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Articles and Statements

Floristic Diversity and Ecological Characteristics of Historical Kalash Valley (Pakistan)

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Abstract

Kalash valley is famous all over the world for its inhabitants having indigenous culture, religion, language and considered to be the descendants of Alexander the Great living in this rigged mountainous series of Hindukush range. Frequent field visits were carried out during 2013–2016 years for the collection of plant samples and documentation of related data. Then the collected plants samples were properly pressed and identified with the help of different volumes of Flora of Pakistan and other available literature. The study showed 389 species belong to 237 genera and 88 families including 62 dicots, 11 monocots, 7 pteridophytes, 4 bryophytes, 3 gymnosperms and 1 fungi family. Species distribution indicated 307 dicots, 55 monocots, 12 pteridophytes, 10 gymnosperms, 4 bryophytes and 1 fungi species. Asteraceae was detected dominant (49 taxa) family followed by Poaceae (36 spp.), Brassicaceae (25 taxa), Lamiaceae (22 spp.), Rosaceae (22 spp.), Fabaceae (16 spp.) and Apiaceae (13 spp.). The remaining families had 12 or less species. The life form classes indicated 205 therophytes, 56 geophytes and 46 hemicryptophytes species while nanophylls (178 spp.) mesophylls (72 spp.) and leptophylls (53 spp.) were dominant leaf spectra classes. The present study is first ever record of floristic diversity of Kalash valley and includes some new reports. The findings will be helpful in future detail studies on plant resources of the area.

Keywords: floristic diversity, plant ecology, Kalash valley, district Chitral, Pakistan.

1. Introduction

Chitral is the largest district of Khyber Pakhtunkhwa and lies between 35° 15´ 06″ to 36° 55´32″ north latitudes and 71° 11´ 32″ to 73° 51´ 34″ east longitudes (Anonymous, 1998). The district has boundaries with Ghizer valley (Gilgit-Baltistan) in the east, with districts of Dir and Swat in the south and with Nooristan province and Wakhan corridor of Afghanistan in the west and north-west respectively (Figure 1). The present study area “Kalash valley” lies to the extreme south-west of district Chitral and is bounded with Nooristan (Afghanistan) in the west and to other parts of Chitral by the three sides. The valley has three sub localities viz: Bumburet, Birir, Rumbor and inhabits people that practice an old, unique and indigenous religion called Kalasha (Figure 2).

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Fig. 1. Map of Pakistan on the globe showing Chitral Valley in Black Square box

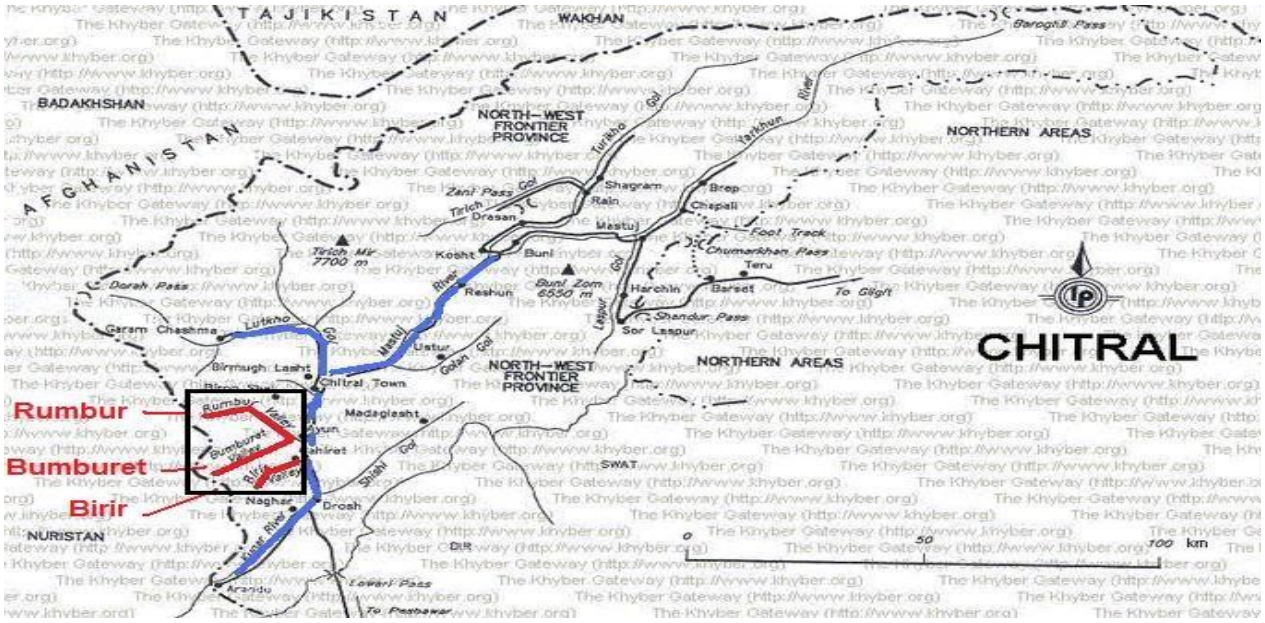

Fig. 2. Map of district Chitral showing the study area in black square box

The people are mostly dependant on different products of plants for food, fodder, medicines and shelter while the natural forests are comprise of *Cedrus deodora, Juniperus communis, Juniperus excelsa, Pinus gerardiana, Pinus wallichiana*, *Quercus baloot* and *Quercus incana*. Cattle rearing are major income source for the locals and the valley has rangelands where the Kalash people graze their animals and also collect plants for domestic and commercial use. The extensive exploitations of these rangelands for different purposes have caused serious drastic changes in annual climatic conditions that lead to severe floods which affected infrastructures, cultivated land, service roads and irrigation channels of the valley.

Flora is the sum of all plant species in a particular habitat and ecosystem. Floristic diversity and its ecological characteristics depend upon climate, altitudinal and related habitat conditions (Ali, 2008). Many researcher have studied on floristic checklists of local flora in different regions

(Durrani et al., 2005; Sher, Khan 2007; Qureshi, Bhatti, 2008; Abdullahi et al., 2009; Jabeen et al., 2009; Saima et al., 2009; Durrani et al., 2010; Udayakumar et al., 2011; Hussain et al., 2012; Qin et al., 2012; Youcef et al., 2012; Badshah et al., 2013; Sher et al., 2014; Hussain et al., 2015; Badshah et al., 2016; Baykal, Atamov 2016; Shaheen et al., 2016).

The present study was initiated to enlist the unexplored flora of Kalash valley, district Chitral which will help for future studies and planning in the area regarding plant resources and their utilization for different purposes.

2. Material and Methods

Plant specimens were collected from entire Kalash valley during 2014-2016. They were dried and identified with the help of available literature (Nasir & Ali, 1970-1989; Ali & Nasir, 1989-1991; Ali & Qaiser, 1993-2015). A complete floristic list was prepared and plants were placed into genera and family. The identified plant specimens were deposited at Herbarium of Department of Botany, University of Peshawar. The ecological characteristics of species viz: leaf persistence, spiny nature, habitat, light requirement, cultivation/wild and leaf shape were observed in the field. Life-form and leaf size spectra were determined by following Raunkiaer (1934) and Hussain (1989).

3. Results and Discussion

a. Flora and its ecological characteristics:

The present study revealed that the Kalash valley contained 389 species of 273 genera and 88 families including 62 (70.45 %) dicots, 11 (12.50 %) monocots, 7 (7.95 %) pteridophytes, 4 (4.54 %) bryophytes, 3 (3.41 %) gymnosperms and 1 (1.13 %) fungi families. Dicots had maximum 307 (78.92 %) species followed by monocot with 55 (14.13 %) species, pteridophytes 12 (3.08 %), gymnosperms 10 (2.57 %), bryophytes 4 (1.03 %) and 1 (0.26 %) was fungi species. Asteraceae had 49 (12.60%) taxa, followed by Poaceae having 36 (9.25 %) species, Brassicaceae 25 (6.42 %) taxa, Lamiaceae and Rosaceae 22 (5.65 %) each, Fabaceae 16 (4.11%), Apiaceae 13 (3.34 %), Boraginaceae and Polygonaceae 12 (3.08 %) each and Schrophulariaceae and Caryophyllaceae had 10 (2.57 %) species each. The remaining families have less than 10 species (Table 1, Figures 3-5). Our findings are supported by different workers viz: Shah and Hussain (2007) that reported 42 species belonging to 31 families from Chamkani area, Peshawar with similar dominant families. Sher and Khan (2007) reported 222 species belonging to 89 families with maximum representation (21 taxa) in Asteraceae. Durrani et al., (2010) reported 123 species of 36 families from Aghberg rangelands Quetta, whereas Asteraceae, Boraginaceae, Brassicaceae, Fabaceae, Lamiaceae and Poaceae were dominant families of the area. 571 species belonging to 82 families were reported from Mastuj valley, Chitral and Asteraceae was leading family (Hussain et al., 2015). Badshah et al., (2016) reported 283 species belonging to 85 families from Parachinar, Kurram Agency where Asteraceae was dominant family with 29 species. These findings are in support of our results as Asteraceae, Poaceae, Fabaceae, Chenopodiaceae and Moraceae were also leading families in their research areas.

The ecological characteristics indicates that the valley included 328 (84.32%) deciduous, 48 (12.34 %) evergreen and 13 (3.34 %) leafless species. This high percentage of deciduous plants indicates the xeric and dry conditions of the area. The leaf appearance showed that 266 (68.38 %) species had simple, 66 (16.97 %) species had compound, 44 (11.31 %) species had dissected and 13 (3.34 %) species were aphyllous. 369 (94.85 %) species were spineless (non-spiny) and 20 (5.15 %) were spiny species (Figures 8-10). The results showed that 291 (74.81%) species were in dry and 98 (25.19 %) were of moist habitats like *Fumaria hygrometrica, Marchantia polymorpha, Adiantum venustum, Equisetum arvense, Selaginella indica, Phragmites karka, Mentha longifolia, Nasturtium officinale* and *Ranunculus muricatus* etc. which agrees with Hussain et al., (2015) and Badshah et al., (2016) with similar species in such dry climatic conditions of the valley where only few localized points having aquatic/moist species. 363 (93.31 %) species were heliophytes (light loving) and only 26 (6.69 %) species were sciophytes (shade loving) as the area consists of scattered vegetation with open sunny environment and favours sun loving plants. Similarly, 340 (87.40 %) species were wild and 49 (12.60 %) were cultivated (Figures 11-13). The cultivated species included crops, fruit plants and vegetables.

b. Life form spectrum

The life form spectrum shows all the life processes of flora and vegetation. It usually represents climatic, microclimatic and bioclimatic habitat conditions of an area (Cain, Castro, 1959). It plays key role in the detection of environmental amplification of plant life. The life form spectrum may be changed due to introduction of therophytes like annual weed, due to anthropogenic activities like agricultural practices, deforestation, grazing and trampling etc. (Malik et al., 2007). In the present study therophyte was dominant class with 205 (52.70 %) species followed by geophytes with 56 (14.40 %) species, hemicryptophytes 46 (11.82 %), nanophanerophytes 29 (7.45 %), chamaephytes 21 (5.40 %), megaphanerophytes 19 (4.90 %), climbers 6 (1.54 %), mesophanerophytes and macrophanerophytes 5 (1.28 %) species each and parasites had 3 (00.77 %) species (Figure 6).

The dominance of therophytes and hemicryptophytes in the valley indicates that the area is under great anthropogenic pressure like deforestation and overgrazing that is destroying the natural habitat for other classes and the vegetation is dominating by annual plants. Our findings are supported by Nazir, Malik 2006; Guo et al., 2009; Kar et al., 2010; Manhas et al., 2010; Fatna et al., 2014; Khan et al., 2014; Osman et al., 2014; Hussain et al., 2015; Badshah et al., 2016; Baykal, Atamov, 2016 and Shaheen et al., 2016 that enlisted therophyte plants dominating in such degraded dry and arid environments.

c. Leaf size spectrum

The leaf size classes show that nanophylls dominated the valleys with 178 (45.76 %) species followed by mesophylls with 72 (18.51 %), leptophylls 53 (13.62 %), microphylls 44 (11.31 %), macrophylls 29 (7.45 %) species and 13 (3.34 %) species were without leaves (Figure 7). Leaf size classes are considered to be useful in determination of plant associations. The Kalash valley is dominated by reduced leaf sized plants (nanophylls) that indicates its extreme condition. The findings of Durrani et al., 2005; Alelign et al., 2007; Sher, Khan, 2007; Parswan et al., 2010; Hussain et al., 2015 and Badshah, 2016 support our results that found nannophylls as dominant class in their studies from such severe climatic areas.

Table 1. Floristic list and ecological characteristics of plants of Kalash Valley, District Chitral, Hindukush range, Pakistan

S#	Plant name	Kalash valley			Plant characteristics							
		B	R	BR	1	2	3	4	5	6	7	8
FUNGI												
1.	**Family Halveliaceae**											
1.	*Morchella esculenta* (L.) Pers ex. Fr	+	+	+	Th	Ap	-	-	M	Sd	W	Ap
BRYOPHYTES												
2.	**Family Funariaceae**											
2.	*Funaria hygrometrica* Hedw.	+	+	+	Th	Ap	-	-	M	Sd	W	Ap
3.	**Family Marchantiaceae**											
3.	*Marchantia polymorpha* L.	+	-	+	Th	Ap	-	-	M	Sd	W	Ap
4.	**Family Aytoniaceae**											
4.	*Reboulia hemisphaerica* (L.) Raddi	+	-	-	Th	Ap	-	-	M	Sd	W	Ap
5.	**Family Polytrichaceae**											
5.	*Polytrichum* sp.	+	+	+	Th	Ap	-	-	M	Sd	W	Ap
PTERIDOPHYTES												
6.	**Family Adiantaceae**											
6.	*Adiantum capillus-veneris* L.	+	+	+	G	N	E	-	M	Sd	W	Com
7.	*Adiantum venustum* D. Don.	+	-	+	G	N	E	-	M	Sd	W	Com
8.	*Cheilanthes pteridioides* (Reichb.) C. Chr	-	-	+	G	N	E	-	M	Sd	W	Com
7.	**Family Aspleniaceae**											
9.	*Asplenium trichomanes* L.	-	-	+	G	N	E	-	M	Sd	W	Com

8. Family Cystopteridaceae												
10.	*Cystopteris fragilis* (L.) Bernh.	-	+	+	G	N	E	-	M	Sd	W	Com
9. Family Dryopteridaceae												
11.	*Dryopteris ramosa* (Hope) C. Chr.	-	-	+	G	L	E	-	M	Sd	W	Com
10. Family Equisetaceae												
12.	*Equisetum arvense* L.	-	+	-	G	Ap	E	-	M	Sd	W	Ap
13.	*Equisetum ramosissimum* Desf.	+	+	-	G	Ap	E	-	M	Sd	W	Ap
11. Family Pteridaceae												
14.	*Cystopteris fragilis* (L.) Bernh.	-	-	+	G	N	E	-	M	Sd	W	Com
15.	*Polystichum acanthophyllum* (Franch) Christ	-	-	+	G	N	E	-	M	Sd	W	Com
16.	*Pteris cretica* L.	-	-	+	G	N	E	-	M	Sd	W	Com
12. Family Selaginellaceae												
17.	*Selaginella indica* (Milde) Alston.	+	+	+	G	N	E	-	M	Sd	W	Com
GYMNOSPERMS												
13. Family Cupressaceae												
18.	*Juniperus communis* L.	-	+	+	NP	L	E	-	D	L	W	Dis.
19.	*Juniperus excelsa* M. Bieb.	-	+	+	Meg P	L	E	-	D	L	W	Dis.
20.	*Juniperus squamata* Buch.	-	-	+	NP	L	E	-	D	L	W	Dis.
21.	*Thuja orientalis* L.	+	-	-	NP	L	E	-	D	L	C	Dis.
14. Family Ephedraceae												
22.	*Ephedra gerardiana* Wall ex. Stapf.	-	+	+	Ch	Ap	E	-	D	L	W	Ap
23.	*Ephedra intermedia* Schrenk & Meyer	-	+	+	Ch	Ap	E	-	D	L	W	Ap
15. Family Pinaceae												
24.	*Cedrus deodora* (Roxb. Ex Lamb.) G.Don	+	+	+	Meg P	L	E	-	D	L	W	Com
25.	*Picea smithiana* (Wall.) Boiss.	+	+	+	MegP	L	E	-	D	L	W	Com
26.	*Pinus gerardiana* Wall. ex Lamb.	+	+	+	MegP	L	E	-	D	L	W	Com
27.	*Pinus wallichiana* A.B. Jackson	+	+	+	MegP	L	E	-	D	L	W	Com
MONOCOTYLEDANAE												
16. Family Alliaceae												
28.	*Allium carolinianum* DC.	+	-	+	G	Mes	Dec	-	D	L	W	S
29.	*Allium cepa* L.	+	+	+	G	Mes	Dec	-	D	L	C	S
30.	*Allium chitralicum* Wang & Tang	+	+	-	G	Mes	Dec	-	D	L	W	S
31.	*Allium sativum* L.	+	+	+	G	Mes	Dec	-	D	L	C	S
17. Family Amaryllidaceae												
32.	*Ixiolirion tataricum* (Pall.) Herb.	-	-	+	G	Mes	Dec	-	M	L	W	S
18. Family Araceae												
33.	*Arum jacquemontii* Blume	+	+	+	G	Mic	Dec	-	M	L	W	S
19. Family Colchicaceae												
34.	*Colchicum luteum* Baker	-	-	+	G	N	Dec	-	M	Sd	W	S
20. Family Cyperaceae												
35.	*Carex orbicularis* Boott.	-	+	-	G	L	E	-	M	L	W	S
36.	*Cyperus diluta* M. Bieb.	+	+	-	G	L	E	-	M	L	W	S
37.	*Scirpus setaceus* L.	+	+	-	G	Mes	E	-	M	L	W	S

21. Family Iridaceae												
38.	*Iris germinea* L.	-	+	+	G	Mes	Dec	-	D	L	C	S
39.	*Iris lacteal* Pallas	+	-	+	G	Mes	Dec	-	D	L	W	S
22. Family Juncaceae												
40.	*Juncus articulata* L.	+	+	+	H	Mic	E	-	M	L	W	S
23. Family Liliaceae												
41.	*Fritillaria imperialis* var. *chitralensis* Hort.	-	-	+	G	Mes	E	-	M	L	W	Com
42.	*Tulipa stellata* Hk. f.	+	+	+	G	L	Dec	-	M	L	W	S
24. Family Orchidaceae												
43.	*Epipactis wallichii* Schlech.	+	-	-	G	N	Dec	-	M	Sd	W	S
44.	*Spiranthes lancea* (Thunb.) Backer	+	-	-	G	N	Dec	-	M	Sd	W	S
25. Family Poaceae												
45.	*Agropyron semicostatum* Nees ex Steud	-	+	+	Th	N	E	-	D	L	W	S
46.	*Agrostis viridis* Gouan.	-	+	-	Th	N	E	-	D	L	W	S
47.	*Aristida cynantha* Nees ex Steud	-	+	+	H	N	E	-	D	L	W	S
48.	*Arundo donax* L.	+	-	-	Ch	Mac	Dec	-	M	L	W	S
49.	*Avena fatua* L	+	-	+	Th	N	E	-	D	L	W	S
50.	*Avena sativa* L.	+	+	+	Th	N	E	-	D	L	W	S
51.	*Bromus danthoniae* Trin.	+	+	-	Th	Mes	Dec	-	D	L	W	S
52.	*Bromus tectorum* L.	+	+	-	Th	Mes	Dec	-	D	L	W	S
53.	*Calamagrostis emodensis* Griseb.	+	-	-	G	Mes	E	-	M	L	W	S
54.	*Chrysopogon echinulatus* (Nees ex Steud.) W. Wats	-	+	-	Th	Mes	E	-	D	L	W	S
55.	*Cynodon dactylon* (L.) Pers.	+	+	+	H	N	Dec	-	D	L	W	S
56.	*Dactylis glomerata* L.	+	-	+	Th	N	Dec	-	D	L	W	S
57.	*Dichanthium annulatum* (Forssk.) Stapf.	-	-	+	H	N	Dec	-	M	L	W	S
58.	*Echinochloa crusgalli* (L.) P. Beauv.	+	-	+	Th	N	Dec	-	M	L	W	S
59.	*Eragrostis poaeoides* P. Beave.	+	+	+	H	N	Dec	-	M	L	W	S
60.	*Hordeum murinum* L.	+	+	+	Th	N	Dec	-	D	L	W	S
61.	*Hordeum vulgare* L.	+	+	+	Th	N	Dec	-	D	L	C	S
62.	*Koeleria gracilis* Pers.	-	-	+	H	N	Dec	-	D	L	W	S
63.	*Lolium rigidum* Gaud.	+	+	-	Th	N	Dec	-	D	L	W	S
64.	*Lolium temulentum* L.	+	-	-	Th	N	Dec	-	D	L	W	S
65.	*Melica inaequiglumis* (Boiss.) Bor.	+	-	-	H	N	Dec	-	D	L	W	S
66.	*Oryza sativa* L.	-	+	+	G	Mic	Dec	-	M	L	C	S
67.	*Panicum antidotale* Retz.	-	-	+	Th	N	Dec	-	D	L	W	S
68.	*Phleum pretense* L.	+	-	-	Th	N	Dec	-	D	L	W	S
69.	*Phragmites karka* (Retz.) Trin. ex Steud	+	+	-	G	Mac	Dec	-	M	L	W	S
70.	*Piptatherum wendelboi* Bor	-	+	-	Th	N	Dec	-	D	L	W	S
71.	*Poa annua* L.	+	+	+	Th	N	Dec	-	D	L	W	S
72.	*Poa bulbosa* L.	-	-	+	Th	N	Dec	-	D	L	W	S
73.	*Poa pratensis* L.	-	-	+	H	N	Dec	-	D	L	W	S
74.	*Poa supina* Schrad.	-	+	-	Th	N	Dec	-	D	L	W	S
75.	*Polypogon fugax* Nees ex Steud	-	-	+	Th	Mic	Dec	-	M	L	W	S
76.	*Saccharum spontaneum* L.	+	-	-	Ch	Mac	Dec	-	D	L	W	S
77.	*Setaria viridis* (L.) P. Beauv.	+	-	-	Th	N	Dec	-	M	L	W	S
78.	*Triticum aestivum* L.	+	+	+	Th	Mes	Dec	-	D	L	C	S
79.	*Vulpia myuros* (L.) Gmel.	-	+	+	Th	N	Dec	-	D	L	W	S
80.	*Zea mays* L.	+	+	+	Th	Mac	Dec	-	D	L	C	S
26. Family Typhaceae												
81.	*Typha angustata* Bory & Chaub	-	+	+	G	Mac	E	-	M	L	W	S
DICOTYLEDONAE												
27. Family Aceraceae												
82.	*Acer pentapomicum* J.L. Stewart	-	+	+	Meg P	Mic	E	-	D	L	W	Com

28. Family Amaranthaceae												
83.	*Amaranthus viridis* L.	+	+	+	Th	Mes	Dec	-	D	L	W	S
29. Family Anacardiaceae												
84.	*Pistacia integerrima* (L.) Steward ex Brandis	+	+	+	NP	Mes	Dec	-	D	L	W	S
85.	*Pistacia khinjuk* Stocks	+	-	+	NP	N	Dec	-	D	L	W	S
86.	*Rhus punjabensis* Steward ex Brandis	+	-	+	H	N	Dec	-	D	L	W	S
30. Family Apiaceae												
87.	*Ammi visnega* (L.) Lamk.	+	-	-	Th	N	Dec	-	D	L	W	S
88.	*Bunium persicum* (Boiss.) B. Fedtsch.	+	+	+	G	N	Dec	-	D	L	W	S
89.	*Bupleurum exaltatum* Clarke	+	+	-	G	N	Dec	-	D	L	W	S
90.	*Bupleurum gilesii* Wolff	-	+	-	G	N	Dec	-	D	L	W	S
91	*Carum capticum* L.	+	+	+	Th	N	Dec	-	D	L	W	Dis.
92.	*Carum carvi* L.	+	+	+	Th	N	Dec	-	D	L	W	Dis.
93.	*Coriandrum sativum* L.	-	-	+	Th	N	Dec	-	D	L	C	Dis.
94.	*Daucus carota* L.	+	+	+	G	Mes	Dec	-	D	L	C	Dis.
95.	*Foeniculum vulgare* Mill.	+	+	+	Th	N	Dec	-	D	L	C	Dis.
96.	*Pimpinella stewartii* (Dunn) Wolff.	-	-	+	Th	N	Dec	-	D	L	W	Com
97.	*Pimpinella diversifolia* DC.	+	+	-	Th	N	Dec	-	D	L	W	Com
98.	*Prangos pabularia* Lindl.	+	-	-	H	N	Dec	-	D	L	W	Com
99.	*Trachyspermum ammi* (L.) Sprague	-	+	+	G	N	Dec	-	D	L	W	Com
31. Family Apocyanaceae												
100.	*Vinca major* L.	+	-	-	G	Mic	E	-	D	L	C	S
32. Family Asclepiadaceae												
101.	*Cynanchum acutum* L.	+	+	+	Ch	Mes	Dec	-	D	L	W	S
102.	*Periploca aphylla* Dcne.	-	-	+	Ch	Ap	E	-	D	L	W	Ap
33. Family Asteraceae												
103.	*Anaphalis contorta* L.	+	+	+	H	Mes	Dec	-	D	L	W	S
104.	*Anaphalis nepalensis* (Spreng.) Hand.	+	+	+	H	Mes	Dec	-	D	L	W	S
105.	*Artemisia brevifolia* Wall. Ex DC.	+	+	+	H	L	Dec	-	D	L	W	Dis.
106.	*Artemisia maritima* L.	+	+	-	H	L	Dec	-	D	L	W	Dis.
107.	*Artemisia parviflora* Roxb.	+	+	+	Th	Mic	Dec	-	D	L	W	Dis.
108.	*Artemisia sacrorum* Ledeb.	+	+	-	Th	Mic	Dec	-	D	L	W	Dis.
109.	*Artemisia scoparia* Waldst. & Kit.	+	+	+	H	N	Dec	-	D	L	W	Dis.
110.	*Aster flaccidus* var. *flaccidus* Bunge	-	-	+	Th	N	Dec	-	D	L	W	S
111.	*Bellis perennis* L.	+	-	-	Th	N	Dec	-	D	L	W	S
112.	*Bidens tripartita* L.	-	-	+	Th	Mes	Dec	-	D	L	W	Dis.
113.	*Calendula officinalis* L.	+	-	-	Th	Mes	Dec	-	D	L	C	S
114.	*Carduus edelbergii* Rech.	+	-	+	Th	Mes	Dec	+	D	L	W	Dis.
115.	*Centaurea iberica* Trev. ex Spreng.	+	+	+	Th	N	Dec	+	D	L	W	Dis.
116.	*Cichorium intybus* L.	+	+	+	Th	Mes	Dec	-	D	L	W	S
117.	*Cirsium arvense* (L.) Scop.	+	+	+	Th	Mac	Dec	+	D	L	W	S
118.	*Cirsium falconeri* (Hk. f.) Petrak	-	-	+	Th	Mac	Dec	+	D	L	W	S
119.	*Conyza bonariensis* (L.) Cronquist	+	+	-	Th	N	Dec	-	D	L	W	S
120.	*Conyza canadensis* (L.) Cronquist	+	+	+	Th	N	Dec	-	D	L	W	S
121.	*Conyza japonica* Less.	+	+	+	Th	N	Dec	-	D	L	W	S
122.	*Cousinia buphthalmoides* Regel & Schm.	+	-	-	Th	L	Dec	-	D	L	W	S
123.	*Cousinia mattfeldii* Bornm.	+	-	-	Th	Mic	Dec	+	D	L	W	S
124.	*Cousinia racemosa* Boiss.	+	-	-	Th	L	Dec	+	D	L	W	S
125.	*Echinops cornigerus* DC.	+	+	+	Th	Mes	Dec	+	D	L	W	S
126.	*Erigeron canadensis* L.	+	-	+	Th	Mic	Dec	-	D	L	W	S

127.	*Filago arvensis* L.	-	-	+	Th	N	Dec	-	D	L	W	S
128.	*Filago desertorum* Pomel	-	-	+	Th	N	Dec	-	D	L	W	S
129.	*Galinsoga parviflora* Cav.	+	-	+	Th	N	Dec	-	D	L	W	S
130.	*Inula rhizocephala* Schrenk Enum.	-	+	+	Th	N	Dec	-	D	L	W	S
131.	*Lachnophyllum gossypinum* Bunge.	-	-	+	Th	Mic	Dec	+	D	L	W	S
132.	*Lactuca decipiens* (H. & T.) Clarke	-	-	+	Th	N	Dec	-	D	L	W	S
133.	*Lactuca sativa* L.	+	+	+	Th	Mac	Dec	-	D	L	C	S
134.	*Lactuca persica* Boiss.	+	+	-	Th	N	Dec	-	D	L	W	S
135.	*Lactuca serriola* L.	+	+	+	Th	Mes	Dec	-	D	L	W	S
136.	*Luctuca dolichophylla* Kitam.	-	-	+	Th	N	Dec	-	D	L	W	S
137.	*Matricaria aurea* L.	+	+	+	Th	N	Dec	-	D	L	W	Dis.
138.	*Matricaria disciformis* (C.A.M.) DC. Prodr.	+	+	+	Th	N	Dec	-	D	L	W	Dis.
139.	*Pentanema indicum* (L.) Y. Ling	-	+	-	Th	N	Dec	-	D	L	W	S
140.	*Phagnalon acuminatum* Boiss.	+	+	-	Th	L	Dec	-	D	L	W	S
141.	*Pulicaria salviaefolia* Bunge	+	-	+	H	N	Dec	-	D	L	W	S
142.	*Saussurea heteromalla* (D. Don.) Hannd.	-	+	-	Th	Mic	Dec	-	D	L	W	S
143.	*Scorzonera virgata* DC	+	-	-	H	L	Dec	-	D	L	W	Dis.
144.	*Sonchus arvensis* Boiss.	+	+	+	Th	Mes	Dec	-	M	L	W	Dis.
145.	*Sonchus asper* (L.) Hill	+	+	+	Th	Mes	Dec	-	M	L	W	Dis.
146.	*Sonchus oleraceus* L.	+	+	+	Th	N	Dec	-	M	L	W	Dis.
147.	*Senecio dublitabilis* C. Jeffery & Y.L. Chen	+	-	-	Th	N	Dec	-	M	L	W	S
148.	*Tagetes erecta* L.	+	+	-	Th	N	Dec	-	D	L	C	Dis.
149.	*Taraxacum officinale* Weber	+	+	+	G	Mes	Dec	-	M	L	W	S
150.	*Tragopogon gracilis* D. Don.	-	+	-	H	N	Dec	-	D	L	W	S
151.	*Xanthium strumarium* L.	+	+	+	Th	Mes	Dec	+	D	L	W	S
34. Family Berberidaceae												
152.	*Berberis lycium* Royle	-	-	+	NP	N	Dec	+	D	L	W	S
35. Family Balsaminaceae												
153.	*Impatiens bicolor* Royle	-	+	+	Th	Mic	Dec	-	M	Sd	W	S
154.	*Impatiens edgeworthii* Hk. f. FBI	-	+	+	Th	Mic	Dec	-	M	Sd	W	S
36. Family Bignoniaceae												
155.	*Campsis grandiflora* L.	+	-	-	Ch (Cl)	Mes	E	-	D	L	C	S
37. Family Boraginaceae												
156.	*Arnebia decumbens* (Vent) Coss & Kral.	-	-	+	H	N	Dec	-	D	L	W	S
157.	*Asperugo procumbens* L.	+	-	-	Th	Mic	Dec	-	D	L	W	S
158.	*Cynoglossum glochidiatum* Wall. ex Benth.	+	+	-	H	N	Dec	-	D	L	W	S
159.	*Cynoglossum lanceolatum* Forssk.	+	+	-	H	N	Dec	-	D	L	W	S
160.	*Lithospermum arvense* L.	+	-	-	Th	N	Dec	-	D	L	W	S
161.	*Lappula microcarpa* (Ledeb.) Gurke	+	+	-	Th	L	Dec	-	D	L	W	S
162.	*Lepechiniella inconspicua* (Brand) Reidl.	+	-	-	H	Mes	Dec	-	D	L	W	S
163.	*Lindelofia longiflora* (Benth.) Baill.	-	+	+	N	N	Dec	-	D	L	W	S
164.	*Onosma dichroanthum* Boiss.	+	-	-	H	N	Dec	-	D	L	W	S
165.	*Onosma hispidum* Wall ex. G. Don.	+	-	-	H	N	Dec	-	D	L	W	S
166.	*Pseudomertensia chitralensis* (Riedl) Reidl in Rechinger	-	+	-	H	N	Dec	-	D	L	W	S
167.	*Solenanthus circinnatus* Ledeb.	-	+	-	H	N	Dec	-	D	L	W	S
38. Family Brassicaceae												
168.	*Alliaria petiolata* (M. B.) Cav. & Grande Boll.	+	-	+	Th	N	Dec	-	D	L	W	S
169.	*Alyssum desertorum* Stapf.	+	-	+	Th	N	Dec	-	D	L	W	S
170.	*Arabidopsis wallichii* (H. & T.) N. Busch.	+	-	+	H	N	Dec	-	D	L	W	S

171.	*Arabis auriculata* Lam.	+	+	+	Th	N	Dec	-	D	L	W	S
172.	*Brassica campestris* L.	+	+	+	Th	Mac	Dec	-	D	L	C	Dis.
173.	*Brassica napus* L.	+	+	+	Th	Mac	Dec	-	D	L	C	Dis.
174.	*Capsella bursa-pastoris* (L.) Medic.	+	+	+	Th	Mes	Dec	-	M	L	W	Dis.
175.	*Cardamine hirsuta* L.	+	-	+	Th	N	Dec	-	M	L	W	Com
176.	*Coronopus didymus* (L.) Sm.	+	+	+	Th	L	Dec	-	M	L	W	Dis.
177.	*Descurainea sophia* (L.) Webb. & Berth.	-	-	+	Th	N	Dec	-	M	L	W	Dis.
178.	*Draba lanceolata* Royle	+	+	-	H	N	Dec	-	D	L	W	S
179.	*Draba altaica* (C.A.M.) Bunge	-	+	-	Th	N	Dec	-	D	L	W	S
180.	*Draba olgae* var. *chitralensis* O.E. Schulz	-	+	-	Th	N	Dec	-	D	L	W	S
181	*Draba trinervis* O.E.S.	-	+	-	Th	N	Dec	-	D	L	W	S
182.	*Eruca sativa* Mill.	+	-	-	Th	Mic	Dec	-	D	L	W	S
183.	*Lepidium sativum* L.	+	+	+	Th	N	Dec	-	D	L	W	S
184.	*Malcolmia africana* (L.) R. Br.	+	+	-	Th	L	Dec	-	D	L	W	S
185.	*Malcolmia cabulica* (Boiss.) H. & T.	-	+	-	Th	N	Dec	-	D	L	W	S
186.	*Matthiola tenera* Rech.f.,	+	-	+	Ch	Mes	Dec	-	M	L	W	S
187.	*Nasturtium officinale* R. Br.	+	+	-	G	N	E	-	M	L	W	Dis.
188.	*Neslia apiculata* Fisch.	+	+	+	Th	L	Dec	-	M	L	W	S
189.	*Raphanus sativus* L.	+	+	+	Th	Mac	Dec	-	M	L	C	Dis.
190.	*Sisymbrium brassiciforme* C. A. Mey.	+	-	-	Th	N	Dec	-	D	L	W	Dis.
191.	*Sisymbrium irio* L.	+	+	+	Th	Mic	Dec	-	M	L	W	Dis.
192.	*Thlaspi andersonii* (H. & T.) O.E.S.	-	+	-	Th	Mic	Dec	-	D	L	W	S
39. Family Campanulaceae												
193.	*Campanula staintonii* Rech.	-	-	+	Th	N	Dec	-	M	L	W	S
194.	*Codonopsis ovata* Bth.	+	+	-	H	Mes	Dec	-	M	L	W	S
40. Family Cannabinaceae												
195.	*Cannabis sativa* L.	+	+	+	Th	N	Dec	-	D	L	W	Com
41. Family Capparidaceae												
196.	*Capparis spinosa* L.	+	+	-	H	Mes	Dec	+	D	L	W	S
197.	*Cleome ariana* Hedge & Lamond	+	+	-	Th	N	Dec	-	D	L	W	S
42. Family Caprifoliaceae												
198.	*Viburnum cotinifolium* D. Don.	+	+	-	H	Mac	Dec	-	M	L	W	Com
43. Family Caryophyllaceae												
199.	*Arenaria griffithii* Boiss.	+	+	-	Ch	L	E	-	D	L	W	S
200.	*Arenaria serpyllifolia* L.	+	-	-	Th	N	Dec	-	D	L	W	S
201.	*Herniaria hirsuta* L.	+	-	+	Th	L	Dec	-	D	L	W	S
202.	*Lepyrodiclis holosteoides* (C. A. Mey) Fenzl.	+	+	-	Th	N	Dec	-	D	L	W	S
203.	*Silene conoidea* L.	+	+	+	Th	N	Dec	-	D	L	W	S
204.	*Silene pseudo-verticillata* Nasir	-	-	+	Th	Mic	Dec	-	D	L	W	S
205.	*Silene viscosa* (L.) Pers.	+	+	+	Th	N	Dec	-	D	L	W	S
206.	*Silene vulgaris* (Moench) Garcke.	-	+	-	H	N	Dec	-	D	L	W	S
207.	*Spergula arvensis* L.	-	+	-	Th	L	Dec	-	D	L	W	S
208.	*Stellaria media* (L.) Cyr.	+	+	+	Th	N	Dec	-	D	L	W	S
44. Family Chenopodiaceae												
209.	*Atriplex crassifolia* C. A. Mey	+	+	+	Th	N	E	-	D	L	W	S
210.	*Chenopodium album* L.	+	+	+	Th	N	Dec	-	D	L	W	S
211.	*Chenopodium ambrosioides* L.	+	-	-	Th	L	Dec	-	M	L	W	S
212.	*Chenopodium botrys* L.	-	-	+	Th	L	Dec	-	D	L	W	S
213.	*Chenopodium foliosum* (Merrich.) Aschers.	-	-	+	Th	N	Dec	-	D	L	W	S
214.	*Chenopodium murale* L.	+	+	+	Th	N	Dec	-	D	L	W	S
215.	*Chenopodium novopokrovskyanum* (Aellen) Uotila	-	+	-	Th	N	Dec	-	D	L	W	S
216.	*Kochia indica* Wight.	+	+	+	Th	L	Dec	-	D	L	W	S

45.	**Family Convolvulaceae**											
217.	*Convolvulus arvensis* L.	+	+	+	Th (Cl)	Mes	Dec	-	D	L	W	S
46.	**Family Crassulaceae**											
218.	*Sedum ewersii* Ledeb.	+	+	-	G	N	Dec	-	M	L	W	S
219.	*Sedum quadrifidum* Pall.	-	+	-	G	N	Dec	-	M	L	W	S
47.	**Family Cucurbitaceae**											
220.	*Citrullus vulgaris* L.	+	+	+	Th	Mes	Dec	-	D	L	C	Com
221.	*Cucumis sativa* L.	+	+	+	Th	Mes	Dec	-	D	L	C	Com
222.	*Cucurbita maxima* Duch ex Lam	+	+	+	Th	Mac	Dec	-	D	L	C	Com
223.	*Cucurbita pepo* L.	+	+	+	Th	Mac	Dec	-	D	L	C	Com
48.	**Family Cuscutaceae**											
224.	*Cuscuta brevistyla* A. Braun. ex A. Rich.	-	-	+	P	Ap	Ap	-	D	L	W	Ap
225.	*Cuscuta lehmanniana* Bunge	-	-	+	P	Ap	Ap	-	D	L	W	Ap
226.	*Cuscuta reflexa* Roxb.	+	+	+	P	Ap	Ap	-	D	L	W	Ap
49.	**Family Dipsacaceae**											
227.	*Dipsacus inermis* var. *mitis (*D. Don) Y. Nasir	-	+	-	Th	L	Dec	-	D	L	W	S
50.	**Family Elaeagnaceae**											
228.	*Elaeagnus angustifolia* L.	+	-	-	Mac P	Mes	Dec	-	D	L	W	S
51.	**Family Euphorbiaceae**											
229.	*Euphorbia granulata* L.	-	+	-	Th	N	Dec	-	D	L	W	S
230.	*Euphorbia falcata* L.	+	+	+	Th	N	Dec	-	D	L	W	S
231.	*Euphorbia helioscopia* L.	+	+	+	Th	N	Dec	-	D	L	W	S
232.	*Euphorbia peplus* L.	+	+	+	Th	L	Dec	-	D	L	W	S
233.	*Euphorbia prosterata* L.	-	-	+	Th	L	Dec	-	D	L	W	S
52.	**Family Fabaceae**											
234.	*Astragalus grahammianus* Royle. ex Bth.	+	-	+	Ch	L	Dec	+	D	L	W	Com
235.	*Astragalus subumbellatus* Klotzsch.	+	+	-	H	N	Dec	-	D	L	W	Com
236.	*Astragalus nivales* Kar & Kir	+	+	-	H	L	Dec	-	D	L	W	Com
237.	*Indigofera heterantha* var. *heterantha* L.	-	+	-	Ch	Mic	Dec.	-	D	L	W	Com
238.	*Lathyrus aphaca* L.	+	+	+	Th	N	Dec	-	D	L	W	S
239.	*Lotus corniculatus* L.	+	+	+	H	N	Dec	-	D	L	W	S
240.	*Medicago lupulina* L.	+	-	-	Th	N	Dec	-	D	L	W	Com
241.	*Medicago polymorpha* L.	+	+	+	Th	N	Dec	-	D	L	W	Com
242.	*Melilotus indica* (L.) All.	+	-	+	Th	N	Dec	-	D	L	W	Com
243.	*Robinia psuedoacacia* L.	+	-	+	NP	N	E	+	D	L	C	Com
244.	*Sophora mollis* (Royle) Baker	+	-	+	NP	N	Dec	+	D	L	W	S
245.	*Trifolium pratense* L.	+	+	+	G	N	Dec	-	M	L	W	S
246.	*Trifolium repens* L.	+	+	+	G	N	Dec	-	M	L	W	S
247.	*Trigonella incisa* Bth.	+	+	+	Th	N	Dec	-	M	L	W	S
248.	*Vicia monentha* L.	+	+	+	Th (Cl)	N	Dec	-	M	L	W	S
249.	*Vicia sativa* L.	+	+	+	Th (Cl)	N	Dec	-	M	L	W	S
53.	**Family Fumariaceae**											
250.	*Fumaria indica* (Hausskn.) H. N. Pugsley	+	+	+	Th	N	Dec	-	D	L	W	Dis.
54.	**Family Fagaceae**											
251.	*Quercus baloot* Griffith	+	+	+	NP	Mic	E	+	D	L	W	Com
252.	*Quercus dilatata* Lindl.	+	+	+	Meg P	Mic	E	-	D	L	W	Com

55. Family Geraniaceae												
253.	*Erodium cicutarium* (L.) L' Herit.	+	-	-	Th	Mic	Dec	-	D	L	W	Com
254.	*Geranium rotundifolium* L.	+	+	+	Th	N	Dec	-	M	L	W	Com
255.	*Geranium wallichianum* D. Don. Ex Sweet	+	-	-	Th	Mes	Dec	-	M	L	W	Com
56. Family Juglandaceae												
256.	*Juglans regia* L.	+	+	+	Meg P	Mac	Dec	-	D	L	W	S
57. Family Lamiaceae												
257.	*Calamintha umbrosa* (M. Bieb.) Fisch. & Mey.	+	+	-	Th	N	Dec	-	D	L	W	S
258.	*Calamintha vulgaris* (L.) Druce	+	+	-	Th	N	Dec	-	D	L	W	S
259.	*Lagochilus cabulicus* Bth. in DC. Prodr.	+	+	-	Th	N	Dec	-	D	L	W	S
260.	*Lallemantia royleana* (Bth.) Bth.	-	+	-	Th	L	Dec	-	D	L	W	S
261.	*Lamium amplexicaule* L.	+	+	+	Th	N	Dec	-	M	L	W	S
262.	*Marrubium vulgare* L.	+	-	-	Ch	Mes	Dec	-	D	L	W	S
263.	*Mentha longifolia* (L.) Huds	+	+	+	G	Mes	Dec	-	M	L	W	S
264.	*Mentha piperata* Benth.	+	+	+	G	N	Dec	-	D	L	W	S
265.	*Nepeta brachyantha* Rech.	+	-	+	Ch	Mes	Dec	-	D	L	W	S
266.	*Nepeta clerkei* Hk. f.	-	-	+	Th	Mic	Dec	-	M	L	W	S
267.	*Nepeta raphanorhiza* Bth.	-	+	+	Th	N	Dec	-	D	L	W	S
268.	*Nepeta sewerzowii* Regel	-	+	+	Th	N	Dec	-	D	L	W	S
269.	*Ocimum basilicum* L.	+	+	+	Ch	N	Dec	-	D	L	C	S
270.	*Phlomis cashmeriana* Royle	+	+	+	Th	N	Dec	-	D	L	W	S
271.	*Prunella vulgaris* L.	+	+	-	Th	N	Dec	-	D	L	W	S
272.	*Salvia aegyptiaca* L	-	+	+	Ch	N	Dec	-	D	L	W	S
273.	*Salvia moorcroftiana* Wall. ex Bth.	+	-	-	Th	Mac	Dec	-	D	L	W	S
274.	*Salvia nubicola* wall. ex Sweet	+	+	-	Ch	Mes	Dec	-	D	L	W	S
275.	*Salvia plebeia* R. Br.	+	+	+	Th	N	Dec	-	D	L	W	S
276.	*Scutellaria nuristanica* Rech.	-	-	+	H	N	Dec	-	D	L	W	S
277.	*Thymus linearis* L.	+	+	+	H	N	Dec	-	D	L	W	S
278.	*Ziziphora tenuior* L.	-	-	+	Th	L	Dec	-	D	L	W	S
58. Family Malvaceae												
279.	*Abelmoschus esculentus* (L.) Moench Meth.	+	+	+	Th	Mes	Dec	-	D	L	C	Dis.
280.	*Althaea rosea* (L.) Cav. Diss.	+	-	-	H	Mac	Dec	-	D	L	C	Com
281.	*Malva neglecta* Wallr.	+	-	-	Th	Mes	Dec	-	D	L	W	Com
282.	*Malva perviflora* L.	+	-	-	Th	N	Dec	-	D	L	W	S
59. Family Moraceae												
283.	*Ficus carica* L.	+	+	+	Mac P	Mac	Dec	-	D	L	W	S
284.	*Morus alba* L.	+	+	+	Meg P	Mac	Dec	-	D	L	C	S
285.	*Morus nigra* L.	+	+	+	Meg P	Mac	Dec	-	D	L	C	S
60. Family Oleaceae												
286.	*Fraxinus xanthoxyloides* (Wall. ex G. Don) DC.	+	+	+	NP	Mic	Dec	-	D	L	W	Com
61. Family Onagraceae												
287.	*Epilobium hirsutum* L.	+	+	+	Th	N	Dec	-	M	L	W	S
288.	*Epilobium latifolium* L.	-	-	+	Th	Mes	Dec	-	M	L	W	S
289.	*Epilobium royleanum* Hausskn.	-	+	+	Th	N	Dec	-	M	L	W	S
62. Family Oxalidaceae												
290.	*Oxalis corniculata* L.	+	+	+	Th	Mes	Dec	-	M	L	W	S
63. Family Paeoniaceae												
291.	*Paeonia emodi* Wall ex G. Don	-	+	-	G	N	Dec	-	M	Sd	W	Com
64. Family Papaveraceae												
292.	*Papaver dubium* L.	-	-	+	Th	L	Dec	-	D	L	W	Dis

65. Family Plantaginaceae												
293.	*Plantago lanceolata* L.	+	+	+	Th	Mes	Dec	-	D	L	W	S
294.	*Plantago major* Aitch.	+	+	+	G	Mac	Dec	-	M	L	W	S
295.	*Plantago ovata* Forssk.	-	-	+	Th	Mic	Dec	-	M	L	W	S
66. Family Platanaceae												
296.	*Platanus orientalis* L.	+	+	+	Meg P	Mac	Dec	-	D	L	C	Com
67. Family Plumbaginaceae												
297.	*Acantholimon lycopodioides* (Girard) Boiss.	-	-	+	Ch	L	Dec	-	D	L	W	S
298.	*Limonium griffithii* (Aitch. & Hemsl.) O. Ktze.	-	+	+	H	Mic	Dec	-	D	L	W	S
68. Family Polygonaceae												
299.	*Bistorta affinis* (D. Don) Green	-	-	+	Ch	N	Dec	-	D	L	W	S
300.	*Bistorta vivipara* (L.) S.F. Gray	-	-	+	H	N	Dec	-	D	L	W	S
301.	*Oxyria digyna* (L.) Hill.	+	+	+	Th	N	Dec	-	M	L	W	S
302.	*Polygonum amplexicaule* D Don.	-	+	+	Th	L	Dec	-	D	L	W	S
303.	*Polygonum aviculare* L.	-	-	+	Th	L	Dec	-	D	L	W	S
304.	*Polygonum convolvulus* L.	-	+	+	Th	L	Dec	-	D	L	W	S
305.	*Polygonum paronychioides* C,A, Mey. ex Hohen.	-	+	+	H	L	Dec	-	D	L	W	S
306.	*Polygonum nepalense* Meissn.	+	+	+	G	N	Dec	-	D	L	W	S
307.	*Rheum webbianum* Royle	+	-	-	G	Mac	Dec	-	D	L	W	Com
308.	*Rumex hastatus* D. Don	+	+	+	Ch	Mes	Dec	-	D	L	W	S
309.	*Rumex longifolius* DC	+	+	+	Th	Mes	Dec	-	D	L	W	S
310.	*Rumex nepalensis* Spreng	+	+	+	H	Mes	Dec	-	D	L	W	S
69. Family Portulacaceae												
311.	*Portulaca oleracea* L	+	+	+	Th	N	Dec	-	D	L	W	S
70. Family Primulaceae												
312.	*Anagallis arvensis* L.	+	+	+	Th	L	Dec	-	D	L	W	S
313.	*Androsace harrissii* Du.	-	-	+	H	N	Dec	-	M	L	W	S
314.	*Primula denticulata* Sm.	-	-	+	H	N	Dec	-	M	L	W	S
315.	*Primula elliptica* Royle	-	+	+	H	N	Dec	-	M	L	W	S
71. Family Punicaceae												
316.	*Punica granatum* L.	+	+	+	NP	Mes	Dec	-	D	L	C	S
72. Family Ranunculaceae												
317.	*Adonis aestivalis* L.	-	-	+	Th	L	Dec	-	D	L	W	S
318.	*Ceratocephalus falcatus* (L.) Pers.	-	-	+	Th	Mic	Dec	-	D	L	W	S
319.	*Clematis orientalis* L.	+	-	+	NP (Cl)	N	Dec	-	D	L	W	Com
320.	*Delphinium denudatum* Wall. ex H. & T	+	+	-	Ch	Mic	Dec	-	D	L	W	Dis
321.	*Thalictrum elegans* Wall. ex Royle	+	-	-	Th	N	Dec	-	M	L	W	Dis.
322.	*Ranunculus aucheri* L.	+	+	+	Th	N	Dec	-	M	L	W	Dis.
323.	*Ranunculus lanata* L.	+	+	+	Th	N	Dec	-	M	L	W	Dis.
324.	*Ranunculus muricatus* L.	+	+	-	Th	N	Dec	-	M	L	W	Dis.
325.	*Ranunculus sceleratus* L.	-	+	-	Th	N	Dec	-	M	L	W	Dis.
73. Family Rosaceae												
326.	*Cotoneaster microphylla* Wall. ex Lindl.	+	+	-	NP	L	Dec	+	D	L	W	S
327.	*Cotoneaster nummularia* Fisch. & Mey	+	+	-	NP	N	Dec	+	D	L	W	S
328.	*Crataegus songarica* C. Koch.	+	-	-	Meg P	Mes	Dec	-	D	L	C	Com
329.	*Cydonia oblonga* Mill.	+	-	-	NP	Mac	Dec	-	D	L	C	S
330.	*Filipendula vestita* (Wall. ex G. Don) Maxim.	-	+	+	NP	Mic	Dec	-	D	L	W	S
331.	*Potentilla pamirica* Wolf.	-	-	+	Th	N	Dec	-	D	L	W	S
332.	*Potentilla sericea* L.	+	+	-	Th	L	Dec	-	D	L	W	S

333.	*Prunus armeniaca* L.	+	+	+	Meg P	Mes	Dec	-	D	L	C	S
334.	*Prunus domestica* L.	+	-	-	Meg P	Mes	Dec	-	D	L	C	S
335.	*Prunus griffithii* (Boiss.) C. K. Sch.	-	-	+	NP	Mes	Dec	-	D	L	W	Dis.
336.	*Prunus kuramica* (Korsh.) Kitam.	+	+	-	Meg P	Mic	Dec	-	D	L	W	S
337.	*Prunus persica* L.	+	+	+	Mes P	Mes	Dec	-	D	L	C	S
338.	*Pyrus communis* L.	+	+	+	Meg P	Mac	Dec	-	D	L	C	S
339.	*Pyrus pashia* Ham. ex D. Don	-	-	+	Mes P	Mic	Dec	-	D	L	W	S
340.	*Pyrus malus* L.	+	+	+	Meg P	Mac	Dec	-	D	L	C	S
341.	*Rosa alba* L.	+	+	+	NP	Mic	Dec	+	D	L	C	Com
342.	*Rosa ecae* Aitch.	+	-	-	NP	N	Dec	+	D	L	W	Com
343.	*Rosa webbiana* Wall. ex Royle	+	+	+	NP	N	Dec	+	D	L	W	Com
344.	*Rubus fruiticosus* L.	+	-	+	NP	Mic	Dec	-	D	L	W	Com
345.	*Rubus irritans* Focke	+	-	+	NP	Mic	Dec	-	D	L	W	Com
346.	*Spiraea canescens* Lour.	+	+	-	NP	N	Dec	-	D	L	W	S
347.	*Sorbaria tomentosa* (Lindl.) Rehder	+	+	-	Ch	Mic	Dec	-	D	L	W	Com
74. Family Rubiaceae												
348.	*Galium aparine* L.	+	+	+	Th (Cl)	N	Dec	-	D	L	W	S
349.	*Galium tricornutum* L.	+	+	+	Th (Cl)	N	Dec	-	D	L	W	S
350.	*Rubia cordifolia* L.	+	+	-	Th	N	Dec	-	D	L	W	S
75. Family Salicaceae												
351.	*Populus alba* L.	-	+	+	Mac P	Mes	Dec	-	M	L	C	S
352.	*Populus nigra* L.	+	+	+	Mac P	Mac	Dec	-	M	L	C	S
353.	*Salix acmophylla* Boiss.	+	+	+	Mes P	Mes	Dec	-	D	L	C	S
354.	*Salix linearifolia* E. Wolf.	+	-	-	Mes P	Mes	Dec	-	D	L	C	S
355.	*Salix tetrasperma* Roxb.	+	+	+	Meg P	Mes	Dec	-	D	L	C	S
356.	*Salix denticulata* Anderson subsp. *denticulata*	+	+	-	Mes P	Mes	Dec	-	D	L	C	S
76. Family Saxifragaceae												
357.	*Bergenia ciliata* (Haw.) Sternb.	+	-	+	G	Mic	E	-	M	Sd	W	S
358.	*Bergenia himalaica* Boriss	+	-	+	G	Mic	E	-	M	Sd	W	S
77. Family Scrophulariaceae												
359.	*Euphrasia aristulata* Penn.	+	-	+	Th	L	Dec	-	D	L	W	S
360.	*Kickxia ramossissima* (Wall.) Janchen	-	-	+	Th	L	Dec	-	M	Sd	W	S
361.	*Linaria bamianica* Patzak	+	+	+	Th	L	Dec	-	D	L	W	S
362.	*Pedicularis chitralensis* Penn.	-	+	-	H (P)	L	Dec	-	D	L	W	S
363.	*Scrophularia robusta* Penn.	-	-	+	Th	Mic	Dec	-	D	L	W	S
364.	*Scrophularia scoparia* Penn.	-	-	+	Th	Mic	Dec	-	D	L	W	S
365.	*Verbascum thapsus* L.	+	+	+	G	Mes	Dec	-	D	L	W	S
366.	*Veronica anagallis aquatica* L.	+	+	+	G	Mes	Dec	-	M	L	W	Com
367.	*Veronica persica* L.	+	-	-	Th	L	Dec	-	M	L	W	S
368.	*Veronica verna* L.	+	-	-	Th	Mic	Dec	-	M	L	W	Com
78. Family Simaroubaceae												
369.	*Ailanthus altissima* (Mill.) Swingle	+	+	+	NP	Mic	Dec	-	M	L	W	Com

79. Family Solanaceae												
370.	*Datura stramonium* L.	+	+	+	Th	Mic	Dec	-	D	L	W	S
371.	*Lycopersicon esculentum* Mill.	+	+	+	Th	Mic	Dec	-	D	L	C	Com
372.	*Solanum melongena* L.	+	+	+	Th	Mac	Dec	-	D	L	C	S
373.	*Solanum nigrum* L.	+	+	+	Th	Mes	Dec	-	M	L	W	S
374.	*Solanum tuberosum* L.	+	+	+	G	Mes	Dec	-	D	L	C	Com
80. Family Tamaricaceae												
375.	*Myricaria squamosa* Desv.	+	-	-	NP	L	Dec	-	M	L	W	S
376.	*Tamarix dioica* Roxb. ex Roth	+	+	+	NP	L	Dec	-	M	L	W	S
81. Family Thymeleaceae												
377.	*Daphne oleoides* Schreb.	-	+	-	NP	L	E	-	M	L	W	S
378.	*Thymelaea passerina* (L.) Coss. & Germ.	+	-	-	Th	N	Dec	-	D	L	W	S
82. Family Ulmaceae												
379.	*Celtis australis* L.	+	-	-	Mac P	Mes	Dec	-	D	L	W	Com
83. Family Urticaceae												
380.	*Parietaria debilis* Forst.	-	+	-	Th	N	Dec	-	D	L	W	Com
381.	*Parietaria judaica* Starand.	-	+	-	Th	N	Dec	-	D	L	W	Com
382.	*Urtica dioica* L.	+	+	+	Th	Mac	Dec	-	D	L	W	Com
84. Family Valerianaceae												
383.	*Valeriana ficariifolia* Boiss.	+	-	-	Th	N	Dec	-	D	L	W	S
85. Family Verbenaceae												
384.	*Duranta repens* L.	+	-	-	NP	Mes	Dec	-	D	L	C	Com
385.	*Verbena officinalis* L.	+	+	-	Th	Mes	Dec	-	D	L	W	S
86. Family Violaceae												
386.	*Viola canescens* Wall. ex Roxb.	+	+	+	G	Mic	Dec	-	M	L	W	S
87. Family Vitaceae												
387.	*Vitis vinifera* L.	+	+	+	NP	Mac	Dec	-	D	L	C	Com
88. Family Zygophyllaceae												
388.	*Peganum harmala* L.	-	-	+	H	N	Dec	-	D	L	W	S
389.	*Tribulus terrestris* L.	+	-	+	Th	N	Dec	-	D	L	W	S

Keys: B = Bumburet, R = Rombor, BR = Birir

(1) Life form: Th. Therophytes, G. Geophytes, H. Hemicryptophytes, Ch. Chamaephytes, NP. Nanophanerophytes, MacP. Macrophanerophytes, MesP. Mesophanerophytes, MegP. Megaphanerophytes, Cl. Climber, P. Parasite.

(2) Leaf Size: AP. Aphyllous, L. Leptophyll, N. Nanophyll, Mic. Microphyll, Mes. Mesophyll, Mac. Macrophyll, Meg. Megaphyll.

(3) Leaf Persistence: E. Evergreen, Dec. Deciduous

(4) Spinyness: + Spiny, – Non spiny

(5) Habitat: M. Moist, D. Dry

(6) Light requirement: L. light, Sd. Shade

(7) Habit:C. Cultivated, W. Wild

(8) Leaf appearance: S. Simple, Com. Compound, Disec. Dissected

Appendix

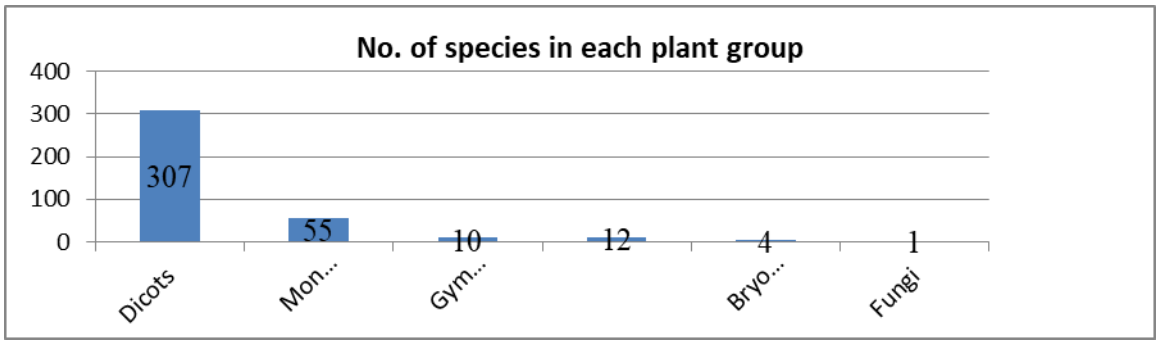

Fig. 3. Graphical presentation of total taxa belong to specific plant group

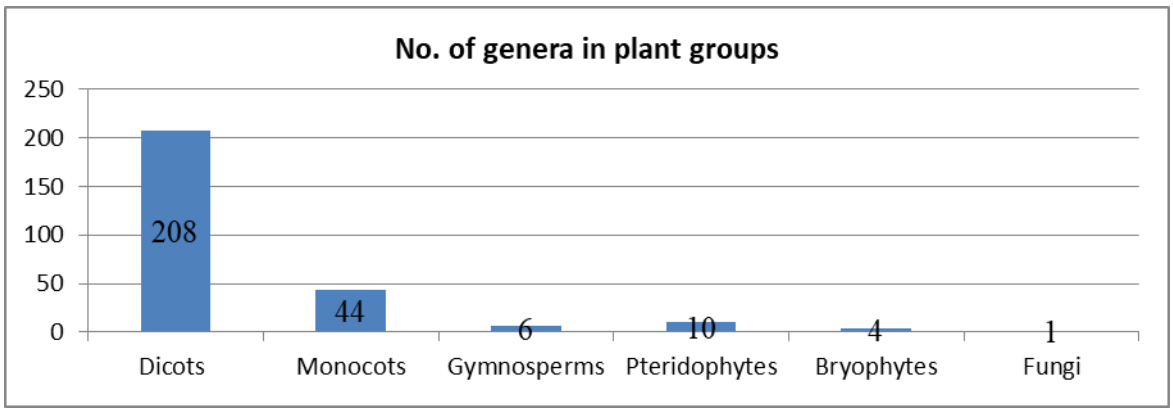

Fig. 4. Graphical presentations of total genera belong to specific plant group

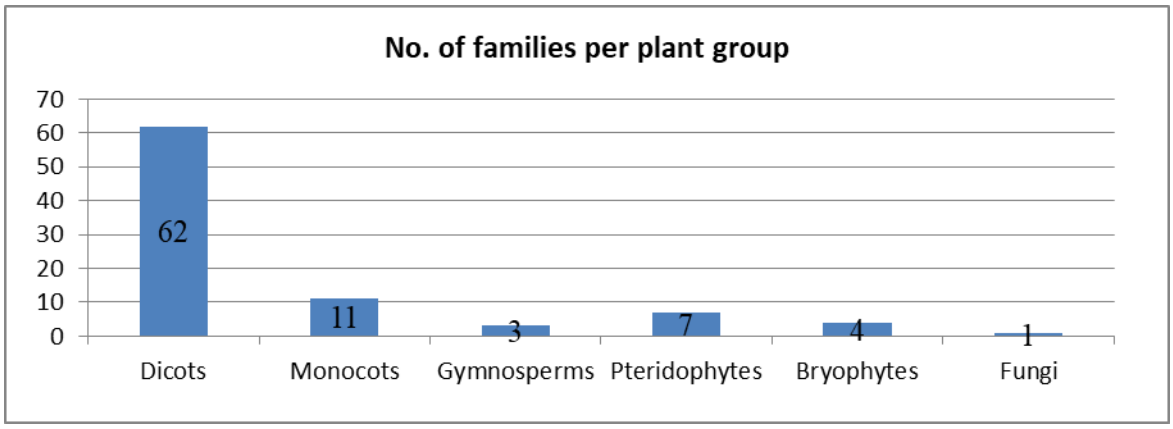

Fig. 5. Graphical presentation of total no. of families belongs to specific plant group

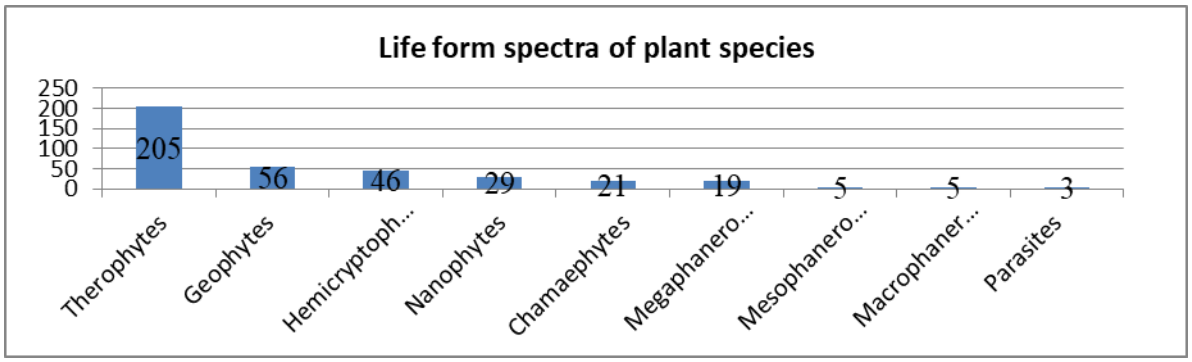

Fig. 6. Graphical presentation of no. of species in different life form

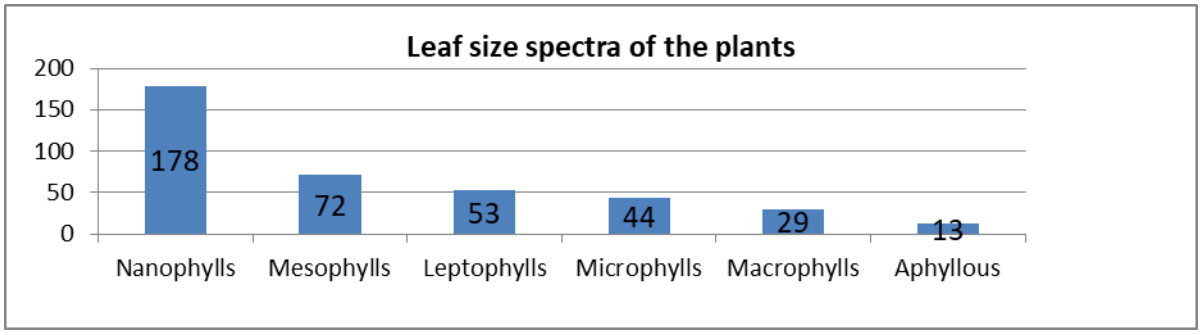

Fig. 7. Graphical presentation of no. of species in different leaf size classes

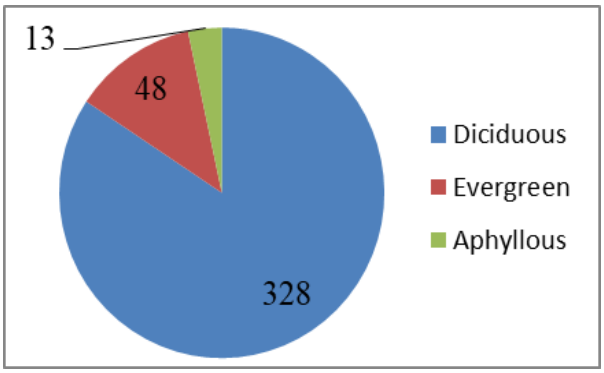

Fig. 8. Graphical presentation of no. of species on the basis of leaf persistence

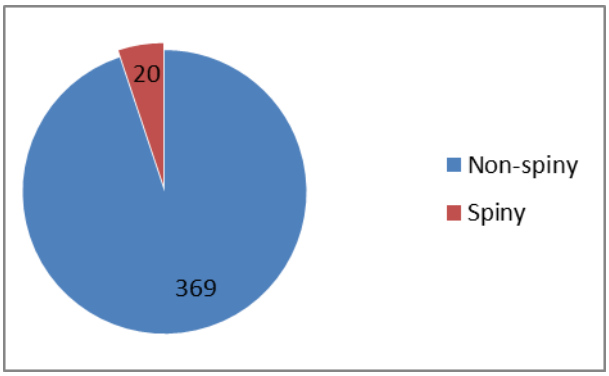

Fig. 9: Graphical presentation of spinyness of plants

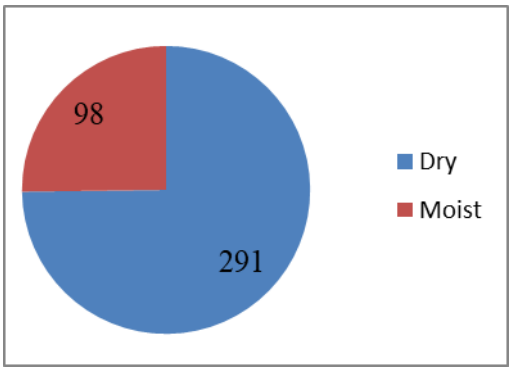

Fig. 10. Graphical presentation of habitat of plants

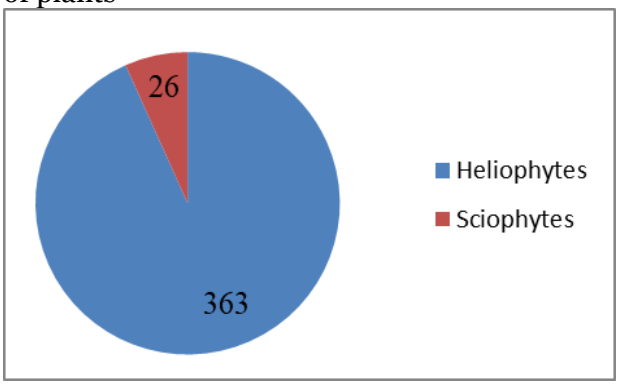

Fig. 11. Graphical presentation of light requirement of plants

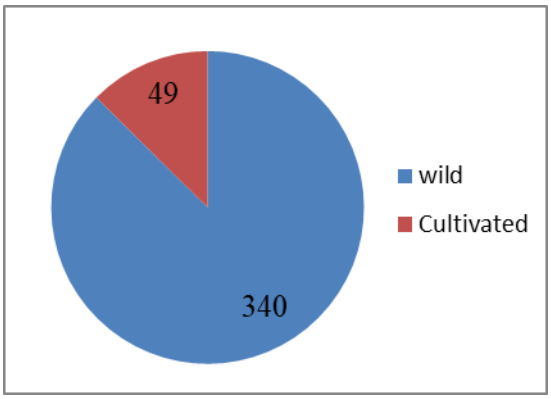

Fig. 12. Graphical presentation of nature of plants

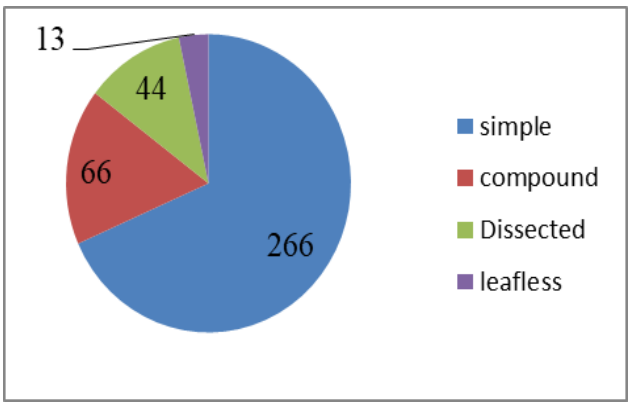

Fig. 13. Graphical presentation of leaf shapes of plants

Pakistan is naturally gifted with diverse flora containing more than 6000 identified vascular plants. The country has mangrove forests at zero feet altitude in Arabian Sea to highest peaks and forests in Hindukush-Karakoram-Himalayan ranges. District Chitral is located to extreme North-west of Pakistan with diverse plant resources. Kalash valley has international fame due to its inhabitants considered as the descendents of Alexander the Great. The Kalash people have their own way of life and mostly depend on plants and their products for daily life needs. In the present study the unexplored floristic wealth of the Kalash valley was documented along with their ecological characteristics. The study showed that the conservation status of plants is alarming and most of them are vulnerable as the area is under heavy anthropogenic pressure due to deforestation

for timber and fuel wood utilization, unscientific medicinal plants collection and overgrazing by livestock. These factors have severely damaged the habitats and causing soil erosion. The drastic changes in the climatic conditions during the last few years have resulted in continuous floods and caused tremendous loses to plant habitats, to cultivated farms, infrastructures and to fruit gardens. Perhaps the locals have realized that it is their moral and ethnic duty to save the plants and other natural resources and have felt that they are destroying themselves by destroying natural resources. Therefore, from last few years the young generation is providing volunteer services in controlling of wood smuggling and deforestation in the area.

4. Conclusion

The present findings suggest further extensive and intensive exploration and attention on plant resources of the area specially the members of families Asteraceae, Poaceae, Rosaceae and some gymnosperm families. The present study might also be helpful for the same type of studies of much closed and unexplored Nooristan Province of war affected Afghanistan.

5. Acknowledgement

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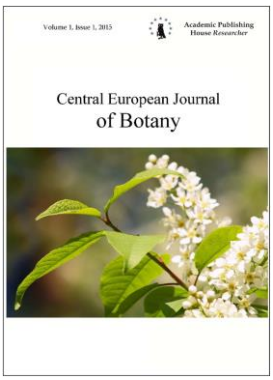

The Floristic and Systematic Reaserchs on the Poaceae in Van Center (Turkey)

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Abstract

This study was conducted on *Poaceae* samples growing in Van (Turkey) center between 2011 and 2015. After identification of plant samples 98 species, 11 subspecies, 6 varieties, totally 115 taxa belong to 46 genus were detected. A new species named *Aegilops vanensis* Öztürk & Şen (sp. nov.) which was recently discovered for the world botanical literature. *Phalaris canariensis, Schismus barbatus, Vulpia myuros, Alopecurus bulbosus* and *Bromus fasciculatus* are new records for B9 phytogeographic square. Some endemic species like *Agropyron deweyi* and *Trisetum thospiticum* were discovered. In addition, some rare taxa were found and their endangered categories were determined.

Keywords: flora, *Poaceae* (*Gramineae*), Systematic, Van, Turkey.

1. Introduction

Systematic and biodiversity studies are important to species conservation, extinction, biodiversity hotspots, bio-prospecting and ecosystem function (Smith, Wolfson, 2004). The analysis of the biodiversity as well as the analysis of the distribution of species richness at different levels, the distribution of the endemic species, the detection of areas whose preservation is necessary and many other topics related to the conservation of the biodiversity requires an important collection effort, so that the organized databases constructed by the herbaria become as comprehensive as possible (Crawford, Hoagland, 2009). The grass or Graminea family (Poaceae Barnhart) consist more than 12.000 species and 763 genera in the World (Soreng et al., 2015b). The Poaceae family has economically and ecologically important taxa; because of this it represents a model family for the research. Graminea is the fifth most species-rich family of flowering plants behind the Asteraceae (23. 000 spp.), Orchidaceae (28 000 spp.), Fabaceae (33 000 spp.) and Rubiaceae (13 500 spp.) (Hodkinson and Parnell, 2007). Graminea taxa are also ecologically dominant, covering, as grasslands or bamboo forests, an estimated 40 % of the Earth's land surface (Gibson, 2008). Economically, Poaceae includes most important plants, providing our staple cereals such as *Eragrostis*, *Hordeum*, *Oryza*, *Secale*, *Sorghum*, *Triticum* and *Zea*; sugar crops such as *Saccharum* and *Sorghum*; reeds such as *Arundo* and *Phragmites*; and bamboo for food, building, and amenity materials such as *Bambusa* and *Phyllostachys* (Hodkinson et al., 2000). They also provide many forage and lawn grasses such as tropical species in *Cynodon*, *Digitaria*, *Panicum*, *Paspalum*, *Pennisetum*, *Stenotaphrum*, *Urochloa*, and *Zoysia* or temperate species in *Alopecurus*, *Cynosurus*, *Dactylis*, *Festuca*, *Lolium*, *Phleum* and *Poa* genera (Hodkinson et al.,

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2007). Recently, they have become important sources of raw material for the biomass and bioenergy industry such as *Arundo*, *Miscanthus*, and *Saccharum* and provide many species of horticultural and ethnobotany value (Jones et al., 2015). In addition, grasses are found on all continents and they are ecologically dominant in some ecosystems such as the African savannas (Kellogg, 2000). Most people on Earth depend on grasses, such as wheat, corn, oats, rice, sugarcane, and rye, for a large part of their diet, domestic animals are fed on diets based largely on forage grasses, many of the most serious weeds growing on agricultural lands (Peterson et al., 2010). In Turkey Poaceae hosts 146 genera including 547 species and 658 taxa (Doğan, Cabi, 2012). Eastern Anatolia Region, especially Van and Hakkari surroundings are important plant areas which have many endemic and Poaceae plants and significant floristic aspect.

In this research, Poaceae diversity of Van central region was investigated and the distribution of Poaceae members were tried to be determined more accurately and detailed. We can summarize some purposes of this study as follows: to gain Poaceae taxa which were not yet found in the VANF Herbarium; to do researches only Poaceae taxa around Van; to facilitate the diagnosis, difficulties and identification of some Poaceae members; to determine economically important Poaceae taxa (*Zea, Elymus*, *Festuca*, *Poa*, *Triticum*, *Agropyron, Aegilops, Phragmites, Lolium, Cynodon, Hordeum*, *Avena, Oryza*....); to determine allergitic Poaceae taxa (*Poa*, *Hordeum*, *Lolium, Bromus, Festuca, Stipa, Aegilops*..) which are important for human health. In the previous floristic studies which were counducted near our research area, only lists of Poaceae taxa were given; in this study, unlike the previous classical studies, many different Poaceae taxa were determined; features of some of them were emphasized, color photographs were introduced with names, endemism situations, ednangered categories and geographical regions of studied samples were also indicated. In this study determination of different morphological features of some Poaceae samples has been tried to shed light on Poaceae literature. By using the Poaceae taxa which was pre-collected in the region or collected and analyzed by us afterwards, it was possible to determine more realistic features of the variation boundaries of the various species and the characters used in the definition and diagnosis; thus provide some facilities identification Poaceae taxa. In addition, some morphological features and population of Poaceae members which were used in agriculture, landscape, pharmacy, food, ethnobotany. have been determined.

Although the plants of Van region are generally studied in terms of floristic, phytosociological and systematic aspects; but has not been found such systematic study involving only Poaceae (Gramineae). For these reasons, this study was carried out on the only Poaceae taxa of the Van (Turkey) center.

2. Materials and methods

The research material consists of Poaceae taxa from center of Van (Turkey). 98 species, 11 subspecies and 6 varietes, totally 115 taxa were detected. During the vegetation period of 2011-2015, plant samples were collected from research area at different periods. Also pre-collected ready materials were also evaluated. Collected samples were pressed and dried according to herbarium technique."Flora of Turkey and the East Aegean Islands" books, herbarium samples and topical books were used to identification of plant samples (Davis, 1985; Güner et al., 2000; Zeynalov et al., 2011; Tatlı, 1988; Korkmaz, 2010; Polunin and Huxley, 1970). Besides, where necessary Flora Europea (Tutin et al., 1964-1981), Flora of Iraq (Townsend, Guest, 1966–1985), Flora of Iranica (Rechinger, 1965-1977), Flora Palaestina (Zohary, 1966–1986), Flora of USSR (Komarov et al., 1934-1964) were used to identification plant taxa. Important characters (gluma, lemma, palea, sheat, lamina, ligula, spica, spicula, rachilla, nod, internod, awn, leaf shapes, flower, root and stem structures) of the Poaceae family were used to identification of taxa. The genus and species names of the plants were arranged according to the alphabetical system and was given in the findings part. Different features of plant samples from Turkey's Flora, distribution areas, endemism, endangered categories and most photos of plant samples were showed in Figure 1. Identificated specimens were adhered to herbarium cartons in a regular and careful manner and recorded to the herbarium (VANF) notebook. Then these samples were placed in cupboards of Herbarium and recorded on the website of the VANF Herbarium.

3. Results and discussion

With this study, 98 species, 11 subspecies and 6 varietes (totally 115 taxa) were detected and 64 taxa were added to the number of Poaceae taxa, which were not identified in previous studies for Van central region. *Aegilops triuncialis* and *Taeniaterum caput-medusa* are common plant associations in the meadows; *Bromus tomentellus, Poa bulbosa* and *Hordeum murinum* are mostly found under trees; *Phragmites australis* was widespread plant associations in wetlands. In research area determination of *Phalaris canariensis, Schismus barbatus, Trisetum thospiticum* is noteworhy. A new species named *Aegilops vanensis* Öztürk, Şen which was recently discovered for the botanical literature. *Vulpia myuros, Alopecurus bulbosus* and *Bromus fasciculatus* are detected as new records for B9 phytogeographic square (Yıldırımlı, 2017). Some endemic species like *Agropyron deweyi* and *Trisetum thospiticum* were found. In addition, some rare taxa were found and their endangered categories were determined. The fact that *Paspalum dilatatum* was collected once and is not found again during study; this is one of the indicators that this species was decreased. VANF herbarium gained *Stipa hohenackeriana* ve *Stipa ehrenbergiana* species with this study. Alphabetical list of detected taxa as below:

AEGILOPS L.: *A. cylindrica* L., *A. triuncialis* L., *A. vanensis* Öztürk & Şen (sp. nova), *A. tauschii* Coss., *A. markgrafii* (Greuter) Hammer, *A. columnaris* Zhukovsky.

AGROPYRON Gaertn.: *A. cristatum* (L.) Gaertner subsp. *pectinatum* (Bleb.) Tzvelev. var. *pectinatum* (L.) Gaertner, *A.deweyii* A.Löve. End.

AGROSTIS L. : *A. gigantea* Roth., *A. stolonifera* L.

ALOPECURUS L. : *A. arundinaceus* Poiret, *A. myosuroides* Huds. var. *myosuroides*, *A. bulbosus* Gouan

ARUNDO L.: *A. donax* L.

ARRHENATHERUM P. Beauv.: *A. palaestinum* Boiss.

AVENA L.: *A. sterilis* L. subsp. *ludoviciana*

BOTHRIOCHLOA O.Kuntze: *B. ischaemum* (L.) Scop.

BROMUS L.: *B. danthoniae* Trin., *B. fasciculatus* C. Presl., *B. hordeaceus* L., *B. inermis* Leysser., *B. intermedius* Guss., *B. japonicus* Thunb. subsp. *japonicus*, *B. scoparius* L., *B. sterilis* L., *B. tectorum* L. subsp. *tectorum*, *B. tomentellus* Boiss., *B. erectus* Huds., *B. riparius* Rehm., *B. armenus* Boiss.

CALAMAGROSTIS Adans : *C. pseudophragmites* (Huller fill) Koeler., *C. epigejos* (L.) Roth., *C. arundineceae* (L.) Roth.

CATABROSELLA L. : *C. parviflora* (Boiss & Buhse) Alexeev ex R. Mill.

CYNODON L. : *C. dactylon* (L.) Pers. var. *villosus* Regel

DACTYLIS L. : *D. glomerata* L. subsp. subsp. *hispanica* (Roth) Nym.

DESCHAMPSIA P. Beauv: *D. caespitosa* (L.) P. Beauv.

DIGITARIA Heis. Ex Fabr. : *D. sanguinalis* (L.) Scop.

ERAGROSTIS P. Beauv.: *E. pilosa* (L.) P. Beauv., *E. minor* Host.

ELYMUS L.: *E. hispidus* (Opiz.) Meld. subsp. *hispidus*, *E. repens* (L.) Gould. subsp. *repens*

EREMOPYRUM (Ledep.) Jaub & Spach.: *E. confusum* Meld., *E. orientale* (L.) Jaub. Et Spach, *E. boneapartis* (Spreng) Nevski., *E. distans* (C.Koch) Nevski.

ELEUSINE Gaertner: *E. indica* (L.) Gaertner

EREMOPOA Rozhev.: *E. multiradiata* (Trautv) Roshev., *E. persica* (Trin.) Roshev., *E. songarica* (Shrenk) Roshev.

ECHINOCLOA L.: *E. cruss-galli* (L.) P. Beauv., *E. oryzoides* (Ard) Fritsch.

FESTUCA L.: *F. arundinaceae* Schreb. subsp. *arundinaceae*., *F. ovina* L., *F. pratensis* Huds.

HENRARARDIA C.H.Hubbard.: *H. persica* (Boiss.) C.H.Hubbard. var. *persica*

HETERANTHELIUM Hochst.: *H. piliferum* (SOL) Hochst,

HORDEUM L.: *H. geniculatum* (Soll) Hochst., *H. murinum* Huds. subsp. *murinum*, *H. marinum* Huds., *H. distichon* L., *H. violeceum* Boiss & Huet., H. *bulbosum* L., *H. spontaneum* var. *anatolicum* K. Koch.

KOELERIA Pers.: *K. cristata* (L.) Pers., *K. eriosachya* Pancic.

LOLIUM L.: *L. perenne* L., *L. persicum* Boiss.& Hohen ex Boiss., *L. rigidum* L.

ORYZA L.: *O. sativa* L.

PANICUM L.: *P. miliaceum* L.

PASPALUM L.: *P. dilatatum* Poiretti.
PHALARIS L.: *P. canariensis* L.
PHLEUM L.: *P. montanum* C.Cohh var. *montanum*, *P. pratense* L.
PHRAGMITES L.: *P. australis* L.
POA L. : *P. bulbosa* L., *P. pratensis* L., *P. trivalis* L., *P. angustifolia* L.
PUCCINELLIA Parl.: *P. gigantea* (Grossh) Grossh.
SECALE L.: *S. cereale* L. var. *vavilovii*, *S. montanum* Guss.
SETARIA (L.) P. Beauv.: *S. verticillata* (L.) P. Beauv var. *verticillata*, *S. viridis* (L.) P.Beauv., *S. glauca* (L.) P. Beauv.
SCHISMUS L.: *S. barbatus* (L.) Thell.
SCLEROCLOA P.Beauv.: *S. dura* (L.) P. Beauv.
SORGHUM Moench: *S. halepense* (L.) Pers.
STIPA L.: *S. hohenackeriana* Trin & Rupr. var. *assyriaca*, *S. holosericea* Trin & Rupr., *S. ehrenbergiana* Trin & Rupr.
TAENIATHERUM Nevski.: *T.caput-medusa* (L.)Nevski subsp. *crinitum* (Schr.) Meld.
TRISETUM Chrtek. : *T. thospiticum* Chrtek.
TRITICUM L.: *T. aestivum* L., *T. vulgare* L.
VULPIA C.C Gmelin: *V. myuros* (L.) C.C.Gmelin.
ZEA L.: *Z. mays* L.

Vulpia myuros, Alopecurus bulbosus and *Bromus fasciculatus* are detected as new records for B9 phytogeographic square (Yıldırımlı, 2017); so with this research original results were obtained for our region, Turkey and botanical literature. For example, so far unknown three species (*Phalaris canariensis, Schismus barbatus, Trisetum thospiticum*) were detected and their endangered categories (EN) was determined. Besides, *Aegilops vanensis* Öztürk & Şen was detected as new species with this research. In Flora of Turkey *P. canariensis* was spreading till 1000 meters in the A1, A2, B1, B4, C5 phytogeographic squares and shown as a Mediterranean element; it is an originality that this species, which has not been encountered before in the area and its surroundings, was discovered in Van in the Iran-Turan phytogeographic region where the continental climate is dominant. *Koeleria eriostachya* ve *Agropyron deweyi* (endemic species) has been determined from Van provinces. It is noteworhy that our collected *Aegilops* species area similar to *Aegilops triuncialis*; but grows in a different ecological niche on soft-loose soil piles, physiologically the stems are curled by a corner, cluster formed, the spiculas were less frequent (5-6), scattered irregularly on the spicas (5-6 cm), the glum veins were more prominent, the arista and the stems were harder and longer. For these reasons, our *Aegilops* species has 6-7 different characters from *Aeglops triuncialis;* so our *Aegilops* species was evaluated as a new species called *A. vanensis* Öztürk & Şen. In the flora of Turkey although only the lower face of gluma of *Phleum pratense* was hairy; in our sample we detected that both face of gluma was hairy. In the flora of Turkey although the lower face of lamina of *Henrardia persica* was not hairy; in our sample we detected that the lower face of lamina was hairy. In the flora of Turkey although the upper gluma of *Eragrostis minor* has single veined; in our sample we detected three veins and this is an important variation. *Dasypyrum villosus* were collected before from YYU campus; we corrected and identified this species as *Secale montanum* with detailed studies. Because of most of Poaceae genera are cosmopolitan, the same species of Poaceae are found in more than one area in our study area. It is interesting that we have not encountered some species (*Triticum dicoccon, Festuca brunescens, Stipa lessingiana*) that have potential to be encountered in the area despite the addition of 64 species to the Poaceae members in and around the area. *Koeleria eriostachya* and *Eragrostis pilosa* rare in eastern part of Turkey we detected this species in our field work. In Flora of Turkey inflorescence of *Koeleria eriostachya* was 2-8 cm, in our sample was 8-17 cm also there are pillose hairs on the panicula nodyum. In Flora of Turkey *Alopecurus bulbosus* spreading in Western Europe and Mediterranean phytogeographic region and anter length stated as 1.3-1.8 mm; our sample is in the Iran-Turan phytogeographic region and anter length is 1.9 mm, awn lenght of lemma is 2 mm, new record for B9 square, stem has was 2-3 nodyums, palea was blunt; it is very interesting to collect this species in our region and it is known that it is spreading generally around Istanbul. In Flora of Turkey *Vulpia myuros* was not given in Eastern Anatolia, was given only Rize, inner Thrace and Gaziantep; so this species can be evaluated “threaten” (NT) endangered

categories. According to the literature, *Agropyron cristatum* subsp. *pectinatum* var. *imbricatum* is usually spreading at high altitudes (1700–2900 m); in our study, it was collected at 1600–1650 meters in the center of Van. The added species from Yuzuncu Yil University Zeve Campus (Ozturk et al., 1998) as follows: *Apera intermedia*, *Catabrosa aquatica*, *Calamagrostis pseudophragmites*, *Eremopyrum confusum*, *Eremopyrum orientale*, *Eremopoa persica*, *Elymus repens* subsp. *repens*, *Cynodon dactylon* var. *villosus*, *Festuca oreophila*, *Hordeum bulbosum*, *Hordeum violaceum*, *Psathryostachys fragilis*, *Eragrostis minor, Eragrostis barrelieri*.

4. Conclusion

In conclusion, although the number of Poacaeae species identified in each of floristic studies previously conducted in the province of Van is at least 8 species, most 30-35 species; with this study, 98 species, 11 subspecies and 6 varietes (totally 115 taxa) were detected and 64 taxa were added to the number of Poaceae taxa of Van center and contributions provided to Poaceae literature.

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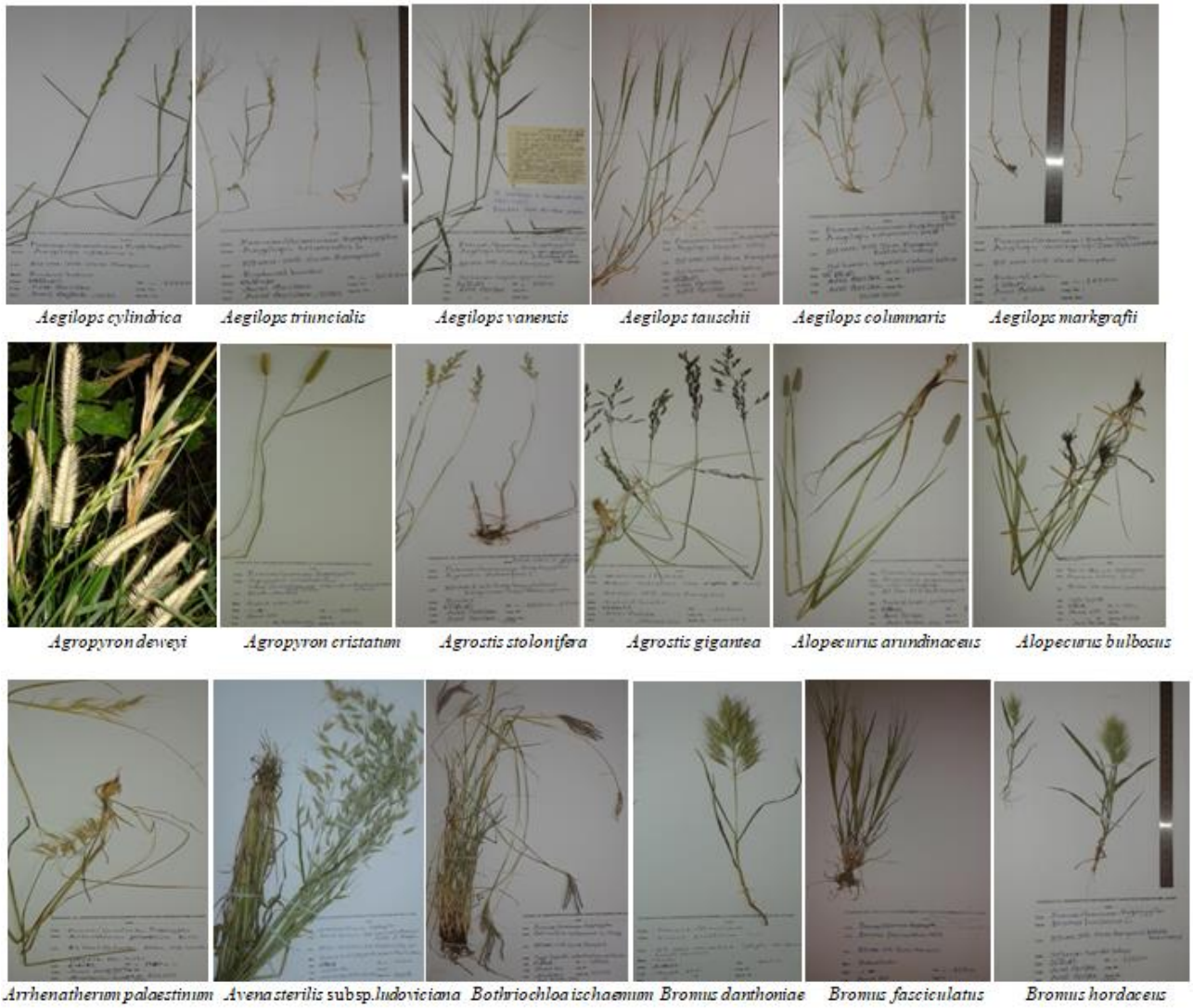
Appendix




Bromus inermis


Bromus intermedius


Bromus japonicus subsp. *japonicus*


Bromus scoparius


Bromus sterilis


Bromus tectorum subsp. *tectorum*


Bromus tomentellus


Bromus armenus


Calamagrostis pseudophragmites


Calamagrostis epigejos


Calamagrostis arundinaceae


Catabrosella paniflora


Deschampsia caespitosa


Digitaria sanguinalis


Eragrostis pilosa


Eragrostis minor


Elymus hispidus subsp *hispidus*


Eremopyrum confusum


Eremopyrum orientale


Eromopyrum distans


Eleusine indica


Eremopoa multiradiata


Eremopoa songarica


Echinochloa cruss-galli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Heteranthelium piliferum


Hordeum geniculatum

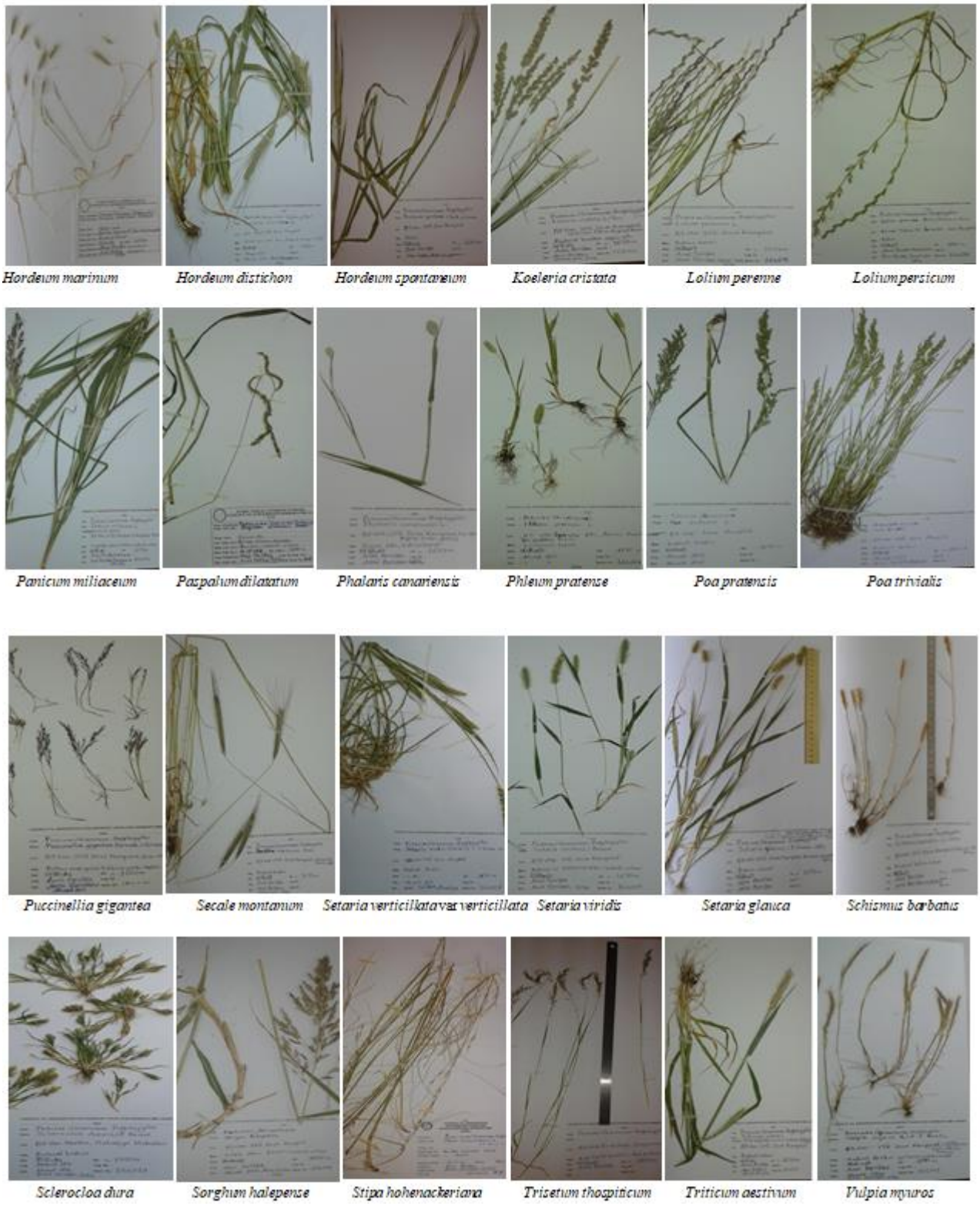

Fig. 1. Some plant taxa in the research area