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Vegetational Analysis of *Pinus roxburghii* forest in Uttarkashi

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Abstract

The present study has been carried out in the district of Uttarkashi, Garhwal, Uttarakhand, India to document the vegetation status of *Pinus roxburghii* forest. To analyze the plant diversity, baseline vegetation survey was conducted by using transect and quadrat method. Total tree diversity ranged from 1.26-1.94 and herb diversity from 3.28-3.65. Shrub diversity ranged from 1.52-2.72.Forests of this region is mainly dominated by *Pinus roxburghii*. *Pinus roxburghii* is the most common resin producing pine species of India and also provide alternate source of fuelwood and leaves for bedding materials. Therefore, an attempt was made to analyze the forest community and structure of a pure *Pinus roxburghii* forest.

Keywords: *Pinus roxburghii* | Plant Diversity | Fuel wood | quadrate | vegetation analysis

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Introduction

Biodiversity is the very basis of human survival and economic well being, and encompasses all life forms, ecosystems and ecological processes, acknowledging the hierarchy at genetic; taxon and ecosystem levels (McNeely *et al*., 1994). High biodiversity favours ecological stability, whereas accelerating species loss could lead to collapse of the ecosystem. The Himalayan embodies diverse and characteristic vegetation distributed over a wide range of topographical variations Himalaya.

For the proper management of a forest, a study on forest inventory is the first requirement. The Himalyan forest vegetation ranges from tropical dry deciduous forests in the foothills to timberline. Forests are the main source of livelihood of the people living in Uttarakhand, Central Himalaya. Forests of this region are mainly dominated by *Pinus roxburghii* and *Quercus leucotrichophora*. *Pinus roxburghii* is the most common resin producing pine species of India and also provide alternate source of fuelwood and leaves for bedding materials, however *Quercus leucotrichophora* is important source of fuel, fodder and other daily

needs of the villagers. Therefore, an attempt was made to analyze the forest community and structure of a pure *Pinus roxburghii* forest.

Materials and Methods

The present study was carried out in the district Uttarkashi. It is located between 38° 28' to 31° 28' North latitude and 77° 49' to 79° 25' East longitude. Two major rivers of India viz. Bhagirathi (called Ganga beyond Deoprayag) and Yamuna have their origin in the snow covered peaks of Gaumukh and Bandarpunch respectively in Uttarkashi. These peaks and rivers are of high reverence to people all over India and are holy centers of pilgrimage since time immemorial. The widely varying climate and topography produce a wide range of vegetation and serve as habitats to diverse species of wild life. Forests occupy a place of pride in the environment of the district not only for the sheer bulk of the area they occupy but also for the richness of variety of vegetation. Pine forests occur between the altitudes of 900-2000 meters and Deodar forests between 2000-3000 meters. Fir and Spruce forests are found over 3000 meters and Kharshu, Birch and Junipers forests upto the height of 4000 meters. Above the fir and Spruce forest zone, alpine pastures are found throughout the district between the heights of 3500 meters to 4877 meters above Sea level.

The phytosociological study was carried in the tree layer by using 10 x 10 m quadrates. A total of 10 randomly placed quadrates were used on each site. The size and number of quadrates were determined by the species area curve (Misra 1968) and the running mean methods (Kershaw 1973). In each quadrate > 30cm circumference (at 1.37 m from the ground) were considered tree. The vegetation data were quantitatively analyzed for abundance, density and frequency (Curtis and McIntosh, 1950). The importance value index (IVI) was determined as the sum of the relative frequency, relative density and relative dominance (Curtis 1959).

Result

Species richness and species diversity

A total of 11 species were recorded from site I out of which 1 tree species *Pinus roxburghii* , 5 shrub species *Asparagus racemoses, Carrisa spinaum, Colebrookia oppositifolia, Rubus ellepticus* and *Lantana camara* and 5 herb species *Apluda mutica, , Carex nubigena, Justicea simplex, Rubia cordifolia, Thalactrum japonica* were reported. All the species were distributed contagiously. On site II 1 tree species *Pinus roxburghii*, 6 shrub species *Asparagus racemoses, Berberis acitica, Carrisa spinaum, Colebrookia oppositifolia, Pyracantha crenulata* and *Rubus ellepticus* and 5 herb species *Apluda mutica, Artemisia nilagarica , Justicea simplex, Rubia cordifolia, Thalactrum japonica* were reported.On site III 1 tree species *Pinus roxburghii*, 3 shrub species *Berberis asitica, Carrisa spinarum and Colebrookia oppositifolia* and 3 herb species *Artemisia nilagarica Carex nubigena* and *Thalactrum japonica* were reported.

Discussion

One of the foundations for conservation of biological diversity in forest landscapes understanding and managing the disturbance regimes of landscape under past-natural and

natural conditions (Spies and Turner1990). Conservation biologists worn that 25% of all species could become extinct during the next 20 to 30years. The causes for the loss of species and fragmentation of natural habitats. In the present study, plant biodiversity is assessed by quantitative analysis of forest vegetation in different forest including various disturbances do not provide time for the ecosystem recovery and widen the forest gap and fragmentation of the land in the region.

Site /Altitude	Species	Frequency (%)	Density (Trees ha-1)	TBC (m 2 ha-1)	IVI	A/F ratio
Site- I (1000m-1200m)	*Pinus roxiburghii*	100	560	56.94	300	0.056
Site-II (1200m-1400m)	*Pinus roxiburghii*	100	540	53.26	300	0.054
Site-III (1400m-1600m)	*Pinus roxiburghii*	100	500	26.79	300	0.051

Table 1: Phytosociological analysis of tree species in three altitudinal zone of study sites.

	Species	Frequency (%)	Density	IVI	A/F ratio
Site I	*Asparagus racemoes*	6.77	0.23	1.33	0.500
	Carrisa spinaum	50.00	3.89	14.36	0.156
	Colebrookia oppositifolia	3.65	0.17	0.80	1.25
	Rubus ellepticus	3.13	0.14	0.67	1.38
	Lantana camara	16.67	0.62	3.38	0.223
Site II	*Asparagus racemes*	9.90	0.31	1.58	0.319
	Berbaris asiatica	2.60	0.07	0.40	1.075
	Carrisa spinaum	3.65	0.11	0.58	0.86
	Colebrookia oppositifolia	8.33	0.38	1.55	0.540
	Pyracantha crenulata	24.48	0.66	3.69	0.110
	Rubus ellepticus	12.50	0.48	2.18	0.313
Site III	*Berbaris asiatica*	43.23	1.96	8.05	0.105
	Carrisa spinaum	17.71	0.70	3.09	0.223
	Colebrookia oppositifolia	4.69	0.18	0.80	0.806

Table 2: Phytosociological analysis of shrub species in three altitudinal zone of study sites

	Species	Frequency (%)	Density (Trees ha-1)	IVI	A/F ratio
Site I	*Apluda mutica*	17.71	0.64	3.36	0.204
	Carex nubigena	8.85	0.34	1.73	0.438
	Justicea simplex	7.55	0.24	1.37	0.429
	Oxalis corniculata	2.34	0.08	0.42	1.375
	Rubia cordifolia	9.11	0.88	2.93	1.063
	Thalactrum japonica	1.04	0.09	0.31	8.400
Site II	*Apluda mutica*	18.23	0.72	2.96	0.216
	Artemisia nilagarica	2.60	0.11	0.44	1.61
	Justicea simplex	7.29	0.14	0.87	0.255
	Nepta leucophylla	22.92	0.68	3.26	0.130
	Oxalis corniculata	26.56	1.36	4.96	0.193
	Rubia cordifolia	27.08	1.33	4.95	0.182
	Thalactrum japonica	61.98	2.99	11.20	0.078
Site III	*Artemisia nilagarica*	7.81	0.21	1.06	0.341
	Carex nubigena	18.23	0.65	2.81	0.194
	Thalactrum japonica	10.42	0.34	1.55	0.317

Table 3: Phytosociological analysis of herbs species in three altitudinal zone of study sites.

Trees	**Family**	**Site 1**	**Site 2**	**Site 3**
Pinus roxburghii	Pinaceae	+	+	+
Shrubs				
Asparagus racemosus	Liliaceae	+	+	
Berbaris asiatica	Acanthaceae		+	+
Carrisa spinaum	Aocynaceae	+	+	+
Colebrookia oppositifolia	Lamiaceae	+	+	+
Pyracantha crenulata	Rosaceae		+	
Rubus ellepticus	Rosaceae	+	+	
Lantana camara	Verbenaceae	+		
Herbs				
Apluda mutica	Poaceae	+	+	
Artemisia nilagarica	Asteraceae		+	+
Carex nubigena	Cyperaceae	+		+
Justicea simplex	Acanthaceae	+	+	
Rubia cordifolia	Rosaceae	+	+	
Thalictrum japonica	Ranunculaceae	+	+	+

Table 4: Species richness in three different sites:

The *Pinus roxburghii* forest was characterized by low species richness. Among the distribution pattern of the species most of the species in oak forest and pine in all the site was distributed contagiously and few species in oak forest were distributed randomly. Contagious

distribution has been reported by several workers Greig-Smith (1957); Kershw (1973); Singh and Yadav (1974). Odum (1971) have emphasized that contagious distribution is the commonest pattern in nature. Kumar and Bhatt (2006) also reported contagious distribution pattern in foot-hills forests of Garhwal Himalaya. Shannon weiner index ranged between 1.26 and 1.94 in three altitudinal sites. The shrub diversity ranged between 1.52 and 2.72. The tree diversity index analyzed for the forest was lower than that reported (2.85) by the earlier workers (Upreti *et al*. 1985). The diversity was lowest for the altitudinal zone 1400-1600 m asl.

The present study highlights a very poor status of total species richness in the entire forest area along with regulation of tree species at various altitudes. Our findings revealed that lower elevational cover types had comparatively higher number of species than less number of species at higher elevation cover types. It implies that higher elevation forest types should be conserved with necessary implementations.

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