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Preliminary analysis of fungal macroflora in Madras Christian college vegetation and ecological aspect

Mirfath Jahan, Jeya Rathi J., Kumar M. and Santhosh S.

Department of Botany, Madras Christian College (Autonomous), East Tambaram, Chennai, India

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ABSTRACT

The present study deals with the mushroom vegetation in rainy season of Madras Christian College campus. For the study, belt transect quadrant method is applied. The recorded quadrant sampling value leads to occurrence of 41 mushrooms, their frequency percentage (28.78 %), abundance (10.23), density (3.1), evenness, Simpsons Index and Shannon - Weiner Index were studied. The values of frequency, abundance and density were calculated using Raunkiaer's formulae. The study of abiotic factors like temperature, pH, soil texture etc, was also carried out. It has been concluded that the type of mushroom vegetation is heterogenous. Thus, the present study shows moderate mushroom diversity.

Key words : *Fungal macroflora, Mushroom, Simpsons index*

Introduction

Mushrooms serve as a major source of food for many animals, insects and flies. The number of recorded mushroom species from India in majority of the places has not yet been explored. The mushrooms occur in a wide variety of habitats like grassland, forest, mangroves and coastal sand dunes as well as the substrates (soil, leaf litter, wood and dung). Mushrooms have been food for human from the ancient times. for example Charles Darwin found a tribe **(Tierra del Fuego)** who used fresh or dried mushrooms with many vegetable and as a part of their diet routine and also for its high medicinal values (Karun and Sridhar, 2015). Ecology is the study of total relationship between the organisms in an environment. Mushrooms have got many uses both ecologically and economically. The study of biodiversity of mushroom community is more significant for observing the effects of natural and artificial disturbance. The purpose of the present survey is to identify and to record the diversity of mushrooms in Madras Christian College campus (MCC), using quadrant method.

Study area

This study was conducted in Madras Christian College campus , Tambaram [80° 7′ E, 12° 55′ N] extending over 306 acres of land situated about 25 km South West of Chennai city. Was mapped using the Global Positioning System (GPS).

The campus composed of the vast diversity of shrubs, herbs, trees, algae and fungi. The mushroom diversity of a particular habitat is not possible to count as such, so we used sampling square quadrant technique to count the mushroom population.
***Belt transect*:** Belt transect method was used to study the diversity of mushroom (20m X 10m size) in different spots. Several field visits have been made to study the mushroom distribution patterns and to know its ecological status. The raw data were recorded in the Quadrant Data Sheet (Figure a).

Data analysis: Belt transect analysis was done within the study site (Figure c, d). The analytical

Fig. a. Field analysis with data sheet **b.** Soil thermometer **c** and **d.** Data analysis using belt transect method

characters of the mushroom community were studied like frequency, density, abundance and frequency percentage with the help of Raunkiaer's formulae. Mushrooms collected in 25 different sample sites under 5 quadrants were also collected for identification (Kalac and Svoboda, 2000).

Field parameters: **A**biotic factors like temperature, light intensity, humidity, pH of air and soil were monitored from the quadrant area (Figure b).

Collection of mushrooms: Specimens were collected

Table 1. Values of Mushroom Diversity Index

	Number of Quadrants				
Index	1	2	3	4	5
Simpsons Index	0.85	0.86	0.49	0.8	0.77
Shannon-weiner Index	2.4	2.3	1	1.8	1.3
Evenness	1	0.95	0.41	0.75	0.54

Table 2. Physical Parameters of the Study Area

Quadrant	Light intensity (lux)	Soil pH	Soil temperature (°C)	Temperature (°C) Max	Min	Relative Humidity (%)
I	753.6	6.7	27.28	27.6	26.2	79.5
II	712.5	6.8	24.7	27.2	25.25	88.25
III	996.35	6.6	27.5	28.2	24	81.5
IV	416	6.7	26.2	26.5	25.5	79.5
V	445	6.7	26.4	29.6	24.6	78.3

in its mature stage and were carefully observed (Kornerup and Wanscher's, 1978) for identification. The mushroom diversity was studied after an average rainfall of about 140 cm (October to December). Regular field visit were undertaken to collect the different types of mushrooms from the study area.

Herbarium: The specimens collected were then kept in a hot air oven at 50 °C for one or two days. The mushroom specimens were then preserved using Silica gel and Naphthalene balls in air tight plastic boxes and the herbarium specimens are deposited in the Mycology Lab, Department of Botany, Madras Christian College, Chennai.

Table 3. Analysis of quadrant using Raunkiaer's formulae

S. No.	Name of the mushroom	Number of quadrant in which species occurred	Frequency percentage	Frequency class	Density	Abundance	Relative density
1	*Polyporus alveolaris*	1	20	A	0.8	4	0.0062
2	*Microporus xanthopus*	2	40	B	2.2	5.5	0.0172
3	*Ganoderma lucidum*	1	20	A	0.2	1	0.0015
4	*Xylaria sps.*	1	20	A	5	25	0.0392
5	*Omphalotus olivascens*	1	20	A	1.8	9	0.0141
6	*Lentinus squarrosulus*	1	20	A	1	5	0.0078
7	*Termitomyces umkowaani*	1	20	A	0.6	3	0.0047
8	*Lenzites sps.*	1	20	A	0.4	2	0.0031
9	*Geastrum triplex*	1	20	A	0.2	1	0.0015
10	*Auricula judae*	1	20	A	1.8	9	0.0141
11	*Schizophyllum commune*	2	40	B	33	82.5	0.2590
12	*Marasmius sps.*	2	40	B	8.6	21.5	0.0675
13	*Ramaria sps.*	1	20	A	3.2	16	0.0251
14	*Marasmius haematocephalus*	1	20	A	3.6	18	0.0282
15	*Polyporus grammocephalus*	2	40	B	2	5	0.0156
16	*Daldinia concentrica*	2	40	B	8	20	0.0627
17	*Trogea infundibuliformis*	1	20	A	2.6	13	0.0204
18	*Calocera cornea*	2	40	B	6.42	16	0.0502
19	*Leucocoprinus flagilissimus*	1	20	A	1.2	6	0.0094
20	*Pycnoporus cinnabarinus*	1	20	A	0.6	3	0.0047
21	*Lepiota sps.*	2	40	B	0.4	1	0.0031
22	*Lepiota bengalensis*	1	20	A	7	35	0.0549
23	*Agaricus sps*	2	40	B	0.4	1	0.0031
24	*Cystolepiota*	1	20	A	0.8	4	0.0062
25	*Coprinus comatus*	2	40	B	1	2.5	0.0078
26	*Coprinus sps.*	2	40	B	6.2	15.5	0.0486
27	*Gymnopilus dilepsis*	4	80	D	0.8	4	0.0062
28	*Agaricus trisulphuratus*	2	40	B	0.4	2	0.0031
29	*Volvariella sps.*	1	20	A	0.8	4	0.0062
30	*Auricularia polytrichum*	1	20	A	1.8	9	0.0141
31	*Chlorophyllum malbidis*	1	20	A	4	20	0.0313
32	*Polyporus sps.*	1	20	A	0.4	2	0.0031
33	*Macrolepiota rhacodes*	2	40	B	1.4	3.5	0.0109
34	*Vascellum pratense*	1	20	A	1	5	0.0078
35	*Phellinus sublinteus*	1	20	A	0.2	1	0.0015
36	*Flavodon flavus*	1	20	A	8.4	14	0.0659
37	*Hexagonia tenuis*	3	60	C	0.6	1.5	0.0047
38	*Xylaria hypoxylon*	2	40	B	2	10	0.0156
39	*Xylaria escharroides*	1	20	A	2.4	12	0.0188
40	*Amanita flavoccosa*	1	20	A	0.4	2	0.0031
41	*Cyathus sps.*	1	20	A	1	5	0.0078

Results

Mushroom diversity: A total of 41 species of macrofungi was collected, identified, described and preserved (Table 3).

Quadrant data analysis

Density and Relative density: Density represents the numerical strength of a species in the community. The number of individuals of the species in a unit area is its density. Density gives an idea of degree of competition among species. Density is calculated by Total number of individual species divided by Total number of quadrants studied.

The density value obtained is expressed as number of individuals per unit area. Among the mushroom species, the *Marasmius* species was observed to be much denser than other species having the value of 8.6, whereas density of the *Phellinus sublinteus, Ganoderma lucidum* and *Auricularia judea* has comparatively much lesser density as the species shows the value of about 0.2 respectively.

The study of relative density of mushroom species was observed to be below 1. The value 1 indicates infinite diversity of a particular area and the value 0 indicates absence of diversity or no diversity. The present study of relative density shows value between 0.5 and 1, which means that the mushroom diversity is moderately rich in the study area. The relative density of *Ganoderma lucidum* shows the least relative density (0.0015) and the highest was the relative density of *Schizophyllum commune* (0.2590).

Abundance : The mushroom *Schizophyllum commune* shows very high value of about 82.5 which is the most abundant species when compared to the other species of mushrooms like *Ganoderma lucidum, Geastrum triplex, Pycnoporus cinnabarinus* and *Phellinus sublintenius* which showed a very low value of 1. The study of Greeshma Dai *et al.,* 2003 also showed high abundance of *Schizophyllum commune* of about 66 (Table 3).

Frequency percentage: The study of the frequency of the species shows that 26 species of the mushrooms are positioned in class A, 14 species of the mushrooms are positioned in class B and only 1 species in the classes C and D. Surprisingly there were no species recorded under class E, which shows that the frequency of the mushroom species diversity in the study area is disturbed. The average frequency percentage value is 28.78% respectively.

***Simpson and shannon's diversity index*:** The Shannon index has been a popular diversity index in the ecological literature, where it is also known as Shannon's Diversity Index, the Shannon Wiener index, or the Shannon Entropy (Simpson, 1949).

The measure was originally proposed by Claude Shannon. Typical values are generally between 1.5 and 3.5 in most ecological studies when the community increases. The fact that the index incorporates both components of biodiversity that can be seen as both strength and weakness (Shannon and Weaver, 1963). In quadrant I, Simpson and Shannon's diversity index was found to be 0.85 and 2.4 respectively and evenness was found to be 1 and in quadrant III, Simpson and Shannon's diversity index was found to be 0.49 and 1 respectively (Table 1).

Evenness: With the help of the values of diversity index, the mushroom evenness can also been calculated as suggested by Pielou evenness index in the year 1996. Evenness was found to be 0.41. This denotes that in quadrant III, the diversity index and evenness was very less which shows poor species diversity, whereas species diversity of other quadrants (I, II, IV and V) shows rich in species diversity.

Physical parameters: Light intensity of maximum 996.25 lux was observed in the sample site 3 (MCC Lake) as it is exposed to sunlight directly. Soil temperature was observed to be high in sample site 3 of about 27.5 °C. Similar result of about 26.5 °C was observed in scrub jungles of South West coast of India (Greeshma Ayyanna *et al.,* 2016).

The soil pH was slightly basic throughout the different sample site. The pH range was from 6.6 to 6.8. Fungi usually grow better in alkalinity than in acidic pH (Table 2). Similar results were observed by Ammatanda *et al.,* 2016.

Conclusion

The species diversity of macrofungi is present all over the world. Mushrooms play a vital role in maintaining ecological balance and in nutrient cycling. They are also used as food, medicine, bioremediation etc. In the present study, Belt Transect Quadrant method was opted and the diversity of mushroom was studied and found to be moderate diversity in Madras Christian College campus. Our future prospectus is to explore the medicinal and ecological importance of the mush-

rooms present in the study area and to conserve .

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