P: ISSN No. 0976-8602 RNI No.UPENG/2012/42622 VOL.-V, ISSUE-IV, October-2016

E: ISSN No. 2349-9443 Asian Resonance

Phytosociological Analysis of Tree Species in Kuchiakol Forest Area of Bankura District, West Bengal

Somen Dey
Post Graduate Student,
Deptt.of Botany,
Ramananda College,
Bishnupur, West Bengal

Shyamal Kanti Mallick
Assistant Professor,
Deptt.of Botany,
Ramananda College,
Bishnupur, West Bengal

Abstract

The present investigation provides information about the floristic composition, phytosociological parameters such as frequency, density, basal area and importance value index (IVI) from a forest patch of Kuchiakol forest range, Bankura district. The result indicates that *Shorea robusta* Gaertn. is the most ecologically dominant species in this forest. Phytosociological analysis reveals that diversified vegetation of Kuchiakol forest is *Shorea –Madhuca-Acacia-Eucalyptus* type. Diversity Index (H) and Dominance Index (cd) are 2.63 and 0.078 respectively. This indicates the trend of inverse relationship between diversity and dominance.

Keywords: Phytosociology, Floristic Composition, IVI (Importance Value Index), Diversity Index (H), Dominance Index (Cd),Frequency, Density.

Introduction

Forest occupies roughly 40% of the land. In India, the forest occupy roughly one tenth of the total land area. Forest is a complex community with predominance of the phanerophytes and complete understanding of such community can be revealed through various qualitative and quantitative investigations of its structure and function. The structural property of a community is the quantitative relationship in between the species growing around. The quantitative study of vegetation is called phytosociology and its principle aim is to describe the vegetation, explain or predicts its pattern and classify it in a meaningful way (llokar and Khatri, 2003). It indicates species diversity which determines the distribution of individual among the species in a particular habitat with increase in human activity in and around forest ecosystems, biodiversity in terms of number of species may decline (Abdulhadi et. al, 1987).

The Indian subcontinent, with its biodiversity is one of the 12 mega diversity centres of the world. Primary forest of Asia, particularly those of the Western ghat and Eastern ghat of Peninsular India are disappearing at an alarming rate due to anthropogenic activities and are replaced by forest comprising inferior species or their land pattern changed (Bahuguna, 1999). Studies from forest survey of India showed an average of 54.7% of forest is affected by fire and 72% of the forest area is subjected to grazing. Annually 3.73 million hectors of the forest area are burnt resulting in economic losses of approximately 440 cores (MoE, 1999).

Tropical dry deciduous forests are enriched with economically important species; vegetation composition, diversity of species and their habitat are well understood for other tropical forest types compared to dry deciduous forests. Dry deciduous forests are among the most exploited and endangered ecosystem of the biosphere (Murphy and Lugo, Jangen 1988).

Among the forest patches of Bankura district, Kuchiakol forest was chosen for the present study.

Aim of the Study

The present paper deals with the species composition of a dry deciduous forest patch from Bankura district of West Bengal.

Study Area

The study site is a tropical dry deciduous forest , located in Bankura district of West Bengal and situated 22°54´ S to 23°25´S latitude and 87°15´E to 87°46´W to longitude. The elevation above mean sea level of the area is 73 meters seasons; Summer (march-may), Rainy (june-october) and Winter (November-february).During summer period the air

temperature may go up to 44°c to 46°c with maximum relative humidity value around 95%. During raining period, the area receives an averagerain fall of 634.1mm and temperature records to an average of 36^0c.Relative humidity during rainy season varies from 30% to 100%. During winter average temperature of 12°c to 15°c at night . Occasionally the area experience winter rain (12-15mm) during December to January .The site exhibited november to may period as the dry period.

Methodology

The floristic composition of the woody species of the study area was randomly sampled using quadrate method. Quadrates of suitable sizes 10m x 10m (Cotton and Curtis, 1956) were laid out. The circumference at breast height of the tree species were taken and were analyzed for its quantitative measures. Different quantitative analysis of the vegetation such as Frequency, Density, Dominance and percentage composition etc was made as per Mira (1968)

Determination of Species Diversity Index $\overline{H}$)

Important Value Index (IVI) for different tree species were calculated from following Shannon and Wiener (1963) formula---

$$\overline{H} = \sum (ni/N) \log_e (ni/N)$$

Where, ni=IVI of Individual species

N=IVI of all species

Determination of Dominance Index (cd)

Concentration of Dominance (cd) value was established by Simpson`s index (Simpson, 1943) as---

$$Cd = \sum (ni/N)^2$$

Where, ni = IVI of Individual species

N=Total IVI of all species in the area

Soil Physio-Chemical Characteristics of the Study Area

The soil of the study area belongs to red lateritic soil which is derived from parent pegmatite rock .Texturally classified as loam, sandy loam or clay loam type.

The $_P$H value of the soil varied from 5.4-6.5.Physico-chemical parameter of the soil have been presented in Table No-1

Table No-1

Soil Properties	Value
⌂Soil Texture	
Sand (%)	43.003±1.4
Silt (%)	32.00±2.5
Clay (%)	18.02±1.2
⌂Water Holding Capacity (%)	54.45±1.01
⌂Total Organic Carbon (%)	1.2±.02
⌂Total Nitrogen	0.16±0.002
⌂Total Organic Matter	3.26±0.003
⌂Available Phosphorus (ppm)	5.67±.80
⌂$_p$H	5.26±.02

Table-2 Analysis of Tree Vegetation of the Study Area

S. No	Name of Species	Frequency (%)	Density (No/M²)	Mean Basal Area(M²)	Relative Frequency (%)	Relative Density (%)	Relative Dominance (%)	IVI(%)
1	*Shorea robusta* Gaertn	100	4.1	299.14	10.75	22.04	19.83	52.62
2	*Madhuca indica* Gmel.	90	2.2	477.17	9.67	11.82	16.97	38.46
3	*Acacia auriculiformis* A.Cum	80	1.7	410.09	8.6	9.13	11.27	29
4	*Eucalyptus tereticorois* L' Herit	60	1.7	160.79	6.45	13.44	6.49	26.38
5	*Tamarindus indica* L.	60	1.7	388.7	6.45	4.83	5.65	16.93
6	*Azadirachta indica* A.Juss.	60	1.7	243.746	6.45	5.55	3.94	15.94
7	*Terminalia bellirica* Gaertn.	70	1.7	314.99	7.52	3.76	3.56	14.84
8	*Diospyros melanoxylon* Roxb.	50	1.7	454.3	5.37	3.76	5.14	14.27
9	*Terminalia chebula* Retz	50	0.8	350.64	5.37	4.3	4.53	14.2
10	*Terminalia arjuna* Roxb	50	0.6	361.6	5.37	3.22	3.5	12.09
11	*Holarrhena antidysentrica*	40	0.6	296.32	4.3	3.22	2.87	10.39
12	*Strychnos nux-vomica* L	40	0.5	328.2	4.3	2.68	2.65	9.63
13	*Tectona grandis* L.f.	40	0.6	213.83	4.3	3.22	2.07	9.59
14	*Ferronia acidissima* Groff	30	0.5	341.202	3.22	2.68	2.75	8.65
15	*Agele marmelos* Corr. Roxb.	40	0.4	304.112	4.3	2.15	1.96	8.41
16	*Mangifera indica* L.	10	0.2	703.355	1.07	1.07	2.27	4.41
17	*Cassia fistula* Linn.	20	0.2	264.32	2.15	1.07	0.85	4.07
18	*Phoenix sylvestris* (L) Roxb.	20	0.2	214.43	2.15	1.07	0.69	3.91
19	*Dalbergia sissoo* Roxb.	10	0.1	905.64	1.07	0.54	1.46	3.07
20	*Acacia nilotica*	10	0.1	905.64	1.07	0.53	1.46	3.06

Table-3
Species Richness (n), Species Diversity (H), Dominance Index (cd), Total Density (no/m^2)

Species Richness(n)	20
Species Diversity(H)	2.63
Dominance Index(cd)	0.078
Total Density(m^2/no)	18.6

Result and Discussion

Phytosociological characters, density, basal area, IVI for tree species were recorded in the forest site.

Shorea robusta and *Madhuca indica* were more frequently and abundantly obserbed tree species.

Basal area analysis revealed the maximum total basal area for *Shorea robusta*. Relative higher frequency and density contributed to the dominance *Shorea robusta*. On the basis of IVI value *Shorea robusta* is the most dominant species in Kuchiakol forest.The IVI value of tree species varied from a minimum 3.06 to a maimum of 52.62.Maximum IVI value was revealed by *Shorea robusta*. It was followed by *Madhuca indica* and *Acacia auriculiformis*. These tree dominant species contributed 49% of total IVI value in Kuchiakol forest. Least IVI value (3.06) was observed in *Acacia nilotica*. Depending on the IVI value, the forest vegetation is classified *Shorea – Madhuca-Acacia-Eucalyptus* type. Diversity index (H) and Dominance Index (cd) calculated for the recorded tree species of the study area have been compiled in table -3 . Perusal of the table indicated maximum Diversity Index in *Shorea robusta* .As the Density was more, basal area observed to be significantly low.This was due to the poor girth size of trees in the forest. Thus from this we can indicate the trend of inverse relationship between Diversity and Dominance.This generalizes that, when the community becomes floristically more and more diverse, Dominance value of the community becomes more dispersed among the existing species for their better mutual establishment. This turn brings stability to the system .We can observed from IVI value that just next to *Shorea robusta* ,*Madhuca indica* ,and *Acacia auriculiformis* occupies the second and third position and fourth *Eucalyptus tereticornis* as a dominant species . And basing on the IVI value , the forest vegetation was classified as a *Shorea – Madhuca-Acacia-Eucalyptus* type.Though such classification of the forest vegetation was done, but *Eucalyptus tereticornis* and *Acacia auruiculiformis* were cultivated plants. This plants were cultivated by the forest Department of West Bengal in the forest areas. This might happened due to deforestation. To reforest the deforest land, forest Department of Kuchiakol forest took this step .Deforestation might have taken place due to increase population of that area. Increase population has forced the mankind to cut the forest for the need of lands for agricultural purpose for growing more food .Urbanization may also be the other cause. One of the other most important cause of deforestation is cutting down of trees on an extensive scale to obtained firewood, wood for timber and other forest products .Thus to overcame this situation, Forest Department had planted these cultivated plants, and thus these plants, *Eucalyptus* and *Acacia* occurs so frequently .It has also been noted that around Eucalyptus plant, the growth of other plants was very low. Which inhibit the other plat to grow in that soil.

References

1. Anonymous. 2003 Forest survey of India, State of forest report. Ministry of Environment and Forests. Dehradun, Govt. Of India.
2. Anonymous, 1999.Annual report 1998-1999. Ministry of Environment and Forests.Goverment of India .MoE and F.
3. Abdulhadi, R.E. Mirmanto and K.A.Kartawinata, 1987.A Lowland dipterocarp forest in Sekundur, North Sumatra, Indonesia: Five years after mechanized logging.Proceeding of 3rd Round Table Conference on DIPterocarps, UNESCO.
4. Bahuguna, V.K.1999.Forest fire prevention and control strategies in India .Int. For.Fire News, 20:5 -9.
5. Cottam, G and J.T. Curtis, 1956.The use of distance measurement in phytosociocal sampling.Ecology, 37:451-460.
6. Ilorkar, V,M and P. K. Khatri ,2003. Phytosociological study of Navegaon National Park (Maharasta) India For.129:377-387.
7. Janzen,D.H.,1998.Tropical Dry Forests:The Most Endangered Major Tropical Endangered Major Tropical Echosystem.1stEdn.,Biodiversity National Academy Press, Washington, DC., pp:130-137.
8. Murphy, P.G.and A.E.Lugo, 1986.Ecology of tropical dry forest. Ann. Rev.Ecol.Syst., 17:67-88.
9. Mallick, S.K. and S.Behera, 2009. Journal of Non-Timber Forest Products,vol. 16 (3) 187-190,2009
10. Misra,R(1968)Ecology work.Oxford and IBH Publishing Co.,New Delhi.P-238
11. Pielou, E.C. (1975).Ecological Diversity.John Wiley and Sons, New York.
12. Simpson. E.H., 1949 Measurement of diversity. Nature,163:638-688
13. Shannon,C.E. and W.Weaver,1949.The mathe matical Theory of Communication 1st Edn., University of Illionois press,urbana,IL., ISBN - 10:0252725484.