

Floristic Composition, Ecological Characteristics and Biological Spectrum of District Bannu, Khyber Pakhtunkhwa, Pakistan

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ABSTRACT Current study was aimed at ecological investigation of floristic composition, ecological characteristics and biological spectrum of district Bannu, KP, Pakistan. In the present study, 193 plant species of 154 genera belonging to 54 families were studied during 2013-2014, using frequent field visits in all seasons for the plant collection. 75.13 percent (145/193) plant species belonged to dicotyledons whereas, 24.87 percent (48/193) species comes from monocotyledons. *Poaceae* was the leading family with 37 species. Based on habitat most plants were observed in the dry area (45.07%) compared to wet (34.71%), and cultivated (18.13%). Floristically 60.62 percent were therophytes, 9.84 percent hemi-cryptophytes, and 9.84 percent geophytes. The leaf size spectra showed that the plants with Nanophyll leaves were dominant having 48.18 percent in the area. The vernal aspect was observed as favorable season for plant growth. In the present study, therophytes were observed dominant with high percentage, indicating that this area is a part of semiarid zone of Khyber Pakhtunkhwa, Pakistan.

INTRODUCTION

Bannu is an important northern district of Khyber Pakhtunkhwa, Pakistan. It is located in between 32.43° to 33.06° North latitudes and from 70.22° to 70.57° East longitudes. Total Area of Bannu is 1227 sq/kilometers with total population 677346. The area is fed by two rivers, termed as Kurram River and the Tochi river. District Bannu is a fertile valley and is home to many herbs, shrubs, trees, natural and cultivated plants. Seasonally, winter is cold while summer is hot (Rehman et al. 2014). The word floristic is derived from flora, which means to list all types of plant species or plant taxa within specific geographical area (Ali 2008). The world has extremely variable type of environments due to variable types of flora from ground to research filed (Qureshi et al. 2011). In the floristic study of Dureji (Khirthar range) showed that 74 species of 62 genera's

and 34 families by Parveen et al. (2008). Qureshi (2008) identified 120 plant species of 84 genera and 39 families of Chotiari Wetland Complex, Nawab Shah, Sindh, Pakistan. Hussain et al. (2009) reported 62 species including 15 monocots and 01 pteridophyte of 24 families from Azakhel Botanical Garden, University of Peshawar. Muhammad et al. (2009) reported 67 weed species, of them 2 plant species belonging to monocot families and 27 species were dicotyledons from wheat, maize and potato crop fields of Tehsil Gojra, District Toba Tek Singh, Punjab. Qureshi and Bhatti (2010) recorded 93 plant species belonging to 67 genera and 30 families of Pai forest, Nawab Shah, Sindh, Pakistan. Khan et al. (2011a, b) designed the ethnobotany of halophytes of Tehsil Karak and Dara Adam Khel. Khan et al. (2011c) reported 161 plant species in the Tehsil Takht-e-Nasratti, District Karak where 25 monocotyledonous and 136 dicotyledonous species belonged to 52 families.

Biological spectrum of vegetation is the index of the phytoclimate of the site, which is based on diverse life forms composing the flora of the site. The life-form in its turn is the ultimate manifestation of the sum of all the adaptations undergone by a plant to the climate in

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which it resides. According to Raunkiaer (1934), biological spectrum is used both for life-form distribution pattern of vegetation and phytoclimatic condition under the prevailing life forms progressed. Life-form study is thus significant part of flora description, ranking toward next to floristic composition. Leaf size play an important role in physiological processes of plant and plant-community in any area. Plant are also classified on the basis of leaf sizes (Oosting 1956). Life form and leaf size spectra are the clear picture of any area, from these it is indicated the climatic condition of a certain region (Cain and Castro 1959). Literature dealing with the life form and leaf size spectra shows that very little work has been made in Pakistan (Abbas et al. 2010; Qureshi and Ahmad 2010; Khan et al. 2011a,b, 2012, 2013).

The present work was not only important for exploration of floristic diversity, ecological characteristics and biological spectrum of plants that were found in the area but also important, how to conserve the local flora for further advance study like their uses in pharmacognosy and phytochemistry as well.

MATERIAL AND METHODS

Frequent field visits were made to different parts in different seasons of district Bannu during 2014-2015. Plants were collected, dried and preserved according to standard method. The plant species were identified with the help of available literature (Nasir and Ali 1971-1999; Ali and Qaisar 1995-2009) assigned with herbarium voucher number and placed in herbarium (PUP) Botany department, University of Peshawar. A whole floristic list, arrange alphabetically and kept in herbarium (PUP) Department of Botany, University of Peshawar. Leaf size, leaf classes and Biological spectrum were classified according to Hussain et al. (2006, 1989) and Raunkiaer (1934).

RESULTS AND DISCUSSION

Plant diversity in any area is the total numbers of the plant species within specific geographic area. Diversity naturally occurs in both wild and cultivated plant species, which is an image of flora and plant resources. Flora of an area is affected by agriculture, over grazing, deforestation, anthropogenic interaction and nat-

ural disasters. The research area was frequently visited and collections of plants were made during (2013-2014). The flora of District Bannu comprised of 193 plant species, 154 genera of 54 families (Table 1). Of them 145 species belonged to Dicotyledons and 48 species to Monocotyledons. Poaceae was the dominant family with 37 species followed by Asteraceae with (17 spp), Papilionaceae (15 spp), Solanaceae (9 spp), Brassicaceae (8 spp), Cucurbitaceae (7 spp), Amaranthaceae (6 spp), Boraginaceae (6 spp), Chenopodiaceae (5 spp), Euphorbiaceae (5 spp), Mimosaceae (5 spp), Polygonaceae (5 spp), Malvaceae (4 spp), Moraceae (4 spp), Zygophyllaceae (3 spp), Alliaceae, Apocynaceae, Aslepiadaceae, Caryophyllaceae, Convolvulaceae, Cyperaceae, Myrtaceae, Ranunculaceae, Rutaceae, Typhaceae, Tamaricaceae and Verbenaceae having (2 spp) each. While the rest of all families had 1 species each. Badshah et al. (2013), Ihsan et al. (2011), Khan et al. (2014) and Malik and Malik (2004). Flora of Pakistan (Ali and Qaisar 1995-2009) and abroad (Antije et al. 2003; Eilu et al. 2004) also indicated similar result.

The highest species percentage was recorded in family Poaceae (19.16%) while lowest is 0.5 percent in numbers of families having only one species (Table 2). Poaceae was dominant family and having large numbers of species which are consistently supported by Parveen et al. (2008), Qureshi and Bhatti (2008) and Hussain et al. (2009).

The habitat conditions of (Table 3) showed that dry plants were dominant (45.07%) followed by wet (34.71%), cultivated (18.13%) and both wet and dry (2.07%). Dry area have greater diversity as compare to wet and cultivated habitat in the study area. Wild xerophytic were dominant in the research area. These results were according to Musila et al. (2003) and Gimenez et al. (2004).

Seasonal variation of (Table 4) indicated that vernal aspect had 156 spp. (41.37%), followed by summer with 94 spp. (24.93%), winter 74 spp. (19.62%) and autumn 53 spp. (14.05%). The research area was clearly classified in four aspects that is, spring, summer, winter and autumn. Durani et al. (2010) and Ahmad et al. (2009) have reported that spring and summer aspects have higher numbers of species than any other aspect.

The biological spectrum of the research area (Table 5) showed that Therophytes plants were dominant (60.62%) followed by Hemi-crypto-

Table 1: Floristic list of plant species of District Bannu

S. No.	Plant species name	Family	Habitat	Seasonality			Life form	Leaf size	Lamina	Spinescence
				A	W	S				
01	Abelmoschus esculentus (Linn.) Moench.	Malvaceae	C	-	-	-	Th	Mic	S	-
02	Achyranthes aspera L.	Amaranthaceae	W	+	-	-	Th	N	S	Sp
03	Acacia modesta Wall.	Mimosaceae	D	+	+	+	Mp	L	Com	Sp
04	Acacia nilotica (L.) Wild. ex Delile	Mimosaceae	D	+	+	+	Mp	L	Com	Sp
05	Aerva javanica (Burm. F.) Juss.	Amaranthaceae	W	+	+	+	Ch	L	S	-
06	Albiza Lebbeck (L.) Benth	Mimosaceae	W	+	+	+	Mp	L	Com	-
07	Alhagi maurorum Medic.	Papilionaceae	W	-	-	+	H	L	Dis	Sp
08	Allium sativum L.	Alliaceae	C	-	+	+	G	N	S	-
09	Allium cepa L.	Alliaceae	C	-	+	+	G	N	S	-
10	Alopecurus nepalensis Trin. ex Steud.	Poaceae	W	-	+	+	Th	Mic	S	-
11	Aloe vera (L.) Brum	Asphodelaceae	D	+	+	+	Th	Mic	S	-
12	Anagallis arvensis L.	Primulaceae	W	-	+	+	Th	N	S	-
13	Amaranthus blitoides S. Watson	Amaranthaceae	W	-	-	+	Th	N	S	-
14	Amaranthus viridis L.	Amaranthaceae	W	+	-	-	Th	N	S	-
15	Aristida adscensionis L.	Poaceae	D	+	-	-	H	Mic	S	-
16	Aristida cyanantha Nees ex Steud.	Poaceae	D	-	-	+	H	Mic	S	-
17	Arnebia hispidissima (Lehm.) A. DC.	Boraginaceae	W	-	+	+	Th	L	S	-
18	Asphodelus tunifolius Caven.	Asphodelaceae	W	-	+	+	G	L	S	-
19	Astragalus hamosus L.	Papilionaceae	D	-	+	+	Ch	L	Com	-
20	Atriplex stocksii Boiss	Chenopodiaceae	W	-	+	+	Np	N	S	-
21	Avena fatua L.	Poaceae	W	-	+	-	Th	N	S	-
22	Boerhavia procumbens Banks ex Roxb	Nyctaginaceae	D	+	-	-	H	N	S	-
23	Brassica campestris L.	Brassicaceae	C	-	+	+	Th	N	Dis	-
24	Brassica tournefortii Gouan	Brassicaceae	W	-	+	+	Th	N	Dis	-
25	Bromus pectinatus Thunb.	Poaceae	W	-	-	+	Th	N	S	-
26	Calendula officinalis L.	Asteraceae	W	-	+	+	Th	N	S	-
27	Calligonum polygonoides L.	Polygonaceae	W	+	+	+	Np	L	S	-
28	Calotropis procera (Willd.) R. Br.	Asclepiadaceae	D	+	+	+	Ch	Mes	S	-
29	Capsicum annuum L.	Solanaceae	C	-	+	+	Th	N	S	-
30	Capparis decidua (Forsk.) Edgew.	Capparidaceae	D	+	+	+	Np	Ap	Abs	Sp
31	Carduus argentatus L.	Asteraceae	D	-	-	+	Th	Mic	S	-
32	Carthamus persicus Willd.	Asteraceae	D	-	-	+	Th	Mic	S	-
33	Carthamus tinctorius L.	Asteraceae	D	-	-	+	Th	Mic	S	Sp
34	Celosia argentea L.	Amaranthaceae	W	-	-	+	Th	N	S	-
35	Genchus bifolius Roxb.	Poaceae	D	-	-	+	H	L	S	-
36	Genchus ciliaris L.	Poaceae	D	-	+	+	H	L	S	-
37	Centaurea iberica Spreng.	Asteraceae	D	-	-	+	Th	N	Dis	Sp

Table 1: Contd...

S. No.	Plant species name	Family	Habitat	Seasonality			Life form	Leaf size	Lamina	Spinescence
				A	W	S				
38	<i>Centaureum pulchellum</i> (Sw.) Druce	Gentianaceae	W	-	-	+	Th	N	Dis	-
39	<i>Chenopodium album</i> L.	Chenopodiaceae	D	-	+	+	Th	N	S	-
40	<i>Chenopodium murale</i> L.	Chenopodiaceae	D	+	-	-	Th	L	S	-
41	<i>Chrozophora plicata</i> (Vahl) A. Juss. Ex Spreng	Euphorbiaceae	D	-	-	+	Th	N	S	-
42	<i>Cicer arietinum</i> L.	Papilionaceae	C	-	-	+	Th	L	Com	-
43	<i>Cirsium arvense</i> (L.) Scop.	Asteraceae	W	-	-	+	Th	Mic	S	-
44	<i>Cistanche tubulosa</i> (Schrenk.) Hook. f.	Orobanchaceae	D	-	-	+	G	L	S	-
45	<i>Citrullus colocynthis</i> (L.) Shred.	Cucurbitaceae	D	+	-	-	Th	Mic	Dis	-
46	<i>Citrus limon</i> (L.) Burm.f	Rutaceae	C	+	+	+	Th	N	S	Sp
47	<i>Citrus reticulata</i> Blanco	Rutaceae	C	+	+	+	Th	N	S	-
48	<i>Convolvulus arvensis</i> L.	Convolvulaceae	D	-	+	+	Th	N	S	-
49	<i>Convolvulus spicatus</i> Hallier f.	Convolvulaceae	D	-	-	+	Th	N	S	-
50	<i>Conyza bonariensis</i> (L.) Cronquist	Asteraceae	D	-	-	+	Th	Mic	S	-
51	<i>Corchorus depressus</i> (L.)	Tiliaceae	W	+	-	-	Th	L	S	-
52	<i>Croton bonplandianus</i> Bat.	Euphorbiaceae	D	-	-	+	Th	N	S	-
53	<i>Cucumis sativus</i> L.	Cucurbitaceae	C	-	-	+	Th	Mic	S	-
54	<i>Cucurbita maxima</i> Duch Ex. Lam.	Cucurbitaceae	C	-	-	+	Th	Mes	S	-
55	<i>Cucurbita pepo</i> L.	Cucurbitaceae	C	-	-	+	Th	Mes	S	-
56	<i>Cuscuta reflexa</i> Roxb.	Cuscutaceae	D	+	+	+	P	Ap	Dis	-
57	<i>Cymbopogon distense</i> Schutt.	Poaceae	D	-	-	+	H	N	S	-
58	<i>Cynopsis tetragonoloba</i> (L.) Taubert	Papilionaceae	C	-	-	+	Th	N	Com	-
59	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	D and W	+	+	+	H	L	S	-
60	<i>Cyperus difformis</i> L.	Cyperaceae	W	-	+	+	G	N	S	-
61	<i>Cyperus rotundus</i> L.	Cyperaceae	W	+	+	+	G	N	S	-
62	<i>Dalbergia sissoo</i> Roxb.	Papilionaceae	W and D	+	+	+	Mp	N	Com	-
63	<i>Datura alba</i> Nees.	Solanaceae	D	-	-	+	Th	Mic	S	Sp
64	<i>Desmostachya bipinnata</i> (L.) Stapf.	Poaceae	D and W	+	+	+	-	H	N	S-
65	<i>Dichanthium annulatum</i> Forssk.	Poaceae	D	-	+	-	H	N	S	-
66	<i>Digera muricata</i> (L.) Mart	Amaranthaceae	D	-	-	+	Th	N	S	-
67	<i>Dinebra retroflexa</i> (Vahl) Panzer.	Poaceae	D	-	-	+	Th	N	S	-
68	<i>Daucus carota</i> Linn.	Apiaceae	C	-	+	+	Th	L	Dis	-
69	<i>Echinochloa crus-galli</i> (L.) P. Beauv.	Poaceae	D	-	-	+	Th	N	S	-
70	<i>Echinops echinatus</i> L.	Asteraceae	D	-	-	+	Th	N	Dis	Sp
71	<i>Eleusine indica</i> (L.) Gaertn.	Poaceae	D	-	-	+	Th	N	S	-
72	<i>Eragrostis pilosa</i> (L.) P. Beauv.	Poaceae	D	-	-	+	H	N	S	-
73	<i>Eragrostis minor</i> Host.	Poaceae	D	-	-	+	H	N	S	-
74	<i>Eruca sativa</i> Mill.	Brassicaceae	C	-	+	+	Th	N	Dis	-

Table 1: Contd...

S.No.	Plant species name	Family	Habitat	Seasonality			Life form	Leaf size	Lamina	Spinescence
				A	W	S				
75	<i>Eucalyptus camaldulensis</i> Dehnh.	Myrtaceae	C	+	+	+	Mp	N	S	-
76	<i>Euphorbia dracunculoides</i> Lam.	Euphorbiaceae	D	-	+	-	Th	N	S	-
77	<i>Euphorbia helioscopia</i> L.	Euphorbiaceae	D	-	-	+	Th	N	S	-
78	<i>Euphorbia prostrata</i> Alt.	Euphorbiaceae	D	-	-	+	Th	L	S	-
79	<i>Fagonia cretica</i> L.	Zygophyllaceae	D	-	-	+	Th	L	S	Sp
80	<i>Farsetia jacquemontii</i> (Hook. F. and thoms.) Jafri	Brassicaceae	D	-	-	+	Th	N	S	-
81	<i>Ficus carica</i> L.	Moraceae	D	+	+	+	Np	Mes	S	-
82	<i>Ficus religiosa</i> L.	Moraceae	C	+	+	+	Np	Mes	S	-
83	<i>Filago pyramidata</i> L.	Asteraceae	D	-	-	+	Th	L	S	-
84	<i>Fumeria indica</i> Hausskn.	Fumariaceae	D	-	+	-	Th	N	Dis	-
85	<i>Galium tricornis</i> Stokes	Rubiaceae	W	-	+	+	Th	N	S	-
86	<i>Heliotropium crispum</i> Desf.	Boraginaceae	D	-	-	+	Th	Mic	S	-
87	<i>Heliotropium europaeum</i> (F. and M.) Kazmi	Boraginaceae	D	-	-	+	Th	Mic	S	-
88	<i>Heliotropium strigosum</i> Wild	Boraginaceae	D	-	-	+	Th	Mic	S	-
89	<i>Hibiscus rosa-sinensis</i> Linn.	Malvaceae	C	+	+	+	Th	Mic	S	-
90	<i>Hordeum vulgare</i> L.	Poaceae	C	-	-	+	Th	Mic	S	-
91	<i>Hypecoum pendulum</i> L.	Papaveraceae	D	-	+	+	Th	L	Dis	-
92	<i>Hyoscyamus niger</i> L.	Solanaceae	D	-	-	+	Th	Mic	S	Sp
93	<i>Juncus inflexus</i> L.	Juncaceae	W	-	-	+	G	L	S	-
94	<i>Ifloga spicata</i> Forssk.	Asteraceae	D	-	-	+	Th	L	S	-
95	<i>Iris lactea</i> Pallas	Iridaceae	W	-	+	+	G	N	S	-
96	<i>Lactuca serriola</i> L.	Asteraceae	D	-	-	+	Th	Mic	S	-
97	<i>Lathyrus aphaca</i> L.	Papilionaceae	W	-	-	+	Th	N	Com	-
98	<i>Lathyrus sativus</i> L.	Papilionaceae	W	-	-	+	Th	N	Com	-
99	<i>Launaea angustifolia</i> (Desf.) Kuntze	Asteraceae	D	-	-	+	Th	Mes	S	-
100	<i>Launaea procumbens</i> Pravin Kawale	Asteraceae	D	-	-	+	Th	Mes	S	-
101	<i>Leptochloa panacea</i> Retz	Poaceae	D	-	+	+	Th	N	S	-
102	<i>Linum corymbulosum</i> Reichenb.	Linaceae	D	-	-	+	Th	N	S	-
103	<i>Luffa aegyptica</i> Mill.	Cucurbitaceae	C	-	-	+	Th	N	S	-
104	<i>Lycopersicum esculentum</i> Miller	Solanaceae	C	-	-	+	Th	Mic	Com	-
105	<i>Magnifera indica</i> L.	Anacardiaceae	C	+	+	+	Mp	Mic	S	-
106	<i>Malcolmia africana</i> (L.) R.Br.	Brassicaceae	D	-	+	+	Th	N	S	-
107	<i>Malva neglecta</i> Wallr.	Malvaceae	D	-	+	+	Th	Mic	S	-
108	<i>Malvastrum coromandelianum</i> (L.) Gracke	Malvaceae	D	-	-	+	H	N	S	-
109	<i>Mentha longifolia</i> L.	Lamiaceae	W	-	+	+	G	N	S	-
110	<i>Mentha spicata</i> (L.) L.	Lamiaceae	W	-	+	+	G	N	S	-

Table 1: Contd...

S. No.	Plant species name	Family	Habitat	Seasonality			Life form	Leaf size	Lamina	Spinescence
				A	W	S				
111	<i>Memordica charantia</i> L.	Cucurbitaceae	C	-	-	-	Th	N	S	-
112	<i>Medicago polymorpha</i> L.	Papilionaceae	D	-	-	-	Th	N	Com	-
113	<i>Melia azedarach</i> L.	Meliaceae	C	+	+	+	Ph	N	Com	-
114	<i>Melilotus alba</i> Desr.	Papilionaceae	D	-	+	+	Th	L	S	-
115	<i>Melilotus indica</i> (L.) All.	Papilionaceae	D	-	+	+	Th	N	S	-
116	<i>Morus alba</i> L.	Moraceae	D	+	+	+	Mp	Mes	S	-
117	<i>Morus nigra</i> L.	Moraceae	D	+	+	+	Mp	Mes	S	-
118	<i>Nerium indicum</i> Mill.	Apocynaceae	D	+	+	+	Np	Mic	S	-
119	<i>Neslia apiculata</i> Fisch.	Brassicaceae	W	-	-	-	Th	N	S	-
120	<i>Nicotiana plumbaginifolia</i> Viv.	Solanaceae	W	-	+	+	Th	N	S	-
121	<i>Nonea philistaea</i> Boiss.	Boraginaceae	W	-	-	-	Th	L	S	-
122	<i>Nonea pulla</i> (L.) DC.	Boraginaceae	W	-	-	-	Th	L	S	-
123	<i>Oligomeris linifolia</i> (Vahl.) Macbride	Resedaceae	D	-	-	+	Th	N	S	-
124	<i>Hordeum murinum</i> Subsp. Glacum (Steud.) Tzvelev.	Poaceae	W	-	-	-	-	Th	L	S -
125	<i>Oryza sativa</i> L.	Poaceae	C	-	-	+	Th	Mic	S	-
126	<i>Ocimum basilicum</i> L.	Lamiaceae	D	+	+	+	Ch	N	S	-
127	<i>Oxalis corniculata</i> L.	Oxalidaceae	W	-	+	+	Th	N	Com	-
128	<i>Oxyria digyna</i> (L.) Hill.	Polygonaceae	D	-	-	+	Th	N	S	-
129	<i>Pennisetum typhoidum</i> L.	Poaceae	C	-	-	-	Th	Mic	S	-
130	<i>Parthenium hysterophorus</i> L.	Asteraceae	D	-	-	+	Th	Mic	Dis	-
131	<i>Pegnum harmala</i> L.	Zygophyllaceae	D	-	-	+	H	L	S	-
132	<i>Periploca aphylla</i> Decne.	Asclepiadaceae	D	+	+	+	Np	Ap	Abs	-
133	<i>Phalaris minor</i> Retz.	Poaceae	D	-	+	-	G	N	S	-
134	<i>Phonex dactylifera</i> L.	Arecaceae	W and D	+	+	+	Mp	Mes	Com	-
135	<i>Phragmites karka</i> (Retz.) Trinm.ex Steud.	Poaceae	W	+	-	+	Ch	Mes	S	-
136	<i>Plantago lanceolata</i> L.	Plantaginaceae	W	-	-	+	Th	N	S	-
137	<i>Plantago ovata</i> Frossk.	Plantaginaceae	W	-	-	+	Th	N	S	-
138	<i>Poa annua</i> L.	Poaceae	W	-	+	+	Th	L	S	-
139	<i>Poa botryoides</i> (Trin. Ex Griseb.) Kom.	Poaceae	W	-	+	+	Th	L	S	-
140	<i>Poa bulbosa</i> L.	Poaceae	W	-	+	+	Th	L	S	-
141	<i>Polygonum biaristatum</i> Aitch. and Hemsl.	Polygonaceae	D	-	+	+	Th	N	S	-
142	<i>Polygonum plebejum</i> R.Br	Polygonaceae	W	-	+	+	H	N	S	-
143	<i>Polygogon monspeliensis</i> (L.) Desf.	Poaceae	W	-	+	+	Th	N	S	-
144	<i>Portulaca oleracea</i> Linn.	Azioaceae	D	-	-	+	Th	N	S	-
145	<i>Psammogeton bitematum</i> Edgew.	Apiaceae	W	-	-	+	Th	L	Dis	-
146	<i>Psidium guajava</i> Linn.	Myrtaceae	C	+	+	+	Th	Mes	S	-
147	<i>Prosopis cineraria</i> L.	Mimosaceae	D	+	+	+	Np	L	Com	Sp
148	<i>Prosopis juliflora</i> Swartz.	Mimosaceae	D	+	+	+	Np	L	Com	Sp
149	<i>Raphanus sativus</i> Linn.	Brassicaceae	C	-	+	-	Th	N	Dis	-

Table 1: Contd...

S. No.	Plant species name	Family	Habitat	Seasonality			Life form	Leaf size	Lamina	Spinescence
				A	W	S				
150	<i>Ranunculus muricatus</i> L.	Ranunculaceae	W	-	-	+	G	Mic	Dis	-
151	<i>Ranunculus sceleratus</i> L.	Ranunculaceae	W	-	-	+	G	Mic	Dis	-
152	<i>Rostraria cristata</i> Linn.	Poaceae	W	-	-	+	H	N	S	-
153	<i>Rostraria pumila</i> (Desf.) Tzvelev.	Poaceae	W	-	-	+	H	N	S	-
154	<i>Rhazya stricta</i> Decne.	Apocynaceae	D	-	-	+	Ch	N	S	-
155	<i>Rumex dentatus</i> (Meisn.) Rech.f.	Polygonaceae	W	-	-	+	G	Mes	S	-
156	<i>Saccharum bengalense</i> Retz.	Poaceae	D	+	-	+	Ch	N	S	-
157	<i>Saccharum officinarum</i> Linn.	Poaceae	C	+	+	+	Ch	Mic	S	-
158	<i>Saccharum spontaneum</i> Linn.	Poaceae	D	-	+	-	Ch	N	S	-
159	<i>Salsola faoetida</i> Del.ex Spreng.	Chenopodiaceae	D	-	+	+	Ch	L	S	-
160	<i>Setaria pumila</i> (Poir.) Roem.	Poaceae	D	-	-	+	Th	L	S	-
161	<i>Silene vulgaris</i> (Moench) Garcke.	Caryophyllaceae	W	-	-	+	Th	N	S	-
162	<i>Sesbania sesban</i> (L.) Merrill.	Papilionaceae	C	-	-	+	Th	Mes	Com	-
163	<i>Sisymbrium irio</i> L.	Brassicaceae	W	-	-	+	Th	N	Dis	-
164	<i>Sonchus asper</i> (L.) Hill.	Asteraceae	W	-	+	+	Th	Mic	Dis	-
165	<i>Solanum nigrum</i> L.	Solanaceae	W	-	-	-	Th	Mic	S	-
166	<i>Solanum surattense</i> Burm.f.	Solanaceae	D	+	-	-	H	N	S	Sp
167	<i>Sorghum halepense</i> (L.) Pers.	Poaceae	W	-	-	+	Ch	N	S	-
168	<i>Sorghum bicolor</i> (Linn.) Moench.	Poaceae	C	-	-	+	Th	Mes	S	-
169	<i>Spergula fallax</i> (Lowe) E.H.L. Krause	Caryophyllaceae	W	-	-	+	Th	N	S	-
170	<i>Suaeda fruticosa</i> Forssk.ex J.F. Gmelin.	Chenopodiaceae	D	+	+	+	Ch	L	S	-
171	<i>Taraxacum officinale</i> F.H. Wiggers	Asteraceae	W	-	-	+	Th	Mic	S	-
172	<i>Tamarix aphylla</i> (L.) Karst	Tamaricaceae	D	-	+	+	Mp	L	S	-
173	<i>Tamarix dioica</i> Roxb. Ex Roth.	Tamaricaceae	W	+	+	+	Mp	L	S	-
174	<i>Torilis nodosa</i> (L.) Gaertn.	Apiaceae	W	-	-	+	Th	N	Dis	-
175	<i>Tribulus terrestris</i> L.	Cucurbitaceae	D	+	-	-	H	L	Com	Sp
176	<i>Trichosanthes dioica</i> Rxb.	Cucurbitaceae	W	-	-	+	Th	N	Dis	-
177	<i>Trifolium alexandrianum</i> L.	Papilionaceae	C	-	+	-	Th	N	Com	-
178	<i>Trifolium repens</i> L.	Papilionaceae	C	-	+	+	Th	N	Com	-
179	<i>Trigonella crassipes</i> Boiss.	Papilionaceae	W	-	+	+	Th	N	Com	-
180	<i>Triticum aestivum</i> L.	Poaceae	C	-	+	+	Th	Mic	S	-
181	<i>Typha latifolia</i> L.	Typhaceae	W	+	+	+	G	Mes	S	-
182	<i>Typha minima</i> Frunck ex Hoppe	Typhaceae	W	+	-	+	G	Mes	S	-
183	<i>Verbena officinalis</i> L.	Verbenaceae	W	-	-	-	Th	N	S	-
184	<i>Veronica aquatica</i> Bern.	Scrophulariaceae	W	-	-	+	G	N	Dis	-
185	<i>Vicia hirsuta</i> (L.) S.F. Gray, Nat.	Papilionaceae	W	-	+	+	Th	N	Com	-
186	<i>Vitis negundo</i> L.	Verbenaceae	W	+	+	+	Np	N	Com	-
187	<i>Vitis vinifera</i> Linn.	Vitaceae	C	+	+	+	Np	Mes	S	-

Table 1: Contd...

S.No.	Plant species name	Family	Habitat	Seasonality			Life form	Leaf size	Lamina	Spinescence
				A	W	S				
188	<i>Viola stockii</i> Boiss.	Violaceae	W	+	-	-	G	Mic	S	-
189	<i>Withania coagulans</i> Dunal.	Solanaceae	D	+	+	+	Ch	Mic	S	-
190	<i>Withania somnifera</i> L.	Solanaceae	D	-	+	+	Ch	Mic	S	-
191	<i>Xanthium strumarium</i> L.	Asteraceae	D	-	+	+	Th	N	S	Sp
192	<i>Zea mays</i> L.	Poaceae	C	-	-	+	Th	Mes	S	-
193	<i>Zizyphus jujuba</i> Mill.	Rhamnaceae	D	+	+	+	Ph	N	S	Sp

Key: D = Dry, W = Wet, C = Cultivated, A = Autumn, S = Spring, W = Winter, Sm = Summer, + = for presence, - = absence, Th = Therophytes, H = Hemipterophytes, Ch = Chamaephytes, G = Geophytes, Np = Nanophanerophytes, Mp = P = Parasites, Microphanerophytes, L = Leptophyll, N = Nanophyll, Mic = Microphyll, Mes = Mesophyll, Ap = Aphyllous, S = Simple, Dis = Dissected, Com = Compound, Abs = Absent and Sp = Spiny.

Table 2: Genera, species and species percentage

S. No.	Family	No. of genera	No. of species	Species percentage
1	Alliaceae	1	2	1.03
2	Amaranthaceae	5	6	3.10
3	Anacardiaceae	1	1	0.51
4	Apocynaceae	2	2	1.03
5	Asclepiadaceae	2	2	1.03
6	Apiaceae	3	3	1.55
7	Asphodelaceae	2	2	1.03
8	Asteraceae	15	17	8.80
9	Arecaceae	1	1	0.51
10	Azioaceae	1	1	0.51
11	Boraginaceae	3	6	3.11
12	Brassicaceae	7	8	4.14
13	Capparidaceae	1	1	0.51
14	Caryophyllaceae	2	2	1.03
15	Chenopodiaceae	4	5	2.59
16	Convolvulaceae	1	2	1.03
17	Cucurbitaceae	6	7	3.62
18	Cuscutaceae	1	1	0.51
19	Cyperaceae	1	2	1.03
20	Euphorbiaceae	3	5	2.59
21	Fumariaceae	1	1	0.51
22	Gentianaceae	1	1	0.51
23	Iridaceae	1	1	0.51
24	Juncaceae	1	1	0.51
25	Lamiaceae	2	3	1.55
26	Linaceae	1	1	0.51
27	Malvaceae	4	4	2.07
28	Meliaceae	1	1	0.51
29	Mimosaceae	3	5	2.59
30	Moraceae	2	4	2.07
31	Myrtaceae	2	2	1.03
32	Nyctaginaceae	1	1	0.51
33	Orobanchaceae	1	1	0.51
34	Oxalidaceae	1	1	0.51
35	Papilionaceae	13	15	7.77
36	Papaveraceae	1	1	0.51
37	Plantaginaceae	1	2	1.03
38	Poaceae	27	37	19.16
39	Polygonaceae	4	5	2.59
40	Primulaceae	1	1	0.51
41	Ranunculaceae	1	2	1.03
42	Resedaceae	1	1	0.51
43	Rhamnaceae	1	1	0.51
44	Rubiaceae	1	1	0.51
45	Rutaceae	1	2	1.03
46	Scrophulariaceae	1	1	0.51
47	Solanaceae	7	9	4.66
48	Tiliaceae	1	1	0.51
49	Typhaceae	1	2	1.03
50	Tamaricaceae	1	2	1.03
51	Verbenaceae	2	2	1.03
52	Violaceae	1	1	0.51
53	Vitaceae	1	1	0.51
54	Zygophyllaceae	3	3	1.55
Total		154	193	

phytes (9.84%), Chamaephytes (7.25%), Geophytes (9.84%), Microphanerophytes (6.73%),

Table 3: Distribution of plant species in the various habitats

S. No.	Habitat	No. of plant species	Percentage
1	Wet	67	34.715
2	Dry	87	45.077
3	Both	4	2.072
4	Cultivated	35	18.134

Table 4: Distribution of plant species in the various aspects

S. No.	Aspect	No. of plant species	Percentage
1	Autumn	53	14.058
2	Hibernal	74	19.628
3	Vernal	156	41.379
4	Astival	95	24.933

Table 5: Distribution of plant species in the various life form spectra

S. No.	Life form	No. of plant species	Percentage
1	Therophytes	117	60.621
2	Hemi-cryptophytes	19	9.844
3	Chamaephytes	14	7.253
4	Geophytes	18	9.844
5	Microphanerophytes	13	6.735
6	Nanophanerophytes	11	5.699
7	Parasite	1	0.518

Nanophanerophytes (5.69%) and Parasites (0.52%). Classification of plant on the basis of life form is authentic. These type of classification is based on the principal of position and protection of parenting buds in adverse condition. Raunkiaer (1934), illustrated 3 main types of phyto climates which is based on life form. It includes that the tropics climate contains phanerophytes, in deserts condition therophytes are found while in cold temperate regions hemi-cryptophytes are found. Therophytic flora was dominant in research area. Biological spectra classification is simple and significant as compared to other classification because geographically and habitually widely separated plant communities are also reflected as a sign of prevalent environments. Biological spectra in any regions may change due to biotic effects like agricultural rehearses, overgrazing, deforestation, crushing and climatic fluctuations (Hussain 1989).

The leaf size spectra (Table 6) expressed that the plants with Nanophyll leaves were dominant

Table 6: Distribution of plant species according to leaf size spectra

S. No.	Life size	No. of plant species	Percentage
1	Leptophyll	41	21.243
2	Nanophyll	93	48.186
3	Microphyll	37	19.170
4	Mesophyll	19	9.844
5	Aphyllous	3	1.554

(48.18%) followed by Leptophyll (21.24%), Microphyll 19.17%), Mesophyll (9.84%), and Aphyllous (1.55%). Nanophyll species and leptophyll species are characteristic of hot desert while microphyll is the characteristic of steppes these results were agree with earlier study like (Khan et al. 2013; Tareen and Qadir 1993; Sher and Khan, 2007) who observed the high ratio of leptophyllous and nanophyllous from Chagarrzai areas. Nanophyllous plant is characteristic of dry area and because xeric habitat is dominated. This type of plant species adapted in dry and adverse habitat (Nasir and Sultan 2002). Microphyllous plant species also occurred in the area and these results were according to Hussain and Chudhary (2009) who described upper ratio of microphyllous in moist environments in Azad Kashmir. In dry environments, soil is generally sandy, there are lack of nutrient contents and low water holding capacity due to which plant roots have difficulties in absorbing soil moisture. In this area, leptophyllous and nanophyllous type of vegetation is nourishing well (Sher and Khan, 2007).

Plants with simple leaves (Table 7) were dominant (76.16%) followed by compound leaves (11.39%), dissected leaves (11.39%) and absent leaf type (1.03%).

Table 7: Distribution of plant species according to lamina shape

S. No.	Lamina shape	No. of plant species	Percentage
1	Simple	147	76.165
2	Compound	22	11.398
3	Dissected	22	11.398
4	Absent	2	1.036

During present investigation, 18 species (9.32%) were spiny and 175 species (90.67%) were non-spiny in nature. Spiny plant is also sign of dry soil and environment. The plants

bearing simple leaves were dominated (76.16%) over compound leaves (23.79%) while (1.03%) were leafless plant in the area. Similarly studies have been conducted in other regions of Pakistan (Badshah et al. 2013 and Durrani et al. 2010). Although 193 species were recorded in District Bannu, though, quantitatively they had limited distribution in the study area. A rich flora is that one which has high species diversity and species abundance. Floristic configuration of vegetation is a qualitative feature and cannot display the real picture of flora of the area. Therefore here is a need of quantitative consideration of the vegetation resources. It helps in the recognition of ecological explanation of vegetation.

CONCLUSION

This study site is rich in diverse flora and so is important from biodiversity point of view. In the present study, therophytes were observed dominant with high percentage, indicating that this area is a part of semi-arid zone of Khyber Pakhtunkhwa, Pakistan. The people of this area extensively uproot the plants for burning purposes.

RECOMMENDATIONS

Based on the results of the present study, the plant species were decreasing in number in the area and special care is needed for their conservation. Furthermore, high ratio of therophytes also indicated that this area was under heavy biotic stress due to over grazing and deforestation, which needs to be controlled for creating sustainable environment. Creation of public awareness is also recommended to highlight the importance of plants and devastation of afforestation.

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