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Research Article

COMPARATIVE STUDY OF PLANT DIVERSITY IN BANDERDEWA FOREST RANGE AND COMMUNITY FOREST: A CASE STUDY OF ARUNACHAL PRADESH, EASTERN HIMALAYA.

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ABSTRACT

The plant diversity of Banderdewa forest range (BFR) and Community forest (CF) of two villages of Arunachal Pradesh were studied. In BFR, the number of family, genera and species was found higher than CF. In both BFR and CF, the dominant family was Verbenaceae. The evergreen species was found higher in CF (47.368%) than reserve forest. The species similarity between RF and CF was 66.66% for shrub and herbs whereas the density of trees and shrub was higher in BFR than CF, which is 272 ha^{-1} and 1792 ha^{-1}, respectively. However the basal area in CF (98.96 cu.m per ha) was higher than BRF (38.661 m^3 ha^{-1}). The BFR had higher shannon diversity index than community forest for tree (1.18), shrubs (0.85) and herbs (0.64). On the contrary, the dominance index (Simpson) of tree was higher in community forest (0.19).

Keywords: management regime, Community forest, Banderdewa forest range, basal area.

INTRODUCTION

In world widely, the eastern Himalaya is well known as biodiversity hotspot. It encompasses Sikkim, Darjeeling, and Arunachal Pradesh. In eastern Himalaya, the forest resources have been managed by both formal and informal institutions since time immemorial. In formal institutions, forest has been managed with scientific forest management through approved working plan by forest department personnel. However, forests have been managed by the indigenous communities through traditional knowledge since time immemorial. Moreover, village council and its customary laws plays tremendous role in the protection of forest resources (Pant 1997).

The present study has been done in Arunachal Pradesh, which is the 2nd largest forest cover in the country and harbor rich biodiversity. It falls in Biotic Province 2D 'East Himalayas' of Zone 2-The Himalayas (Rodgers and Pawar 1988). This region also brought under priority Global 200 ecoregion. The state has three types of forests i.e. reserve forest, protected forest and unclassed state forest (USF), which cover an area of 10,545 km^2, 9,530 km^2 and 31,465 km^2, respectively. In the state, the 'village council' plays an important role in the management of the forest resource in community forest (Pant 1997).

The present study documented the species diversity of forest in two different forest management regimes i.e. conventional forest and community forest. The type of management practices and biotic disturbance brings changes in plant diversity and community structure in the forest (Mishra *et al.* 2004).

MATERIAL AND METHODS

Study area:

The present study was done in the Banderdewa Forest Range, Banderdewa Forest Division, Papum pare district, Arunachal Pradesh and community forest of two villages i.e., Taying Tarang and Emchi. The study was done from October 2008 to May 2009. The dominant tribe of two selected villages was Nyishi tribe. The moist deciduous forest was predominant forest type, and the prevailing soils types varies from sandy to sandy loam in the plain areas whereas moist and fertile in the hills. The average annual rainfall is 2800 mm and minimum and maximum temperature of this area is 18^{0}C and 30^{0}C, respectively.

Methods:

The species composition and plant diversity were studied through quadrat method. The analysis of trees, shrubs and herbs were done by adopting quadrate sizes viz., 10m x 10m, 5m x 5m, and 1m x 1m, respectively. A total of 25 quadrats in each category were laid down. The plants collected from the study sites were identified by experts from SFRI, BSI, Forestry department of NERIST, etc. Hooker (1872-1879) was followed for the nomenclature part. Density, frequency, and basal area of all the constituent species were

determined using standard methods (Misra, 1968).

RESULTS AND DISCUSSION

There are 18 families with 30 genera found in the Banderdewa forest range (BFR) whereas 14 families with 19 genera found in community forest. The dominant family in the BFR was Verbenaceae followed by Apocynaceae, Asteraceae, Lauraceae, Leguminosae, Magnoliaceae and Piperaceae (Table 1).

Family	No. of species		Family	No. of species	
	RF	CF		RF	CF
Acanthaceae	1	1	**Leguminosae**	2	-
Anacardiaceae		1	**Lythraceae**	1	1
Apocynaceae	2	1	**Magnoliaceae**	2	-
Asteraceae	2	2	**Malvaceae**	-	1
Combretaceae	1	1	**Meliaceae**	-	1
Dilleniaceae	1	-	**Myrtaceae**	1	1
Dipterocarpaceae	1	-	**Piperaceae**	2	2
Dryopteridaceae	1	1	**Punicaceae**	1	
Euphorbiaceae	1	1	**Solanaceae**	1	1
Fagaceae	1		**Verbenaceae**	3	4
Lauraceae	2	-			

Table 1: Species distribution in Banderdewa Forest Range (BFR) and Community forest (CF)

In BFR, the total number of species, genus and family were found to be 30, 30 and 18 respectively, which was higher than Community forest (CF) (Table 2). The total number of species found in CF was lower

than Panchayat forest (PF) of Garwal, which was 17 to 26 (Negi. *et al.,* 2008). Whereas, the number of species found in BFR was higher than reserve forest (RF) of Garwal (17-28) (Negi. *et al.,* 2008). The number of genera found in BRF was similar to Reserve forest of Garwal (Negi. *et al.,* 2008). However, the number of genera found in CF was found lower than Panchayat forest of Garwal (Negi. *et al.,* 2008). The total number of families in CF and BFR was found lower than PF and RF of Garwal (Negi. *et al.,* 2008).

Parameter	**RF**	**CF**
Total no. of species	30	18
Total no. of genera	30	19
Total no. of families	18	14
Species/ genus ratio	1	0.947
Species / family ratio	1.667	1.286

Table 2: Floristic characters of the reserve forest and community forest

The floristic composition of BFR were *Dipterocarpus macrocarpa, Delonix regia, Duabanga grandiflora, Tectona grandis, Actinodaphne obovata, Dillenia indica, Terminalia myriocarpa, Litsea sp., Talauma hodgsonii, Michelia champaca,* etc. whereas in CF were *Psidium guajava, Gmelina arborea, Terminalia sp., Mangifera indica, Melia azedarach, Callicarpa arborea, Alstonia scholaris, Lagerstroemia sp.,* etc.

The predominant shrub of BFR were *Tabernaemontana divaricata, Clerodendron sp., Solanum sp., Lantana camara, Adhatoda vasica, Eupatorium odoratum,* **Ricinus communis** etc. whereas in the CF were *Solanum sp., Lantana camara, Eupatorium odoratum, Clerodendron sp., Adhatoda vasica, Urena lobata*, etc. In the BFR, the ground floras were dominated by *Diplazium esculentum, Houttuynia cordata, Mikania micrantha, Piper sp.,* etc. whereas in CF, *Ageratum conyzoides, Diplazium esculentum, Houttuynia cordata,* and *Piper sp.* were abundant.

In total, the presence of deciduous species was comparatively higher than evergreen species in both reserve forest (56.6%) and community forest (52.6%) (Table 3).

Life form	Forest stand	
	RF	CF
Evergreen species (%)	43.333	47.368
Deciduous species (%)	56.666	52.632

Table 3: Tree forms in the reserve forest (RF) and community forest (CF)

The species similarity was as low as 29.16% between BFR and CF. In case of shrub and herbs, the species similarity between BFR and CF found to be 66.66% whereas the species similarity for trees was the lowest i.e. 8%.

The density of trees was found higher in BFR (272 per ha) than CF (264 per ha). However, the density of tree in both BRF and CF were lower than the Panchayat forest and Reserve Forest of Garwal (Negi. *et al.,* 2008). The basal area of trees was found higher in CF (98.96 cu. m per ha) than BFR (38.661 m^3 ha^{-1}).

In CF, tree density was higher in *Melia azedarach* (76 ha^{-1}) followed by *Lagerstroemia sp.* (48 ha^{-1}). Among the shrub community, the plant density was highest in *Adhatoda vasica* (384 ha^{-1}) in BFR, followed by *Solanum sp* (368 ha^{-1}) in the CF. Whereas highest frequency for trees was recorded in *Melia azedarach (*44%), followed by *Psidium guajava (*28%) in the CF. Frequency for shrub was 32% for *Clerodendron sp.* and *Lantana camara* in BFR and CF, respectively. In BFR, highest frequency (44%) for herbaceous species was found in *Diplazium esculentum* and *Mikania micrantha*.

The greater basal cover was found in *Melia azedarach* (44.32 cu.m ha^{-1}) followed by *Lagerstroemia sp (*30.16 cu.m ha^{-1}) in CF. Highest basal cover for shrub was found in *Solanum sp.* (2.24 cu.m ha^{-1}) followed by *Lantana camara* (2.08 cu.m ha^{-1}) in community forest.

Sl. No	Vegetation components	Diversity indices (Shannon)		Diversity indices (Simpson)	
		BFR	CF	BFR	CF
1	Tree	1.18	0.79	0.071	0.196
2	Shrub	0.85	0.65	0.143	0.271
3	Herb	0.63	0.57	0.250	0.273

Table 4: Comparison of diversity indices of Shannon and Simpson of trees, shrubs and herbs of two forest management regimes

Shannon diversity index of tree species was higher in BFR (H′=1.18) than CF (H′= 0.77). Similar reports were observed for both shrubs and herbs (Table 4). On the contrary, the Simpson dominance index of tree was found higher in CF (C=0.196) than BFR (C= 0.0711) (Table 4).

CONCLUSION

The Banderdewa forest range (BFR) has higher number of families (18), genera (30) and species diversity (30) as compare to community forest. The dominant family found in BFR and CF was Verbenaceae. The density of trees was found higher in BFR (272 per ha) than CF (264 per ha). However, the basal area of trees was found higher in CF (98.96 cu.m per ha) than BFR (38.661 m^3 ha^{-1}). The Shannon diversity index in BFR was higher than CF whereas contrary in case of Simpson index.

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