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Quantification of Anekkadu Reserve Forest by Structural Analysis

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KEYWORDS

PCQ, Phytosociological analysis, IVI, FIV, Frequency, Density, Girth at Breast height(GBH), Basal area and Dominance

A B S T R A C T

Anekkadu, a dry deciduous forest of Kushalnagar range, Kodagu district, Karnataka was sampled for the study. The forest was evaluated by the structure and floristic composition through Point Centered Quarter method (PCQ). A total of 22 plant species belonging to 12 families were encountered. The present study provides basic information about floristic composition of the reserve forest as well as species conservation status. As per the phytosociological analysis, plant species composition, basal area, height, density, frequency, dominance, IVI and FIV were determined. Anekkadu reserve forest is predominantly occupied by *Termina liatomentosa* and followed by *Tectona grandis*, these plant species make the forest as dry deciduous type.

Introduction

Kodagu district is situated on the southwest tip of Karnataka state and the tract lies between 11055 and 12050 North latitude and 75020 and 76015 East longitude. The tract has mountainous configuration presenting a grand panorama of valleys, ravines, peaks and spurs. The forest which is situated in different slopes and aspects plays an important role in distribution of the species. The average rainfall of the district is 2725 mm. Rainfall decreases from west to east due to hilly terrain. The nature of vegetation greatly varies from Bhagamandala receiving 6000mm of rainfall to Kushalnagar that receives 1100mm of rainfall annually. The forest of kodagu belongs to Western Ghats which is confined to a hilly region. Depending upon the phenology and other ecological factors, the forest is divided into moist and dry type. The moist forest can be further subdivided into wet evergreen, semi evergreen and moist deciduous. The dry type can be subdivided into dry deciduous and thorn

forest. In moist deciduous forest species remain deciduous only for a short time were number of evergreen dominates are present in the understory. The general nature of the forest is deciduous and there are semi deciduous species in the upper canopy. The undergrowth has bamboo in open and canes on wet ground. In moist deciduous forest, trees become leafless during March to April and before the monsoon sets in most of trees get back the foliage. Fire is a serious problem in the deciduous belt of the kodagu where there is substantial accumulation of leaf litter on the forest floor (Ajay Misra, 2008). As there are no reports on the floristic analysis of Anekkadu reserve forest, the present study attempts to reveal the structure of this dry deciduous forest.

Materials and Methods

Anekkadu forest is the dry deciduous reserve forest which covers an area of 2635.40 hectares. It is located $12^0$26' North and $075^0$54' East of Kushalnagar range with an altitude of 885 meter above sea level. It has an annual rain fall of 1246.35 mm and a mean temperature of 21^0C during winter and 28.6^0C during summer.

A 1000 meter transect (Line) was established through the habitat. At regular intervals of 100 meter, transect points were demarcated. At each point, an imaginary line was drawn perpendicular to transect thereby creating four quadrants. In each of the quadrates, the closest single living plant with a GBH≥5 cm was identified taxonomically (Keshavamurthy and Yoganarasimhan, 1990), distance from the point to each of four trees was measured; GBH and total height were taken (Cottam and Curtis 1956; Gibbs et al1980; Cavassan et al 1984: Krebs 1989: Dias et al 1992 and Sparks et al 2002).

The Phytosociological data viz basal area, relative densities, relative frequency, relative dominance, IVI and FIV, the index of diversity viz Simpson index, Shannon index and Equitability were determined. (Krebs, 1989; Shivaprasad et al, 2002 and Vasanthraj&Chandrashekar ,2006).

Data Analysis

GBH and Height Classes of a number of individuals of different species were calculated. The density, basal area, dominance, frequency, Importance value index (IVI) and Family Importance Value (FIV) were calculated (Pascal, 1988).

The density (ni) of each species was recorded by counting the total number of individuals. The Dominance (d) was determined by the basal area (at 1.3m height) of individuals of the same species.

1. The Relative frequency (RFi) was determined by using the formula

RFi = AFi /TF x100

Where AFi=Absolute frequency of species and TF = Total Frequency (Sum of AFi)

2. Relative density (RDi) was determined by using the formula

RDi =ADi /AD x100

Where ADi = Absolute density of species and AD = Absolute density

3. Relative Dominance or Cover (RCi) was determined by using the formula

RCi = BAi /TBA x100

Where BAi = Basal area of species and TBA = Total basal area

4.Importance Value Index of a species were calculated by adding The Relative frequency (RFi), Relative density (RDi) and Relative dominance(RCi).The Family Importance Value Index (FIV) for botanical families were calculated by adding the IVI for different species of the same family. The floristic diversity was measured by using Simpson's index

$D=1-\sum_{i=1}^{s} (ni/N)2$

Where ni = number of individuals of species

N= total number of individuals in the plot and
S=number of species in the plot
Shannon-Wiener's index

1) $H' = 3.3219(\log10N-1/N \sum_{i=1}^{S} ni \log10 ni)$

Where ni, N and S are the same as in Simpson's index and 3.3219 is the conversion factor from log2 to log10

2)H max =3.3219 log10 S

Results and Discussion

Floristic Composition

A total of 22 species belonging to 12 families, among these Fabaceae was represented by maximum of 5 species belonging to 5 different genera i.e. *Pterocarpus, Erythrina, Dalbergia, Bauhinia and Albizzia.* Combretaceae was represented by 4 species belonging to different 2 genera i.e. *Terminalia* and *Anogeissus*. Ebenaceae, Malvaceae, Meliaceae, Myrtaceae, Phyllanthaceae, Lythraceae, Anacardiaceae and Moraceae were monospecific. Undergrowth was represented by canes, reeds, creepers and climbers such as *Cycleapeltata, Acacia sinuata, Jasminum malabaricum, Lantana camera, Chromolaena odorata* and *Piper nigrum* (wild) *Bambusabamboo, Calamus pseudotenuis, Calamus rheedii* and *Macaranga roxburghii*.(Table -1).

Importance Value Index (IVI)

The FIV of Combretaceae was very high 129.43 followed by Fabaceae (58.37) Lamiaceae (37.98) Rubiaceae(27.32) Ebenaceae(14.57) and Myrtaceae(12.29). In Combretaceae, *Terminali atomentosa* alone showed highest (IVI 67.58) i.e. 52.21% and other Combretaceae members such as Anogeissus *latifolia* (IVI=26.51) 20.48%, *Terminalia bellerica*(IVI=20.92) 16.92% and *Terminalia paniculata*(IVI=14.42) 11.14%. Hence Combretaceae family was considered as dominant family and *Terminalia tomentosa* as dominant species in the forest. FIV of Fabaceae is high compared to Lamiaceae but species were showed low IVI than *Tectona grandis* (34.32) and become second dominant species in the sampled area. FIV of rest of the families was less than 10 (Table 2&3).

Table.1

SL.No	Name of the Family	Number of species
1.	Fabaceae	5
2.	Combrataceae	4
3.	Rubiaceae	3
4.	Lamiaceae	2
5.	Ebenaceae	1
6.	Malvaeae	1
7.	Meliaceae	1
8.	Myrtaceae	1
9.	Phyllanthaceae	1
10.	Lythraceae	1
11.	Anacardiaceae	1
12.	Moraceae	1

Table.2

	Species i	ni	ADi	RDi	Ji	AFi	RFi	BAi	MBAi	ACi	RCi	IVI
1	*Terminaliatomentosa*	21	92.4	26.25	15	75	22.058	41.177	1.960	0.0181	19.271	67.580
2	*Mitragynaparviflora*	4	17.6	5	4	20	5.882	13.713	3.428	0.006	6.418	17.300
3	*Diospyrosmontana*	4	17.6	5	4	20	5.882	7.897	1.974	0.003	3.696	14.578
4	*Pterocarpusmarsupium**	6	26.4	7.5	6	30	8.823	23.809	3.968	0.010	11.143	27.466
5	*Adina cordifolia*	2	8.8	2.5	1	5	1.470	1.585	0.792	0.00069	0.742	4.712
6	*Erythrinastricta*	1	4.4	1.25	1	5	1.470	14.51	14.51	0.0063	6.793	9.513
7	*Gmelinaarborea*	1	4.4	1.25	1	5	1.470	2.009	2.0096	0.00088	0.9405	3.661
8	*Tectonagrandis*	8	35.2	10	7	35	10.294	29.979	3.747	0.013	14.030	34.325
9	*Anogeisuslatifolia*	8	35.2	10	6	30	8.823	16.430	2.053	0.0072	7.689	26.513
10	*Dalbergialatifolia*	4	17.6	5	4	20	5.882	8.495	2.123	0.0037	3.976	14.858
11	*Bombaxceiba*	1	4.4	1.25	1	5	1.470	1.697	1.697	0.00074	0.794	3.515
12	*Meliacomposita*	1	4.4	1.25	1	5	1.470	1.697	1.697	0.00074	0.794	3.515
13	*Terminaliapaniculata*	4	17.6	5	4	20	5.882	7.559	1.889	0.0033	3.538	14.420
14	*Terminaliabellerica*	4	17.6	5	4	20	5.882	21.461	5.365	0.0094	10.044	20.926
15	*Syzygiumcumini*	3	13.2	3.75	3	15	4.411	8.825	2.941	0.003	4.130	12.292
16	*Phyllanthusemblica*	1	4.4	1.25	1	5	1.470	1.130	1.130	0.00049	0.529	3.249
17	*Ficusbengalensis*	1	4.4	1.25	1	5	1.470	1.130	1.130	0.00049	0.529	3.249
18	*Hymenodictyonexcelsum*	2	8.8	2.5	1	5	1.470	2.865	1.432	0.00126	1.341	5.311
19	*Bauhinia malabarica*	1	4.4	1.25	1	5	1.470	0.635	0.635	0.00027	0.297	3.018
20	*Legerstomialanceolata*	1	4.4	1.25	1	5	1.470	1.1304	1.1304	0.00049	0.529	3.249
21	*Lanneacoromondalica*	1	4.4	1.25	1	5	1.470	4.152	4.152	0.00182	1.943	4.664
22	*Albizzialebbek*	1	4.4	1.25	1	5	1.470	1.766	1.766	0.00077	0.826	3.547
	Total	80	AD=352	100		TF=340	101.459	TBA=213.66		TC=0.0940	99.9925	301.461

Table-2 ni=number of individuals,ADi=absolute density, RDi=relative density, Ji=number of quadrates in which sps is present, AFi=absolute frequency, RFi=relative frequency, BAi=basal area, MBAi=Mean basal area ,ACi=absolute cover/dominance, RCi=relative cover/dominance, IVI=importance value index and *Threatened species

Table.3

Sl.No	Family	FIV
1.	Combrataceae	129.43
2.	Fabaceae	58.37
3.	Lamiaceae	37.98
4.	Rubiaceae	27.32
5.	Ebenaceae	14.57
6.	Myrtaceae	12.29
7.	Anacardiaceae	4.66
8.	Malvaeae	3.51
9.	Meliaceae	3.51
10.	Phyllanthaceae	3.24
11.	Lythraceae	3.24
12.	Moraceae	3.24

Table.4

Height Class(m)	No of individuals	Percentage
0-4	02	2.5
4-8	21	26.25
8-12	27	33.75
12-16	24	30
16-20	06	7.5
20-24	00	00
24-28	00	00

Table.5

Girth Range (cm)	No of individuals	Percentage
10-40	00	00
40-80	00	00
80-120	07	8.75
120-160	33	41.25
160-200	10	12.50
200-240	19	23.75
240-280	06	7.5
280-320	01	1.25
320-360	04	5

Table.6

Taxa (S)	Individuals (N)	N/S	Simpson _1-D	Shannon _H
22	80	3.6	0.88	2.61

Density

Absolute density of the study area was 352 Individuals /hectare. The member of Combretaceae accounted 46.25% of the total individual's. Among the Combretaceae *Terminalia tomentosa* (56.75%) *Anogeisus latifolia* (21.62%) *T.paniculata* (10.8%) and *T.bellerica* (10.8%) were predominantly represented. Other than Combrataceae, *Tectona grandis* only showed 10%and the remaining species were less than 10% of the total individuals (Table-2). The forest predominantly consisted of Combrataceae members among which *Termina liatomentosa* only found frequently along line of transect.

Basal Area

The total basal area was 213.66 m^2/ hectare, of which Combretaceae members constituted 40.53% of the total basal area. *Terminalia tomentosa* alone represented 41.17m^2/ hectare, *T.bellrica*21.46m^2/ hectare, *Anogeisus latifolia* 16.43m^2/ hectare *T.paniculata* 7 m^2/ hectare and the basal area of few species like, *Tectonagrandis*29 m^2/ hectare *Pterocarpus marsupium* 23 m^2/ hectare, *Erythrin asricta* 14.51m^2/ hectare and *Mitragyna parviflora* 13.71m^2/ hectare where the other species had less than 10 (Table-2). Along the line of transect, *Terminalia tomentosa* was seen frequently and its relative dominance was also high compared to *Tectona grandis*. *T.tomentosa* showed high density with high dominance as it occupied major portion of the sampled area.

Height and GBH Classes

Nearly 63.75% of the individuals were within of 8-16 m height range, 28.75% of the individuals belonged to the class 1-8 height. Only 7.5 % of the individuals were exceeded 16m height, among them most of the individuals belonged to Rubiaceae, Fabaceae and moraceae and they formed top storey of the forest. Middle storey of the forest was formed by most of the Combretaceae members (Table-4).

8.75% of the individuals belonged to 10-120 cm GBH class and 77.50 % of the individuals belonged to 120-240 GBH range, only 13.75% of the individuals exceeded 240cm GBH range, among them most of the species belonged to Lamiaceae, Fabaceae and Combretaceae (Table -5). Based on height and GBH classes, nearly 70% of the individuals of the forest represented set of the present, nearly 11% represented set of the past and nearly 19% represented set of the future. This indicated that forest was of matured type.

Floristic Richness

The high value for Simpson index (0.88) indicated that out of every 100 pairs of individuals taken randomly; only 12 belonged to the same species that revealed a high floristic richness of the forest. The lower N/S ratio of plot (3.6) suggested that the number of individuals of the species in the plot was less. High Shannon- Wiener's index (h'=2.61) indicated a moderate representation of most of the species in the forest (Table-6). The diversity indices revealed that the forest represented moderate diversity.

Conclusion

In Anekkadu Reserve Forest, *Terminalia tomentosa* was showed high relative frequency and high relative density than *Tectona grandis* which indicated that *Termina liatomentosa* distributed evenly and was relatively common along the line of transect. Meanwhile it showed very high relative dominance (19.27) and maximum IVI (67.58). This indicated that *Terminalia tomentosa* was common not only because of their density, but also because of their high relative dominance as they turned out to be the most important species within the community. *Tectona grandis* became second dominate species in the forest with respect to all the values. The members of Combretaceae showed maximum IVI hence the Combretaceae was an important family in the forest (FIV=129.43). The Anekkadu Reserve Forest was moderately rich in floristic composition as well as a matured type.

References

Ajay Misra. 2008. Working plan of madikeri forest division.Mysore, pp1-18.

Cavassan O, Cesar O, Martins FR 1984 Fitossociologia da vegetacaoarborea da ReservaEstadual de Bauru, Estado de Sao Paulo. RevistaBrasileira de Botanica 7:91–106

Dias LL, Vasconcellos JMO, Silva CP, Sobral M, Benedeti MHB 1992 Levantamentoflorı´stico de umaa´rea de mata subtropical no ParqueEstadual do Turvo, TenentePortela, RS. In: CongressoNacionalSobreEsseˆncias Nativas, 2, 1992, Sa˜o Paulo. Anais, Instituto Forestall: Sao Paulo, pp 339–346

Gibbs PE, LeitaoFilho HF, Jabbott RJ 1980 Application of the point-centered quarter method in a floristic survey of an area of gallery forest at Mogi-Guac¸u, SP, Brazil.RevistaBrasileira de Botanica 3:17–22

Grant Cottam and J.T.Curtis.1956.The use of distance measures in phytosociologicalsampling.Ecology, 37(3):451-460, ISSN 00129658.

Keshavamurty, K.R. and Yoganarasimhan, S.N., 1990.In: Flora of Coorg.VismathPubl.Bangalore.pp 1-12.

Krebs CJ 1989. Ecological methodology. Harper Collins, New York NY

Pascal, J.P.1998.Wet evergreen forest of the Western Ghats of India: Ecology, Structure, Floristic Composition and Succession .French Institute, Pondicheri.3455pp.

Shivaprasad, P.V., Vasanthraj, B.K. & Chandrasekhar, K.R.2002.Studies on the Structure of Pilarkan Reserve Forest, India. Journal of Tropical forest Science 14(1):71-81.

Sparks JC, Masters RE, and Payton ME 2002 Comparative evaluation of accuracy and efficiency of six forest sampling methods. Proc. Oklahoma Acad. Sci. 82:49–56

Vasanthraj, B.K. &Chandrashekar, K.R.2006.Analysis of the Structure of Charmady Reserve Forest .Tropical Ecology 47(2):279-290.