

## PHYTOSOCIOLOGICAL STUDY OF PUSH ZIARAT AREA (SHAWAL) IN THE SOUTH WAZIRISTAN, PAKISTAN

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### ABSTRACT

*Based on the highest importance value Pinus-Abies-Sophora, Pinus-Abies, Abies-Cedrus, Abies-Pinus and Pinus-Abies communities are established in Push Ziarat area. All the communities contained economically valuable timber; firewood, medicinal and aromatic plants. The study showed that the vegetation cover is depleting at a very high pace due to population explosion and bringing terrestrial ecosystems in their agri.-land use. The communities so established reflected the characters of dry temperate entities.*

**Key words:** Phytosociology, high altitude area, ethnobotany, floristic composition.

### INTRODUCTION

Push Ziarat is situated in the Shawal hills of District Laddah in South Waziristan. Elevation of the site varies from 2500 m to 2730m. It lies between 69°15' to 70°15' longitude and 31°55' to 32°40' latitude. Towards its east side is Shora valley, to the south are Pirghar and Outma hills, to the west are Miami Kabul Khel and Jhoni Khel Wazir tribes while to its north is Shoedar Hill of North Waziristan. Map of the area is given in Fig. 1.

Climatically the area falls in dry temperate zone. Its winter is long and severe, and lasts from November to March. Temperature is often below 0°C in winter and precipitation is in the form of snow. The spring season is in the months of April and May. The summer season starts after mid June and ends in the end of August. Most of the rainfall occurs in summer. Large numbers of ephemeral grows in summer. In autumn rainfall rate is very low i.e., between 15-25 cm. The soil in the area is generally shallow and calcareous.

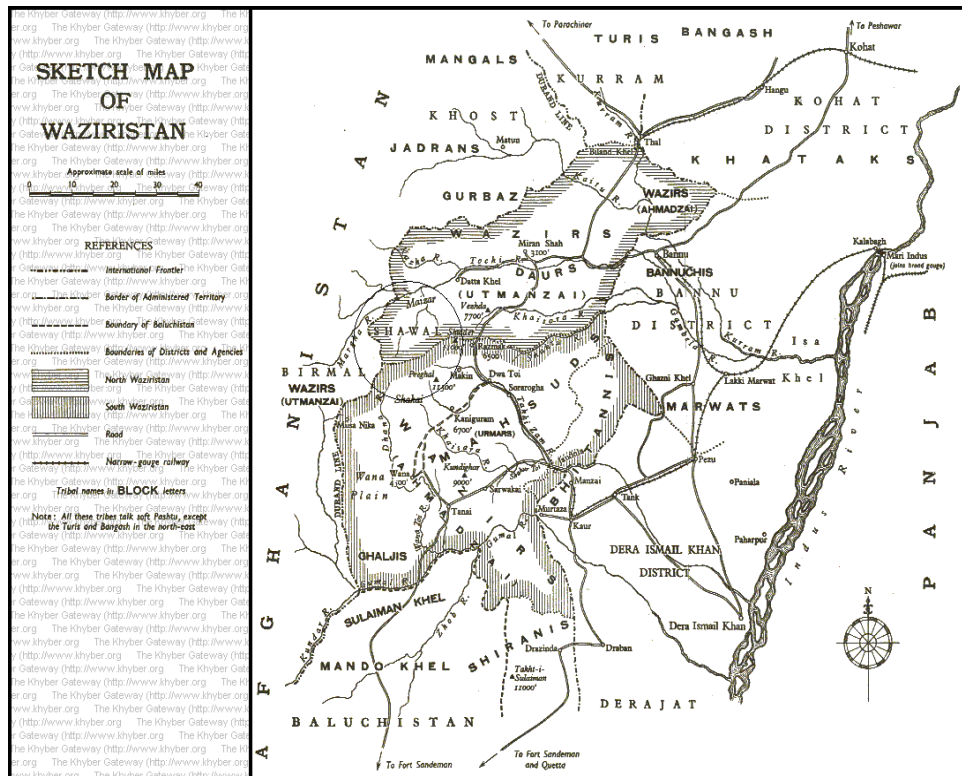
Literature review on the ecological studies in the various ecological zones of the country and Brazil reflects that Hussain and Badshah (1998) studied vegetation structure of Pirghar hills in South Waziristan, while Malik *et al.*, (2007) conducted studies on phytosociological attributes of different plant communities of Pir Chinasi hills of Azad Jammu and Kashmir. Similarly, Ahmad *et al.*, (2006) reported phytosociology and structure of the Himalayan forests

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from different climatic zones of Pakistan. Abbas *et al.*, (2009) described phytosociological analysis within the range of Grey Goral in Pakistan and Azad Kashmir. Moinuddin (1988) reported plant communities of some Northern temperate forests of Pakistan. Hargreaves (2008) studied phytosociology in Brazil with specific emphasize on Amazone, Cerrado, Caatinga, Pantanaal, Atlantic forest, Coast and Island biomes. Similarly, Nascimento *et al.*, (2003) analyzed phytosociology of the remaining xerophytic woodland associated to an environmental gradient at the banks of Sao Iranisco River. Literature search of the country elucidated that the study area is virgin; therefore, it was considered imperative to document its phytosociology.



**Fig. 1. Map of Waziristan. The study area Shawal, South Waziristan is encircled in the Map.**

**MATERIALS AND METHODS**

The study was conducted in June, 2003. Based on the homogeneity of the vegetation, the research area was divided into five sites. 1. Site A (East side) 2. Site B (South side) 3. Site C (East side)

4. Site D (a) (North side) (5) Site D (b) (North side). The Physico-Chemical properties of soils in the research sites are documented in (Table-1). In each site 25 quadrates were laid. The vegetation was recorded and analyzed according to the methods of Braun-Blanquet (1965) and Hussain (1989). Quadrate size was taken as 10x10 m<sup>2</sup> for trees, 4x4 m<sup>2</sup> for shrubs and 1x1m<sup>2</sup> for herbaceous plants.

Plant specimens were collected in triplicate and pressed in the blotting papers (Jaffery, 1968). They were shade dried by changing blotting papers on alternate days and treated with the solution of Copper Sulphate and Mercuric Chloride (in the ratio of 1000 CC water, 1 gram Copper Sulphate, 5 drops Mercuric chloride) for preservation. The specimens were taxonomically characterized by consulting available literature, catalogues, monographs and fascicles of the Flora of Pakistan by Nasir and Ali (1970-2002). The specimens were deposited in the Herbarium, Pakistan Council of Scientific and Industrial Research Laboratories Complex, Peshawar (PES).

Soil samples were collected from all sites at a depth of 1-15 cm and 15-30 cm. Soil was analyzed in Agriculture Research Center, Serai Naurang and matched with the reported limits of Collinson (1977).

**Table-1. Physico-chemical properties of Soil composition of various research sites.**

S.No	Parameters	Site A		Site B	Site C	Site D (A)	Site D (B)
		Low altitude	High altitude				
1.	Altitude	2500m	2630m	2650-2730m	2500-2550m	2350-2500m	2500-2620m
2.	Soil type	Sand loam	Silt loam	Sand loam	Loamy	Silt loam	Loam
3.	pH	8.30	7.70	8.35	8.14	8.18	8.40
4.	CaCO <sub>3</sub>	5.00	4.80	4.51	5.00	4.4	5.40
5.	Organic matter	1.38	0.69	0.61	0.89	1.03	1.74
6.	N %	0.80	0.03	0.03	0.04	0.05	0.09
7.	P %	9.00	2.00	8.30	6.00	7.00	16.00
8.	K %	0.00	0.00	0.00	0.00	0.00	0.00
9.	Ec <sub>x</sub> 10 <sup>6</sup>	550	390	660	350	430	860

## RESULTS AND DISCUSSION

The general features are described (Table-2) so that the detail of the sites and communities coincide in the table form. Whereas, based on the Importance Value (Table-3), five communities were established. Pinus-Abies-Sophora community was established in the Site A (East side). 36 species are characterized in these communities which were based on morphology. Important taxa other than the cited dominant species included *Salvia nubicola*, *Cedrus deodara*, *Caragana*

*gerardiana*, *Astragalus psilocentros*, *Morina persica*, *Quercus incana* and *Q. dilatata*. It was observed that the vegetation of the East side was thin in comparison with the North Slope. *Sophora mollis* and *Saliva nubicola* were recorded as dominant species at the bottom of the Mountainous slope. Grazing and browsing were limited in this site. Soil of the lower elevation was sandy loam while at the higher elevation it was silt loam. pH value of the soil at the lower elevation was high, contrary to this it was low in the higher elevation (Table-1).

The second community recorded was Pinus-Abies community in the Site B (South side). 49 species could be collected in this site. Other associate species included *Cedrus deodara*, *Berberis lycium*, *Ajuga spp.*, *Potentilla gerardiana* and *Solanum surratense*. Although the species number was high in this community but still the density and frequency of the taxa were low, hence the vegetation was sparse. Soil of the site was loam sand. High amount of the litter and dough was present in it. Due to the deforestation the number of species were constantly declining hence the taxa were depleting, which is quite alarming on the conservation view point (Table-3).

Abies-Cedrus community was the third one which was established in the Site C (East side) or the Western slope. 42 species could be recorded in community. *Abies pindrow* and the Himalayan cedar were the taxa having high importance values successively. Followed by them were *Pinus wallichiana*, *Berberis lycium*, *Solanum surratense*, *Astragalus spp.*, *A. psilocentros*, *Taraxacum officinale*, *Ajuga spp.* and *Cynodon dactylon* (Table-1). Due to ruthless cutting of *Abies pindrow*, *Pinus wallichiana* and *Cedrus deodara*, the vegetation was becoming thin. Soil of the site is loam and has high pH value.

Abies-Pinus was the fourth community which could be established in Site D (a) (North side). 34 species were recorded in this site. *Abies pindrow* and *Pinus wallichiana* had high importance values hence were recognized as dominant taxa in the vegetation. Other associate species in the community were *Salvia glutinosa*, *Pinus gerardiana*, *Cedrus deodara*, *Trifolium spp.*, *Salsola baryosma*, and *Pimpinella sterwartii*. Due to the high humidity in the site, the vegetation was thick. Among the trees Pinus, Abies and Cedrus were the major Genera of economic importance. Record from the Hug altimeter showed that the heights of the trees were high in this community as compared to the others (Table-2).

Finally, record of the data in Table-3 exhibits Pinus-Abies community as established one in the Site D (b) (North side). Forty one species were recorded in this site. Besides *Pinus wallichiana* and *Abies pindrow*, *Salvia glutinosa*, *Solanum surratense*, *Quercus incana*, *Taraxacum officinale*, *Potentilla gerardiana*, *Astragalus psilocentros*, and *Fragaria nubicola* could be recorded as other important taxa.

*Thymus serpyllum*, *Valeriana wallichii*, *Solanum surratense* and *Taraxacum officinale* were the medicinal and aromatic plants which were used as medicaments for carminative, anxiolytic, spasmolytic and laxative properties. *Thymus serpyllum* was used as green tea because of its aroma while roots of *Taraxacum officinale* are roasted, ground and used as coffee for its mild laxative property.

Economic plants such as *Cedrus deodara*, *Pinus gerardiana*, *Pinus wallichiana*, *Abies pindrow* and *Abies webbiana* are used as building material and for the material of furniture as well, while *Quercus incana* and *Q. dilatata* are used as fire wood in the area. Since the area is situated in the uplands and is inhabited by Mahsood ethnic race, therefore medicinal plants like *Berberis lycium*, *Adiantum capillus-veneris*, *Hypericum perforatum*, *Onosma spp.*, *Viola serpens*, *Pimpinella anisum*, *Thymus serpyllum*, *Saussurea lappa* and *Taraxacum officinale* are used in the folk therapy. Grazing and browsing of *Poa cristata* and *Cynodon dactylon* is limited. Deforestation is depleting many species in the area, since the forests are under biotic pressure. Thus ecological management of the area is direly needed. Many medicinal plants are used for burning and as fodder for live stock. Poisonous plants like *Conium oscaligera* also exist in the area.

In view of the conservation of forest, biodiversity and terrestrial ecosystem, it is considered imperative to use alternate energy sources in the study area. Besides this it is observed that the farmland is increasing at the expense of forest cover, therefore, the trend can be checked through alternate refined sources. The forest cover also be assessed periodically, so that the community is educated to check it from decline and convinced about its impact on the nature and air cleaning. Choice of the rapid growing species by farmland managers in the area is encouraged during reforestation through community participation, because farmers are interested in the economic development through earnings from the farmlands.

Rehabilitation of vegetative cover through bottom up approach be made. Poverty reduction strategy of the community is devised, so that timber source dependence is minimized for livelihood. The ecological services provided by the elders/forefathers for conservation of forests also be kept sustained through emphasis on community participation. Also the sustainable development initiatives are encouraged for the uplift of the area through the cited source.

#### **ACKNOWLEDGEMENT**

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**Table-2. General features of the communities established in Push Ziarat area in the South Waziristan.**

	1. Pinus – Abies - Sophora community	2. Pinus – Abies community	3. Abies - Cedrus community	4. Abies-Pinus community	5 Pinus-Abies community
<b>Site of occurrence</b>	Site "A" or East side	Site "B" or South side	Site "C" or Western side	Site "D" (a) " or North (a) side	Site "D (b) " or North (b) side
<b>Altitude</b>	2500m to 2630 m	2650m to 2730m	2500m to 2550m	2350 to 2500m	2500 to 2620m
<b>No. of taxa recorded</b>	36	49	42	34	41
<b>Decending taxa on basis of I.V:</b>	<i>Pinus wallichiana</i> (19.60) <i>Abies pindrow</i> (14.50) <i>Sophora mollis</i> (11.50)	<i>Pinus wallichiana</i> (19.52) <i>Abies pindrow</i> (16.80)	<i>Abies pindrow</i> (16.37) <i>Cedrus deodara</i> (14.40)	<i>Abies pindrow</i> (18.80) <i>Pinus wallichiana</i> (15.86)	<i>Pinus wallichiana</i> (24.28) <i>Abies pindrow</i> (20.30)
<b>Other associate genera</b>	<i>Salvia, Cedrus deodara, Berberis lyceum, Desmodium, Solanum surratteuse, Caragana, Astragalus, Morina persica, Quercus incana, Q.dilatata</i>	<i>Cedrus deodara, Berberis lycium, Astragalus, Rosa macrophylla, Trifolium, Potentilla, Solanum surattense</i>	<i>Pinus wallichiana, Berberis lycium, Solanum surratense, Astragalus, Taraxacum, Ajuga, Cynodon dactylon</i>	<i>Salvia, Pinus gerardiana, Cedrus deodara, Trifolium, Salsola, Pimpinella</i>	<i>Salvia, Solanum surrattense, Quercus incana, Taraxacum, Potentilla, Astragalus, Fragaria, Thymus serphyllum, Valerian wallachii</i>
<b>Economic plants</b>	<i>Cedrus deodara, Pinus wallichiana, Quercus incana, Quercus dilatata</i>	<i>Pinus, wallichiana, Abies pindrow Cedrus deodara</i>	<i>Abies pindrow Pinus wallichiana Cedrus deodara</i>	<i>Abies pindrow Pinus gerardiana Cedrus deodara</i>	<i>Pinus wallichiana, Abies pindrow</i>
<b>Dominant species in hill below</b>	<i>Sophora mollis</i> <i>Salvia</i> spp.	---	---	<i>Sophora mollis</i> <i>Salvia</i> spp.	---
<b>Grazing &amp; browsing</b>	Limited	---	---	Limited	---
<b>Vegetation status</b>	Vegetation on East slope in comparison to Northern slope: Sparse	Depleting	Thin	Thick, height of the trees is high comparatively	Thin
<b>Soil type of site</b>	Low altitude: Sandy loam High altitude: Silty loam	Sandy loam	Loamy	Silty loam	Loam
<b>pH value</b>	Low altitude: 8.30 High altitude: 7.70	8.35	8.14	8.18	8.40

**Table-3. Chronological order and importance values of taxa in communities established.**

S.No	Plant Species	Voucher No	Site A I.V	Site B I.V	Site C I.V	Site D (A) I.V	Site D (B) I.V
1.	<i>Abies pindrow</i>	10207	14.50	16.80	16.37	18.80	20.30
2.	<i>Adiantum capillus-veneris</i>	10208	--	--	--	1.04	--
3.	<i>Ajuga spp.</i>	10209	2.0	3.82	1.83	--	--
4.	<i>Aster spp.</i>	10210	--	0.45	1.96	--	1.61
5.	<i>Astragalus spp.</i>	10211	2.10	2.23	2.69	1.18	1.03
6.	<i>Astragalus psilocentros</i>	10212	3.45	1.59	2.96	1.15	0.75
7.	<i>Androsace spp.</i>	10213	--	2.3	5.55	2.52	1.43
8.	<i>Berberis lyceum</i>	10214	3.45	1.93	3.75	--	--
9.	<i>Calendula arvensis</i>	10215	1.49	1.35	1.5	1.25	--
10.	<i>Caragana gerardiana</i>	10216	1.87	1.04	0.61	--	--
11.	<i>Cedrus deodara</i>	10217	2.30	1.93	3.75	0.77	1.21
12.	<i>Celtis australis</i>	10218	--	0.19	--	--	--
13.	<i>Circium argyracantha</i>	10219	1.69	2.53	9.13	0.9	--
14.	<i>Conium oscaligera</i>	10220	0.95	1.72	2.1	0.83	0.92
15.	<i>Cotoneaster spp.</i>	10221	2.30	1.38	1.07	--	--
16.	<i>Cynodon dactylon</i>	10222	2.52	0.81	1.06	3.52	1.94
17.	<i>Desmodium spp.1</i>	10223	1.59	0.80	3.29	--	--
18.	<i>Desmodium Spp.2</i>	10224	--	1.94	--	--	--
19.	<i>Desmostachya pinnata</i>	10225	--	0.80	0.45	1.15	--
20.	<i>Fragaria vesca</i>	10226	--	1.21	1.46	6.99	--
21.	<i>Gallium spp.</i>	10227	--	--	--	2.98	3.09
22.	<i>Geranium spp.</i>	10228	--	1.50	0.55	0.7	2.37
23.	<i>Gnaphalium 1 spp.</i>	10229	2.72	0.19	0.45	1.15	--
24.	<i>Gnaphalium 2 spp.</i>	10230	1.15	--	2.15	--	--
25.	<i>Gnaphalium 3 spp.</i>	10231	--	1.24	--	--	1.16
26.	<i>Hypericum perforatum</i>	10232	--	1.50	0.55	0.7	2.37
27.	<i>Malva neglecta</i>	10233	--	--	--	--	1.63
28.	<i>Macfadyena unguis-cati</i>	10234	1.64	1.79	1.06	--	--
29.	<i>Medicago lupulina</i>	10235	1.96	1.30	2.53	2.39	1.89
30.	<i>Morina persica</i>	10236	--	--	--	--	0.53
31.	<i>Nepeta erecta</i>	10237	--	--	--	1.87	2.19
32.	<i>Nepeta podostachys</i>	10238	2.05	2.54	0.67	2.74	2.01
33.	<i>Polytrichum spp.</i>	10239	--	--	--	--	1.26
34.	<i>Onosma spp.</i>	10240	--	--	--	--	1.55
35.	<i>Parrotiopsis spp.</i>	10241	--	--	--	--	0.37
36.	<i>Peganum harmala</i>	10242	--	--	--	--	0.56
37.	<i>Phlomis stewartii</i>	10243	0.78	0.59	0.58	0.58	0.37
38.	<i>Pimpinella stewartii</i>	10244	--	0.68	1.39	0.87	0.9
39.	<i>Pinus geradiana</i>	10245	0.80	0.20	1.14	0.21	0.2
40.	<i>Pinus wallichiana</i>	10246	19.60	19.52	7.12	15.86	24.48
41.	<i>Poa spp.</i>	10247	--	--	0.80	--	3.03
42.	<i>Polytrichum spp.</i>	10248	--	--	---	---	1.26
43.	<i>Potentilla geradiana</i>	10249	2.52	1.5	1.14	2.7	1.68
44.	<i>Quercus dialatata</i>	10250	1.28	0.27	--	--	1.12
45.	<i>Quercus incana</i>	10251	1.46	0.22	--	--	1.34
46.	<i>Ranunculus spp.</i>	10252	1.91	1.41	--	--	2.2
47.	<i>Rosa macrophylla</i>	10253	1.85	3.4	1.09	--	--
48.	<i>Rumex spp.</i>	10254	--	--	--	--	--
49.	<i>Salsola baryosma</i>	10255	--	0.96	0.58	0.5	0.79
50.	<i>Salvia glutinosa</i>	10256	11.50	1.7	--	0.43	1.36

S.No	Plant Species	Voucher No	Site A I.V	Site B I.V	Site C 1.V	Site D (A) I.V	Site D (B) I.V
51.	<i>Salvia nubicola</i>	10257	7.20	1.84	1.63	--	--
52.	<i>Saussurea lappa</i>	10258	1.85	--	1.23	--	--
53.	<i>Schinus molle</i>	10259	--	1.47	--	--	--
54.	<i>Scutellaria edelbergii</i>	10260	--	1.25			
55.	<i>Solanum nigrum</i>	10261	1.45				
56.	<i>Solanum surattense</i>	10262	1.43	1.64	1.02	0.43	--
57.	<i>Sophora mollis</i>	10263	11.45	1.65	0.9	3.08	2.22
58.	<i>Stachys parviflora</i>	10264	--	0.31	--		
59.	<i>Taraxacum officinale</i>	10265	1.85	2.30	2.15	--	2.21
60.	<i>Thymus serpyllum</i>	10266	--	--	--	--	1.55
61.	<i>Torilis spp.</i>	10267	--	--	0.45	0.99	
62.	<i>Trifolium spp.</i>	10268	2.07	2.79	1.96	1.67	0.89
63.	<i>Urtica dioica</i>	10269	--	--	--	2.47	1.98
64.	<i>Valeriana wallichii</i>	10270	2.09	1.20	1.47	1.7	--
65.	<i>Verbascum thapsus</i>	10271	--	1.58	1.85	--	--
66.	<i>Veronica agrestis</i>	10272	--	--	--	--	2.4
67.	<i>Veronica anagallis-aquatica</i>	10273				1.62	0.37
68.	<i>Vernonia cinerea</i>	10274	0.65	0.78	--	--	
69.	<i>Viola serpens</i>	10275	--	1.18	1.65	2.76	1.29

## REFERENCES CITED

- Abbas, F.I., T. Akhtar, and A. Mian. 2009. Phytosociological analysis within the range of Grey Goral in Pakistan and Azad Kashmir. *Pak. J. Bot.*, 41(2):667-682.
- Ahmed, M., T. Husain, A.H. Sheikh, S.S. Hussain and M.F. Siddiqui. 2006. Phytosociology and structure of Himalayan forests from different climatic zones of Pakistan. *Pak. J. Bot.* 38(2): 361-383.
- Braun-Blanquet, J. 1932. *Plant Sociology*. Translated by G.D.Fuller and H.S. Conard. (1965). McGraw Hill Book Co. Inc., New York.
- Collinson, A.S. 1977. *Introduction to world vegetation*. The Lavenham Press Ltd. Laveham Suffox, England.
- Hargreaves, P. 2008. Phytosociology in Brazil. *The Americas J. Plant Sci. and Biotech.* 2 (1-2):21-31.
- Hussain, F. 1989. *Field and Laboratory Manual for Plants Ecology*, Univ. Grants Commission, Islamabad.
- Hussain, F and L. Badshah. 1998. Vegetation structure of Pirghar Hills, South Waziristan. *Pak. J. Trop. and Subtrop. Bot.* 6(3):187-195.
- Jaffery, C. 1968. *An introduction to Plant Taxonomy*. J&A Churchil Ltd. 104 Gloucester London.



- Malik, N.Z., M. Arshad and S.N. Mirza. 2007. Phytosociological Attributes of Different Plant Communities of Pir Chinasi Hills of Azad Jammu and Kashmir. *Inter. J. Agric. Biol.* 9(4): 569-574.
- Moinuddin, A. 1988. Plant Communities of some northern temperate forests of Pakistan. *Pak. J. For.* 38(1):33-40.
- Nascimento, C.E.S., Mj. J.N. Rodal and A.C. Cavalcanti. 2003. Phytosociology of the remaining xerophytic woodland associated to an environment gradient at the banks of the San Francisco river-Petrolina Pernambuco Brazil. *Acta Amazonica* 34:21-34.
- Nasir, E. and S.I. Ali. (eds.). 1970-2002. *Flora of Pakistan Fascicles 1-207.*