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Floristic Analysis of Dabbadka Reserve Forest, Kodagu, Karnataka, India

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A B S T R A C T

Dabbadka Reserve Forest is a moist deciduous forest located in Sampaje Range of Madikeri Forest Division, Kodagu district, Karnataka. Phytodiversity study of the reserve forest was conducted through Point Centered Quarter method (PCQ). The aim was to provide basic information about floristic composition of the reserve forest. Plant species composition, Basal area, height, density, frequency, Dominance, IVI and FIV were determined. A total of 21 plant species belonging to 13 families were encountered. Combretaceae and Fabaceae were the dominant families in the Reserve forest.

Introduction

Kodagu district is situated on the southwest tip of Karnataka state and the tract lies between $11^{0}55$' and $12^{0}50$' north latitude and $75^{0}20$ and $76^{0}15$' 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 till Kushalnagar, which receives 1100 mm of rainfall annually. The forest of kodagu belongs to Western Ghats is confined to the hilly region. Depending upon the Phenological condition 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 under storey. The general nature of the forest is deciduous and there are semi deciduous species in the upper canopy. The under growth 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 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 were no reports on the floristic analysis of Dabbadka reserve forest, the present study attempts to reveal the structure of the moist deciduous forest.

Materials and Methods

Dabbadka forest is the reserve forest which covers an area of 3273.29 hectors. It is located $12^0$25-North and $075^0$33-East of Sampaje range with an altitude of 890 meter above sea level. It has annual rain fall of 4500mm and a mean temperature of 20^0 C during winter and 33^0C during summer.

A 1000 meter transect (Line) was established through the habitat. At regular intervals of 100meter along the transect points were demarcated. At each point, an imaginary line was drawn perpendicular to the transect thereby creating four quadrates. In each of the quadrates, the closest single living plant with a GBH≥5cm was identified taxonomically (Keshavamurty and Yoganarasimhan, 1990), distance from the point to each of four trees was measured, GBH and Total height were taken (Grant Cottam and Curtis, 1956; Gibbs *et al.,* 1980; Cavassan *et al.,* 1984; Krebs, 1989; Dias *et al.,* 1992; Sparks *et al.,* 2002).

The phytosociologocal 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; Vasanthraj and Chandrashekar, 2006).

Data analysis

GBH and height classes of 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, 1998).

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 was 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-Wieners index

1) H' =3.3219(log10N-1/N ∑S ni log 10ni)
i=1
Where ni, N and S are the same as in Simpson's index and
3.3219is the conversion factor from log2 to log10
2) H max =3.3219 log10 S
3) Equitability (E)=H'/H_{max}

Results and Discussion

Floristic composition

A total of 21 species belonged to 13 families, among the families *Combrataceae* (3 sps) *Fabacea*e (6 sps) *Euphorbiaceae* (2sps), *Verbanaceae (*2sps), *Lythraceae*, *Dillinaceae*, *Sapindaceae*, *Rubiaceae*, *Meliaceae*, *Malvaceae*, *Rutaceae*, *Lecithadaecae* and *Apocyanaceae* were represented by monospecific (Table 1). *Fabaceae* was represented by maximum number of 5 species belonging to different 5 genera. But combrataceae was represented by 3 species belonging to same genera i.e. *Terminalia*. The top storey was predominantly occupied by Combrataceae members, undergrowth was represented by canes, reeds, creepers and climbers such as *Cycleapeltata*, *Acaciasinuate*, *Jasminum malabaricum*, and *Piper nigrum* (wild) *Bambusa bamboo*, *Calamu spseudotenuis*, *Calamusr heedii* and *Macarangarox burghii.*

Importance Value Index (IVI)

The IVI of the *Terminalia tomontosa* (61.24) highest in this forest and followed by *Terminalia paniculata* (58.50), *Deliniaindica* (IVI=34.37) and *Xyliaxylo carpa* (IVI=31.19). Three other species showed IVI range of 10.15–28.65 while 14 species showed IVI less than 10 (Table 2). The FIV of combrataceae was very high (123.05) followed by Fabaceae (52.936) Dillanaceae (34.37) and Euphorbiaceae (32.45) (Table 3). *Terminaliato montosa* showed high IVI indicates that it occupies most of the sampled area. The FIV of Combratceae was very high (123.06) where 36.25% of the individuals were represented by combrataceae only.

Table.1 Floristic Composition

Name of the family	Number of species
Fabaceae	5
Combrataceae	3
Euphorbiaceae	2
Verbanaceae	2
Lythraceae	1
Dillinaceae	1
Sapindaceae	1
Rubiaceae	1
Meliaceae	1
Malvaceae	1
Rutaceae	1
Apocyanaceae	1
Lecithadaceae	1

Table.2 Floristic analysis of Dabbadka Reserve Forest

	Species i	ni	ADi	RDi	Ji	AFi	RFi	BAi	MBAi	ACi	RCi	IVI
1	***Terminalia paniculata***	16	136.21	20	13	65	20.3125	23.31	1.45688	0.019844094	18.1917509	58.50425089
2	***Legerstroemia lanceolata***	3	25.539375	3.75	3	15	4.6875	8.7	2.9	0.007406419	6.78971397	15.22721397
3	***Dillenia indica***	9	76.618125	11.25	8	40	12.5	13.61	1.51222	0.011586363	10.62161	34.37161002
4	***Euphoria longana***	2	17.02625	2.5	2	10	3.125	5.68	2.84	0.004835455	4.43282476	10.05782476
5	***Mitragyna parviflora***	1	8.513125	1.25	1	5	1.5625	0.63	0.63	0.000536327	0.49166894	3.304168943
6	***Aporosa lindleyana***	12	102.1575	15	8	40	12.5	1.8	0.15	0.001532363	1.40476841	28.90476841
7	***Terminalia bellerica***	1	8.513125	1.25	1	5	1.5625	0.63	0.63	0.000536327	0.49166894	3.304168943
8	***Terminalia tomontosa(alata)***	12	102.1575	15	9	45	14.0625	41.24	3.43667	0.035108128	32.1848051	61.24730509
9	***Tectona grandis***	1	8.513125	1.25	1	5	1.5625	3.46	3.46	0.002945541	2.70027705	5.512777052
10	***Emblica officinalis***	1	8.513125	1.25	1	5	1.5625	0.95	0.95	0.000808747	0.74140555	3.553905549
11	***Albizzia lebbek***	1	8.513125	1.25	1	5	1.5625	1.13	1.13	0.000961983	0.88188239	3.69438239
12	***Dalbergia latifolia***	2	17.02625	2.5	2	10	3.125	0.405	0.2025	0.000344782	0.31607289	5.941072892
13	***Pongamia pinnata***	1	8.513125	1.25	1	5	1.5625	0.28	0.28	0.000238368	0.21851953	3.03101953
14	***Careya arborea***	2	17.02625	2.5	2	10	3.125	1.28	0.64	0.00108968	0.99894642	6.623946424
15	***Kydia calycina***	1	8.513125	1.25	1	5	1.5625	0.33	0.33	0.000280933	0.25754087	3.070040875
16	***Xylia xylocarpa***	9	76.618125	11.25	4	20	6.25	17.55	1.95	0.014940534	13.696492	31.19649198
17	***Pterocarpus marsupium***	2	17.02625	2.5	2	10	3.125	4.43	2.215	0.003771314	3.45729114	9.082291138
18	***Evodia roxburghiana***	1	8.513125	1.25	1	5	1.5625	1.13	1.13	0.000961983	0.88188239	3.69438239
19	***Gmelina arborea***	1	8.513125	1.25	1	5	1.5625	0.64	0.64	0.00054484	0.49947321	3.311973212
20	***Tabernaemontana Heyneana***	1	8.513125	1.25	1	5	1.5625	0.31	0.31	0.000263907	0.24193234	3.054432337
21	***Swetenia mahogani***	1	8.513125	1.25	1	5	1.5625	0.64	0.64	0.00054484	0.49947321	3.311973212
	Total	**4k=80**	**AD=681.05**	**100**		**TF=320**	**100**	**TBA=128.135**	**27.4333**	**TC=0.109829**	**100**	**300**

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 of Dabbadka forest

Table.3 Family Importance Value

Family	FIV
Combrataceae	123.06
Fabaceae	52.9
Dillinaceae	34.371
Euphorbiaceae	32.46
Lythraceae	15.2
Sapindaceae	10.05
Verbanaceae	8.82
Lecithidaceae	6.6
Rubiaceae	3.3
Meliaceae	3.31
Malvaceae	3.07
Rutaceae	3.69
Apocyanaceae	3.05

Table.4 Height & GBH Classes

Height Class(m)	No of individuals	Percentage
0-4	8	10
4-8	32	40
8-12	18	22.5
12-16	9	11.25
16-20	3	3.7
20-24	8	10
24-28	2	2.5

Table.5 Girth Range

Girth Range (cm)	No of individuals	Percentage
10-40	16	20
40-80	12	15
80-120	12	15
120-160	13	16.25
160-200	16	20
200-240	9	11.25
240-280	1	1.25
280-320	0	0
320-360	1	1.25

Table.6 Floristic richness

Taxa (S)	Individuals(N)	N/S	Simpson_1-D	Shannon_H	*Equitability_E*
21	80	3.8	0.88	2.477	0.8136

Density

Absolute density of the study area was 681.05 Individuals /hectare. The member of combrataceae accounted 36.25% of the total individual's. Among the Combrataceae *T. paniculata* (55.2%), *T. tomontosa* (41.4%) and *T. bellerica* (3.4%) were predominantly represented. Other than combrataceae *Aporasalind leyana* (15%), *Dilliniaindica* (11.25%), *Xyliaxylocarpa* (11.25%) and the remaining species were showed less than 10 (Table 2). The forest predominantly consists of Combrataceae members among which only *T. paniculata* is frequently found along transect.

Basal area

The total basal area was 128.135 m^2/ hectare, of which Combrataceae members constitute 51% of the total basal area. *T. tomontosa* alone represented 41. m^2/ hectare, *T. paniculata* 23.31 m^2/ hectare and *T. bellrica* 0.63 m^2/ hectare. The basal area of a few species like, *Xiliaxylocarpa* 17.55 m^2/ hectare and *Dellenia indica* 13.61 m^2/ hectare where the other species had less than 10 (Table 2). Along with the transect, *T. paniculata* can be seen frequently but its relative dominance was very less compared to *T. tomontosa*. So *T. tomontosa* showed low density with high dominance hence it occupied major portion of the sampled area.

Height & GBH classes

50 % of the individuals belonged to the class of 8–16 height. Only 16.2% of the individuals were exceeded 16m height among them most of the individuals (61.%) are belonging to Combrataceae and rest of them belong to Fabaceae (Table 4).

50% of the individuals were belonged to 10–120 cm gbh class and 47% of the individuals belonged to 120–240 gbh range, only 3% belonged to 200cm range, among them 50% of the individuals are belonging to Combrataceae (Table 5). Based on height and GBH classes, 50% of the individuals of the forest represented set of the future, nearly 40% represented set of the present and nearly 10% represented set of the past. This indicates that forest is rejuvenating type.

Floristic richness

The high value for Simpson index (0.88) indicates that out of every 100 pairs of individuals taken randomly, 12 belong to same species that reveals high floristic richness of the forest. The lower N/S ratio of plot (3.8) suggested that the number of individuals of the species in plot was less. Shannon- Wiener's index (h'=2.477) and equitability value (E=0.81) were high which indicates moderate representation of the most of the species in the forest (Table 6). At last diversity indices revealed that the forest showed high diversity.

Conclusion

In Dabbadka RF, *Terminalia paniculata* was showed high relative frequency and high relative density than *T. tomontosa* which indicates that both the species were distributed evenly and relatively common along the transect. But *T. tomontosa* showed very high relative dominance (32.18) hence IVI was maximum (61.24). This indicated that *T. tomontosa* are not common because of their size, they turn out to be the most important species within the community. The members of Combrataceae were showed maximum IVI hence the Combrataceae is an important family in the forest (FIV=123.06). The Dabbadka RF is rich in floristic composition as well as regenerating type.

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