

ESTIMATION OF TREE SPECIES DIVERSITY INSIDE CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, PARALAKHEMUNDI CAMPUS, BY USING SIMPSONS DIVERSITY INDEX

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Abstract: Tree population is the fundamental source to stabilize the changes of the local environment, due to the increase in population. Urbanization is the cause to alter the habitat, climate, hydrology, and primary production of a local area. This paper has attempted to present a list of tree species and its diversity in the university campuses of, Centurion University of Technology and Management, Paralakhemundi. Estimation of richness of trees, dominant trees in the campuses and estimated Tree Diversity Index using Simpson's Diversity Index were determined to draw a comparative inference. A total of 2795 numbers of forest trees, along with plantation tree and horticultural species were recorded inside the University campus. Data collection was done by dividing the study area into several plots, identification and counting of the tree species was done on each plot. A total of 39 woody tree species including bamboo, belonging to 20 families is represented in the study area. A comparative study revealed that Teak, belonging to family Lamiaceae has the largest tree population and high diversity index than other families. The second most dominant species is Mango followed by coconut and other largely occurring tree species is Devil's tree, Calophyllum, Debdaru, Jackfruit, Acacia and Cashew.

Keywords: Phytosociology, Simpson's index, Species, Tree diversity

INTRODUCTION

Tropical forests are often referred to as one of the most species-diverse terrestrial ecosystems. Their immense biodiversity generates a variety of natural resources which help to sustain the livelihood of local communities (Mishra, 1968). Trees provide both direct and indirect benefits to the humans, starting from the wood, bark, leaves, root every part of the tree is having high value for the subsistence of people living in rural and tribal areas. Most of the tribes of rural areas basically depend on Non-Timber Forest Products (NTFP) for their livelihood and it acts as a backbone to them. Women from different tribes in Odisha are mostly involved in NTFPs collection and marketing, generating a huge income (Panigrahi *et al.* 2019). However, in recent days, there is rapid depletion of forest covers, which results in loss of these valuable trees, thereby affecting the livelihood and culture of the tribes. The ability of a tree to cope with the harsh environmental condition of an area is the most important criterion to reduce the climatic change, but the consideration of tree should be based on the aesthetic value of the tree, the landscaping objective, and the health of the urban tree population, the seedling availability, the site condition, the planting techniques, and the maintenance management (Li *et al.* 2011). Especially tree species richness in an area facilitates the opportunity for the other living organism to develop. Because trees have a very long life span, good crown cover to nest, breed and fruits to eat etc. comparatively urban trees have very vital role in urban biodiversity (Nodza *et al.* 2014). With an

estimated 3000 wild plant species, Odisha is considered as biodiversity rich state in India. While more than 100 species are listed as classified as threatened plants.

Odisha is a rich source of forest produce and the forest cover is 61,204.17sq km which constitutes 39.31% of the state's geographic area (FSI, Report). The university is located in, R. Sitapur, Paralakhemundi, Gajapati, Odisha mainly covered with rugged forest and mountainous terrain of Eastern Ghats. So keeping in view the importance of the study in this paper we have assessed the species composition of Centurion University of Technology and Management, campus based on the Simpson's species diversity richness formula so to establish the relationship between vegetation structure and conservation strategy. The aim of the project is to understand tree species richness in the educational institution. We have studied species richness based on the Simpson's species diversity richness formula in Centurion University of Technology and Management, (<http://www.countrysideinfo.co.uk/simpsons.htm>).

MATERIALS AND METHODS

Site Description

The district is situated between 180 45' and 190 38' North latitude and 830 56' and 840 29' East and longitude respectively. The average elevation of hills ranges from 500 to 1200m above mean sea level. The temperature ranges from 18 to 35° in the district which favours a great diversity in the forest. The Vansadhara River is the major river flowing in this

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region. The district is situated in southern Odisha, covering 44% of forest cover (Swain, and Mohapatra, 2013). The climate of the district is tropical with hot and dry summer, cold winter and erratic rainfall in Monsoon, which enhance the possibilities of more tree cover in this region.

Phytosociological studies:

This study is based on intensive field surveys conducted in Centurion University of technology and management, Paralakhemundi. For identification and counting of tree species, the study area was divided into different sampling plots. Trees were enumerated in 50 x 20m quadrats were laid randomly for recording tree vegetation respectively. Counting of individual tree species was extensively carried out by dividing the researchers into two groups. The grouping was done in order to overcome any possible error or mistake at the time of survey of the present investigation. All the data are exploited in the excel spread sheet and according to the family of tree species, the Simpson's formula has been formulated. The occurrence of species was strictly taken into account. Tree species present in higher numbers, i.e., more than 1, was taken into consideration for determining the Simpson diversity index. Tree species whose number was 1 or less was considered to have no diversity (Anandan *et al.* 2014).

Simpson's Species Diversity Index:

Simpson's Diversity Index is a measure of diversity which takes into account the number of species present, as well as the relative abundance of each

species. The formula for calculating D is presented as:

$$D = 1 - \left(\frac{\sum n(n-1)}{N(N-1)} \right)$$

Where n=the total number of organisms of each individual species

N=the total number of organisms of all species

The value of **D** ranges from 0 to 1. With this index, 0 represents infinite diversity and, 1 for no diversity. That is, the bigger the value the lower the diversity.

RESULTS AND DISCUSSION

Based on the survey of the campus a total of 2795 numbers of forest trees, along with plantation tree and horticultural species were recorded. The result of this survey recorded a total of 39 woody tree species including bamboo, belonging to 20 families in the study area (Table 1). Of all the families encountered, the maximum number of tree found is Teak tree with a number of 936 under the family Lamiaceae followed by Mango tree with a number of 588 under the family Anacardiaceae. Two families have less than ten species each and five families have more than ten species each. Of these, the family Lamiaceae has the highest frequency (959 numbers of tree species representing 60.40% of total species encountered) occurring in all the plots followed by Anacardiaceae which consists of 630 number of tree species (30.45%) (Table 2). Nine trees are less than ten in number including *Bauhinia variegata* that is 3.

Table 1. Total number of species per family encountered in the study area

SI. No.	Tree Species	Number
1	Lamiaceae	959
2	Anacardiaceae	630
3	Arecaceae	344
4	Fabaceae	246
5	Apocynaceae	221
6	Moraceae	133
7	Calophyllaceae	52
8	Myrtaceae	34
9	Annonaceae	33
10	Sapotaceae	28
11	Combretaceae	24
12	Rubiaceae	21
13	Malvaceae	14

14	Rutaceae	12
15	Meliaceae	12
16	Moringaceae	11
17	Bignoniaceae	10
18	Araucariaceae	7
19	Sapindaceae	4

Trees identified are counted individually and the number is recorded. At the end the species diversity is measured by using Microsoft Excel spread sheet and the Simpson's formula has been formulated

(Table 2). Seven tree families having more than 200 trees is taken into consideration for the D value comparison and presented in the form of chart.

Table 2. D value is between 0-1. Result nearer to 0.

SI No	Species	D value
1	Lamiaceae	0.05
2	Fabaceae	0.84
3	Moraceae	0.71
4	Anacardiaceae	0.13
5	Apocynaceae	0.23
6	Myrtaceae	0.51
7	Combretaceae	0.49

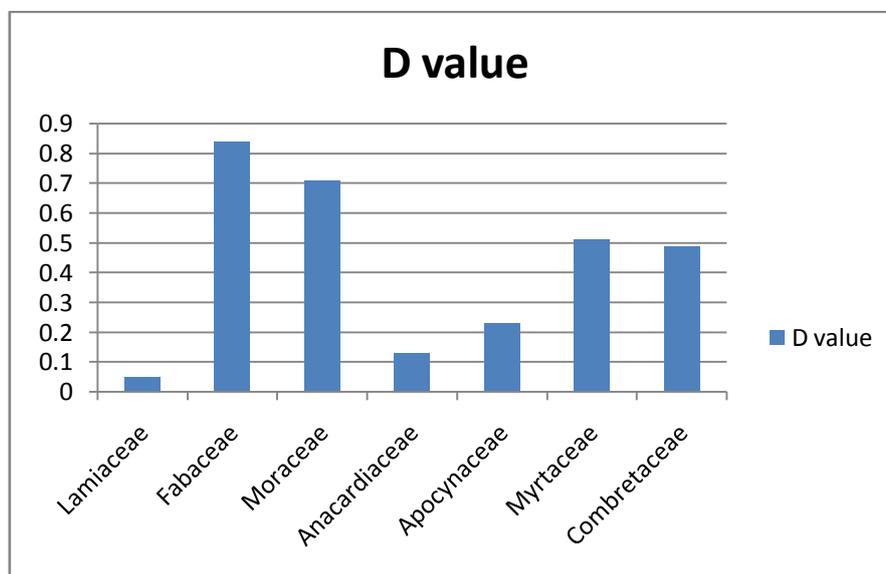


Fig1. D value is between 0-1. Result nearer to 0.

The D value is 0.05, which indicates a greater diversity in Lamiaceae family with a highest number of tree species inside the campus i.e 959 numbers followed by Anacardiaceae, D value is 0.13 with 630 numbers of trees. The lowest diversity found in the family Fabaceae with 246 numbers of trees.

Result nearer to 0 shows rich in diversity and result nearer to 1 show poor in diversity Fig.1. The D value is graphically represented in Fig. 1. The types of tree species present inside the campus and its uses are listed below in Table 2.

Table 3. List of Species and its Uses

Sl.No.	Common Name	Scientific Name	Family	Uses
1.	Kathabadam	<i>Terminalia catapa</i>	Combretaceae	Scaffoldings, rafters temporary bridges
2.	Saguan	<i>Tectona grandis</i>	Lamiaceae	Furniture and construction of boat, carving, general carpentry.
3.	Arjuna	<i>Terminalia arjuna</i>	Combretaceae	Beams , rafters, posts
4.	Tamarind	<i>Tamarindus indica</i>	<i>Caesalpiaceae</i>	Country liquor, gum, edible fruit
5.	Jamun	<i>Syzygium cumini</i>	Myrtaceae	Fodder, country liquor, furniture, agricultural implements, edible fruit
6.	Mahogany	<i>Swetenia macrophyla</i>	Meliaceae	Furniture, Paper making and cabinet work
7.	Patali	<i>Sterospermum colais</i>	Bignoniaceae	Avenue plantation
8.	Kusum	<i>Schleichera oleosa</i>	Sapindaceae	Gum, lac tree
9.	Ashoka	<i>Saraca asoca</i>	Fabaceae	Timber
10.	Rain tree	<i>Samanea samman</i>	Fabaceae	Fruit tree
11.	Bijasal	<i>Pterocarpus marsupium</i>	Fabaceae	House construction, furniture, gum
12.	Guava	<i>Psidium guajava</i>	Myrtaceae	Fruit tree
13.	Karanja	<i>Pongamia pinnata</i>	Fabaceae	Tooth brush, body or massage oil
14.	Debdaru	<i>Polyalthia longifolia</i>	Annonaceae	Ornamental
15.	Katha Champa	<i>Plumeria alba</i>	Apocynaceae	Flowering plant
16.	Kadamba	<i>Neolamarckia cadamba</i>	Rubiaceae	Ornamental
17.	Curry tree	<i>Murraya koengii</i>	Rutaceae	Leaves are used in cooking
18.	Drumstick tree	<i>Moringa oleifera</i>	Moringaceae	Pulp for writing paper, news print, calico printing
19.	Baula	<i>Mimusops elengi</i>	Sapotaceae	Ornamental, shade tree in gardens and along roads, cabinets making
20.	Mango	<i>Mangifera indica</i>	Anacardiaceae	Toys, packing boxes, panels for door and window
21.	Subabul	<i>Leucaena leucocephala</i>	Fabaceae	hedge plant, green manure, food for animal, timber and as a bio energy crop
22.	Gambhari	<i>Gmelina arborea</i>	Lamiaceae	Furniture, agricultural implements, musical instruments, building, firewood
23.	Gliricidia	<i>Gliricidia seepium</i>	Fabaceae	live fencing, fodder, firewood, green manure, intercropping
24.	Peepal	<i>Ficus religiosa</i>	Moraceae	Ornamental tree in gardens and park
25.	Krusnachuda	<i>Delonix regia</i>	Fabaceae	agricultural implements; handles for carpentry tools, combs
26.	Sissoo	<i>Dalbergia sissoo</i>	Fabaceae	Plywood, railway sleepers,

				sports goods.
27.	Coconut	<i>Cocos nucifera</i>	Arecaceae	used as timber to make houses and boats, in bridge building, furniture, drums, and canoes.
28.	Sana chakunda	<i>Casia seamea</i>	Fabaceae	Diuretic, hemorrhoids, gout, laxative, rheumatism, diabetes.
29.	Polanga	<i>Callophyllum innophyllum</i>	Calophyllaceae	Shipbuilding and timber industries
30.	Palasa	<i>Butea monosperma</i>	Fabaceae	Lac host, pulp wood, cups and bidi wrapping, gum, fodder
31.	Seemul	<i>Bombax ceiba</i>	Malvaceae	Match industry, packing cases
32.	Kanchana	<i>Bauhinia variegata</i>	Fabaceae	Ornamental and aesthetic value
33.	Bamboo	<i>Bambusa vulgaris</i>	Poaceae	Flooring, roof tiles, panelling, and walls, flutes, fishing rods
34.	Neem	<i>Azadirachta indica</i>	Meliaceae	Tooth brush, body or massage oil, insect and pest repellent, bio-pesticide.
35.	Jackfruit	<i>Artocarpus heterophyllus</i>	Moraceae	Building construction, structural work, paving and furniture
36.	Araucaria	<i>Araucaria heterophylla</i>	Araucariaceae	Ornamental plant, avenue purpose
37.	Kaju	<i>Anacardium occidentale</i>	Anacardiaceae	Cashew shell oil and cashew apple
38.	Devil tree	<i>Alstonia scholaris</i>	Apocynaceae	Households utensils, Plantation tree
39.	Acacia	<i>Acacia mangium</i>	Fabaceae	Furniture, doors and window frames
40.	Acacia	<i>Acacia auriculoformis</i>	Fabaceae	Paper, furniture, tools, ornamental

The table 3. shows the tree species present in the campus and the beneficial uses of them. By collecting the non timber forest product the local people get revenue which can improve their living standard and also the tree provide shelter for different birds species, insects and become a host for the complex microhabitats. Tree strengthens the distinctive character of a place and encourage local pride. (Wiryo *et al*, 2018). The tree species present inside the campus helps to reduce the wind speeds and cool the air and create a pleasant environment for the campus people. The canopies of tree act as a physical filter, trapping dust and absorbing pollutant from the air and it also provide shade from solar radiation and reduce noise.

CONCLUSION

From the study the tree planting tradition of Centurion University can be understood. The

campuses are fully occupied by ornamental trees and commercial trees. This is a unique feature of our campus tradition. The occupancy of individual tree species differs in campus has its own tradition of maintaining greenery in and around the campus. In future the university may plan to plant number of trees species wherever chance are there. Also must take effort to have diversified tree species which will provide peculiar appearance to the university. The findings of this study could also help in proper management of vegetation which will lead to more sustainability and to conserve regional diversity.

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