

Phytosociological analysis of Meenukolli Reserve Forests of Kodagu, Karnataka, India

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Abstract:

For this Research Paper, we sampled Meenukolli Reserve Forest of Kushalnagar Range, Kodagu district, Karnataka. We evaluated the forest by Phytosociological analysis through Point Centered Quarter method (PCQ). A total of 17 plant species belonging to 11 families were encountered. The present study provides basic information about floristic composition of the reserve forest as well as species conservation status. According to phytosociological analysis plant species composition, Basal area, height, density, frequency, dominance, IVI and FIV were determined. Ultimately Meenukolli reserve forest predominately occupied by *Vitexaltissima* and *Terminalia alata* and these plant species makes the forest as moist deciduous.

Key words: PCQ, Phytosociological analysis, IVI, FIV, Frequency, density, Basal area, Girth at Breast height (GBH) and Dominance

Introduction:

Kodagu District also known as Kodava Nadu, is a district of Karnataka. It occupies an area of 4,102 square kilometres (1,584 sq mi) in the Western Ghats of southwestern Karnataka. Kodagu district is situated on the southwest tip of Karnataka state and the tract lies between 11°55' and 12°50' north latitude and 75°20' and 76°15' east longitude. The district is bordered by Dakshina Kannada district to the northwest, Hassan district to the north, Mysore district to the east, Kannur district of Kerala to the southwest, and the Wayanad district of Kerala to the south. 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. Agriculture is the most important factor that upholds the economy of Kodagu and the main crops cultivated in this region are rice and coffee. The average rainfall of the district is 2725mm. 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 1100mm of rainfall annually. Coorg is rich in natural resources which included timber and spices. Madikeri (English: Mercara) is the headquarters of Kodagu. 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 where number of evergreen dominants are present in the understorey. 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 the 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). This research article reveals the floristic component as well as quantifies Meenukolli Reserve forest.

Materials and methods:

Meenukolli Reserve forest is located 12°23'-North and 075°52'-East of Kushal nagar Range with an altitude of 880 meter above sea level. It is the Moist deciduous reserve forest which covers an area of 151.35 hectares. It has annual rain fall of 1246.5mm and a mean temperature of 26°C during winter and 33°C 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 (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 al 1980; 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; Shiva Prasad et al, 2002 and Vasanthraj & 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, 1988).

The density (n_i) 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 (RF_i) was determined by using the formula

$$RF_i = A_{Fi} / TF \times 100$$

Where A_{Fi} = Absolute frequency of species and TF = Total Frequency (Sum of A_{Fi})

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

$$RD_i = AD_i / AD \times 100$$

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

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

$$RC_i = BA_i / TBA \times 100$$

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

4. Importance Value Index of a species were calculated by adding The Relative frequency (RF_i), Relative density (RD_i) and Relative dominance (RC_i). 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

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

$i=1$

Where n_i = number of individuals of species

N = total number of individuals in the plot and

S = number of species in the plot

Shannon-Wieners index

$$1) H' = 3.3219 (\log_{10} N - 1/N \sum_{i=1}^s n_i \log_{10} n_i)$$

$i=1$

Where n_i , N and S are the same as in Simpson's index and

3.3219 is the conversion factor from \log_2 to \log_{10}

$$2) H_{\max} = 3.3219 \log_{10} S$$

Results and Discussion:

Floristic Composition:

According to Phytosociological analysis, a total of 17 species belonged to 11 families, among these families Combrataceae (4sps) Lamiaceae (2sps) Fabaceae (2sps), Rubiaceae (2sps), Anacardiaceae, Boraginaceae, Meliaceae, Lythraceae, Cannabaceae, Tiliaceae,

Myrtaceae were represented by mono specific. (Table -1). Four species of Combrataceae belonging to two different genera and represented as Dominant family. But the second dominant family Lamiaceae was represented by 2 species belonging to two different genera. Fabaceae was the third dominant family which include two species of different genera. The undergrowth was represented by Canes, Reeds, creepers and Climbers such as *Bambusa bamboo*, *Calamus pseudotenius*, *Calamus heedii*, *Lantana camera*, *Ageratum comnizoides* and *Macaranga roxburghii*.

Table -1

Name of the Family	Number of species
Combrataceae	4
Lamiaceae	2
Fabaceae	2
Anacardiaceae	1
Boraginaceae	1
Meliaceae	1
Lythraceae	1
Rubiaceae	2
Cannabaceae	1
Tiliaceae	1
Myrtaceae	1

Importnce Value Index (IVI)

The IVI of the *Vitexaltissima* (69.67) highest in this forest and followed by *Terminalia alata* (42.92), *Chukrasia tabularis* (33.75) and *Pterocarpus marsupium* (30.90) (Table-2). But the FIV of Combrataceae was very high (84.34) followed by Lamiaceae (74.21) Fabaceae (36.39) and meliaceae (33.74) (Table -3). Because of the high IVI, *Vitexaltissima* occupied most of the sampled area. The FIV of Combrataceae was very high (84.34) so the sampled area was occupied by 27.5% of the Combrataceae member.

Table -3

Family	FIV
Combrataceae	84.3424
Lamiaceae	74.2197
Fabaceae	36.9049
Anacardiaceae	24.7559
Boraginaceae	18.4642
Meliaceae	33.7461
Lythraceae	13.4707
Rubiaceae	7.1079
Cannabaceae	6.0231
Tiliaceae	3.5796
Myrtaceae	3.5796

Density:

Sampled area showed absolute density is about 555 Individuals / hectare. 27.5 % of the total individual's represented by Combrataceae only. Among the Combrataceae *Terminalialalata* 59.09%, *T.paniculata* 22.72%, *T.bellerica* 13.63% and *Anogeisuslatifolia* 4.54% were predominantly represented. Other than combrataceae *Vitexaltissima* (Family ;Verbenaceae) itself showed 25% and the remaining species were showed less than 10(Table-2). The forest predominantly occupied by Combrataceae as well as Lamiaceae members among which only *Terminalialalata* and *Vitexaltissima* were frequently found along the transect.

Basal area:

The total basal areawas 175.65 m²/ hectare, of which Lamiaceae members itself constitute 46.99 % of the total basal area among which *Vitexaltissima* alone represented 43.86 m²/ hectare, and *Gmelinaarborea* 3.14 m²/ hectare. The basal area of a few species like, *Terminalialalata*20.23m²/ hectare and *Terminaliapaniculata* 13.47 m²/ hectare, where the other species had less than 10(Table-2). Along with the transect, *Vitexaltissima* can be seen frequently because , its relative dominance and relative density were more compared to other species. So *Vitexaltissima* alone occupied the major portion of the sampled area.

Height & GBH Classes:**Table -4**

Height Class(m)	No of individuals	Percentage
0-4	08	10
4-8	12	15
8-12	22	27.5
12-16	20	25
16-20	12	15
20-24	5	6.25
24-28	1	1.25

Nearly 67.5% of the individuals were within 8-20m height range, 25% of the individuals belonged to the class of 4-8m height. Only 7.5 % of the individuals were exceeded 20-28m height .Species like *Legerstomialanceolata*, *Chukrasiatabularis* and *Pterocarpusmarsupium*

were forms upper storey as well as *Terminaliapaniculata*, *Terminalialata*, *Terminaliabellerica*, *Vitexaltissima* and *Lanneacoromandelica* were forms middle storey. Finally Canes, Reeds, creepers and Climbers such as *Bambusa bamboo*, *Calamus pseudotenuis*, *Calamus rheedii*, *Lantana camera*, *Ageratum conizoides* etc which forms undergrowth

Table-5

Girth Range (cm)	No of individuals	Percentage
10-40	01	1.25
40-80	10	12.5
80-120	27	33.75
120-160	12	15
160-200	11	13.75
200-240	08	10
240-280	06	7.5
280-320	04	5
320-360	01	1.25

Among Total plants 62.50% of the individuals were belonged to 80-200 cm gbh class and 23.75% of the individuals belonged to 200-360gbh range, only 13.75% belonged to 10-40cm range, (Table -5). Based on height and GBH classes, 62.50% of the individuals of the forest represented set of the present nearly 23.75% represented set of the past and only 10% represented set of the future. This indicates that forest is matured type.

Floristic richness:

Table -6

Taxa (S)	Individuals(N)	N/S	Simpson_1-D	Shannon_H
17	80	4.7	0.8741	2.371

The high value for Simpson index (0.87) indicates that out of every 100 pairs of individuals taken randomly, 13 belong to same species that reveals high floristic richness of the forest. The lower N/S ratio of plot (4.7) suggested that the number of individuals of the species in plot was slightly more. Shannon- Wiener's index ($h' = 2.371$) 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 Meenukolli RF, *Vitexaltissima* was showed high relative frequency (65%), relative dominance (24.97) and relative density (25) hence IVI was maximum (69.67). This indicates that *V. altissima* is common in the most of the quadrat and they turn out to be the most important species within the community. Among the individuals *Terminalialata* were showed IVI (42.91), relative density (16.25) but less relative dominance (11.51), meanwhile *Chukrasia tabularis* also showed more relative dominance (18.67) hence both the species were considered as second important species in the sampled area. According to FIV, Combrataceae (84.34) and Lamaiaceae (74.21) it indicates that by showing species diversity Combrataceae family play a very important role in diversity of the sampled area. Among plant species

Pterocarpus marsupium is threatened species and its relative density is about 8.75. Hence the MeenukolliRF is moderately rich in floristic composition .

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