The campus has variety of avenue plants of plethora of species including unusual and rare plant species which have grown in the campus over the years. In addition, multiple natural forest patches are also being maintained in their own natural set-up in the campus providing immense support to the campus in maintaining biodiversity (Anjali et al., 2020).

The study area IGNOU campus lies at the Latitude of 28o30'01.06'' N and a Longitude of 77° 12' 03.45'' E with an average elevation of 250 m above mean sea level (Figure 1). This campus has a humid sub-tropical climate where the temperature ranges from 5 to 40°C, and annual mean temperature is 25°C. It mainly receives an annual rainfall ranging between 600 to 800 mm. Vegetation of this part of Delhi is thorny scrub and is peculiar to arid and semi-arid region.

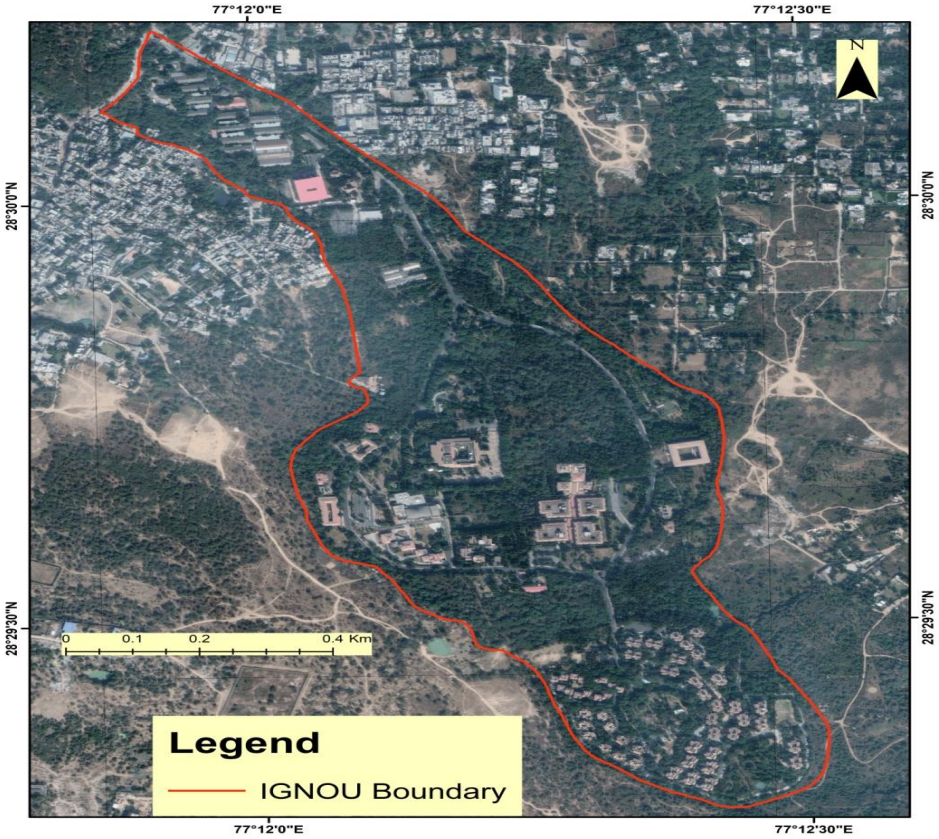

Figure 1. Location map of IGNOU Campus (Retrieved from Google Earth)

Methodology and data analysis: Phytosociological studies were carried out during the month of Sep 2019 to Feb 2020 to cover all spectrum of vegetation. For phytosociological studies of campus vegetation at IGNOU which is study area, the Quadrates methods were used. Phytosociological studies were carried out by Quadrates sampling method as per Misra (1968) and Kershaw (1973). Size of the Quadrates was varied based on the vegetation patterns. In this study 1mx1m quadrates were applied for Herbs, 5mx5m size Quadrates were applied for shrubs and for trees they were of 40mx40m size. Apart from this a total of thirty-four Quadrates of 40 m × 40 m were randomly laid for trees (≥ 20 cm gbh). Twenty-Six Quadrates for shrubs and saplings of 5 m × 5 m each and Twenty-six Quadrates for herbs of 1 m × 1 m size for analysis were laid in this study. Keeping in view the objective with respect to the phytosociology study of campus along with important community parameters such as frequency (F), density (D) and abundance (AB) of all plant species were calculated following the standard methods. Their relative values (%) such as relative frequency (RF), relative density (RD), relative abundance (RD) as per Phillips (1959) and importance value index (IVI) were also analysed as per the standard method

of the data related to the Trees, Herbs, Shrubs collected from the entire campus of IGNOU in the excel sheet. Importance value index (IVI) of each species was calculated. Basal area was calculated from the perimeter which was measured at a trees breast height. Importance Value is a measure of how dominant a species is there in a given forest or any community area. It is considered to be a standard tool which has mostly been used to inventory a forest by foresters who generally do not inventory a forest by counting all the trees. They rather do it by locating points in the forest and by sampling a specified area around those points. The importance value index ranges between 0 and 300.

For this purpose, the entire study area of campus around 120 acre was divided into 10 segments. In each segment a sampling area of 800 m2 with length and breadth of 40 m and 40 m respectively were measured and laid as temporary plots for quadrat sampling. All plants above 3 m tall were recorded by measuring girth at breast height (GBH) species wise. For bushes, shrubs and saplings a sampling area of 25 m^2 (5 m × 5 m) was plotted inside the abovementioned 1600 m^2 plot. After that the sampling plot of 1 m2 (1 m × 1 m) area was also plotted inside the whole plots to make inventory of all herbaceous vegetation (Figure 2). Entry of Data with all the details like plants names along with their scientific names and number of individuals etc. from each grid/Plot have been completed in Excel sheet to create a database for further analysis.

The main purpose of the phytosociological analysis is to understand floristic vegetation characteristics, to estimate the species richness and diversity which is existing in the study area. The standard protocols of Curtis & McIntosh (1950) have been followed to analyse the density, frequency and abundance. Calculation of density, frequency and abundance need to be applied in the following formula

$$\text{Density} = \frac{\text{Total no. of individuals of a species in all Quadrates}}{\text{Total number of Quadrates studied}}$$

(Density is expressed as the number of individuals per unit area)

$$\text{Relative Density (\%)} = \frac{\text{Density of one species}}{\text{Sum of densities of all the species}} \times 100$$

$$\text{Abundance} = \frac{\text{Total number of individuals of a species in all quadrats}}{\text{Total Number of Quadrats in which Species occurred}}$$

$$\text{Frequency (\%)} = \frac{\text{No. of Quadrats in which a species occurred}}{\text{Total Number of Quadrats studied}} \times 100$$

$$\text{Relative Frequency (\%)} = \frac{\text{Frequency of one species}}{} \times 100$$

$$\text{Relative Dominance (\%)} = \frac{\text{Total basal cover of a species}}{\text{Sum of Frequency of all the species}} \times 100$$

$$\text{Relative Dominance (\%)} = \frac{\text{Total basal cover of a species}}{\text{Sum of basal cover of all the species}} \times 100$$

where

Basal Cover: $GBH^2/ 4pie$

where

GBH= Girth at Breast Height

Note: The basal area of a stand of trees is the sum of the cross-sectional surface areas of each live tree, measured at Girth or circumference of trees, and reported on a per unit area basis. Basal area is a measure of tree density, and widely used in forestry, wildlife, and other natural resource management professions.

Figure 2. Measurement and record of Herbs using Quadrat Method

Importance Value Index (IVI) demonstrates the complete or overall picture of ecological importance of any species in a community. Basic parameters are required to be satisfied to estimate the desired community structure comprising study of frequency, density, abundance and basal cover of species. Importance Value Index (IVI) following Curtis and McIntosh (1951) were calculated as under

Important Value Index (IVI) = Relative density (%) + Relative frequency (%) + Relative basal area

For non-woody species the importance value known as Relative Importance Value (RVI) and calculated as follows (Rout et al., 2018)

RVI= Relative Density + Relative Frequency

RESULTS AND DISCUSSION

In this study the results reveal that field observation data indicates that total of 116 species of plants belonging to 28 different families. Among which 55 species of trees, (Table 1) 29 species of shrubs, (

Table 2) and 32 species of herbs are identified and recorded (

Table 3). The plant diversity shows the following families namely, Apocynaceae, Euphorbiaceae, Meliaceae, Fabaceae, Malvaceae, Poaceae as dominated among others. In these Fabaceae topped the list with 11 Genus which includes total of 14 species followed by Poaceae with 5 genera consisting of 8 species.

Table 1. Phytosociological analysis of Trees species of Campus

Sr.	Name of Plant	Scientific Name	Family	D	RF	AB	IVI
1	Neem	*Azadirachta indica*	Meliaceae	4.50	55.88	8.05	66.63
2	Casurina	*Casuarina equistifolia*	Casurinaceae	1.15	26.47	4.33	28.88
3	Amaltas	*Cassia fistula*	Fabaceae	0.68	32.35	2.09	34.24
4	Amla	*Phyllanthus emblica*	Euphorbiaceae	0.76	23.53	3.25	25.25
5	Desi kikar	*Vachellia nilotica*	Fabaceae	7.94	23.53	33.75	39.10
6	Ber	*Zizyphus Jujube*	Rhamnaceae	0.41	20.59	2.00	22.97
7	Ficus	*Ficus recemosa*	Moraceae	0.44	20.59	2.14	29.39
8	Tecoma	*Tecoma stans*	Bignoniaceae	1.29	38.24	3.38	41.35
9	Kamandal	*Cresentia cujete*	Lecythidaceae	0.97	17.65	5.50	20.08
10	Chilbil	*Holoptelea integrifolia*	Ulmaceae	0.59	32.35	1.82	34.76

11	Bottle Brush	*Callistemon viminalis*	Verbenaceae	1.44	11.76	12.25	15.14
12	Kachnar	*Bauhinia purpurea*	Fabaceae	0.94	32.35	2.91	34.59
13	Dhak	*Butea monosperma*	Fabaceae	0.65	8.82	7.33	12.20
14	Siris	*Albizia lebbeck*	Fabaceae	9.71	41.18	23.57	60.16
15	Sagwan	*Tectona grandis*	Lamiaceae	1.68	17.65	9.50	22.45
16	Maulishri	*Mimusops elangi*	Sapotaceae	0.59	8.82	6.67	11.13
17	Gulmohar	*Delonix regia*	Fabaceae	1.12	14.71	7.60	17.51
18	Silver Oak	*Grevillea robusta*	Proteaceae	0.68	17.65	3.83	19.53
19	Shisham	*Dalbergia Sissoo*	Fabaceae	0.62	26.47	2.33	31.33
20	Jamun	*Syzygium cumini*	Myrtaceae	0.44	20.59	2.14	22.47
21	Date Palm	*Phoenix dactlifera*	Arecaceae	0.03	2.94	1.00	5.68
22	Chakresia	*Chukrasia Velutina*	Meliaceae	0.29	5.88	5.00	7.21
23	Kanel	*Thevetia peruviana*	Apocynaceae	1.71	20.59	8.29	24.05
24	Khirni	*Manilkara hexandra*	Sapotaceae	0.06	5.88	1.00	7.87
25	Maha Neem	*Alianthus excelsa*	Simaroubaceae	0.47	11.76	4.00	14.07
26	Cycas	*Cycas revoluta*	Cycadaceae	0.12	5.88	2.00	7.31
27	Bargad	*Ficus bengalensis*	Fabaceae	0.03	2.94	1.00	11.62
28	Imli	*Tamarindus indica*	Fabaceae	0.15	11.76	1.25	12.88
29	Mango	*Mangifera indica*	Anacardiaceae	0.44	11.76	3.75	14.56
30	Ficus ireland	*Ficus cairnsii*	Moraceae	0.03	2.94	1.00	3.42
31	Guava	*Psidum guajava*	Myrtaceae	0.65	20.59	3.14	22.20
32	Kanak champa	*Pterospermum acerifolium*	Apocynaceae	0.56	8.82	6.33	11.28
33	Mausmi	*Citrus limetta*	Rutaceae	1.00	2.94	34.00	5.07
34	Palm Tree	*Butia capitata*	Palmaceae	0.03	2.94	1.00	9.42
35	Sharifa	*Annona squamosa*	Annonaceae	0.50	11.76	4.25	13.15
36	Raunj	*Vachellia leucophloea*	Fabaceae	1.29	17.65	7.33	21.12
37	Kabuli Kikar	*Prosopis juliflora*	Fabaceae	4.74	14.71	32.20	24.75
38	Orange	*Citrus sinensis*	Rutaceae	0.65	8.82	7.33	10.27
39	Arjun	*Terminalia arjuna*	Combretaceae	0.09	5.88	1.50	8.73
40	Champa	*Plumeria alba*	Apocynaceae	1.65	26.47	6.22	29.65
41	Kusum	*Schleichera oleosa*	Sapindaceae	0.06	2.94	2.00	3.65
42	Ashok	*Polyalthia longifolia*	Annonaceae	1.00	8.82	11.33	11.01
43	Bel Pathar	*Aegel marmelos*	Rutaceae	0.18	8.82	2.00	9.86
44	Kari patta	*Murraya koenigii*	Rutaceae	0.09	5.88	1.50	6.41
45	Mulberry	*Morus alba*	Moraceae	0.06	2.94	2.00	5.01

46	Saptaparni	*Alstonia Scholaris*	Apocynaceae	1.18	32.35	3.64	36.59
47	Jack Fruit	*Artocarpus heterophyllus*	Moraceae	0.09	5.88	1.50	8.09
48	Semal	*Bombax ceiba*	Bombaceae	0.26	5.88	4.50	6.83
49	Chandan	*Santalum album*	Santalaceae	0.18	5.88	3.00	7.11
50	Peepal	*Ficus Religiosa*	Moraceae	0.47	14.71	3.20	21.38
51	Kadam	*Neolamarckia cadamba*	Rubiaceae	0.09	5.88	1.50	10.34
52	Royal Bottle palm	*Roystonea Regia*	Arecaceae	0.50	5.88	8.50	12.54
53	Pilkhan	*Ficus infectoria*	Moraceae	0.35	5.88	6.00	9.66
54	Mahua	*Madhuca longifolia*	Sapotaceae	0.09	2.94	3.00	4.19
55	Phalsa	*Grevia asiatica*	Malvaceae	0.21	5.88	3.50	8.56

RF=relative Frequency, D=density, F = Frequency, AB= Abundance, IVI= Importance value index

Table 2. Phytosociological analysis of shrub species of Campus

Sr.	Name of Plant	Scientific Name	Family	D	F	AB	RVI
1	China Palm	*Livistona chinensis*	Arecaceae	0.19	66.67	5.00	4.40
2	Bottle Palm	*Hyophorbe lagenicaulis*	Arecaceae	0.08	33.33	1.00	7.91
3	Babuna	*Matricaria chamomilla*	Asteraceae	9.85	77.78	42.67	51.49
4	Golden Duranta	*Duranta repens*	Verbenaceae	1.88	58.33	12.25	20.82
5	Single Chandini	*Matricaria chamomilla*	Apocynaceae	0.15	50.00	2.00	8.14
6	Double Chandini	*Taberaemontana divaricata*	Apocynaceae	0.31	66.67	4.00	8.58
7	Baugainvilliea	*Bougainvillea spinosa*	Nyctaginaceae	1.04	60.00	5.40	22.23
8	Nikotium	*Leucophyllum frutenscens*	Scrophulariaceae	0.27	66.67	3.50	8.47
9	Morphanki	*Platycladus orientalis*	Cuppressaceae	0.12	50.00	1.50	8.03
10	Phlox	*Phlox paniculate*	Polemoniaceae	2.12	33.33	27.50	13.80
11	Hibiscus	*Hibiscus rosa-sinensis*	Malvaceae	0.73	66.67	2.71	29.03
12	Marigold	*Tagetes erecta*	Asteraceae	5.19	66.67	33.75	30.37
13	Calendula	*Calendula officinalis*	Oleaceae	1.31	66.67	17.00	11.47
14	Guava	*Psidum guajava*	Myrtaceae	0.04	33.33	1.00	3.96
15	Kanel	*Thevetia peruviana*	Apocynaceae	0.62	75.00	4.00	17.16
16	Saptaparni	*Alstonia Scholaris*	Apocynaceae	0.12	66.67	3.00	4.18
17	Tecoma	*Tecoma stans*	Bignoniaceae	0.50	100.00	13.00	5.29
18	Jungli Ber	*Zizyphus nummularia*	Rhamnaceae	0.92	83.33	12.00	10.36
19	Potush	*Lantana camara*	Verbenaceae	1.42	73.33	7.40	23.34

20	Lasaura	*Cordia dichotoma*	Boraginaceae	0.04	33.33	1.00	3.96
21	Poe/Malabar spinach	*Basella alba*	Basellaceae	0.04	33.33	1.00	3.96
22	Periwinkle	*Catharanthus roseus*	Apocynaceae	0.12	66.67	3.00	4.18
23	Lily	*Lillum candidium*	Liliaceae	1.27	33.33	33.00	7.51
24	Ban Tulsi	*Croton bonplandianus*	Euphorbiaceae	0.08	33.33	2.00	4.07
25	Makoi	*solanum nigrum*	Solanaceae	0.04	33.33	1.00	3.96
26	Firebush	*Hamelia patens*	Rubiaceae	0.04	33.33	1.00	3.96
27	Jatropha	*Jatropha curcus*	Euphorbiaceae	0.04	33.33	1.00	3.96
28	Rose	*Rosa alba*	Rosaceae	5.69	75.00	37.00	31.81
29	Lemon	*Citrus lemon*	Rutaceae	0.46	66.67	3.00	16.72

D=density, F = Frequency, AB= Abundance, RVI= Relative value index (Raut et al 2018)

Table 3. Phytosociological analysis of herb species of Campus

Sr.	Name of Plant	Scientific Name	Family	D	F	AB	RVI
1	Dhoob Ghas	*Cynodon dactylon*	Poaceae	22.38	58.00	38.00	68.67
2	Jungli Methi	*Sida acuta*	Fabaceae	16.15	62.00	42.00	44.88
3	Badi Doodhi	*Euphorbia hirta*	Euphorbiaceae	1.46	30.00	6.33	23.66
4	Choti Doodhi	*Euphorbia thymifolia*	Euphorbiaceae	8.00	50.77	16.00	53.18
5	Baboona	*Matricaria chamomilla*	Asteraceae	5.08	46.67	14.67	36.63
6	Oxalis	*Oxalis corniculata*	Oxalidaceae	9.92	49.33	17.20	61.64
7	Sada Hari	*Bidens pilosa*	Asteraceae	3.38	41.54	5.87	59.04
8	Jungli Petonia	*Ruellia nudiflora*	Acanthaceae	6.04	46.67	52.33	13.94
9	Nal velai	*Cleome gynandra*	Cleomaceae	0.19	20.00	5.00	3.92
10	Centipede Grass	*Eremochloa ophiuroides*	Poaceae	11.54	53.85	23.08	54.59
11	Creeping tick	*Desmodium trifolium*	Fabaceae	4.62	45.00	30.00	17.22
12	Jungli Ajwain	*Seseli indicum*	Apiaceae	1.92	37.78	5.56	35.38
13	Kateli	*Argemon maxicana*	Papaveraceae	2.62	43.33	11.33	24.12
14	Gajar Ghas	*Parthenium hysterophorus*	Asteraceae	17.27	58.67	29.93	64.56
15	Gathila Ghas	*Digitaria sanguinalis*	Poaceae	1.46	60.00	19.00	8.27
16	Cholai	*Amaranthus cruentus*	Amaranthaceae	1.46	66.67	12.67	12.12
17	Pathar chatta	*Kalanchoe pinnata*	Crassulaceae	0.27	40.00	3.50	7.80
18	Jungli Bathua	*Chenopodium alba*	Amaranthaceae	6.77	66.67	58.67	14.23
19	Sada Hari	*Portulaca olearaecea*	Asteraceae	2.88	50.00	37.50	8.84
20	Tetar	*Ambrosia artemisiifolia*	Asteraceae	3.08	44.00	8.00	39.68
21	Jungli Sarsoon	*Sinapis arvensis*	Brassicaceae	14.65	68.57	54.43	32.75

22	Jungli Cholai	*Amaranthus Viridis L.*	Amaranthaceae	3.31	46.67	9.56	35.93
23	Motha Ghas	*Cyprus rotundus*	Poaceae	8.12	42.00	21.10	41.69
24	Jungli Palak	*Rumex denatus*	Amaranthaceae	1.85	56.00	9.60	19.96
25	Jungli jai	*Avena fatula L.*	Poaceae	3.58	43.33	15.50	24.50
26	Nutsedge	*Cyprus difformis*	Poaceae	2.08	60.00	27.00	8.52
27	Ghehunsa	*Phalaris minor*	Gramineae	6.15	56.00	32.00	21.68
28	Jungli Karonda	*Carissa spinarum*	Apocynaceae	0.23	40.00	6.00	3.94
29	Latjeera	*Achyranthes aspera L.*	Amaranthaceae	6.15	55.00	20.00	33.22
30	Jungli Pudina	*Ageratum conyzoids*	Lamiaceae	20.31	64.00	52.80	46.53
31	Jungli rice	*Echinochloa colona*	Poaceae	1.38	40.00	7.20	19.78
32	Marua Ghas	*Origanum majorana*	Poaceae	6.00	51.43	31.20	21.62

D=density, F = Frequency, AB= Abundance, RVI= Relative value index (Raut et al 2018)

Among the recorded quadrate information, tree species dominated around the study area with dry deciduous habitat. Similar Plants such as *Azadirachta indica*, *Casuarina equistifolia, Cassia fistula; Phyllanthus emblica, Vachellia nilotica, Ficus recemosa, Delonix regia and Tecoma stans* species are top canopy trees present in abundant number. In the ground layer *Taberaemontana divaricata, Bougainvillea spinosa* and similarly other species were also recorded in which some of them are woody and economically important plants. In addition to this, individual species were counted, *Cynodon dactylon, Sida acuta, Euphorbia hirta, Euphorbia thymifolia, Matricaria chamomilla, Oxalis corniculata, and Bidens pilosa.*

Further, *Azadirachta indica* shows highest in number followed by *Albizia lebbeck* species, but the other species are sparsely distributed. Frequency, density and abundance of floral distribution were calculated, it shows 10-80% of frequency, density 0.1-4.8 and abundance of species shows *Albizia lebbeck* 24 and number of regenerations in the campus. Similarly, herbs are more in number compared to shrubs climbers. Further abundance of trees, shrubs, herbs also recorded in the campus. The most common plant species based on importance value in tree, shrub and herb layers were found to be *Azadirachta indica* (IVI-66.87), *Matricaria chamomilla* (RVI-51.89) and *Cynodon dactylon* (RVI- 68.67) respectively.

It is necessary here to mention various studies related to the phytosociology of the tropical forests of India and also other parts of the world (Chandran et al., 2020; Dar & Sundarapandian, 2016; Durairaj & Panneerselvam, 2014; Garai et al., 2013; Iyagin & Adekunle, 2017; Rout et al., 2018; Udayakumar & Sekar, 2015) which have significantly put

their efforts to understand and compare the values and its importance regarding the sustainable and judicious consumption of our biodiversity which is under severe threat and over exploitation.

In conclusion, the present study has documented the prevalence of the managed and natural forest areas both among the urban location. It further confirms that these urban patches have managed to survive up to the modern times but are harassed for continued existence now. Despite their disturbing conservation status, the biodiversity conserved in them is significantly affluent, diverse and valuable. IGNOU University campus is located near Asola Wildlife Sanctuary which supports valuable fauna and flora diversity of tropical forest. Considering over all phytosociological status of IGNOU campus New, Delhi India, it reveals that there is a big gap between the values of various parameters like IVI, density, frequency and abundance. There are many tree species having very low values of IVI and other parameters and these species deserve more attention. This study, concludes that, *Azadirachta indica* juss. *Albizia lebbeck* (Roxb.) Taub, *Vachellia nilotica*, are the dominant tree species. On the other hand*, Cynodon dactylon, Sida acuta, Euphorbia hirta, Euphorbia thymifolia, Matricaria chamomilla*, and some other are abundantly distributed in the ground layer along with predominant *Taberaemontana divaricata, Bougainvillea spinosa* and *Lantana camara var. aculeata* (L.) Moldenke in shrub flora. Further, this area exhibits good regeneration status, and offer opportunities to investigate natural as well as managed dynamics and changes in species relative abundances in the future. Although the study site is protected, this managed area is experiencing destruction because of the frequent visits of students, staff from all over for their work. Further, educating the resident people and with effective awareness program implementation of the rules would be helpful in decreasing the depletion of natural vegetation and add biodiversity near campus avenues. The area of IGNOU is adjoined by Asola forest having rich floral diversity supporting microclimate as well as diversity makes faunal rich area and promotes favourable environment fit for research in the associated fields. so, the present study will be more crucial in terms of baseline data generation and documentation. Hopefully this may be helpful to estimate the ecological footprint data in maintaining campus ecosystems in the near future.

REFERENCES

Anjali, K., Khuman, Y., & Sokhi, J. (2020). A Review of the interrelations of terrestrial carbon sequestration and urban forests. AIMS Environmental Science, 7(6), 464–485. https://doi.org/10.3934/environsci.2020030

Anjali, K., Khuman, Y., Sokhi, J., & Nigam, A. (2022). Assessment of Biomass and Carbon Stock of Trees within the Campus of IGNOU, New Delhi (India). Sustainability, Agri, Food and Environmental Research, 12(1), 719–726.

Chandran, M. V., Gopakumar, S., & Mathews, A. (2020). Comparative phytosociological assessment of three terrestrial ecosystems of Wayanad Wildlife Sanctuary, Kerala, India. Journal of Threatened Taxa, 12(5), 15631–15645. https://doi.org/10.11609/jott.4754.12.5.15631-15645

Corlett, R. T. (2016). Plant diversity in a changing world: Status, trends, and conservation needs. Plant Diversity, 38(1), 10–16. https://doi.org/10.1016/j.pld.2016.01.001

Curtis, J. T., & McIntosh, R. P. (1950). The Interrelations of Certain Analytic and Synthetic Phytosociological Characters. Ecology, 31(3), 434–455. https://doi.org/10.2307/1931497

Dar, J. A., & Sundarapandian, S. (2016). Patterns of plant diversity in seven temperate forest types of Western Himalaya, India. Journal of Asia-Pacific Biodiversity, 9(3), 280–292. https://doi.org/10.1016/j.japb.2016.03.018

Durairaj, R., & Panneerselvam, A. (2014). Flora of a veeriya vandayar memorial sri pushpam college campus. Journal of Biological & Scientific Opinion, 2(4), 261–266. https://doi.org/10.7897/2321-6328.02458

Garai, M., Kar, D., Palit, D., & Banerjee, A. (2013). Phyto-Sociological Assessment of Vegetation of Durgapur Government College Campus, Durgapur, West Bengal, India Mousumi. Int. Journal of Engineering Research and Applications, 3(6), 835–840.

Howe, H. F. (2014). Diversity Storage: Implications for tropical conservation and restoration. Global Ecology and Conservation, 2, 349–358. https://doi.org/10.1016/j.gecco.2014.10.004

IGNOU. (2020). IGNOU Profile 2020, Indira Gandhi National Open University.

Iyagin, F. O., & Adekunle, V. A. J. (2017). Phytoecological studies of some protected and degraded forest areas of Lowland Humid forest, Ondo state Nigeria: a Comparative approach. Tropical Plant Research, 4(3), 496–513. https://doi.org/10.22271/tpr.2017.v4.i3.066

Kant, N., & Anjali, K. (2020). Traditional Ecological Knowledge (TEK): A Strategic Resource. In Handbook of Research on Protecting and Managing Global Indigenous Knowledge Systems. IGI Global, USA.

Kershaw, K. A. (1973). Quantitative and dynamic plant ecology. Edward Arnold.

Konatowska, M., & Rutkowski, P. (2019). Phytosociology—A Useful Tool for the Assessment of Past and Future Human Impacts on Plants and Forest Ecosystems. Journal of

Biosciences and Medicines, 07(11), 154–163. https://doi.org/10.4236/jbm.2019.711014

Krishnamurthy, Y. L., Prakasha, H. M., Nanda, A., Krishnappa, M., Dattaraja, H. S., & Suresh, H. S. (2010). Vegetation structure and floristic composition ofa tropical dry deciduous forest in BhadraWildlife Sanctuary, Karnataka, India. Trop Ecol, 51, 235–246.

Misra, R. (1968). Ecology work book. Oxford and IBH.

Narayana, J., Savinaya, M. S., Manjunath, S., & Rudresh, S. (2017). Distribution and diversity of flora and fauna in and around Kuvempu University campus, Bhadra Wildlife Sanctuary range, Karnataka. Int J Plant Anim Environ Sci, 7(2), 89–99. https://doi.org/10.21276/Ijpaes

Nayak, S. R., Kant, N., & Anjali, K. (2020). Strategy of using ICT in ODL to disseminate higher education in tribal communities: a case of MP, India. Asian Association of Open Universities Journal, 15(2), 189–206. https://doi.org/10.1108/AAOUJ-05-2020-0029

Parthasarathy, N. (2010). Flora of Pondicherry University Campus: A Pictorial Guide to the Wild and Cultivated Plant Biodiversity. Department of Ecology and Environmental Sciences, School of Life Sciences, Pondicherry Univ.

Phillips, E. A. (1959). Methods of Vegetation Study. In OALib. Holt, Rinehart and Winston, New York. https://doi.org/10.4236/OALIB.1107653

Raghubanshi, A. S., & Tripathi, A. (2009). Effect of disturbance, habitat fragmentation and alien invasive plants on floral diversity in dry tropical forests of Vindhyan highland: A review. Tropical Ecology, 50, 57–69.

Rao, D., Pragada, P., & Kumar, O. (2015). Plant biodiversity and phytosociological studies on tree species diversity of Khammam district, Telangana state, India. Journal of Pharmaceutical Sciences and Research, 7, 518–522.

Raturi, G. P. (2012). Forest Community Structure along an Altitudinal Gradient of District Rudraprayag of Garhwal Himalaya, India. Ecologia, 2(3), 76–84. https://doi.org/10.3923/ecologia.2012.76.84

Rout, S. D., Panda, S. K., & Panda, T. (2018). Phytosociological and floristic evaluation of Kuldiha Wildlife Sanctuary, Odisha, India. Tropical Plant Research, 5(3), 419–423. https://doi.org/10.22271/tpr.2018.v5.i3.051

Sundarapandian, S. M., Amritha, S., Gowsalya, L., Kayathri, P., Thamizharasi, M., Dar, J. A., Srinivas, K., & Sanjay Gandhi, D. (2014a). Biomass and carbon stock assessments of woody vegetation in Pondicherry University campus, Puducherry. International Journal of Environmental Biology, 4(2), 87–99.

Sundarapandian, S. M., Amritha, S., Gowsalya, L., Kayathri, P., Thamizharasi, M., Dar, J. A., Srinivas, K., & Sanjay Gandhi, D. (2014b). Estimation of biomass and carbon stock of woody plants in different land-uses. For Res Open Access, 3(1), 1–5.

Udayakumar, S. M., & Sekar, T. (2015). Estimation of urban tree biomass in Pachaiyappa's College, Chennai, India. Scholars Academic Journal of Biosciences, 3(4), 338–347.

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