

FLORISTIC COMPOSITION AND ECOLOGICAL CHARACTERISTICS OF PLANTS OF CHAIL VALLEY, DISTRICT SWAT, PAKISTAN

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Abstract

The present study was carried out during 2012-2014 to enumerate the floristic and ecological characteristics of plants of Chail Valley, District Swat. A total of 463 species belonging to 104 families were recorded. Leading families were Asteraceae (42 Spp), Poaceae (35 Spp), Rosaceae and Lamiaceae (each with 26 Spp), Papilionaceae (25 Spp), Brassicaceae and Boraginaceae (each with 16 Spp), Apiaceae (14 Spp), Solanaceae (13 Species) and Ranunculaceae (12 Spp). Each of the remaining families had less than 12 species. Therophytes with 188 species, 40.60% were dominant. They were followed by hemicryptophytes (77 species, 16.63%). *Cuscuta europaea* L., *C. reflexa* Roxb. and *Viscum album* L. were the three shoot parasites. The leaf spectra was dominated by mesophylls (147 Spp; 31.75%), microphylls (140 Spp.; 30.24%) and nanophylls (136 Spp.; 29.37%). Two species were aphyllous. Majority of the species (305 Spp., 65.87%) had simple lamina. Eight species (1.73%) had spiny leaves.

Key words: Floristic diversity, Ecological characteristics, Chail valley, District Swat, Pakistan.

Introduction

Chail Valley is located between 72° 32' 1" to 72° 43' 3" longitude and 35° 3' 40" to 35° 11' 40" latitude. The Valley has Mankial and Gornai towns in its North while in the East the valley is guarded by Lelawnai town of District Shangla. On Southern side of the valley lies the town of Pia (Fig. 1). Flora refers to all the plant species found in a particular locality. It differs from vegetation, which refers to the population, distribution, size and relative importance of plant species (Ali, 2008). Floristic inventories help in understanding various attributes of vegetation, soil and climatic features. Chail Valley possesses diverse flora of Sino-Japanese region. The major part of this valley lies in moist temperate region. Stewart (1967) was the first worker to prepare the floristic list of Northwest Pakistan including Swat. Valuable contributions in preparation of floristic lists are made by many workers from abroad such as Alsharif *et al.* (2013), Blanckaert *et al.* (2004), Djaha *et al.* (2008), Addo-Fordjout *et al.* (2009), Ozgur & Ansin (2003) and Yalcin *et al.* (2011). Similarly floristic inventories and ecological characteristics of different localities in Pakistan are enumerated by Hussain *et al.* (2015), Qureshi *et al.* (2011), Fazal *et al.* (2010), Haq *et al.* (2010), Qureshi & Bhatti (2010), Saima *et al.* (2010; 2009). Ahmad *et al.* (2014) reported 50 plants of medicinal value from Chail valley. There is no record available on floristic composition and ecological attributes of Chail Valley apart from the references of Ilyas *et al.* (2013) and Rashid *et al.* (2011) on Kabal Valley and Malam Jabba respectively.

Materials and Methods

Regular visits were made for plant collections along with field data in all four seasons during 2012-2014. Plants were dried, preserved and mounted on herbarium sheets. Plants were identified with the help of Flora of Pakistan (Nasir & Ali, 1970-1989; Ali & Nasir, 1989-1992; Ali & Qaiser, 1995-2015). A complete floristic list was prepared

and plant families were arranged in alphabetical order. Plant species were classified into leaf size classes and life form according to Raunkiaer (1934) and Hussain (1989). Biological spectrum was determined as per Raunkiaer (1934), Hussain (1989) and Badshah *et al.* (2013).

Results and Discussion

Floristics and ecological attributes: Floral diversity refers to all the plants present in any geographic locality, both wild and cultivated. Floristic composition of any area reflects the prevalent climatic conditions, edaphic characteristics, anthropogenic pressure and other natural stresses. Flora of Chail Valley consisted of 104 families, 332 genera and 463 species. Of these Gymnosperms was represented by 3 families (9 Spp), Monocots with 17 families (70 Spp) and Dicots with 84 families (384 Spp). Largest families were Asteraceae (42 Spp), Poaceae (35 Spp), Rosaceae and Lamiaceae (26 Spp) each, Papilionaceae (25 Spp), Brassicaceae and Boraginaceae each with (16 Spp), Apiaceae (14 Spp), Solanaceae (13 Spp), Ranunculaceae (12 Spp), Polygonaceae, Caryophyllaceae and Scrophulariaceae (8 Spp each), Primulaceae and Caprifoliaceae (7 Spp), Araceae, Moraceae, Cucubitateae, Euphorbiaceae, Amaranthaceae and Rubiaceae (each with 6 Spp), Pinaceae and Salicaceae (5 Spp. each), Liliaceae, Fagaceae, Geraniaceae, Onagraceae, Malvaceae, Gentianaceae, Convolvulaceae and Oleaceae (each with 4 Spp). Rest of the families were having less than 4 species (Table 1).

Durrani *et al.* (2005), Marwat & Qureshi (2000), Musharaf *et al.* (2014; 2011) and Parveen *et al.* (2008) also reported these families as dominant ones in their study areas. Asteraceae, Poaceae, Rosaceae, Lamiaceae and Papilionaceae have a wide ecological amplitude and therefore distributed along a diverse range of microhabitats. The present result is also supported by the Flora of Pakistan (Nasir & Ali, 1970-1989; Ali & Nasir, 1989-1992; Ali & Qaiser, 1995-2015), which also shows these families to be major families.



Fig. 1. Map of Swat showing the location of Chail Valley.

In Chail Valley winter is very cold while summer is pleasant. Highest number of species was recorded in summer (396 Spp. 38.04%) followed by spring (279 Spp. 26.80%). Due to chilling frozen winters the number of species was declined to 173 Spp. (16.62%). In autumn 193 Spp. (18.54%) were found (Table 2). Seasonal variation has no effect on woody, shrubby and perennial plants. Some perennial herbs were present in all the seasons. However most of the herbaceous flora has varied distribution pattern in different seasons. Studies by Badshah *et al.* (2013) and Durrani *et al.* (2010) also indicate that summer and spring flora had more species richness in comparison to autumn and winter aspects. Based on habit, herbs were the most abundant with 340 Spp. (73.43%), followed by shrubs with 64 Spp. (13.82%), trees with 49 Spp. (10.58%), climbers with 10 Spp. (2.16%).

Lifeform: Physiognomy of flora and vegetation depends upon the life forms and environmental conditions. Raunkiaer (1934) proposed life form classification which is based on position of perennating structures during unfavorable conditions. When Raunkiaerian classification was applied, it

was found that most abundant life form was therophytes (188 Spp., 40.60%), followed by hemicryptophytes (77 Spp., 16.63%) and nanophanerophytes (71 Spp., 15.33%). Geophytes (57 Spp., 12.31%), chamaephytes (19 Spp., 4.10%), mesophanerophytes (18 Spp., 3.89%), megaphanerophytes (17 Spp., 3.67%) and microphanerophytes (13 Spp., 2.81%) were the next most prevailing life forms. Parasitic life form was represented by *Cuscuta europaea* L., *C. reflexa* Roxb. and *Viscum album* L. (0.65%). (Table 2, Fig. 2) Biological spectrum is modified by anthropogenic pressure, agriculture, grazing and climatic shift. Seasonal variation in life form displayed a diverse picture. In spring season the dominant life form was therophytes with 92 species (32.97%), which were followed by nanophanerophytes 71 species (25.45%). Geophytes and hemicryptophytes were represented by 29 species each (10.39%), mesophanerophytes with 18 species (6.45%), magaphanerophytes with 17 species (6.09%) and microphanerophytes were represented by 13 species (4.66%). During summer the species richness was at its maximum. The most abundant were therophytes 146 species (36.87%), followed by nanophanerophytes 71 species (17.93%), hemicryptophytes 68 species (17.17%),

mesophanerophytes 18 species (4.55%), chamaephytes & megaphanerophytes with 17 species each (4.29%) and microphanerophytes were represented with 13 species (3.28%). Nanophanerophytes dominated the autumn season with 71 Spp. (36.79%), followed by therophytes 47 species (24.35%), hemicryptophytes 19 species (9.84%), mesophanerophytes 18 species (9.33%), megaphanerophytes 17 species (8.81%), microphanerophytes 13 species (6.74%) and chamaephytes with 5 species (2.59%). Lowest number of species was recorded in winter. The dominant life form was nanophanerophytes 71 species (41.04%), followed by therophytes 41 species (23.70%), mesophanerophytes 18 species (10.40%), megaphanerophytes 17 species (9.83%), microphanerophytes 13 species (7.51%), hemicryptophytes 4 species (2.31%) and chamaephytes with 2 species (1.16%) (Table 3). The life form spectra in present study clearly show that Therophytes dominated in terms of species richness followed by Hemicryptophytes, Geophytes and Nanophanerophytes. Our results are in line with the work of Cain & Castro (1959), Batalha & Martins (2002), Badshah *et al.* (2013) and Musharaf *et al.* (2011). During the course of evolution, Therophytes have emerged as life form which is capable to cope with unfavorable conditions (Guo *et al.*, 2009; Manhas *et al.*, 2010 and Badshah *et al.*, 2013).

Vegetation in the valley shows definite stratification. The tree layer comprises of Megaphanerophytes (such as *Abies pindrow*, *Cedrus deodara*, *Picea smithiana*, and *Pinus wallichiana*), Mesophanerophytes (such as *Pinus roxburghii*, *Pinus wallichiana*, *Alnus nitida* and *Quercus baloot*) and Microphanerophytes (*Pistacia chinensis*, *Crataegus songarica*, *Prunus armeniaca* and *Zanthoxylum armatum*). Shrub layer is represented by nanophanerophytes. Below these are chamaephytes, hemicryptophytes, therophytes and geophytes respectively. Anthropogenic pressures such as deforestation and grazing are destroying the characteristic vegetation that has resulted in loss of herbaceous and shrubby vegetation.

Vegetation with open physiognomies have a relative abundance of therophytes and chamaephytes (Batalha & Martins, 2002). In Chail Valley chilling winter creates unfavorable conditions which contribute to the

abundance of these life forms. Work of Sher & Khan (2007) also supports our findings who reported the nanophanerophytes and therophytes as characteristic life forms from District Bunir. Similar life form spectra were obtained by Kar *et al.* (2010), during their studies in grasslands of Odisha, India.

Leaf sizes spectra: Study of leaf size spectra revealed that there were 147 Spp. of mesophylls (31.75%), followed by microphylls with 140 Spp. (30.24%), nanophylls with 136 Spp. (29.37%), leptophylls with 25 Spp. (5.40%), macrophylls with 10 Spp. (2.16%) and megaphylls with 3 Spp. (0.65%). There were only 2 aphyllous i.e., *Cuscuta europaea* L. and *C. reflexa* Roxb. (Table 2, Fig. 3). Seasonal variation among leaf form classes showed that in spring the mesophyllous forms were dominant (93 Spp. 33.33%), followed by microphylls with 85 Spp. (30.47%) and nanophylls with 76 Spp. (27.24%). In summer, mesophylls dominated with 128 Spp. (32.32%). Next to them were nanophylls with 119 Spp. (30.05%) and microphylls with 117 Spp. (29.55%). In autumn the most abundant leaf spectra appeared to be mesophyll with 72 Spp. (37.31%), microphyll with 53 Spp. (27.46%) and nanophylls with 52 Spp. (26.94%). Mesophyll were also dominant in winter (62 Spp., 35.84%) followed by microphylls with 48 Spp. (27.75%) and nanophylls with 46 Spp. (26.59%) (Table 3). Leaf size is related to climatic features in any geographic locality (Batalha & Martins, 2004). Variation among different leaf size classes is also affected by elevation. During this study it was observed that seasonal variation in leaf size classes was mainly due the presence of geophytes and therophytes. Evergreen plants remain persistent, such as *Abies pindrow*, *Taxus fauana*, *Picea smithiana* etc. Studies conducted in Waziristan and District Tank reported the relative dominance of microphyllous and nanophyllous (Badshah *et al.*, 2010, 2013). Leaf size is an indicator of the prevailing climatic and edaphic conditions but it cannot be trusted as a criterion for sorting distinct leaf zones. Leaf size classes in combination with morpho-anatomical data yield much accurate results in establishing leaf zone or climates.

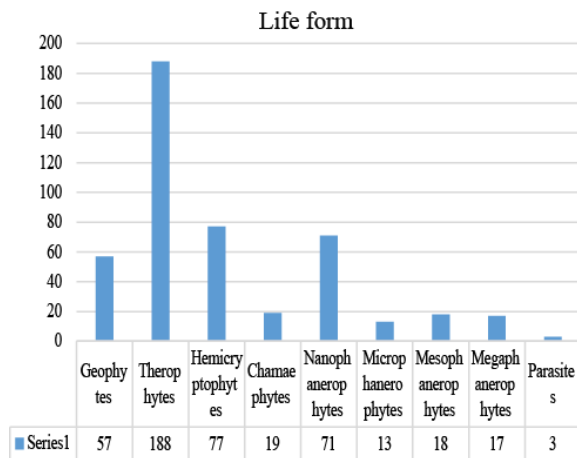


Fig 2. Life Form Spectra.

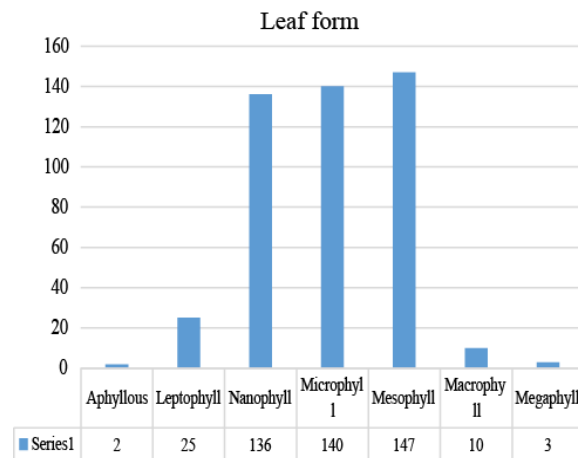


Fig 3. Leaf Form Spectra.

Table 1. Floristic composition and ecological attributes of plants of Chail Valley, Swat Pakistan.

S. No.	Taxon	Seasonality				Life form	Leaf Size	Lamina	Habit
		Spring	Summer	Autumn	Winter				
Gymnosperms									
Cupressaceae									
1.	<i>Cupressus sempervirens</i> L.	+	+	+	+	Micp	L	N	I
2.	<i>Juniperus communis</i> L. var. <i>saxatilis</i> Pallas	+	+	+	+	Np	L	N	D
3.	<i>Thuja orientalis</i> L.	+	+	+	+	Np	L	N	I
Pinaceae									
4.	<i>Abies pindrow</i> Royle.	+	+	+	+	Megp	N	N	F
5.	<i>Cedrus deodara</i> (Roxb. ex D. Don) G. Don	+	+	+	+	Megp	N	N	F
6.	<i>Picea smithiana</i> (Wall.) Boiss	+	+	+	+	Megp	N	N	F
7.	<i>Pinus roxburghii</i> Sargent	+	+	+	+	Mesp	N	N	F
8.	<i>Pinus wallichiana</i> A.B. Jackson	+	+	+	+	Megp	N	N	F
Taxaceae									
9.	<i>Taxus fauana</i> (Zucc.) Pilger	+	+	+	+	Mesp	N	N	F
Monocotyledonae									
Alismataceae									
10.	<i>Alisma plantago-aquatica</i> L.		+			H	N	S	M
11.	<i>Sagittaria trifolia</i> L.	+	+			G	Mes	Dis	M
Alliaceae									
12.	<i>Allium cepa</i> L.	+				G	Mes	S	CU
13.	<i>Allium sativum</i> L.	+				G	Mes	S	CU
Amaryllidaceae									
14.	<i>Ixiolirion tataricum</i> (Pall.) Herb.	+				G	Mic	S	R
15.	<i>Narcissus tazetta</i> L.				+	G	Mes	S	GY
Araceae									
16.	<i>Acorus calamus</i> L.		+			G	Mes	S	W
17.	<i>Arisaema flavum</i> (Forsk.) Schott		+			G	Mes	Comp	F
18.	<i>Arisaema jacquemontii</i> Blume		+			G	Mes	Comp	F
19.	<i>Arum jacquemontii</i> Blume	+				G	Mes	S	D
20.	<i>Colocasia esculenta</i> (L.) Schott	+			+	G	Meg	S	CU
21.	<i>Sauromatum venosum</i> (Ait.) Schott.	+	+			G	Mes	S	D
Asphodelaceae									
22.	<i>Eremurus himalaicus</i> Baker		+			G	Mes	S	D
Colchicaceae									
23.	<i>Colchicum luteum</i> Baker	+			+	G	N	S	R
Commelinaceae									
24.	<i>Commelina benghalensis</i> L.		+			Th	Mic	S	M
25.	<i>Commelina paludosa</i> Blume		+			G	Mes	S	M
Cyperaceae									
26.	<i>Cyperus cyperoides</i> (L.) Kuntze		+			G	Mic	S	WC
27.	<i>Cyperus rotundus</i> L.		+			G	N	S	WC
Dioscoreaceae									
28.	<i>Dioscorea deltoidea</i> Wall. ex Kunth		+			G	Mes	S	A
Iridaceae									
29.	<i>Iris germanica</i> L.	+				G	Mes	S	R
30.	<i>Iris hookeriana</i> Foster		+			G	Mes	S	R
31.	<i>Moraea sisyrinchium</i> (L.) Ker Gawl.	+	+			G	Mic	S	WP
Juncaceae									
32.	<i>Juncus articulatus</i> L.		+			G	N	S	S
33.	<i>Juncus benghalensis</i> Kunth		+			G	N	S	S
34.	<i>Juncus inflexus</i> L.		+			G	N	S	WC
Liliaceae									
35.	<i>Asparagus capitatus</i> subsp. <i>Gracilis</i> Browicz	+				Ch	L	Abs	M
36.	<i>Gagea elegans</i> Wall. ex D. Don		+			G	N	S	A
37.	<i>Notholirion thomsonianum</i> (Royle) Stapf	+				G	N	S	WC
38.	<i>Tulipa clusiana</i> DC.	+				G	Mes	S	R
Orchidaceae									
39.	<i>Calanthe tricarinata</i> Lindl.		+			G	N	S	A
40.	<i>Cypripedium cordigerum</i> D. Don		+			H	Mes	S	R
Poaceae									
41.	<i>Agrostis munroana</i> Aitch. & Hemsl.		+			H	N	S	D
42.	<i>Agrostis viridis</i> Gouan		+			H	N	S	D-A
43.	<i>Apluda mutica</i> L.		+			H	N	S	D-A
44.	<i>Aristida cyanantha</i> Nees ex Steud.		+			H	Mic	S	D
45.	<i>Arthraxon prionodes</i> (Steud.) Dandy		+			H	Mic	S	A
46.	<i>Arundo donax</i> L.		+			Ch	Mic	S	WC
47.	<i>Avena fatua</i> L.		+			Th	Mic	S	D-A
48.	<i>Bothriochloa ischaemum</i> (L.) Keng		+	+		H	Mic	S	D
49.	<i>Brachiaria reptans</i> (L.) Gardner & Hubbard		+			Th	Mic	S	D
50.	<i>Brachypodium sylvaticum</i> (Huds.) P. Beauv.		+	+		Th	Mic	S	WP
51.	<i>Bromus japonicus</i> Thunb. ex Murr.		+			Th	Mic	S	WP
52.	<i>Cenchrus pennisetiformis</i> Hochst. & Steud. ex Steud.	+			+	H	N	S	D
53.	<i>Chrysopogon serrulatus</i> Trin.				+	H	N	S	D

Table 1. (Cont'd.).

S. No.	Taxon	Seasonality				Life form	Leaf Size	Lamina	Habit
		Spring	Summer	Autumn	Winter				
54.	<i>Chrysopogon gryllus</i> (L.) Trin.		+	+		H	N	S	D
55.	<i>Cymbopogon commutatus</i> (Steud.) Stapf		+	+		H	N	S	D
56.	<i>Cynodon dactylon</i> (L.) Pers.		+	+		H	Mic	S	D-A
57.	<i>Dactylis glomerata</i> L.		+			G	N	S	D-A
58.	<i>Dactyloctenium aegyptium</i> (L.) Willd.		+	+		Th	N	S	WP
59.	<i>Dicanthium annulatum</i> (Forssk.) Stapf	+			+	H	N	S	GY-A
60.	<i>Digitaria abludens</i> (Roem. & Schult.) Veldk.		+			Th	N	S	D
61.	<i>Eragrostis minor</i> Host		+			H	N	S	WP
62.	<i>Heteropogon contortus</i> (L.) P. Beauv. ex Roem. & Schult.			+		G	Mic	S	D
63.	<i>Lolium temulentum</i> L.		+			Th	N	S	A
64.	<i>Muhlenbergia huegelii</i> Trin.		+			G	N	S	D
65.	<i>Panicum miliaceum</i> L.	+	+			Th	Mic	S	D
66.	<i>Pennisetum orientale</i> L.C. Rich.	+	+			Th	Mic	S	D
67.	<i>Phalaris minor</i> Retz.	+	+			Th	N	S	D-A
68.	<i>Poa annua</i> L.	+	+			H	N	S	D
69.	<i>Polypogon fugax</i> Ness ex Steud.		+			H	N	S	D
70.	<i>Setaria viridis</i> (L.) P.Beauv.		+	+		Th	Me	S	D
71.	<i>Sorghum halepense</i> (L.) Pers.		+	+		H	Mes	S	A
72.	<i>Stipa sibirica</i> (L.) Lam.		+	+		H	Mic	S	D
73.	<i>Themeda anathera</i> (Nees ex Steud.) Hack.		+	+		H	N	S	D
74.	<i>Triticum aestivum</i> L.		+	+		Th	Mic	S	CU
75.	<i>Zea mays</i> L.		+	+		Th	Mes	S	CU
	Trilliaceae								
76.	<i>Trillium govanianum</i> Wall. ex Royle		+			Ch	Mes	S	F
	Dicotyledonae								
	Acanthaceae								
77.	<i>Dicliptera bupleuroides</i> Nees var. <i>ciliata</i> Malik & A. Ghafoor	+	+	+		H	Mes	S	GY
78.	<i>Justicia adhatoda</i> L.	+	+	+	+	Np	Mes	S	GY
79.	<i>Strobilanthes urticifolia</i> Wall. ex Kuntze		+	+		Np	N	S	M
	Aceraceae								
80.	<i>Acer cappadocicum</i> Gleditsch	+	+	+	+	Megp	Mac	Dis	F
	Amaranthaceae								
81.	<i>Achyranthes aspera</i> L. var. <i>pubescens</i> (Moq.) C.C.Townsend			+	+	Th	Mic	S	WP-A
82.	<i>Amaranthus spinosus</i> L.		+			Th	Mic	S	WP
83.	<i>Amaranthus viridis</i> L.		+			Th	Mic	S	D
84.	<i>Celosia argentea</i> L. var. <i>crinata</i> (L.) Schinz		+			Th	N	S	WP
85.	<i>Deeringia amaranthoides</i> (Lam.) Merr.	+	+	+	+	Np	Mic	S	F
86.	<i>Digera muricata</i> (L.) Mart.		+			Th	Mic	S	R
	Anacardiaceae								
87.	<i>Pistacia chinensis</i> Bunge ssp. <i>integerrima</i> (J.L.S) Rech. f.	+	+	+	+	Micp	Mic	Comp	F
88.	<i>Rhus punjabensis</i> J. L.	+	+	+	+	Micp	Mes	Comp	F
89.	<i>Rhus javanica</i> L.	+	+	+	+	Micp	Mes	Comp	F
	Apiaceae								
90.	<i>Ammi visnaga</i> (L.) Lam.	+	+		+	Ch	L	Dis	D-A
91.	<i>Anethum graveolens</i> L.	+	+			Th	L	Dis	D
92.	<i>Angelica glauca</i> Edgew.		+			Th	N	Comp	D
93.	<i>Bunium persicum</i> (Boiss.) Fedtsch.		+			Th	L	Dis	WP
94.	<i>Bupleurum falcatum</i> L.		+			Th	Mic	S	F
95.	<i>Bupleurum longicaule</i> Wall. ex DC. var. <i>ramosum</i> Nasir		+	+		Th	Mic	S	D
96.	<i>Coriandrum sativum</i> L.		+	+		Th	L	Dis	CU
97.	<i>Eryngium coeruleum</i> M. Bieb.		+	+		H	N	S	D
98.	<i>Foeniculum vulgare</i> Mill.		+	+		Th	N	Dis	A
99.	<i>Oenanthe javanica</i> (Blume) DC.		+	+		Th	N	Comp	R
100.	<i>Pimpinella diversifolia</i> DC.		+	+		Th	Mes	Comp	A
101.	<i>Scandix pecten-veneris</i> L.	+			+	Th	Mic	Comp	A
102.	<i>Torilis leptophylla</i> (L.) Reichb. f.	+			+	Th	N	Dis	R
103.	<i>Trachyspermum ammi</i> (L.) Sprague	+	+			Th	L	Dis	D
	Apocynaceae								
104.	<i>Nerium oleander</i> L.	+	+	+	+	Np	Mes	S	D
	Araliaceae								
105.	<i>Hedera nepalensis</i> K. Koch	+	+	+	+	Np	Mes	S	F-GY
	Asclepiadaceae								
106.	<i>Cynanchum jacquemontianum</i> Dcne.	+	+			Th	Mes	S	D
	Asteraceae								
107.	<i>Achillea millefolium</i> L.		+			H	L	Dis	A-D
108.	<i>Anaphalis adnata</i> Wall. ex DC.		+			Th	Mes	S	A
109.	<i>Anaphalis triplinervis</i> (Sims.) C.B. Clarke		+			G	Mes	S	A-D
110.	<i>Artemisia absinthium</i> L.		+	+		Th	N	Dis	R
111.	<i>Artemisia santolinifolia</i> Turcz. ex Krasch.		+	+		Ch	N	Dis	R-GY
112.	<i>Artemisia scoparia</i> Waldst. & Kit.		+	+		Th	N	Dis	W
113.	<i>Artemisia vulgaris</i> L.		+			Ch	Mic	Dis	A-R
114.	<i>Aster mollisculus</i> (DC.) C.B. Clarke	+				Th	Mic	S	D

Table 1. (Cont'd.).

S. No.	Taxon	Seasonality				Life form	Leaf Size	Lamina	Habit
		Spring	Summer	Autumn	Winter				
115.	<i>Bidens biternata</i> (Lour.) Merrill & Scheriff				+	Th	Mic	Dis	WP-R
116.	<i>Bidens cernua</i> L.				+	Th	Mic	S	WP
117.	<i>Calendula arvensis</i> L.	+				Th	Mic	S	A
118.	<i>Calendula officinalis</i> L.	+	+	+	+	Th	Mes	S	A
119.	<i>Carduss edelbergii</i> Rech. f.	+			+	Th	Mac	Sp	D
120.	<i>Carthamus oxyacantha</i> Bieb.		+			Th	Mic	S	A
121.	<i>Centaurea iberica</i> Trev. ex Spreng.	+				Th	Mic	Dis	WP
122.	<i>Cichorium intybus</i> L.		+	+	+	Th	N	S	WP
123.	<i>Cirsium falconeri</i> (Hk. f.) Petrak		+			H	Mes	Sp	D
124.	<i>Cnicus benedictus</i> L.	+				H	Mes	Dis	D
125.	<i>Conyza canadensis</i> (L.) Cronquist		+			Th	N	S	WP
126.	<i>Echinops griffithianus</i> Boiss.		+			Ch	N	S	D
127.	<i>Erigeron multicaulis</i> Wall. Ex DC.		+			Th	Mic	S	D
128.	<i>Koelipinia linearis</i> Pallas		+	+		Th	Mic	S	D
129.	<i>Lactuca dissecta</i> D. Don	+	+			Th	Mic	Dis	A
130.	<i>Lactuca orientalis</i> Boiss.	+	+			Th	N	Dis	D
131.	<i>Lactuca serriola</i> L.	+	+			Th	Mes	Dis	D
132.	<i>Launaea procumbens</i> (Roxb.) Ramayya & Rajagopal	+			+	H	L	Sp	D
133.	<i>Onopordum acanthium</i> L.	+	+			G	Mes	Dis	A
134.	<i>Pseudognaphalium affine</i> (D. Don.) Anderb.	+	+			H	Mes	S	F
135.	<i>Scorzonera virgata</i> DC.		+			Th	Mes	S	WP
136.	<i>Senecio chrysanthemoides</i> DC.	+	+			Th	Mes	S	R
137.	<i>Seriphidium brevifolium</i> (Wall. ex DC.) Ling & Y. R. Ling	+	+	+	+	Np	Mes	Dis	F
138.	<i>Serratula palida</i> DC.		+			G	N	Dis	WP
139.	<i>Silybum marianum</i> (L.) Gaertn.	+	+			Ch	Mes	Sp	WP
140.	<i>Solidago virgaurea</i> L.		+			Th	Mic	S	WP
141.	<i>Sonchus arvensis</i> L.		+			Th	Mic	Dis	A-D
142.	<i>Sonchus asper</i> (L.) Hill		+			Th	Mic	Dis	A-D
143.	<i>Sonchus oleraceus</i> L.		+			Th	Mic	Dis	A
144.	<i>Tagetes erecta</i> L.		+			Th	N	Comp	GY
145.	<i>Taraxacum officinale</i> F.H. Wigg	+	+			Th	Mic	Dis	D
146.	<i>Tragopogon gracilis</i> D. Don	+	+			H	Mic	S	D
147.	<i>Tussilago farfara</i> L.	+	+			G	Mes	S	WP
148.	<i>Xanthium strumarium</i> L.		+			Th	Mes	S	WP
Balsaminaceae									
149.	<i>Impatiens bicolor</i> Royle ssp. <i>pseudo bicolor</i> (Grey-Wilson) Y. Nasir		+			Th	Mes	S	W
150.	<i>Impatiens brachycentra</i> Kar. & Kir.		+			Th	Mic	S	M
151.	<i>Impatiens edgeworthii</i> Hk. f.		+	+		Th	Mes	S	W
Berberidaceae									
152.	<i>Berberis lycium</i> Royle	+	+	+	+	Np	N	Sp	F
153.	<i>Berberis parkeriana</i> Schneid.	+	+	+	+	Np	N	S	D
Betulaceae									
154.	<i>Alnus nitida</i> (Spach) Endl. Gen.	+	+	+	+	Mesp	Mes	S	F
155.	<i>Betula utilis</i> D. Don.	+	+	+	+	Mesp	Mes	S	F
Boraginaceae									
156.	<i>Achusa arvensis</i> (L.) Bieb.	+	+			Th	Mic	S	D
157.	<i>Arnebia linearifolia</i> A. DC.	+	+			Th	Mic	S	D
158.	<i>Buglossoides arvensis</i> (L.) Johnston	+	+			Th	N	S	WP
159.	<i>Cynoglossum glochidiatum</i> Wall. ex Bth.	+	+			H	N	S	W
160.	<i>Cynoglossum lanceolatum</i> Forssk.		+			H	N	S	W
161.	<i>Heliotropium bacciferum</i> Forssk.	+			+	G	L	S	D
162.	<i>Heliotropium strigosum</i> Willd. ssp. <i>brevifolium</i> (Wall.) Kazmi		+	+		Th	Mic	S	D
163.	<i>Lindelofia longiflora</i> (Bth.) Baill. var. <i>longiflora</i> Y. Nasir		+			H	Mes	S	WP
164.	<i>Myosotis alpestris</i> F. W. Schmidt var. <i>albicans</i> (H. Riedl) Y. Nasir		+			H	Mic	S	F
165.	<i>Myosotis caespitosa</i> C. F. Schultz.		+			H	Mic	S	D
166.	<i>Nonea caspica</i> (Willd.) G. Don ssp. <i>Caspica</i> Y. Nasir	+			+	Th	Mic	S	F-D
167.	<i>Onosma dichroantha</i> Boiss.	+			+	Th	N	S	A-D
168.	<i>Onosma griffithii</i> Vatke	+	+			Th	N	S	A-D
169.	<i>Onosma hispida</i> Wall. ex G. Don	+			+	Th	Mic	S	D
170.	<i>Pseudomertensia parvifolia</i> (Decne.) Riedl	+	+			Th	Mic	S	F
171.	<i>Trichodesma indicum</i> (L.) R. Br.	+	+			Th	Mic	S	D
Brassicaceae									
172.	<i>Alliaria petiolata</i> (M. Bieb.) Cavara & Grande	+	+	+	+	Th	N	S	A
173.	<i>Arabidopsis thaliana</i> (L.) Heynh.	+	+			Th	N	S	A
174.	<i>Brassica rapa</i> L. ssp. <i>campestris</i> (L.) Clapham	+				Th	Mic	Dis	CU
175.	<i>Brassica rapa</i> L. ssp. <i>Rapa</i>	+				Th	Mes	Dis	CU
176.	<i>Capsella bursa-pastoris</i> (L.) Medik.	+			+	Th	Mic	S	WP
177.	<i>Cardamine flexuosa</i> With.	+	+		+	Th	N	S	D
178.	<i>Cardamine macrophylla</i> Willd.	+	+			G	Mic	Comp	D
179.	<i>Eruca sativa</i> Mill.	+	+			Th	Mic	Dis	WP
180.	<i>Lepidium apetalum</i> Willd.	+	+			Th	N	S	WP

Table 1. (Cont'd.).

S. No.	Taxon	Seasonality				Life form	Leaf Size	Lamina	Habit
		Spring	Summer	Autumn	Winter				
181.	<i>Lepidium sativum</i> L.	+	+			Th	Mic	S	WP
182.	<i>Nasturtium officinale</i> R. Br.	+	+		+	G	Mic	Comp	W
183.	<i>Neslia apiculata</i> Fisch., CA.Mey. & Avec-Lall	+	+		+	Th	L	S	A
184.	<i>Rorippa islandica</i> (Oed.) Borb.	+	+			Th	Mes	Dis	ST
185.	<i>Sisymbrium irio</i> L.	+	+		+	Th	N	Dis	M
186.	<i>Thlaspi andersonii</i> (Hk. f. & Thoms.) O.E. Schulz	+	+		+	Th	N	S	WP
187.	<i>Thlaspi perfoliatum</i> L.	+	+		+	Th	Mic	S	WP
	Buddlejaceae								
188.	<i>Buddleja crispa</i> Bth.	+	+	+	+	Np	Mic	S	D
	Buxaceae								
189.	<i>Sarcococca saligna</i> (D. Don) Muell.Arg.	+	+	+	+	Np	Mic	S	D-F
	Caesalpinaceae								
190.	<i>Caesalpinia decapetala</i> (Roth) Alston	+	+	+	+	Np	Mic	Comp	D
	Campanulaceae								
191.	<i>Campanula cashmeriana</i> Royle		+			Th	N	S	A
192.	<i>Campanula pallida</i> Wall. var. <i>pallida</i>	+	+			H	Mes	S	A-D
193.	<i>Campanula pallida</i> Wall. var. <i>tibetica</i> (Hk.f. et Thoms.) Hara		+			H	Mic	S	A-D
	Cannabaceae								
194.	<i>Cannabis sativa</i> L.	+	+			Th	Mic	S	WP
	Cannaceae								
195.	<i>Canna indica</i> L.	+	+			Ch	Meg	S	I
	Caprifoliaceae								
196.	<i>Lonicera asperifolia</i> (Decne.) Hk. f. & Thoms.	+	+	+	+	Np	N	S	D
197.	<i>Lonicera caucasica</i> Pallas. ssp. <i>govianiana</i> (Wall. ex DC.) Hara	+	+	+	+	Np	Mes	S	D-F
198.	<i>Lonicera obovata</i> Royle ex Hk. f. & Thoms.	+	+	+	+	Np	N	S	D-F
199.	<i>Lonicera purpurascens</i> (Decne.) Walp.	+	+	+	+	Np	Mic	S	D-F
200.	<i>Lonicera quinquelocularis</i> Hardw.	+	+	+	+	Np	N	S	D-R
201.	<i>Viburnum cotinifolium</i> D. Don	+	+	+	+	Np	Mic	S	D
202.	<i>Viburnum grandiflorum</i> Wall. ex DC.	+	+	+	+	Np	Mes	S	D
	Caryophyllaceae								
203.	<i>Arenaria serpyllifolia</i> L.		+	+		Th	L	S	M
204.	<i>Cerastium dichotomum</i> L.	+	+			Th	N	S	M
205.	<i>Cerastium fontanum</i> Baumg.	+			+	Th	N	S	R
206.	<i>Dianthus orientalis</i> Adams.		+			Th	N	S	GY
207.	<i>Silene conoidea</i> L.	+			+	Th	Mic	S	W
208.	<i>Silene viscosa</i> (L.) Pers.	+	+			Th	Mic	S	W
209.	<i>Silene vulgaris</i> (Moench) Garcke	+	+			Th	Mic	S	M
210.	<i>Stellaria media</i> (L.) Vill.	+	+			Th	N	S	M
	Celastraceae								
211.	<i>Maytenus royleanus</i> (Wall. ex Lawson) Cuf.	+	+	+	+	Np	Mic	S	D
	Chenopodiaceae								
212.	<i>Chenopodium album</i> L.		+			Th	Mes	S	A
213.	<i>Chenopodium ambrosioides</i> L.		+			Th	Mes	Dis	D
214.	<i>Chenopodium botrys</i> L.	+	+			Th	Mic	Dis	A
	Convolvulaceae								
215.	<i>Convolvulus arvensis</i> L.	+			+	Th	Mes	S	F-A
216.	<i>Evolvulus alsinoides</i> L.	+			+	Th	Mic	S	F
217.	<i>Ipomoea eriocarpa</i> R. Br.		+	+		Th	Mic	S	A
218.	<i>Ipomoea purpurea</i> (L.) Roth.		+	+		Th	Mes	S	A
	Crassulaceae								
219.	<i>Hylotelephium ewersii</i> (Ledeb.) H. Ohba		+			G	N	S	R
220.	<i>Sedum hispanicum</i> L.		+			H	N	S	M
	Cucurbitaceae								
221.	<i>Cucumis melo</i> L. ssp. <i>agrestis</i> (Naud.) Grebensch. var. <i>agrestis</i> Naud		+	+		Th	Mac	S	CU
222.	<i>Cucumis sativus</i> L.		+	+		Th	Mac	Dis	CU
223.	<i>Cucurbita maxima</i> Duch. ex Lam.		+	+		Th	Mac	Dis	CU
224.	<i>Lagenaria siceraria</i> (Molina) Standley	+				Th	Mac	Dis	A
225.	<i>Luffa cylindrica</i> (L.) Roem.		+	+		Th	Mac	Dis	CU
226.	<i>Solena amplexicaulis</i> (Lam.) Gandhi	+	+			G	Mic	S	D
	Cuscutaceae								
227.	<i>Cuscuta europaea</i> L.	+	+			P	Ap	Abs	Epi
228.	<i>Cuscuta reflexa</i> Roxb.	+	+	+		P	Ap	Abs	Epi
	Datisceae								
229.	<i>Datisca cannabina</i> L.		+			Ch	Mic	Comp	WP
	Dipsacaceae								
230.	<i>Scabiosa candolii</i> DC.	+	+			H	Mes	S	D
	Ebenaceae								
231.	<i>Diospyros kaki</i> L.	+	+	+	+	Megp	Mes	S	I
232.	<i>Diospyros lotus</i> L.	+	+	+	+	Megp	Mes	S	D-F
	Elaeagnaceae								
233.	<i>Elaeagnus umbellata</i> Thunb.	+	+	+	+	Np	Mic	S	D-F

Table 1. (Cont'd.).

S. No.	Taxon	Seasonality				Life form	Leaf Size	Lamina	Habit
		Spring	Summer	Autumn	Winter				
Euphorbiaceae									
234.	<i>Andrachne cordifolia</i> (Wall.ex Dcne.) Muell. Avg.	+	+	+	+	Np	Mic	S	F-D
235.	<i>Euphorbia helioscopia</i> L.		+			Th	N	S	A-D
236.	<i>Euphorbia hispida</i> Boiss.		+	+		Th	N	S	A-D
237.	<i>Euphorbia peplus</i> L.		+			Th	L	S	A-D
238.	<i>Euphorbia prostrata</i> Ait.	+			+	Th	L	S	A-D
239.	<i>Ricinus communis</i> L.	+	+	+	+	Np	Mac	S	A
Fagaceae									
240.	<i>Quercus baloot</i> Griffith	+	+	+	+	Mesp	Mic	Sp	F-D
241.	<i>Quercus dilatata</i> Royle	+	+	+	+	Mesp	Mic	S	F-D
242.	<i>Quercus incana</i> Roxb.	+	+	+	+	Mesp	Mic	S	F-D
243.	<i>Quercus semecarpifolia</i> Smith	+	+	+	+	Mesp	Mic	S	F-D
Fumariaceae									
244.	<i>Fumaria indica</i> (Hauusskn.) Pugsley	+	+			Th	N	Dis	WP
Gentianaceae									
245.	<i>Gentianodes argentea</i> (Royle ex D. Don) Omer, Ali & Qaiser	+	+			G	N	S	F
246.	<i>Swertia ciliata</i> (G. Don) B. L. Burtt			+	+	Th	Mes	S	D
247.	<i>Swertia cordata</i> (G. Don) Clarke		+	+		Th	Mes	S	D-F
248.	<i>Swertia paniculata</i> Wall.	+	+			Th	Mic	S	R
Geraniaceae									
249.	<i>Erodium ciconium</i> (L.) L' Herit ex Aiton	+			+	Th	Mes	Comp	W
250.	<i>Erodium cicutarium</i> (L.) L' Herit ex Aiton	+			+	Th	Mes	Comp	W
251.	<i>Geranium himalayense</i> Klotzsch		+			Th	Mic	Dis	F
252.	<i>Geranium rotundifolium</i> L.	+				Th	Mic	Dis	D
Grossulariaceae									
253.	<i>Ribes himalense</i> Dcne.	+	+	+	+	Np	Mic	Dis	D
254.	<i>Ribes orientale</i> Desf.	+	+	+	+	Np	Mic	Dis	D-F
Hamelidaceae									
255.	<i>Parrotiopsis jacquemontiana</i> (Dcne.) Rehder	+	+	+	+	Np	Mes	S	D
Hippocastanaceae									
256.	<i>Aesculus indica</i> (Wall. ex Camb.) Hk. f.	+	+	+	+	Megp	Mes	Dis	F
Hypericaceae									
257.	<i>Hypericum oblongifolium</i> Choisy	+	+	+	+	Np	N	S	D
258.	<i>Hypericum perforatum</i> L.		+			Ch	N	S	D
Juglandaceae									
259.	<i>Juglans regia</i> L.	+	+	+	+	Mesp	Mic	Comp	D
Lamiaceae									
260.	<i>Ajuga bracteosa</i> Wall. ex Bth.	+	+	+		H	Mic	S	D
261.	<i>Ajuga parviflora</i> Bth.	+	+			Th	Mes	S	D
262.	<i>Clinopodium umbrosum</i> (M. Bieb.) C. Koch.	+	+			Th	Mic	S	D
263.	<i>Eremostachys superba</i> Royle ex Bth.	+	+			H	Mes	Dis	A
264.	<i>Isodon rugosus</i> (Wall. ex Bth.) Codd	+	+	+	+	Np	Mes	S	D
265.	<i>Lamium album</i> L.		+	+		Th	Mes	S	D
266.	<i>Lamium amplexicaule</i> L.		+			Th	Mic	S	WP
267.	<i>Leonurus cardiaca</i> L.		+			Th	Mes	Dis	W
268.	<i>Leucas cephalotes</i> (Roth.) Spreng.	+	+			Th	Mic	S	D
269.	<i>Marrubium vulgare</i> L.	+	+			Th	Mic	S	F
270.	<i>Mentha arvensis</i> L.	+	+			G	N	S	W
271.	<i>Mentha longifolia</i> (L.) L.	+	+			G	N	S	W
272.	<i>Micromeria biflora</i> (Buch.-Ham.ex D. Don) Bth.		+			Th	L	S	WP
273.	<i>Nepeta govaniiana</i> (Wall. ex Bth.) Bth.		+			Th	Mic	S	F
274.	<i>Nepeta laevigata</i> (D. Don) Hand.-Mazz.		+			Th	Mic	S	F
275.	<i>Origanum vulgare</i> L.		+	+		Ch	Mic	S	F
276.	<i>Phlomis spectabilis</i> Falc. ex Bth	+	+	+	+	Np	Mic	S	D
277.	<i>Prunella vulgaris</i> L.	+			+	H	Mes	S	W
278.	<i>Rosmarinus officinalis</i> L.	+	+	+	+	Np	N	S	D
279.	<i>Salvia lanata</i> Roxb.	+			+	Th	Mes	S	D
280.	<i>Salvia moorcroftiana</i> Wall. ex Bth.	+			+	Th	Mac	S	D-A
281.	<i>Salvia nubicola</i> Wall. ex Sweet		+	+	+	Th	Mes	S	D
282.	<i>Salvia plebeia</i> R. Br.		+	+		H	Mes	S	D
283.	<i>Stachys parviflora</i> Bth.		+			H	N	S	D
284.	<i>Teucrium stocksianum</i> Boiss. var. <i>incanum</i> (Aitch. & Hemsley) Hedge & Lamon	+	+			H	Mic	S	D-W
285.	<i>Thymus linearis</i> Bth. ssp. <i>linearis</i> Jalas		+			H	L	S	D
Linaceae									
286.	<i>Linum corymbulosum</i> Reichenb.	+	+			Th	L	S	WP
287.	<i>Reinwardtia trigyna</i> (Roxb.) Planch.	+	+	+	+	Np	N	S	D
Loranthaceae									
288.	<i>Viscum album</i> L.	+	+	+	+	P	L	S	Epi
Malvaceae									
289.	<i>Abelmoschus esculentus</i> (L.) Moench		+	+		Th	Mes	Sp	CU
290.	<i>Malvastrum coromendelianum</i> (L.) Garcke		+			Th	N	Sp	A-WP
291.	<i>Malva neglecta</i> Wall.	+	+			Th	Mes	S	A

Table 1. (Cont'd.).

S. No.	Taxon	Seasonality				Life form	Leaf Size	Lamina	Habit
		Spring	Summer	Autumn	Winter				
292.	<i>Malva sylvestris</i> L. Meliaceae	+				Th	Mes	S	A
293.	<i>Cedrela serrata</i> Royle	+	+	+	+	Megp	Mic	Comp	D
294.	<i>Melia azedarach</i> L. Moraceae	+	+	+	+	Megp	N	Comp	GY
295.	<i>Ficus carica</i> L. ssp <i>carica</i>	+	+	+	+	Megp	Mes	S	D
296.	<i>Ficus palmata</i> Forssk.	+	+	+	+	Mesp	Mes	S	D
297.	<i>Ficus sarmentosa</i> Buch.-Ham. ex J.E. Smith	+	+	+	+	Mesp	Mes	S	D
298.	<i>Morus alba</i> L.	+	+	+	+	Megp	Mes	S	A
299.	<i>Morus macroura</i> Miq.	+	+	+	+	Megp	Mes	S	A
300.	<i>Morus nigra</i> L. Myrsinaceae	+	+	+	+	Megp	Mes	S	A
301.	<i>Myrsine africana</i> L. Nyctaginaceae	+	+	+	+	Np	N	S	D-F
302.	<i>Boerhavia procumbens</i> Banks ex Roxb.	+	+			H	N	S	W
303.	<i>Mirabilis jalapa</i> L. Oleaceae	+	+	+	+	Np	Mes	S	GY
304.	<i>Fraxinus hookeri</i> Wenzig	+	+	+	+	Micp	Mes	Comp	D
305.	<i>Jasminum humile</i> L.	+	+	+	+	Np	Mic	Comp	D
306.	<i>Jasminum officinale</i> L.	+	+	+	+	Np	Mic	Comp	D
307.	<i>Olea ferruginea</i> Royle Onagraceae	+	+	+	+	Mesp	Mic	S	GY-D
308.	<i>Circaea cordata</i> Royle		+			G	Mes	S	WP
309.	<i>Epilobium hirsutum</i> L.	+	+	+	+	Np	N	S	W
310.	<i>Epilobium parviflorum</i> Schreb.		+	+		H	N	S	W
311.	<i>Oenothera rosea</i> L' Her. Ex Ait. Oxalidaceae		+	+		H	Mic	S	W
312.	<i>Oxalis acetosella</i> L.	+	+			Th	N	Comp	M
313.	<i>Oxalis corniculata</i> L. Paeoniaceae	+	+	+		Th	N	Comp	M-A
314.	<i>Paeonia emodi</i> Wall. ex Royle Papaveraceae	+	+		+	Ch	Mes	Dis	F
315.	<i>Papaver dubium</i> L.	+	+			Th	Mes	Dis	A-D
316.	<i>Papaver somniferum</i> L. Papilionaceae	+	+			Th	Mes	Dis	A-D
317.	<i>Argyrolobium roseum</i> (Camb.) Jaub. & Spach	+				H	N	Comp	D
318.	<i>Aeschynomene indica</i> L.	+				H	N	Comp	F
319.	<i>Astragalus graveolens</i> Buch.-Ham. ex Bth.	+	+	+	+	Np	N	Comp	D
320.	<i>Astragalus psilocentros</i> Fisch.	+	+	+	+	Np	N	Comp	D
321.	<i>Desmodium elegans</i> DC.	+	+	+	+	Np	Mes	Comp	D
322.	<i>Indigofera heterantha</i> Wall. ex Brandisvar. <i>gerardiana</i> (Wall. ex Baker) Ali	+	+	+	+	Np	L	Comp	F
323.	<i>Indigofera heterantha</i> Wall. ex Brandis var. <i>heterantha</i>	+	+	+	+	Np	L	Comp	D-F
324.	<i>Lathyrus aphaca</i> L.	+			+	Th	Mic	Comp	A
325.	<i>Lathyrus pratensis</i> L.		+		+	Th	Mic	Comp	A
326.	<i>Lathyrus sativus</i> L.	+	+			Th	N	Comp	A
327.	<i>Lathyrus sphaericus</i> Retz.	+			+	Th	Mic	Comp	A
328.	<i>Lespedeza juncea</i> (L. f.) Pers. var. <i>juncea</i>	+	+	+	+	Np	Mic	Comp	D
329.	<i>Lotus corniculatus</i> L. var. <i>corniculatus</i>	+				H	Mic	Comp	A
330.	<i>Medicago lupulina</i> L.	+	+			Th	N	Comp	D-A
331.	<i>Medicago minima</i> (L.) Grufb.	+			+	Th	N	Comp	A
332.	<i>Medicago polymorpha</i> L.	+			+	Th	N	Comp	A
333.	<i>Melilotus indicus</i> (L.) All.	+			+	Th	Mic	S	D-A
334.	<i>Phaseolus lunatus</i> L.	+				Ch	Mes	Comp	CU
335.	<i>Pisum sativum</i> L. var. <i>sativum</i>	+				Th	Mic	Comp	CU
336.	<i>Sophora mollis</i> (Royle) Baker ssp <i>mollis</i>	+	+	+	+	Np	Mic	Comp	D
337.	<i>Trifolium repens</i> L.	+	+			H	N	Comp	A
338.	<i>Trifolium resupinatum</i> L.	+	+			H	Mic	Comp	CU
339.	<i>Trigonella emodi</i> Bth.		+	+		Th	N	Comp	A
340.	<i>Vicia monantha</i> Retz.		+	+		Th	N	Comp	D
341.	<i>Vicia sativa</i> L. Plantaginaceae	+			+	Th	N	Comp	A
342.	<i>Plantago himalaica</i> Pilger		+			Th	Mic	S	D
343.	<i>Plantago lanceolata</i> L.		+			Th	Mes	S	W
344.	<i>Plantago major</i> L. Platanaceae		+	+		Th	Mes	S	w
345.	<i>Platanus orientalis</i> L. Plumbaginaceae	+	+	+	+	Megp	Mes	Dis	F
346.	<i>Limonium cabulicum</i> (Boiss.) O. Kuntze	+	+	+	+	Np	Mes	S	D
347.	<i>Limonium gilesii</i> (Hemsl.) Rech.f. & Koeie Podophyllaceae	+	+	+	+	Np	Mes	S	D
348.	<i>Podophyllum emodi</i> Wall. ex Royle	+	+			H	Mic	Comp	F

Table 1. (Cont'd.).

S. No.	Taxon	Seasonality				Life form	Leaf Size	Lamina	Habit
		Spring	Summer	Autumn	Winter				
Polygalaceae									
349.	<i>Polygala abyssinica</i> R. Br. ex Fresen	+	+	+		Ch	N	S	F
Polygonaceae									
350.	<i>Aconogonon alpinum</i> (All.) Schur		+	+		H	N	S	WP
351.	<i>Bistorta amplexicaulis</i> (D. Don) Green		+	+		H	Mes	S	F
352.	<i>Fallopia dumetorum</i> (L.) Holub		+	+		Th	Mic	S	F
353.	<i>Persicaria glabra</i> (Willd.) M. Gomes		+	+		Th	Mes	S	W
354.	<i>Polygonum aviculare</i> L.		+	+		Th	N	S	W
355.	<i>Polygonum plebejum</i> R. Br.		+	+		Th	N	S	A
356.	<i>Rumex dentatus</i> L.		+	+		Ch	Mes	S	W
357.	<i>Rumex hastatus</i> D. Don		+	+	+	Ch	N	Dis	W
Portulacaceae									
358.	<i>Portulaca oleracea</i> L.	+	+			Th	N	S	A
Primulaceae									
359.	<i>Anagallis arvensis</i> L. var. <i>coerulea</i> (L.) Gouan.	+			+	Th	N	S	W-A
360.	<i>Androsace foliosa</i> Dcne. ex Duby		+			H	Mes	S	D
361.	<i>Androsace rotundifolia</i> Hardw. ssp. <i>glandulosa</i> (Hk.f.) Y.Nasir		+			H	Mes	S	D
362.	<i>Androsace rotundifolia</i> Hardw. ssp. <i>rotundifolia</i> Y.Nasir	+	+			H	Mes	S	D
363.	<i>Cortusa brotheri</i> Pax ex Lipsky		+			H	Mes	S	D
364.	<i>Primula denticulata</i> Smith	+			+	G	Mes	S	F
365.	<i>Primula rosea</i> Royle		+			G	Mic	S	F
Punicaceae									
366.	<i>Punica granatum</i> L.	+	+	+	+	Micp	Mic	S	D
Ranunculaceae									
367.	<i>Aconitum violaceum</i> Jacq. ex Stapf		+			G	N	Dis	D
368.	<i>Anemone falconeri</i> Thoms.		+			H	Mic	Dis	GY
369.	<i>Aquilegia pubiflora</i> Wall. ex Royle var. <i>pubiflora</i>		+			H	N	Comp	F
370.	<i>Caltha alba</i> Camb. var. <i>alba</i>		+			H	N	S	W
371.	<i>Ceratocephala falcata</i> (L.) Pers.		+			Th	L	Comp	D
372.	<i>Clematis connata</i> DC.	+	+	+	+	Np	Mes	Comp	D
373.	<i>Clematis grata</i> Wall.	+	+	+	+	Np	Mic	Comp	D-A
374.	<i>Delpinium uncinatum</i> Hk. f. & Thoms.		+			H	N	Dis	CU
375.	<i>Ranunculus arvensis</i> L.	+				G	N	Dis	M
376.	<i>Ranunculus laetus</i> Wall. ex Hk. f. & Thoms.		+			G	N	Dis	WP
377.	<i>Ranunculus muricatus</i> L.	+	+			G	N	Dis	WP
378.	<i>Ranunculus sceleratus</i> L.	+	+			G	N	Dis	WP
Rhamnaceae									
379.	<i>Sageretia thea</i> (Osbeck) M.C. Johnston var. <i>thea</i>	+	+	+	+	Np	Mic	S	F
Rosaceae									
380.	<i>Agrimonia eupatoria</i> L.		+			Ch	Mic	Comp	D
381.	<i>Cotoneaster microphyllus</i> Wall. ex Lindl.	+	+	+	+	Np	L	S	F
382.	<i>Cotoneaster nummularia</i> Fisch. & Mey.	+	+	+	+	Np	N	S	F
383.	<i>Crataegus songarica</i> K. Koch.	+	+	+	+	Micp	Mes	Dis	F
384.	<i>Duchesnea indica</i> (Andr.) Focke	+	+			H	Mic	Comp	D
3865.	<i>Fragaria vesca</i> L.	+	+			H	Mic	Comp	D
386.	<i>Geum elatum</i> Wall. ex G. Don	+	+			H	Mes	Comp	F
387.	<i>Geum urbanum</i> L.	+	+			G	Mes	Comp	F
388.	<i>Malus pumila</i> Mill.	+	+	+	+	Np	Mes	S	CU
389.	<i>Potentilla nepalensis</i> Hk.f.		+			G	N	Comp	D
390.	<i>Potentilla reptans</i> L.	+	+			H	N	Comp	D
391.	<i>Prunus armeniaca</i> L.	+	+	+	+	Micp	Mes	S	CU
392.	<i>Prunus domestica</i> L.	+	+	+	+	Micp	Mes	S	CU
393.	<i>Prunus persica</i> (L.) Batsch.	+	+	+	+	Micp	Mes	S	CU
394.	<i>Pyrus pashia</i> Ham. ex D. Don	+	+	+	+	Micp	Mes	S	CU
395.	<i>Pyrus pyrifolia</i> (Burm.) Nak.	+	+	+	+	Micp	Mes	S	D
396.	<i>Rosa alba</i> L.	+	+	+	+	Np	N	Comp	CU
397.	<i>Rosa brunonii</i> Lindl.	+	+	+	+	Np	N	Comp	F
398.	<i>Rosa webbiana</i> Wall. ex Royle	+	+	+	+	Np	N	Comp	F
499.	<i>Rubus ellipticus</i> Smith	+	+	+	+	Np	N	Comp	F
400.	<i>Rubus fruticosus</i> L.	+	+	+	+	Np	Mes	Comp	F-D
401.	<i>Rubus ulmifolius</i> Schott	+	+	+	+	Np	Mes	Comp	D
402.	<i>Sanguisorba minor</i> Scop.		+			H	L	Comp	D
403.	<i>Sibbaldia procumbens</i> L.		+			H	Mic	Comp	WP
404.	<i>Sorbaria tomentosa</i> (Lindl.) Rehd.	+	+	+	+	Np	Mic	Comp	WP
405.	<i>Spiraea canescens</i> D. Don	+	+	+	+	Np	Mic	S	F
Rubiaceae									
406.	<i>Galium aparine</i> L.	+	+			Th	N	S	WP-A
407.	<i>G. elegans</i> Wall. ex Roxb.	+	+			Th	N	S	WP-A
408.	<i>Galium tetraphyllum</i> Nazim. & Ehrend.		+			Th	N	S	A-D
409.	<i>Himalrandia tetrasperma</i> (Roxb.) Yamazaki	+	+	+	+	Np	N	S	F
410.	<i>Rubia cordifolia</i> L.		+	+		H	Mic	S	D
411.	<i>Rubia infundibularis</i> Hemsl. & Lacey	+	+	+		H	Mes	S	R
Rutaceae									
412.	<i>Skimmia laureola</i> (DC.) Sieb. & Zucc. ex Walp	+	+	+	+	Np	Mes	Comp	F

Table 1. (Cont'd.).

S. No.	Taxon	Seasonality				Life form	Leaf Size	Lamina	Habit
		Spring	Summer	Autumn	Winter				
413	<i>Zanthoxylum armatum</i> DC. Salicaceae	+	+	+	+	Micp	Mes	Comp	D
414.	<i>Populus alba</i> L.	+	+	+	+	Mesp	Mes	S	W
415.	<i>Populus ciliata</i> Wall. ex Royle	+	+	+	+	Mesp	Mes	S	W
416.	<i>Salix babylonica</i> L.	+	+	+	+	Mesp	Mes	S	W
417.	<i>Salix denticulata</i> Anderson	+	+	+	+	Mesp	Mes	S	W
418.	<i>Salix tetrasperma</i> Roxb.	+	+	+	+	Mesp	Mes	S	W
419.	<i>Sambucus wightiana</i> Wall. ex Wight & Arn. Sambucaceae		+			Th	Mes	Comp	F
420.	<i>Saussurea albescens</i> (DC.) Sch. Bip. Sapotaceae		+			H	Mes	S	D
421.	<i>Bergenia ciliata</i> (Haw.) Sternb. f. ciliata Yeo	+	+			G	Mes	S	D
422.	<i>Bergenia stracheyi</i> (Hk.f. & Thoms.) Engl.		+			G	Mes	S	D
423.	<i>Saxifraga moorcroftiana</i> (Ser.) Sternb. Saxifragaceae		+	+		H	Mic	S	D
424.	<i>Kickxia ramosissima</i> (Wall.) Janchen	+			+	Th	Mes	S	R
425.	<i>Picrorhiza kurrooa</i> Royle ex Bth.		+			Th	Mes	S	F
426.	<i>Scrophularia calycina</i> Bth.		+			Th	Mic	S	D
427.	<i>Scrophularia scabiosifolia</i> Bth.		+			Th	N	S	D
428.	<i>Verbascum thapsus</i> L.		+			Th	Meg	S	W
439.	<i>Veronica biloba</i> L.	+			+	Th	N	Dis	W
440.	<i>Veronica didyma</i> Tenore	+				Th	N	Dis	W
431.	<i>Wulfenia amherstiana</i> Wall. ex Bth. Simaroubaceae		+			H	Mes	S	R
432.	<i>Ailanthus altissima</i> (Mill.) Swingle Smilacaceae	+	+	+	+	Megp	Mes	Comp	A-I
433.	<i>Smilax glaucophylla</i> Klotzsch	+	+	+	+	Np	Mes	S	F
434.	<i>Smilax vaginata</i> Decne. Solanaceae	+	+	+	+	Np	Mic	S	F
435.	<i>Atropa acuminata</i> Royle ex Miers		+			Th	Mes	S	D
436.	<i>Capsicum annum</i> L.		+	+		Th	Mic	S	CU
437.	<i>Capsicum frutescens</i> L.	+	+	+	+	Np	Mes	S	GY
438.	<i>Datura innoxia</i> Mill.		+	+		Th	Mes	S	D
439.	<i>Datura stramonium</i> L.		+			Th	Mes	S	D-GY
440.	<i>Hyoscyamus niger</i> L.	+				Th	Mes	S	A
441.	<i>Lycopersicon esculentum</i> Miller	+	+	+	+	Th	Mes	S	CU
442.	<i>Physalis divaricata</i> D. Don		+	+		Th	Mic	S	A
443.	<i>Solanum nigrum</i> L. var. <i>nigrum</i>		+	+		Th	Mes	S	A-GY
444.	<i>Solanum pseudo-capsicum</i> L.		+	+		Th	Mic	S	GY
445.	<i>Solanum surattense</i> Burm. f.		+			H	Mes	S	GY
446.	<i>Solanum tuberosum</i> L.		+			G	Mes	Comp	CU
447.	<i>Withania somnifera</i> (L.) Dunal Thymeleaceae		+			Ch	Mac	S	A-GY
448.	<i>Daphne mucronata</i> Royle	+	+	+	+	Np	N	S	D-F
449.	<i>Wikstroemia canescens</i> Meisn. Ulmaceae	+	+	+	+	Np	N	S	F
450.	<i>Celtis caucasica</i> Willd.	+	+	+	+	Megp	Mic	S	D
451.	<i>Celtis eriocarpa</i> Decne. Urticaceae	+	+	+	+	Mesp	Mic	S	D
452.	<i>Debregeasia salicifolia</i> (D. Don) Rendle	+	+	+	+	Np	Mes	S	W
453.	<i>Lecanthus peduncularis</i> (Royle) Wedd.	+	+			H	Mes	S	M
454.	<i>Urtica dioica</i> L. Valerianaceae	+	+			Th	Mic	S	M
456.	<i>Valeriana jatamansi</i> Jones	+	+			G	Mic	S	M-W
455.	<i>Valeriana pyrolifolia</i> Decne. Verbenaceae	+	+			G	N	S	M-W
457.	<i>Verbena officinalis</i> L.	+	+	+	+	Th	Mic	Dis	M-W
458.	<i>Vitex negundo</i> L.	+	+	+	+	Np	Mes	Comp	D
459.	<i>Viola biflora</i> L.	+	+			Th	Mic	S	M
460.	<i>Viola canescens</i> Wall. ex Roxb. Vitaceae	+				Th	Mic	S	R-M
461.	<i>Vitis Jacquemontii</i> Parker	+	+	+	+	Np	Mes	S	D
462.	<i>Vitis vinifera</i> L. Zygophyllaceae	+	+	+	+	Np	Mes	S	CU
463.	<i>Tribulus terrestris</i> L.		+			H	N	Comp	A-WP

Key to Abbreviations:

(Life form) G-geophyte, Th-Therophyte, H-Hemicryptophyte, Ch-Chamaephyte, Np-Nanophanerophyte, Mip- Microphanerophyte, Mesp- Mesophanerophyte, Megp-Megaphanerophyte, P-Parasite.

(Leaf form) Ap-Aphyllous, L-Leptophyll, N-Nanophyll, Mic-Microphyll, Mes-Mesophyll, Mac-Macrophyll, Meg-Megaphyll. (Lamina) A-Absent, S-Simple, Dis-Dissected, Comp-Compound, Sp-Spiny, N-Needle. (Habitat) A-Agricultural fields, D-Dry slopes, W-Wet places, CU-Cultivated, GY-Graveyards, F-Forest, M-Moist shady places, R-Rock crevices, WP-Waste places, I-Introduced, Epi-Epiphyte

Table 2. Summary of ecological characters of Chail Valley Swat.

S. No.	Characteristics	No.	Percentage
1.	Flora		
i.	Families	104	-
ii.	Genera	332	-
iii.	Species	463	-
2.	Life form spectra		
i.	Geophytes	57	12.31%
ii.	Therophytes	188	40.60%
iii.	Hemicryptophytes	77	16.63%
iv.	Chamaephytes	19	4.10%
v.	Nanophanerophytes	71	15.33%
vi.	Microphanerophytes	13	2.81%
vii.	Mesophanerophytes	18	3.89%
viii.	Megaphanerophytes	17	3.67%
ix.	Parasites	3	0.65%
3.	Leaf size spectra		
i.	Aphyllous	2	0.43%
ii.	Leptophyll	25	5.40%
iii.	Nanophyll	136	29.37%
iv.	Microphyll	140	30.24%
v.	Mesophyll	147	31.75%
vi.	Macrophyll	10	2.16%
vii.	Megaphyll	3	0.65%
4.	Lamina shape		
i.	Absent	3	0.65%
ii.	Simple	305	65.87%
iii.	Dissected	62	13.39%
iv.	Compound	76	16.41%
v.	Spiny	8	1.73%
vi.	Needle	9	1.94%
5.	Habitat		
i.	Dry mountain sloop	175	37.79%
ii.	Wet Soil	31	6.69%
iii.	Cultivated	27	5.83%
iv.	Forest	77	16.63%
v.	Moist Shady Place	22	4.75%
vi.	Rock Crevices	17	3.67%
vii.	Waste Places	43	9.28%
viii.	Graveyard	16	3.45%
ix.	Introduced	5	1.07%
x.	Epiphyte	3	0.64%
xi.	Agricultural fields	78	16.84%
6.	Seasonality		
i.	Spring	279	26.80%
ii.	Summer	396	38.04%
iii.	Autumn	193	18.54%
iv.	Winter	173	16.62%

Table 3. Seasonal variation in life form and leaf size spectra of plants of Chail Valley District Swat.

S. No.	Life form	Spring	% Age	Summer	% Age	Autumn	% Age	Winter	% Age
1.	Geophytes	29	10.39%	43	10.86%	1	0.52%	6	3.47%
2.	Therophytes	92	32.97%	146	36.87%	47	24.35%	41	23.70%
3.	Hemicryptophytes	29	10.39%	68	17.17%	19	9.84%	4	2.31%
4.	Chamaephytes	7	2.51%	17	4.29%	5	2.59%	2	1.16%
5.	Nanophanerophytes	71	25.45%	71	17.93%	71	36.79%	71	41.04%
6.	Microphanerophytes	13	4.66%	13	3.28%	13	6.74%	13	7.51%
7.	Mesophanerophytes	18	6.45%	18	4.55%	18	9.33%	18	10.40%
8.	Megaphanerophytes	17	6.09%	17	4.29%	17	8.81%	17	9.83%
9.	Parasites	3	1.08%	3	0.76%	2	1.04%	1	0.58%
		279	100 %	396	100 %	193	100 %	173	100 %
	Leaf form	Spring	% Age	Summer	% Age	Autumn	% Age	Winter	% Age
1.	Aphyllous	2	0.72%	2	0.51%	1	0.52%	0	0.00%
2.	Leptophyll	16	5.73%	21	5.30%	9	4.66%	12	6.94%
3.	Nanophyll	76	27.24%	119	30.05%	52	26.94%	46	26.59%
4.	Microphyll	85	30.47%	117	29.55%	53	27.46%	48	27.75%
5.	Mesophyll	93	33.33%	128	32.32%	72	37.31%	62	35.84%
6.	Macrophyll	5	1.79%	7	1.77%	6	3.11%	4	2.31%
7.	Megaphyll	2	0.72%	2	0.51%	0	0.00%	1	0.58%
		279	100 %	396	100 %	193	100 %	173	100 %

Habitat: Highest number of species (175 Spp., 37.79%) were found growing on dry exposed mountain slopes. These were followed by 78 species (16.84%) recorded from agricultural fields, 77 species (16.63%) within forest, 43 species (9.28%) from waste places and 31 species (6.69%) from wet places (Table 2). The area is under tremendous anthropogenic pressure as people from the locality obtain fuel wood and timber from the forest and rapid deforestation is resulting in habitat disturbance and destruction. Some medicinally important plants such as *Trillium govianum* and *Hypericum perforatum* are under the threat of extinction from the locality because of their lavish and improper collection methods. Results of present study strongly advocate the further exploration of the floristic details of the area. It is further recommended to restore the degraded forest by encouraging In-situ conservation as plants would flourish well in their original habitat rather going for Ex-situ practices.

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References

- Addo-Fordjour, P., S. Obeng. A.K. Anning and M.G. Addo. 2009. Floristic composition, structure and natural regeneration in a moist semi-deciduous forest following anthropogenic disturbances and plant invasion. *Int. J. Biod. & Cons.*, 1(2): 021-037.
- Ahmad, M., Shazia. S. Hadi. S.F.H. Hadda. T.B. Rashid. S. Zafar. M. Khan. M.A. Khan. M.P.Z. and G. Yaseen. 2014. An ethnobotanical study of medicinal plants in high mountainous region of Chail Valley, Swat. *J. Ethnobot. & Ethnomed.*, 10(36): 10.1186/1746-4269-10-36.
- Ali, S.I. 2008. The significance of flora with special reference to Pakistan. *Pak. J. Bot.*, 40(30): 967-971.
- Ali, S.I. and M. Qaiser (Eds.). 1995-2015. *Flora of Pakistan*. Department of Botany, University of Karachi.
- Ali, S.I. and Y.J. Nasir (Eds.). 1989-1992. *Flora of Pakistan*. Islamabad, Karachi.
- Alsherif, E.A., M. Ahmad, Ayesha and S.M. Rawi. 2013. Floristic composition, life form and chorology of plant life at Khulais Region, Western Saudi Arabia. *Pak. J. Bot.*, 45(1): 29-38.
- Badshah, L., F. Hussain and N. Akhtar. 2010. Vegetation structure of subtropical forest of Tabai, South Waziristan, Pakistan. *Front. Agri. China*, 4(2): 232-236.
- Badshah, L., F. Hussain and Z. Sher. 2013. Floristic inventory, ecological characteristics and biological spectrum of rangeland, District Tank, Pakistan. *Pak. J. Bot.*, 45(4): 1159-1168.
- Batalha, M.A. and F.R. Martins. 2002. Life-form spectra of Brazilian Cerrado sites. *Flora, Morphology, Distribution, Functional Ecology of Plants*, 197(6): 452-460.
- Batalha, M.A. and F.R. Martins. 2004. Floristic frequency, and vegetation life form spectra of a Cerrado site. *Braz. J. Biol.*, 4(2): 203-209.
- Blanckaert, I.R., L. Swennen. M. Flores. R. Lopez and L. Saade. 2004. Floristic composition, plant uses and management practices in homegardens of San Rafael Coxactlan Valley of Tehuacan-Cuicatlan, Mexico. *J. Arid Environ.*, 57(2004): 39-62.
- Cain, S.A. and G.M. Castro. 1959. *Manual of Vegetation analysis*. Harper, NYpp. 325.
- Djaha, K., A.Y.C. Yves, K.K. Edouard, N.G.K. Edouard and A. Kouadio. 2008. Preliminary Floristic Inventory and Diversity in Azagny National Park (Côte D'Ivoire). *Eur. J. Sci. Res.*, 23(4): 537-547.
- Durrani, M.J., A. Razaq, S.G. Muhammad and F. Hussain. 2010. Floristic diversity, ecological, characteristics and ethnobotanical profile of plants of Aghbergrange lands, Balochistan, Pakistan. *Pak. J. Pl. Sci.*, 16(1): 29-36.
- Durrani, M.J., F. Hussain and S.U. Rehman. 2005. Ecological characteristics of plants of Harboi rangeland, Kalat, Pakistan. *J. Trop. & Sub Trop. Bot.*, 13(2): 130-138.
- Fazal, H., N. Ahmad, A. Rashid and S. Farooq. 2010. A checklist of phanerogamic flora of Haripur Hazara, Khyber Pakhtunkhwa, Pakistan. *Pak. J. Bot.*, 42(3): 1511-1522.
- Guo, Q.S., X.F. Wang, G. Bar, Y. Kang, M. Hong, S.X. Pei and F.J. Zhang. 2009. Life forms spectra, leaf character, and hierarchical-synusia structure of vascular plants in *Thuja sutchuehensis* community. *Pub. Med.*, 20(9): 2057-2062.
- Haq, F.U., H. Ahmad, M. Alam, I. Ahmad and R. Ullah. 2010. Species diversity of vascular plants of Nandiar Valley Western Himalaya, Pakistan. *Pak. J. Bot.*, 42(S.I.): 213-229.
- Hussain, F. 1989. *Field and Laboratory Manual of Plant Ecology*. UGC. Islamabad.
- Hussain, F., S.M. Shah, L. Badshah and M.J. Durrani. 2015. Diversity and ecological characteristics of flora of Mastuj Valley, District Chitral, Hindukush Range, Pakistan. *Pak. J. Bot.*, 47(2): 495-510.
- Ilyas, M., R. Qureshi. M. Arshad and S.N. Mirza. 2013. A preliminary checklist of Vascular flora of Kabal Valley, Swat. *Pak. J. Bot.*, 45(2): 605-615.
- Kar, P.K., A.K. Biswal and K.L. Barik. 2010. Floristic composition and biological spectrum of a grassland community of Rangamatia in the District of Mayurbhanj, Odisha. *J. Curr. Sci.*, 15(2): 465-469.
- Manhas, R.K., L. Singh, H.B. Vasistha and M. Negi. 2010. Floristic diversity of protected ecosystems of Kandi Region of Punjab, India. *NY. Sci. J.*, 3(4): 96-103.
- Marwat, Q. and R.A. Qureshi. 2000. A check list of the vascular plants found in upper Siran reserved and guzara forests, District Manshera, Pakistan. *Pak. J. Pl. Sci.*, 6(1-2): 43-57.
- Musharraf, K., F. Hussain. S. Musharraf and Imdadullah. 2011. Floristic composition, life form and leaf size spectra of the coal mine area vegetation of Dara Adam Khel, Khyber Pakhtunkhwa, Pakistan. *J. Biod. Env. Sci.*, 1(3): 2222-3045.
- Musharraf, K., F. Hussain and S. Musharraf. 2014. Floristic composition and ecological characteristics of Shahbaz Garhi, District Mardan, Pakistan. *Glob. J. Sci. Front. Res.*, 14(1): ISSN: 2249-4626.
- Nasir, E. and S.I. Ali (Eds.). 1970-1989. *Flora of Pakistan*, Islamabad, Karachi.
- Ozgun, E. and R. Ansin. 2003. The flora of Hatila Valley National Park and its close Environs (Artvin), Turkey. *Turk. J. Bot.*, 27(2003): 1-27.
- Perveen, A., G. R. Sarwar and I. Hussain. 2008. Plant biodiversity and phytosociological attributes of Dureji (Khirthar Range). *Pak. J. Bot.*, 40(1): 17-24.
- Qureshi, R. and G.R. Bhatti. 2010. Floristic inventory of Pai forest, Nawab Shah, Sindh, Pakistan. *Pak. J. Bot.*, 42(4): 2215-2224.

- Qureshi, R., G.R. Bhatti and G. Shabbir. 2011. Floristic inventory of Pir Mehr Ali Shah Arid Agriculture University research farmat Koont and its surrounding areas. *Pak. J. Bot.*, 43(3): 1679-1684.
- Rashid, A., M.F. Swati, H. Sher and M.N. Al Yemeni. 2011. Phyteocological evaluation with detail floristic appraisal of the vegetation around Malam Jabba, Swat, Pakistan. *Asian Pac. J. Trop. Biomed.*, 1(6): 461-467.
- Raunkiaer, C. 1934. The life forms of plants and statistical plants geography being the collected papers of C. Raunkiaer. Clarend on press, Oxford.
- Saima, S., A.A. Dasti, Q. Abbas and F. Hussain. 2010. Floristic diversity during mon soon in Ayubia National Park, District Abbottabad, Pakistan. *Pak. J. Pl. Sci.*, 16(1): 43-50.
- Saima, S.A., A. Dasti, F. Hussain. S.M. Wazir and S.A. Malik. 2009. Floristic compositions along an 18-KM long transection in Ayubia National Park District Abbottabad. *Pak. J. Bot.*, 41(5): 2115-2127.
- Sher, Z. and Z.U. Khan. 2007. Floristic composition, lifeform and leaf spectra of the vegetation of Chagharzai Valley, District Buner. *Pak. J. Pl. Sci.*, 13(1): 57-66.
- Stewart, R.R. 1967. Checklist of the plants of Swat State, NorthwestPakistan. *Pak. J. Forest.*, 17(4): 457-528.
- Yalcin, E., M. Kilinc, H.G. Kutbay, A. Bilgin and H. Korkmaz. 2011. Floristic properties of low land meadows in Central Black Sea Region of Turkey. *Eurasian J. Biosci.*, 5: 54-63.

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