"DOMINANCE- DIVERSITY AND DISTRIBUTION PATTERN ALONG AN ALTITUDINAL GRADIENT OF JAMMU REGION"

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ABSTRACT:

In this study, we examined the species composition, distribution pattern and diversity of tree and shrub species along an altitudinal gradient of Jammu Region.Vegetational analysis was analyzed along four forest stands at an altitude of 750m-1000ma.s.l. The total tree density ranged from 340-610 tree/hac. Pinusroxburghii displayed maximum density and IVI at all four sites. Carissa apaca showed maximum density and IVI amongst shrubs. Trees were distributed randomly while shrubs displayed contagious distribution. Species diversity ranged from 0-1.87 amongst trees while .98-1.36 values are reported for species diversity of shrubs..

Key words: Altitude, Distribution Pattern, Diversity,Shrubs, Forest Ranges.

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1.1 INTRODUCTION

The Jammu forests, which range from tropical dry deciduous forests in the foothills to timber line forests, are the main source of income for the people who reside in Jammu and KashmirThePinusroxburghii and Quercusleucotrichophora trees dominate the Western Himalayan forests in this region. Trees determine fundamentally the templates for structural complexity and environmental variety in forest ecosystems because they are responsible for the overall physical structure of habitats (Malik et al 2016). Understanding the diversity and species composition of trees is crucial for developing and implementing the community's conservation strategy as well as for comprehending the structure of a forest community (Malik et al., 2014, Malik and Bhatt, 2015).

One of the key analytical traits of the plant ecosystem is species (Malik et al 2014).

The most prevalent species of Indian pine, Pinusroxburghii, also provides an alternative source of fire wood and leaves for bedding materials (Gaur, 1982). Chir-pine (Pinusroxburghii) forest, which represents the region's highly populated zone, predominates in the area between 1000 and 1800 metres above sea level. A pine forest can be found between 300 and 2000 metres above sea level in the Jammu Region.

Oak and pine mixed forests, as well as other conifers often found at higher altitudes from climatic vegetation, occupy the temperate forest's lower elevation (Bhandari et al., 1997). Since the Himalayan region's forest resources are being over-exploited, there is a growing desire to preserve, maintain, and improve them. These forests have seen intense biotic pressure (lopping, grazing, and firewood collecting) from the population of people and animals, which has an impact on the frequent and quick changes in resource usage, a decrease in the number of species, and a shift in the temperature pattern. Biodiversity is directly impacted by these changes (Heywood, 1995).

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The primary goal of the current study was to track the distribution and dominance patterns of forests along an altitudinal gradient. The current study offers quantitative data and a species distribution pattern for the studied sites.

1.2 MATERIALS AND METHODS

The study site had a monsoonic climate as is common. Physical, chemical, and biological processes cause phyllite rocks to weather, which results in the formation of soil. Ten 10x10m quadrats were placed at each site to conduct a phytosociological investigation of the region. The species area curve approach was used to assess the size and quantity of quadrats. Each species' occupied individuals as well as the kinds of plants they were (trees and shrubs) were recorded. Trees were regarded as having a circumference at breast height (cbh) greater than 30 cm (Saxsenaet.al.1984). The formulas provided by Curtis and McIntosh were used to quantitatively examine the phytosociological data for percentage frequency, abundance, and density (1950). The total of the relative density, relative frequency, and relative dominance was used to calculate the importance value index for trees (Curtis, 1959). Following Curtis and Cottam, abundance to frequency ratio was conducted (1956) Distribution patterns were classified as infectious distribution (>0.05), random distribution (0.025–0.05), and regular distribution (0.025). Following Whittaker (1975), the number of species at each location was tabulated to evaluate the species richness or evenness. Utilizing Shannon-Wiener, species diversity was calculated (1963). Using Simpson's index, the concentration of dominance (CD or) was calculated (Simpson, 1949)

1.3 RESULTS AND DISCUSSION

Phytosociological analysis of vegetation at different study sites are given in table1and 2. A total of 12 species of Trees and 7 species of shrubs were recorded from the study sites. Among the Trees, the maximum density was that of Pinusroxburghii(410tree/hac) at site III and least density was occupied by two species i.e.Terminaliaspp and Pyruspashia (20 tree/ha) in site I. Among trees,Pinusroxburghii was the dominantspecies (IVI-300) at site II While least dominant species was Terminaliaspp (IVI=10.80) at site I (Table 1.1).

TABLE 1.1: PHYTOSOCIOLOGICAL ATTRIBUTES OF TREES AT ALL STUDY SITES

Species	Stand I(800m)		Stand II (1000m)		Stand III (950m)		Stand IV (750m)	
	Density (Tree/ha)	IVI	Density	IVI	Density	IVI	Density	IVI
Mallotusphilippensis (Lam.) Muell.-Arg.	240	79.69	-	-	-	-	-	-
Terminalia sp. L.	20	10.80	-	-	-	-	-	-
Eucalyptus globulusLabbil	50	31.07	-	-	-	-	--	-
PyruspashiaBuch.-	20	11.58	-	-	-	-	--	--

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Ham.exD.Don								
BauhiniavahliiWight&Arn.	30	17.59	-	-	-	-	-	-
PinusroxburghiiSarg.	60	69.28	410	300	300	264.62	400	192.26
DalbergiasissoRoxb.	60	32.88	-	-	-	-	-	-
Lanneacoromandelica (Houttuyn) Merrill	-	-	-	-	40	35.38	-	-
Syzygiumsp.L.	-	-	-	-	-	-	50	22.10
Cassia fistula L.	-	--	-	-	-	-	100	38.47
Phyllanthusemblica L.	-	-	-	-	-	-	40	15.54
Mangiferaindica L.	50	47.11	-	-	-	-	30	31.63
Total	530		410		340		610	

Among Shrubs, Carissa apaca displayed maximum density and IVI (2680 Shrubs/hac; 178.75) at site II while minimum density and IVI was shown by Zanthoxylumarmatum(80shrubs/hac; 4.09) at site I (Table 1.2).

TABLE 1.2:

PHYTOSOCIOLOGICAL ATTRIBUTES OF SHRUBS AT ALL STUDY SITES

Species	Stand I(800m)		Stand II (1000m)		Stand III (950m)		Stand IV (750m)	
	Density (Shrubs /ha)	IVI	Density (Shrubs /ha)	IVI	Density (Shrubs/ ha)	IVI	Density (Shrubs /ha)	IVI
Asparagus adscendensBuch.-Ham	160	47.73	1040	43.28	1280	90.26	1720	53.36
Berberisaristata DC.	280	10.04	-	-	-	-	-	-
Carissa apacaStapf.	2080	158.97	2680	178.75	1720	126.24	2120	152.84
Euphorbia royleanaBoiss.	280	13.26	-	-	400	26.92	400	40.03
Lantana camara L.								

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	1880	55.55	2360	77.98	1280	56.58	1680	53.77
RhusparvifloraRoxb.	280	10.35	-	-	-	-	-	-
Zanthoxylumarmatum DC.	80	4.09	-	-	-	-	-	-
Total	4960		6080		4680		5920	

Among trees, the distribution pattern of study site indicates that mostly species are in random distribution while few of them distributed contagiously (Table1.3). While shrubs are distributed contagiously.Only one shrub species distributed randomly(Table 1.4)

TABLE 1.3: DISTRIBUTION PATTERN (%) OF TREE SPECIES AT ALL SITES

Sites	Distribution pattern (%)		
	Regular	Random	Contagious
I	-	62.5 (5)	37.5(3)
II	-	100(1)	0
III	-	100(2)	0
IV	-	60(3)	40(2)

TABLE 1.4:

DISTRIBUTION PATTERN (%) OF SHRUBS AT ALL SITES

Sites	Distribution pattern (%)		
	Regular	Random	Contagious
I	-		100(7)
II	-		100(3)
III	-		100(4)
IV	-	25(1)	75(3)

Alpha diversity, total diversity, evenness, and dominance value were displayed along four separate locations in Tables 1.5 and 1.6. Site 2 had the least variety of trees (just one tree was present there), whereas Site 1 had the greatest diversity of trees (1.87). Its range was correspondingly 0-1.87. The largest diversity among shrubs was between 0.89 and 1.36. (Table 1.6).

At all sites, the concentration of dominance values among the trees ranged from 0.44 to 1. Between the bushes, site I had the highest dominance (0.344) while site III had the lowest dominance (0.31). (Table 1.6).

The highest evenness value was found at site 1, where it was 2.070, and the lowest at site 2, where it was 0 score. Site 3 recorded the most evenness among the bushes, 2.08, and Site 1

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recorded the lowest evenness, 1.61. (Table 1.5& 1.6).

The community's species diversity is represented by the alpha diversity. For trees, site 1 had the highest alpha diversity (8), whereas site 2 had the lowest value (1). At every site, the alpha diversity ranged from (1 to 8). The alpha diversity of the bushes was highest at site 1 (seven) and lowest at site 2 (three) (Table 1.5& 1.6).

TABLE 1.5:

ALPHA DIVERSITY, EVENNESS, TOTAL DIVERSITY INDEX (H) AND CONCENTRATION OF DOMINANCE (CD) OF TREES AT ALL SITES

Sites	Alpha diversity	Evenness	Total diversity (H)	Conc. of Dominance (cd)
I	8	2.07	1.87	0.18
II	1	0	0	1
III	2	1.20	0.36	0.79
IV	5	1.62	1.13	0.44

TABLE 1.6:

ALPHA DIVERSITY, EVENNESS, TOTAL DIVERSITY INDEX (H) AND CONCENTRATION OF DOMINANCE (CD) OF SHRUBS AT ALL SITES

Sites	Alpha diversity	Evenness	Total diversity index (H)	Conc. of Dominance (cd)
I	7	1.61	1.36	0.344
II	3	2.05	0.98	0.44
III	4	2.08	1.25	0.31
IV	4	2.03	1.22	0.34

1.4 CONCLUSION

The present study's locations had an average tree density of 340 to 610 trees per hectare, which was within the range of values previously reported by Saxsena and Singh (1982), Pangteyet.al. (1989), and Dhaulakhandiet.al (2008). The total tree density value varied between 140 and 750 trees/ha in the Pindari catchments forest (Pangteyet al., 1989), 820 trees/ha in the natural Gangotri forest (Dhaulakhandiet al. 2008), and 420 to 1640 trees/ha in the temperate forests of the Kumaun Himalaya (Saxsena and Singh,1982).

There were 4680 to 6080 shrubs per hectare overall. Most tree species are dispersed randomly, according to the distribution pattern of the trees, whereas only a small number of species have a contagious distribution. The spread of shrubs is contagious. Among the trees and plants, regular distribution was completely

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missing. The contagious distribution of species across all sites suggested that plants and climate interact in a way that enables individuals to settle in one area and climate before moving on to another. (Joshi and Tiwari, 1990; Bhandariet al., 1995; Pandeet al., 1996; Bhandariet al., 1997; Rawat, 2002; Kumar and Bhatt) Contiguous pattern is also observed for the grazinglands of the Jammu Region (2006).

The ecosystem's capacity for productivity is increased through dominance, and the system becomes stable due to diversity. This straightforward layer of the site's biodiversity pattern, the Shannon-wiener index (H), is given as species evenness and species richness. Simsons index (cd) similarly demonstrated a dominating tendency among the stands. For the moist temperate forest in the Jammu Region, Baduni and Sharma (1997) recorded a value for the diversity index ranging from 0.00 to 1.70. The current diversity index results (0.00–1.87) comfortably fit within the range of other temperate forests.

In the current study, site II's cd value for tree strata was greater (1.00), whereas site I's was the lowest (0.18). A monospecific forest type is indicated by cd's maximum value. Site II (0.44) demonstrated the bushes' dominance, followed by sites I, IV, and III. The current study's findings varied within the (0.10-0.99) range that other researchers have reported for temperate forests (Risser and Rice,1971; Baduni and Sharma,1997).

Plant diversity is also being impacted by anthropogenic activities in the Jammu Region of India, including the building of hill roads, forest fires, overgrazing, felling of trees for fuel and fodder, and removal of leaf and wood litter from the forest floor (Malik et al 2016).

The biodiversity of plants has been seriously threatened by the conversion of forest land to agricultural land, log-cutting for fuelwood, and deforestation for domestic use. Coniferous dominated forests are highly valuable economically, but they are also subject to a variety of disruptions from nearby human activity, which is what ultimately leads to the loss of plant biodiversity. A few other causes of poor regeneration and deterioration include forest fires, loping, and chopping of stems for terpentine. Regular removal of tree boles lowers annual wood production as well as the number of trees per hectare. As a result, it is anticipated that the forest will experience significant stress in the years to come. The goal of the current investigation was to better understand the structure of these forests. The Jammu region's forest may benefit from these data's conservation and monitoring of new management techniques.

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