VEGETATION DESCRIPTION OF SOME PINE FORESTS OF SHANGLA DISTRICT OF KHYBER PAKHTUNKHWA PAKISTAN. A PRELIMINARY STUDY.

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Abstract

The vegetation of pine forests of Shangla District of Khyber Pakhtunkhwa Province of Pakistan is described. Thirty stands at different locations were selected in this study. In each stand gymnospermic species were widely distributed and dominated. Sampling was performed by Point Centered Quarter Method (PCQ). *Pinus wallichiana* exhibited higher density 409 ha^{-1} with 132.1 m^2 ha^{-1} basal area occurring in 26 stands. *Abies pindrow* occurred in 7 stands with density of 384 ha^{-1} and 145.3 m^2 ha^{-1} basal area, while *Picea smithiana* attained low frequency, recorded from 2 sites. It is shown that population of young stands exhibited higher density.

Introduction

Shangla District is located in the Khyber Pakhtunkhwa province of Pakistan. The district headquarter is located at Alpurai. The total area of the district is 1,586 square kilometers. The district lies between 33.08^o to 34.31^o North Latitude and 72 .33^o to 73.01^o East Longitude. The district is bounded in the north by Kohistan district, in the East by Battagram district and Kala Dhaka (Black mountain of Hazara), in the West by Swat district and in the South by Buner district. Shangla district consist of small valleys, situated between the hillocks and surrounded by high mountains covered by forests. The area situated on much height above sea level has thick and open gymnospermic forests. The topography of Shangla district is dominated by high mountains and narrow valleys. These mountains are the Western extremities of the great Himalaya range. The general elevation of the district is 1300 to 3000 meters above sea level. A number of medicinal plants of economic importance are found in the area. Some of these are Tarkha, Unab, Banafsha, Mushkibala, White Rose, Mint etc. The area has a variety of Fauna like Markhur, Brown Bear, Leopard, Snow Leopard, Wolf, Monkeys, pigeon, Dove, Chakor and Snakes etc.

In Pakistan, the earlier ecological studies were generally observational. However, with the passage of time gradually quantitative methods were introduced and the vegetation description evolved quantitative description. Various workers like Champion *et al*., (1965), Ahmed & Qadir (1976), Ahmed (1986, 1988, 1991), Ahmed *et al.*,(1989). Ahmed *et al*., (1990 a & b), Ahmed *et al*., (2006); Khan *et al*., (2008) and Siddiqui *et al*., (2009) have investigated the phytosociology of different mountainous areas of Pakistan, but no comprehensive study of Shangla district has been undertaken. The present study dealt with the quantitative description of pine forests of Shangla District.

Champion *et al*., (1965) described this district under the moist temperate area. Its formation extends along the whole length of the outer ranges of the Himalaya between the subtropical pine forests and the sub-alpine formation. Rainfall from about 25" (64cm) or 30" (76cm) to about 60" (152cm) and the altitudinal range is from about 1372 m up to 3047 m, the limits varying markedly with aspect and configuration. According to Amjad *et al* (1996) Pakistan has insufficient forest resources. The country due to its sharp climatic variations, arid conditions lacks reasonable tree cover. There is hardly 4.28 million hectares or 4.9 percent of total area under forest / tree cover and still it is deteorating. Out of it the productive forests are less than 2%.

Materials and Methods

Sampling was carried out in conifer dominating forests, throughout their natural limits in Shangla Mountains. Though some forests are disturbed but mature and least disturbed forests were selected for quantitative sampling. Point Centered Quarter (PCQ) Method of Cottam and Curtis (1956), was followed in the whole forests for quantitative sampling. In each stand 20 points were taken at 20 meter of intervals. Ground flora was also recorded by using circular plot of 2.5 meters at each point. Phytosociological attributes (relative density, relative frequency and relative basal area) and absolute values (density ha^{-1} and basal area m^2 ha^{-1}) were calculated by following the method of Muller- Dombois and Elenbearg (1974) and Ahmed & Shaukat (2012). Other factors *i.e* (elevation, slope angle, aspects) of each stand were recorded. Slope angle was recorded by

using slope meter. Importance Value Index (Brown and Curtis, 1952) was used to rank each plant species with highest importance value in each stand was considered as dominant species. Each plant community was named on the basis of dominant species. Plant species were collected from each stand and then identified with the help of flora of Pakistan (Nasir & Ali, 1970-1989; Ali & Qaiser, 1993-2008).

Table1. Site characteristics and distribution of Pine tree species in Shangla District of Khyber Pakhtunkhwa, Pakistan.

Stand No.	Location and sites	Elevation (m)	Slope (°)	Aspect	Canopy	Communities & pure stands
1	Shangla Top Near Mangar Kot.	2120	30	NW	Open	*Pw* (Pure)
2	Rehman Abad (Pagorai)	1490	30	NE	Open	*Pw* (Pure)
3	Picho Banda (Dawlat Kalay)	1560	40	W	Open	*Pw* (Pure)
4	Matta Karin (Dherai)	1720	30	SE	Open	*Pw* (Pure)
5	Wachobi Card (Rahim Abad)	1780	35	W	Open	*Pw* (Pure)
6	Kwaro Alpurai.	1795	45	NE	Open	*Pw* (Pure)
7	Nakhtaro Ghar Macharr	1990	45	NW	Close	*Pw* (Pure)
8	Matta Morr Macharr 2	1890	40	NW	Close	*Pw* (Pure)
9	Kotkay.1 Malak Khail	1790	45	N	Moderate	*Pw* (Pure)
10	Kotkay .2 Near Puran Morr	1780	50	NW	Open	*Pw* (Pure)
11	Kandao. 1 (Pir Khana)	2690	45	SW	Close	*Ap* (Pure)
12	Kandao. 2 Near Ajmeer	1790	40	SE	Close	*Pw* (Pure)
13	Bahadar Sar (Lilownai Hill)	2810	35	S	Moderate	*Ap* (Pure)
14	Mann Sar (Copper Sar)	2620	40	E	Moderate	*Ap/Ps*
15	Safaray Karrall Near Mann Sar	2780	45	W	Close	*Ap/Ps*
16	Nakhter Nao (Kotkay)	2040	50	W	Open	*Pw* (Pure)
17	Board Near Kotkay	2130	30	W	Open	*Pw* (Pure)
18	Shangla Top.1 Check Post	2540	40	SW	Moderate	*Pw* (Pure)
19	Shangla Top .2 Near Chishma Hotel	2550	40	S	Open	*Pw* (Pure)
20	Alpurai Dipu Police Line	1650	35	NE	Open	*Pw* (Pure)
21	Lilownai Near Dipu	1610	30	N	Moderate	*Pw* (Pure)
22	Yakh Tangay Poran Hill	2620	40	W	Open	*Pw* (Pure)
23	Yakh Tangay Near Sharono	2190	30	NW	Close	*Pw/Ap*
24	Chakat (Near Karora)	1990	40	W	Open	*Pw* (Pure)
25	Goli butt Near Radar Tower	2000	40	SW	Close	*Pw* (Pure)
26	Yakh Tangay Check Post Hill	2180	45	W	Open	*Pw* (Pure)
27	Yakh Tangay 2 Kandao Hill	2240	40	W	Close	*Pw/Ap*
28	Yakh Tangay 3 Bazar Koat	2260	30	NE	Open	*Pw* (Pure)
29	Yakh Tangay 4 Near Sar Thana	2160	45	E	Open	*Pw* (Pure)
30	Yakh Tangay 5 Acharo	2120	40	NE	Moderate	*Pw /Ap*

Key to abréviations: Pw = *Pinus wallichiana*, Ap = *Abies pindrow*, Ps = *Picea smithiana*, Elev.= Elevation, E = East, W = West, N = North, S = South

Table 2. Phytosociological Attributes and absolute values of tree species in thirty stands of Pine forests of Shangla District of KPK. Pakistan.

Main Location, Sites and Stand No.		Species Name	Phytosociological Attributes				Absolute Values	
			Relative Frequency	Relative Basal Area	Relative Density	IVI	D.ha^{-1}	BA m^2 ha^{-1}
1	Mangar kot (Shangla Top)	*Pinus wallichiana*	100	100	100	100	55.61	14.47
2	Rehman Abad	*Pinus wallichiana*	100	100	100	100	353	71.04
3	Picho Banda (Dawlat Kalay)	*Pinus wallichiana*	100	100	100	100	242.81	64.71
4	Matta Karin	*Pinus wallichiana*	100	100	100	100	317.46	53.41
5	Wachobi Carrd (Rahim Abad).	*Pinus wallichiana*	100	100	100	100	313.81	68.56
6	Kwaro (Alpurai)	*Pinus wallichiana*	100	100	100	100	295.43	52.85
7	Nakhtaro Ghar (Machaarr).	*Pinus wallichiana*	100	100	100	100	298.29	126.89
8	Matta Mor (Machaarr)	*Pinus wallichiana*	100	100	100	100	371.61	91.56
9	Kotkay 1	*Pinus wallichiana*	100	100	100	100	298.04	40.49
10	Kotkay 2	*Pinus wallichiana*	100	100	100	100	375.58	71.33
11	Kandao 1(Ajmer)	*Abies pindrow*	100	100	100	100	379.20	139.38
12	Kandao 2 (P.K)	*Pinus wallichiana*	100	100	100	100	293.46	141.14
13	Bahadar Sar	*Abies pindrow*	100	100	100	100	383.71	145.37
14	Man sar	*Abies pindrow*	80	80	63.36	74.45	242.18	74.72
		Picea smithiana	20	20	36.64	25.55	60.54	43.20
15	Safaray	*Abies pindrow*	82.5	82.5	77.21	80.74	289.86	108.94
		Picea smithiana	17.5	17.5	22.79	19.26	61.49	32.16
16	Nakhter Nao	*Pinus wallichiana*	100	100	100	100	372.68	75.55
17	Board Kotkay	*Pinus wallichiana*	100	100	100	100	390.96	62.48
18	Shangla Top 1	*Pinus wallichiana*	100	100	100	100	345.17	103.70
19	Shangla Top 2	*Pinus wallichiana*	100	100	100	100	289.987	109.61
20	Alpurai Dipu	*Pinus wallichiana*	100	100	100	100	354.33	84.06
21	Lilownai (P.L)	*Pinus wallichiana*	100	100	100	100	335.75	65.88
22	Poran Hill(Y.T)	*Pinus wallichiana*	100	100	100	100	409.36	132.11
23	Yakh Tangay1	*Pinus wallichiana*	95	95	94.48	94.83	366.68	91.08
		Abies pindrow	5	5	5.52	5.17	19.30	5.32
24	Chakat(Karora)	*Pinus wallichiana*	100	100	100	100	327.30	94.29
25	Goli butt	*Pinus wallichiana*	100	100	100	100	396.03	87.56
26	Yakh Tangay 2	*Pinus wallichiana*	100	100	100	100	346.78	158.88
27	Yakh Tangay 3	*Pinus wallichiana*	85	85	89.28	86.43	280.23	109.44
		Abies pindrow	15	15	10.72	13.57	49.45	13.15
28	Yakh Tangay 4	*Pinus wallichiana*	100	100	100	100	392.12	158.83
29	Yakh Tangay 5	*Pinus wallichiana*	100	100	100	100	381.47	115.43
30	Acharo (Y.T) 6	*Pi Pinus wallichiana*	75	75	65.47	72.07	278.97	92.60

Key to abbreviations: D ha^{-1} = Density ha^{-1}, BA m^2 ha^{-1} = Basal area m^2 ha^{-1}, IVI = Importance Value Index.

Authority of species: *Pinus wallichiana* A.B.Jackson, *Abies pindrow* Royle, *Picea smithiana* (Wall.)

Table 3. Summary of Phytosociological sampling of 30 stands of District Shangla. Mean importance value, absolute density ha^{-1}, basal area m^{2}ha^{-1} and dominant position of pine tree species are presented. Species are ranked on the basis of importance value.

S. No	Name of Species	Presence in # of Stands	Mean importance value	Mean density ha^{-1}	Mean basal area m^{2}ha^{-1}	Dominant 1st	Dominant 2nd
1	*Pinus wallichiana*	26	98.205 ± 1.18	328.5 ± 15.2	88.9 ± 7.7	26	-
2	*Abies pindrow*	7	57.41 ± 15.41	208.1 ± 58.1	76.5 ± 21.6	4	3
3	*Picea smithiana*	2	22.4.5 ± 3.145	61.015 ± 0.475	37.68 ± 5.52	-	2

Results and Discussion

Conifer species are widely distributed in different parts of Pakistan depending upon elevation and climatic conditions of the area. Summary of sites characteristics is given in (Table 1), while the phytosociological summary with absolute values are describe in Table 2. These stands were located at the range of elevation from 1490 to 2810m above sea level. Slope was from 30^o to 50^o, facing N, W, E. and South aspect. In most of the stands the canopy was open due the history of human and animal's disturbance. A few close and moderate forest canopies were also recorded. Most of the study area occupied monospecific stands. On the basis of phytosociological analysis, floristic composition and IVI following two communities and two monospecific forests were recognized in this area.

1. *Pinus wallichiana* pure stands
2. *Abies pindrow* pure stands
3. *Abies – Picea* community
4. *Pinus wallichiana* - *Abies* community.

Ground flora or associated angiospermic shrubs, herbs and grasses will be described in next paper.

1. ***Pinus wallichiana* pure stands**: These stands were recorded from twenty six different locations of sampling sites of Shangla shown in Table 1. At twenty three locations, *Pinus wallichiana* was present as a single dominating specie however this specie is found in association with *Abies pindrow* in other locations. Most of the sites were facing West steep slope and elevation ranges from 1490 to 2620m. It's occupied highest density 409 ha^{-1} with 132.1m^2 ha^{-1} basal area at stand no 22 (Table.2). The canopy was mostly open at these forests. Ahmed *et al.,* (2006) reported pure stands of *Pinus wallichiana* at Nalter (Gilgit) on south facing slopes at 2770 m elevation and Takht-e-Sulaiman (Baluchistan) at 3100 m elevation. They recorded *Pinus wallichiana-Quercus incana* community from moist temperate mixed forests i.e., Lower Topa, Jhika Gali and Murree hills at the elevations of 1970m to 2250 m. *Pinus wallichiana* occurred as dominant with 72% importance value with 63% density and 88% basal area while associated species *Quercus incana* attained 16%importance value. Siddiqui *et al.,* (2013) sampled *Pinus wallichiana* monospecific forests at two different locations i.e., Chikar forest, Azad Kashmir (stand 7) and Patriata, Murree (stand 13). These stands were located at the elevation of 1930 m and 2230m with 25^o to 28^o moderate slopes respectively. In these monospecific stands *Pinus wallichiana* density ranged from 135 to 429 ha^{-1}with 69 to 78 m^{2}ha^{-1} basal area. Seven non-Conifer understorey species with seedlings of *Pinus wallichiana* and *Cedrus deodara* were also recorded from these two stands. Compare to these stands our stands are young with higher density and basal area.

2. ***Abies pindrow* pure stands:** *Abies pindrow* was sampled from 7 different sites of study area. In these seven stands *Abies pindrow* was found as pure specie in two stands while in five stands it is found in association with *Pinus wallichiana* and *Picea smithiana.* These sampling stands were located at the elevation of 2690m to 2810m and 35 to 45^o steep slopes. The canopy of these areas was recorded as close and moderate respectively. In these monospecific stands density ranged from 293 to 384 density ha^{-1} with 139.3 to 145.3 basal area m^2 ha^{-1}. Siddiqui *et al.,* (2013) observed pure stand of *Abies pindrow* at only one location at Lalazar, (Naran, Kaghan valley) at the elevation of 3000m on North West facing aspect, with 45^o steep slope. Among the communities studied this forest prevails in the coldest area with highest annual precipitation. This stand showed a density of 189 trees ha^{-1} with 109 m^2 ha^{-1} basal area. The area is extensively disturbed due to human interference, which indicates little or no regeneration in this forest.

3. ***Abies–Picea* community:** This community was recorded from two different locations of sampling area of Shangla shown in Table 1. Both stands were occurred on East and West facing 40^o to 45^o steep slopes and elevation ranges from 2620m to 2780m above sea level. In these stands *Abies pindrow* was dominant species and associated with *Picea smithiana. Abies pindrow* showed 63.3 to 77.2 % importance value with 242 to 290

density ha^{-1} and 74.7 to 108.9 basal area m^2 ha^{-1} while *Picea smithiana* showed 19.2 to 25.5 importance value with 60.5 to 61.4 density ha^{-1} and 32.1 to 43.2 basal area m^2 ha^{-1} It is suggested that these low values may be related to the continuous cutting for decoration and fuel purposes which have been exported to the other areas. This type of community was found by Siddiqui (2013) at two different location of Malam Jabba at 2600 m elevation and Sri, Shogran at 2900 m elevation. Importance value of *Abies pindrow* in Malam Jabba was 90 % whereas in Sri, it was 32 %. Density of trees was 288 ha^{-1}in Malam Jabba and 138 ha^{-1} from Sri, with basal area of 64 and 44 m^2ha^{-1}, respectively.

4. ***Pinus wallichiana - Abies*** **community:** This community was distributed in three stands of Yakh Tangay area near sharono and Kandaow hill respectively. These stands occur in North West and West facing aspects at 30 to 40^o steep slopes with elevation ranges from 2120 to 2240m. The canopy was closed in both stands. In these stand the importance value of *Pinus wallichiana* was higher than *Abies pindrow* (72.07 to 94.83%) density 279 to 367 ha^{-1} with 91.08 to 109.4 m^2 basal area. While *Abies pindrow* attained low importance value of (5.1 to 27.9) and 19 to 93 density ha^{-1} with 5.3 to 48.8 m^2 ha^1 basal area.

The vegetation observed in this study area is almost similar to that described by the other researchers, like Champion *et al*., (1965); Chaghtai *et al*., (1989). They observed such type of vegetation in moist temperate area of Himalayan region and Miranjani top (Galyat forest, Hazara division K.P.K.) respectively. The vegetation of Miranjani top has considerably changed in twelve years (1974-86). Greater changes have occurred in the vegetation on East-West, and South facing aspects. Hussain & Badshah (1998) recorded oak forest in the lower part of Pir Garh hills of Waziristan and coniferous forest (*Pinus wallichiana, Abies pindrow* and *Cedrus deodara*) at the upper part. Ahmed & Naqvi (2005) described the quantitative vegetation description of *Picea smithiana* from Himalayan range of Pakistan. Ahmed *et al*., (2006) presented phytosociological and structural description of Himalayan forest (including moist temperate forests) from different climatic zones of Pakistan. They reported 24 different communities and 4 monospecific forests types on the basis of floristic composition and importance values of species.

On the basis of above results and discussion it is concluded that extreme human disturbances and illegal cutting of trees the future of these forests is at great threat. If government and local agencies, organizations do not show concern, these forests may vanish soon.

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