

## DIVERSITY AND ECOLOGICAL CHARACTERISTICS OF FLORA OF MASTUJ VALLEY, DISTRICT CHITRAL, HINDUKUSH RANGE, PAKISTAN

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### Abstract

This study revealed that the floristic diversity consisted of 571 species belonging to 82 families including 65 dicots, 13 monocots, 2 gymnosperms and 2 pteridophyte families. There were 334 genera including 3 Pteridophytes, 2 gymnosperms, 54 monocot and 275 dicot genera. Asteraceae (91 Spp., 15.95 %), Poaceae (58 Spp., 10.16 %), Papilionaceae (38 Spp., 6.65 %), Lamiaceae & Rosaceae (each with 26 Spp., 4.55 %), Polygonaceae (25 spp; 4.38), Caryophyllaceae (23 spp.; 4.03%), Apiaceae (21 Spp., 3.68 %), Boraginaceae and Brassicaceae (20 Spp., each with 3.50 %) were the leading families. There were 45 (13.47%), 32 (9.58%), 19 (5.69%), 18 (5.39%) and 16 (4.79%) genera respectively in Asteraceae, Poaceae, Brassicaceae, Apiaceae and Papilionaceae. Flora consisted of 91.59% wild species, 92.64% deciduous species, 92.12% non-spiny species, 80.04% mesophytes and 94.57% heliophytes. Biological spectrum was dominated by therophytes (234 spp., 40.98%), followed by hemicryptophytes (154 spp., 26.97%), geophytes (82 spp., 14.36%), chamaephytes (44 spp., 7.71%), nanophanerophytes (31 spp, 5.43%) and megaphanerophytes (24 spp., 4.20%). The leaf size spectra was dominated by nanophylls (40.98%), leptophylls (24.87%), mesophylls 18.56% and microphylls (9.11%). Further plant exploration is suggested in this remote inaccessible valley in the Hindukush Range, Pakistan

**Key words:** Phytodiversity, Ecological characteristics, Mastuj Valley, Hindukush range, Pakistan.

### Introduction

Floristic diversity and its ecological characteristics depend upon climate, altitudinal and related habitat condition. The character of flora such as phenology, leaf size and life form spectra and other morphological features reflect the existing ecological and habitat conditions. A rich floristic diversity means favourable growing conditions. Listing of species has always been a pre requisite for any ecological and plant resource management. Many studies for listing floristic diversity and its ecological behaviour have been done at home and abroad. Nusbaumer *et al.* (2005) described the structure and floristic composition of 534 species of Scio, Western Ivory Coast forest. Estrella *et al.* (2006) prepared a checklist of 52 genera and 124 taxa of Caesalpinoideae from Equatorial Guinea. Ssegawa & Nkuutu (2006) recorded 179 species belonging to 70 families and 146 genera from forests in the Ssesse Islands of Lake Victoria, Central Uganda.

Alelign *et al.* (2007) recorded the composition of 113 woody plant species. Costa *et al.* (2007) identified 133 plant species belonging to 47 families including 42.9% therophytes, 26.3% phanerophytes, 15.8% chamaephytes, 12.8% hemicryptophytes and 2.3% cryptophytes. Devineau & Fournier (2007) identified 130 herbaceous species of West African Sudan Type Savanna. Shukla (2009) reported 615 species of angiosperms from Terai landscape in Northeastern Uttar Pradesh. Parswan *et al.* (2010) reported 80 species of 36 families and biological spectrum of vegetation of alpine meadows of Kedarnath. Asteraceae was dominant family and major life-form class was chamaephytes followed by therophytes. Kotresha *et al.* (2011) reported 303 plant species of 238 genera and 75 families from Karnataka, India. They reported that Fabaceae with 44 species was the dominant family. Hussain *et al.* (2000) reported 92

species of 56 families from Ghalegay Hills, District Swat. Marwat & Qureshi (2000) recorded 383 species of 110 families including 5 conifers, 43 broad leaved trees, 56 shrubs and 279 herbs from upper Siran Reserved forests. Durrani *et al.* (2005) reported 202 plant species of 45 families from Harboi rangeland, Kalat. The dominant life-form was therophytes and hemicryptophytes, while leptophylls, nanophylls, and microphylls were dominant leaf-sizes. Sher & Khan (2007) reported 222 plant species of 88 families from Chagharzai Valley, District Buner. They stated that therophytes and nanophanerophytes were dominant life-forms while microphylls and mesophylls were important leaf-size classes. Durrani *et al.* (2010) reported 123 plant species of 36 families from protected sites and 28 species from unprotected sites from Aghberg rangeland, Balochistan. Saima *et al.* (2009) reported 167 plant species of 65 families from Ayubia National Park, District Abbottabad. Asteraceae was dominant followed by Lamiaceae. The floristic diversity and ecological features of flora of District Tank is worked out by Badshah *et al.* (2013). Sher *et al.* (2014) reported the diversity and ecological features of flora of Gadoon, District Swabi.

Mastuj Valley is botanically less explored that invites the plant scientists to come forward. Some references are available on weed flora and ecology (Hussain *et al.*, 1994, 2004 a, b; Hussain & Murad, 2004), flora and vegetation of Mastuj (Shah *et al.*, 2006; Hussain *et al.*, 2007), medicinal plants (Shah & Hussain, 2012), aquatic vegetation (Hussain *et al.*, 2012), status of juniper (Shah *et al.*, 2013 a) and phytosociology (Shah *et al.*, 2013 b). No other reference on the plants of Mastuj Valley is available. The present effort therefore brings on record the diversity and ecological features of plants of Mastuj Valley that might be helpful for future workers.

## Materials and Methods

**Floristic diversity:** Plants including cultivated species were collected from Mastuj Valley during 2006-2009. They were dried, identified with the help of available literature (Nasir & Ali, 1970-1989, Ali & Nasir, 1989-1991; Ali & Qaiser, 1993-2012). The identification was further confirmed at National Herbarium, National Agriculture Research Council, Islamabad and at the Herbarium Department of Botany, University of Karachi. A complete floristic list was compiled by arranging plants alphabetically within each group, family and genera. Some plants were deposited at the University of Karachi, others at the Department of Botany and Botanical Garden, Centre of Plant Biodiversity at Azakhel, University of Peshawar.

**Ecological characteristics:** Leaf persistence, spiny nature, habitat, light requirement, cultivation/wild and leaf shape of species were observed in the field.

**Life-form and leaf size spectra:** Life-form and leaf size classes were assigned to plants by following Raunkiaer (1934) and Hussain (1989) and Raunkiarian life-form and leaf size spectra (Biological Spectra) was prepared.

## Results and Discussion

**Floristic composition:** The floristic list comprised of 571 species of 82 families (Tables 1 & 2). It included 65 dicots, 13 monocots, 2 gymnosperms and 2 pteridophyte families. In all there were 334 genera. Pteridophyte and gymnosperms had 3 and 2 genera, respectively. There were 54 monocot and 275 dicot genera. Table 3 shows that Asteraceae (91 Spp., 15.95 %) and Poaceae (58 Spp., 10.16 %) were the leading families. They were followed by Papilionaceae (38 Spp., 6.65 %), Lamiaceae and Rosaceae (each with 26 Spp., 4.55 %), Polygonaceae (25 spp; 4.38), Caryophyllaceae (23 spp.; 4.03%), Apiaceae (21 Spp., 3.68 %), Boraginaceae and Brassicaceae (20 Spp. Each; 3.50 %), Scrophulariaceae and Chenopodiaceae respectively had 16 (2.80) and 14 (245) species. Each of the Cyperaceae and Ranunculaceae had 13 species (2.28%). The remaining families had less than 13 species in the area. Of the total 334 genera (Table 2), there were 45 (13.47%), 32 (9.58%), 19 (5.69%), 18 (5.39%) and 16 (4.79%) genera respectively in Asteraceae, Poaceae, Brassicaceae, Apiaceae and Papilionaceae. Shah *et al.* (2006) reported 218 plant species of 63 families while studying the summer flora of Tehsil Mastuj, District Chitral. The present study reported double the number of species and genera compared to them. These also included the previously reported species and many more. The presence of high species diversity is attributable to extensive exploration from diverse localities round the year and diverse habitats and altitudinal range within the valley. The present floristic list is also improved over the flora reported by Sher & Khan (2007), who reported 222 plant species belonging to 88 families from Chagharzai Valley, District Buner. Addo-Fordjour *et al.* (2008) reported 108 plant species belonging to 37 families from Tinte Bepo forest reserve. Durrani *et al.* (2010) reported 123 plant species from Aghberg rangeland, Quetta and some of the species are common to the present study due to some similarity in climatic features as both the locations are arid temperate. Saima *et al.* (2009) recorded 167 plant

species belonging to 65 families from Ayubia National Park, District Abbottabad. The present floristic list differs from them due to moist temperate climate, which is contrasting to dry arid climatic of Mastuj Valley. Floristic list is ecologically important as it provides information about natural resources and associations of plants with each other and their interaction with other biotic and abiotic factors. Floristic composition varies in response to altitudinal and habitat differences. Floristic diversity provides an idea about the life-form, stratification, habitat and related environmental condition. Floristic listing is easy to handle and is less time consuming (Saima *et al.*, 2009). Families Asteraceae and Poaceae were on the top of the list in the area (Table 3). Parswan *et al.* (2010) also reported Asteraceae as the dominant family in alpine meadows of Kedarnath. Both these families are the largest families in the flora of Pakistan (Nasir & Ali, 1970-1989; Ali & Nasir, 1989-1991; Ali & Qaiser, 1993-2012). A similar trend for both these and other families has been reported by many workers (Durrani *et al.*, 2005, 2010; Shah *et al.*, 2006; Saima *et al.*, 2009; Khan *et al.*, 2011; Peer *et al.*, 2001, 2007) in the arid and moist climatic conditions of Pakistan and our results in this regard are strengthened by them. Almeida Jr *et al.* (2011) and Kotresha *et al.* (2011) also reported Fabaceae (Papilionaceae) as the leading families in their study area. The findings also agree with Badshah *et al.* (2013) and Sher *et al.* (2014).

Table 4 shows that the floristic diversity respectively included 523 (91.59%) and 48 (8.41%) wild and cultivated species. *Allium cepa*, *Allium sativum*, *Coriandrum sativum*, *Daucus carota*, *Foeniculum vulgare*, *Oryza sativa*, *Triticum aestivum* and *Zea mays* are some of the cultivated species in the area. There are 5 (0.88%) aphyllous species, 529 (92.64%) deciduous species and only 37 (6.48%) evergreen species (Table 4). This is well in agreement with the arid dry temperate climate of the area. The rain fall is poor and snow fall is predominant with short growing season that does not favour the evergreen species. There were 45 (7.8%) and 526 (92.12%) spiny and non spiny species in the area. Keeping in mind the habitat form (Table 4), it was obvious that 457 (80.04%) species belonged to dry habitat which is the main habitat form. The area is arid mountainous with eroded shallow soil surface. There were 66 (11.56%), 66 (11.56%) and 25 (4.38%) in mesic and moist soil types. Aquatic species were the least as there are few aquatic habitats that had only 23 (4.03%) species. These included one insectivorous plant, *Utricularia australis* which is submerged hydrophyte. Other submerged hydrophytes included species of *Potamogeton*, *Callitriche palustris* and *Hippuris vulgaris*. *Mentha longifolia*, *Oxyria digyna*, *Phragmites karka*, *Primula denticulata* and *Nasturtium officinale* were some of the aquatic plants and this agrees with Hussain *et al.* (2012). Major bulk of species, i.e., 540 (94.57%) were heliophytes and only 31 (5.43%) species were sciophytes (Table 4). *Adiantum venustum*, *Equisetum ramossimum*, *Colchicum aitchisonii*, *Geranium* sp, *Pteris* sp, *Swertia speciosa* and *Tussilago farfara* were sciophytes. The leaves were simple in 427 (74.78%) species, incised in 63 (11.03%) and compound in 76 (13.31%) species (Table 4). Five species (0.88%) were aphyllous. This floristic list demands write up of complete flora for the area with taxonomic description, keys for identification and further exploration in the area.

Table 1. Floristic composition and ecological characteristics of plants of Mastuj Valley, District Chitral.

S. No.	Plant species	1	2	3	4	5	6	7	8
<b>A. Pteridophyta</b>									
<b>1. Family Equisetaceae</b>									
1.	<i>Equisetum ramosissimum</i> Desf.	G	Aph	Aph	-	Aq	L	W	Aph
<b>2. Family Pteridaceae</b>									
2.	<i>Adiantum venustum</i> D. Don	G	N	E	-	M	S	W	Comp
3.	<i>Pteris</i> sp.	G	N	E	-	M	S	W	Comp
<b>B. Gymnospermae</b>									
<b>3. Family Cupressaceae</b>									
4.	<i>Juniperus excelsa</i> M.Bieb	MP	L	E	-	D	L	W	Incised
5.	<i>Juniperus communis</i> L. var. <i>saxatilis</i> Pallas.	NP	L	E	-	D	L	W	Incised
6.	<i>Juniperus semiglobosa</i> Regel	NP	L	E	-	D	L	W	Disc
7.	<i>Juniperus squamata</i> Buch.-Ham. ex D. Don	NP	L	E	-	D	L	W	Incised
<b>4. Family Ephedraceae</b>									
8.	<i>Ephedra gerardiana</i> Wall ex Stapf	Ch	Aph	Ap	-	D	L	W	Aph
9.	<i>Ephedra intermedia</i> Schrenk & Meyer	Ch	Aph	Ap	-	D	L	W	Aph
<b>C. Monocotyledonae</b>									
<b>5. Family Alliaceae</b>									
10.	<i>Allium carolinianum</i> DC.	G	Mes	Dec	-	D	L	W	Simple
11.	<i>Allium cepa</i> Linn.	G	Mes	Dec	-	D	L	C	Simple
12.	<i>Allium chitralicum</i> Wang & Tang	G	Mes	Dec	-	D	L	W	Simple
13.	<i>Allium griffithianum</i> Boiss.	G	Mes	Dec	-	D	L	W	Simple
14.	<i>Allium sativum</i> L.	G	Mes	Dec	-	D	L	C	Simple
15.	<i>Allium tuberosum</i> Rottl. ex Spreng	G	Mes	Dec	-	D	L	C	Simple
<b>6. Family Amaryllidaceae</b>									
16.	<i>Ixilirion montanum</i> (Labill.) Herb.	G	Mes	Dec	-	M	L	W	Simple
<b>7. Family Araceae</b>									
17.	<i>Arisaema jacquemontii</i> Blume	G	Mic	Dec	-	M	L	W	Comp
<b>8. Family Colchicaceae</b>									
18.	<i>Colchicum aitchisonii</i> (Hook. f.) E. Nasir	G	N	Dec	-	M	S	W	Simple
<b>9. Family Cyperaceae</b>									
19.	<i>Blysmus compressus</i> subsp. <i>brevifolius</i> (Decne.) Kukkonen	G	Mic	E	-	M	L	W	Simple
20.	<i>Carex haematostoma</i> Nees	G	L	Dec	-	M	S	W	Simple
21.	<i>Carex alpina</i> Swartz.	G	L	E	-	D	S	W	Simple
22.	<i>Carex infuscata</i> Nees	G	L	E	-	M	L	W	Simple
23.	<i>Carex diluta</i> M. Bieb.	G	L	E	-	M	L	W	Simple
24.	<i>Carex nivalis</i> Bootl.	G	L	E	-	D	L	W	Simple
25.	<i>Carex stenocarpa</i> Turcz. ex V. Krecz	G	L	E	-	D	L	W	Simple
26.	<i>Carex stenophylla</i> Wahlenb	G	L	E	-	D	L	W	Simple
27.	<i>Schoenoplectus lacustris</i> (L.) Palla subsp. <i>tabernaemontani</i> (C. C. Gmel) A. & D. LÖve	G	Mic	E	-	M	L	W	Simple
28.	<i>Kobresia humilis</i> (C.A. Mey) Serg.	G	Mic	E	-	M	L	W	Simple
29.	<i>Kobresia nitens</i> C.B. Clarke	G	Mic	E	-	M	L	W	Simple
30.	<i>Kobresia schoenoides</i> (C. A. Mey) Steud	G	Mic	E	-	M	L	W	Simple
31.	<i>Schoenoplectus</i> sp	G	Mic	E	-	D	L	W	Simple
<b>10. Family Iridaceae</b>									
32.	<i>Iris germanica</i> Linn	G	Mes	Dec	-	D	L	W	Simple
33.	<i>Iris hookeriana</i> Foster	G	Mes	Dec	-	D	L	W	Simple
34.	<i>Iris lactea</i> Pallas	G	Mes	Dec	-	D	L	W	Simple
<b>11. Family Juncaceae</b>									
35.	<i>Juncus articulata</i> Linn.	H	Mic	E	-	M	L	W	Simple
36.	<i>Juncus himalensis</i> Klotzsch	H	Mic	E	-	M	L	W	Simple
37.	<i>Juncus membranaceus</i> Royle ex D. Don	H	Mic	E	-	M	L	W	Simple
<b>12. Family Juncaginaceae</b>									
38.	<i>Triglochin palustris</i> Linn.	G	N	E	-	Aq	L	W	Simple
<b>13. Family Liliaceae</b>									
39.	<i>Eremurus perisicus</i> (Jaub & Spach) Boiss.	G	N	Dec	-	D	L	W	Simple
40.	<i>Eremurus stenophyllus</i> (Boiss. & Buhse) Baker	G	N	Dec	-	D	L	W	Simple
41.	<i>Gagea chitralensis</i> S. Dasgupta & Deb	G	L	Dec	-	M	L	W	Simple
42.	<i>Gagea setifolia</i> Baker	G	N	Dec	-	D	L	W	Simple
43.	<i>Gagea uliginosa</i> Siehe et Pascher	G	L	Dec	-	D	L	W	Simple
44.	<i>Tulipa chusiana</i> DC	G	L	Dec	-	D	L	W	Simple
<b>14. Family Orchidaceae</b>									
45.	<i>Cyperipedium cordigerum</i> D. Don	G	N	Dec	-	M	S	W	Simple
46.	<i>Dactylorhiza hatagirea</i> (D. Don) Soo	G	N	Dec	-	M	S	W	Simple
<b>15. Family Poaceae</b>									
47.	<i>Aeluropus macrostachyus</i> Hack.	Th	N	Dec	-	D	L	W	Simple
48.	<i>Alloteropsis crimicina</i> (Linn.) Stapf	Th	N	Dec	-	D	L	W	Simple

Table 1. (Cont'd.).

S. No.	Plant species	1	2	3	4	5	6	7	8
49.	<i>Aristida cynantha</i> Nees. & Steud.	H	N	Dec	-	D	L	W	Simple
50.	<i>Avena sativa</i> Linn	Th	N	Dec	-	D	L	W	Simple
51.	<i>Avena barbata</i> Pott ex Link	Th	N	Dec	-	D	L	W	Simple
52.	<i>Bromus danthoniae</i> Trin	Th	N	Dec	-	D	L	W	Simple
53.	<i>Bromus gracillimus</i> Bunge	Th	Mic	Dec	-	D	L	W	Simple
54.	<i>Bromus pectinatus</i> Thunb.	Th	Mic	Dec	-	D	L	W	Simple
55.	<i>Bromus stenostachyus</i> Boiss	Th	Mic	Dec	-	D	L	W	Simple
56.	<i>Calamogrostis pseudophragmites</i> (Hall. f.) Koeler.	G	Mes	E	-	Aq	L	W	Simple
57.	<i>Cynodon dactylon</i> (Linn.) Pers.	H	N	Dec	-	D	L	W	Simple
58.	<i>Dactylis glomerata</i> Linn.	Th	N	Dec	-	D	L	W	Simple
59.	<i>Dichanthium annulatum</i> (Forssk.) Stapf.	H	N	Dec	-	M	L	W	Simple
60.	<i>Echinochloa crus-galli</i> (Linn.) P. Beauv.	Th	N	Dec	-	M	L	W	Simple
61.	<i>Elymus cognatus</i> (Hack) T.A. Cope	H	L	Dec	-	D	L	W	Simple
62.	<i>Elymus nutans</i> Griseb.	H	N	Dec	-	D	L	W	Simple
63.	<i>Elymus repens</i> (Linn) Gould	H	N	Dec	-	D	L	W	Simple
64.	<i>Elymus schugnanicus</i> (Nevski) Tzvelev	H	N	Dec	-	D	L	W	Simple
65.	<i>Eragrostis minor</i> Host.	Th	N	Dec	-	M	L	W	Simple
66.	<i>Eragrostis nigra</i> Nees ex Steud.	Th	N	Dec	-	M	L	W	Simple
67.	<i>Eragrostis sp.</i>	H	N	Dec	-	M	L	W	Simple
68.	<i>Eremopoa persica</i> (Trin) Rozhev	Th	L	Dec	-	D	L	W	Simple
69.	<i>Festuca alatavica</i> (St-Yves) Rozhev	Th	L	Dec	-	D	L	W	Simple
70.	<i>Festuca kashmiriana</i> Stapf	H	L	Dec	-	D	L	W	Simple
71.	<i>Festuca olgae</i> (Regel) Krivot.	H	L	Dec	-	D	L	W	Simple
72.	<i>Festuca valesiaca</i> Schleich ex Gaud	H	L	Dec	-	D	L	W	Simple
73.	<i>Festuca valesiaca subsp hypsophila</i> (St.- Yves ) Tzvelev	H	L	Dec	-	D	L	W	Simple
74.	<i>Heteropogon contortus</i> (Linn) P. Beauv. ex Roem & Schult	H	Mic	Dec	-	D	L	W	Simple
75.	<i>Hordeum spontaneum</i> C.Koch.	Th	N	Dec	-	D	L	W	Simple
76.	<i>Hyparrhenia hirta</i> (Linn.) Stapf	H	N	Dec	-	D	L	W	Simple
77.	<i>Ischaemum timorense</i> Kunth.	Th	Mic	Dec	-	D	L	W	Simple
78.	<i>Koeleria macrantha</i> (Ledeb) Schult.	H	L	Dec	-	D	L	W	Simple
79.	<i>Koeleria crstata</i> Pers.	H	N	Dec	-	D	L	W	Simple
80.	<i>Lolium rigidum</i> Guad.	Th	N	Dec	-	D	L	W	Simple
81.	<i>Lolium persicum</i> Boiss & Hohen ex Boiss.	Th	N	Dec	-	D	L	W	Simple
82.	<i>Melica sp.</i>	H	N	Dec	-	D	L	W	Simple
83.	<i>Melica persica</i> Kunth	H	L	Dec	-	D	L	W	Simple
84.	<i>Oryza sativa</i> Linn.	G-Hyd	Mic	Dec	-	Aq	L	C	Simple
85.	<i>Phragmites australis</i> (Cav.) Trin ex Steud.	G-Hyd	Mac	E	-	Aq	L	W	Simple
86.	<i>Piptatherum gracile</i> Mez	H	L	Dec	-	D	L	W	Simple
87.	<i>Poa attenuata</i> Trin	H	L	Dec	-	D	L	W	Simple
88.	<i>Poa alpina</i> Linn	Th	L	Dec	-	D	L	W	Simple
89.	<i>Poa araratica</i> Trautv.	Th	L	Dec	-	D	L	W	Simple
90.	<i>Poa bulbosa</i> Linn.	Th	N	Dec	-	D	L	W	Simple
91.	<i>Poa pratensis</i> Linn	H	N	Dec	-	D	L	W	Simple
92.	<i>Poa sinaica</i> Steud.	Th	N	Dec	-	D	L	W	Simple
93.	<i>Poa sterilis</i> M. Bieb.	Th	L	Dec	-	D	L	W	Simple
94.	<i>Saccharum spontaneum</i> Linn.	Ch	Mac	E	-	D	L	W	Simple
95.	<i>Setaria glauca</i> (Linn.) P. Beauv.	Th	N	Dec	-	D	L	W	Simple
96.	<i>Setaria intermedia</i> Roem & Schult.	Th	N	Dec	-	D	L	W	Simple
97.	<i>Setaria viridis</i> (L.) P.Beauv.	Th	N	Dec	-	M	L	W	Simple
98.	<i>Stipa arabica</i> Trin & Rupr	H	N	Dec	-	D	L	W	Simple
99.	<i>Stipa himalaica</i> Rozhev	H	N	Dec	-	D	L	W	Simple
100.	<i>Stipa trichoides</i> P. Smirnn	H	N	Dec	-	D	L	W	Simple
101.	<i>Stipagrostis plumosa</i> (Linn) Munro ex Anders.	H	Mes	Dec	-	D	L	W	Simple
102.	<i>Tetrapogon villosus</i> Desf.	H	N	Dec	-	D	L	W	Simple
103.	<i>Triticum aestivum</i> L.	Th	Mes	Dec	-	D	L	C	Simple
104.	<i>Zea mays</i> L.	Th	Mac	Dec	-	D	L	C	Simple
<b>16. Family Potamogetonaceae</b>									
105.	<i>Potamogeton alpinus</i> Balbis	G-Hyd	L	Dec	-	Aq	S	W	Simple
106.	<i>Potamogeton nodosus</i> Poir.	G-Hyd	L	Dec	-	Aq	S	W	Simple
<b>17. Family Typhaceae</b>									
107.	<i>Typha angustata</i> Borry. & Chaub.	G-Hyd	Mac	E	-	Aq	L	W	Simple
<b>D. Dicotyledonae</b>									
<b>18. Family Amaranthaceae</b>									
108.	<i>Amaranthus cruentius</i> Linn.	Th	Mes	Dec	-	D	L	W	Simple
109.	<i>Amaranthus hybridus</i> Linn.	Th	N	Dec	-	D	L	W	Simple
110.	<i>Amaranthus retroflexus</i> Linn.	Th	Mes	Dec	-	D	L	W	Simple
111.	<i>Amaranthus viridis</i> Linn.	Th	Mes	Dec	-	D	L	W	Simple

Table 1. (Cont'd.).

S. No.	Plant species	1	2	3	4	5	6	7	8
<b>19. Family Anacardaceae</b>									
112.	<i>Pistacia integerrima</i> J. L. Stewart ex Brandis.	NP	Mes	Dec	-	D	L	W	Simple
113.	<i>Pistacia khinjuk</i> Stocks	NP	N	Dec	-	D	L	W	Simple
<b>20. Family Apiaceae</b>									
114.	<i>Ammi visnaga</i> (L.) Lam.	Th	N	Dec	-	D	L	W	Incised
115.	<i>Anethum graveolens</i> L.	Th	N	Dec	-	D	L	W	Incised
116.	<i>Bunium persicum</i> (Boiss.) Fedtsch.	G	N	Dec	-	D	L	W	Incised
117.	<i>Bupleurum gracillimum</i> KI	H	N	Dec	-	D	L	W	Simple
118.	<i>Bupleurum thomsoni</i> C. B. Clarke	H	N	Dec	-	D	L	W	Simple
119.	<i>Carum capticum</i> L.	G	Mic	Dec	-	D	L	W	Incised
120.	<i>Carum carvi</i> L.	Th	N	Dec	-	D	L	W	Incised
121.	<i>Coriandrum sativum</i> L.	Th	N	Dec	-	D	L	C	Incised
122.	<i>Cortia schmidii</i> Nasir.	Th	N	Dec	-	D	L	W	Incised
123.	<i>Daucus carota</i> L.	G	Mes	Dec	-	D	L	C	Incised
124.	<i>Ferula jaeschkeana</i> Vatke.	G	Mes	Dec	-	D	L	W	Comp
125.	<i>Ferula</i> Sp.	G	Mes	Dec	-	D	L	W	Comp
126.	<i>Foeniculum vulgare</i> Miller.	Th	N	Dec	-	D	L	C	Incised
127.	<i>Pleurospermum stylosum</i> Clarke.	Th	N	Dec	-	D	L	W	Comp
128.	<i>Pimpinella stewartii</i> Dunn. Nasir.	Th	N	Dec	-	D	L	W	Comp
129.	<i>Prongus publaria</i> (Lind.) Hiroe.	H	N	Dec	-	D	L	W	Comp
130.	<i>Seseli libanotis</i> (L.) Koch.	Th	L	Dec	-	D	L	W	Comp
131.	<i>Torilis arvensis</i> (Huds.) Link.	Th	Mic	Dec	-	D	L	W	Comp
132.	<i>Schulzia dissecta</i> (Clarke) Norman	Th	Mic	Dec	-	D	L	W	Simple
133.	<i>Trachydium roylei</i> Lindl.	H	Mic	Dec	-	D	L	W	Comp
134.	<i>Trachyspermum ammi</i> (L.) Spargue.	G	N	Dec	-	D	L	W	Comp
<b>21. Family Apocynaceae</b>									
135.	<i>Trachomitum venetum</i> (Linn.) Woodson	H	Mes	Dec	-	D	L	W	Simple
<b>22. Family Asclepiadaceae</b>									
136.	<i>Cynanchum acutum</i> Linn.	Ch (Cl)	Mes	Dec	-	D	L	W	Simple
137.	<i>Cynanchum arnottianum</i> Wight.	Ch (Cl)	Mes	Dec	-	D	L	W	Simple
<b>23. Family Asteraceae</b>									
138.	<i>Ajania fruticulosa</i> (Ledeb.) Poljakov	H	N	Dec	-	D	L	W	Incised
139.	<i>Anaphalia gracilis</i> Handel & Mazzetti.	H	Mic	Dec	-	D	L	W	Simple
140.	<i>Anthemis cotula</i> L.	Th	N	Dec	-	D	L	W	Incised
141.	<i>Anthemis</i> sp	Th	N	Dec	-	D	L	W	Incised
142.	<i>Artemisia brevifolia</i> Wall ex DC.	H	L	Dec	-	D	L	W	Incised
143.	<i>Artemisia laciniata</i> Willd.	H	L	Dec	-	D	L	W	Incised
144.	<i>Artemisia japonica</i> . Thunb.	H	Mic	Dec	-	D	L	W	Incised
145.	<i>Artemisia persica</i> Boiss	Ch	L	Dec	-	D	L	W	Incised
146.	<i>Artemisia rutifolia</i> Spreng.	H	L	Dec	-	D	L	W	Incised
147.	<i>Artemisia santolinifolia</i> Turcz ex Krasch	Ch	L	DEc	-	D	L	W	Dec
148.	<i>Artemisia scoparia</i> Waldst. & Kit.	H	N	Dec	-	D	L	W	Incised
149.	<i>Artemisia</i> sp	Ch	L	Dec	-	D	L	W	Incised
150.	<i>Aster altaicus</i> Willdenow	H	Mes	Dec	-	D	L	W	Simple
151.	<i>Aster amellus</i> Linn	H	Mes	Dec	-	D	L	W	Simple
152.	<i>Aster flaccidus</i> Bunge	H	N	Dec	-	D	L	W	Simple
153.	<i>Bidens tripartita</i> Linn.	H	N	Dec	-	D	L	W	Simple
154.	<i>Brachyactis roylei</i> (Candolle) Wendelbo	H	Mic	Dec	-	D	L	W	Simple
155.	<i>Calendula officinalis</i> Linn.	Th	Mes	Dec	-	D	L	W	Simple
156.	<i>Carbenia benedicta</i> (Linn) Bth & HK	Th	N	Dec	+	D	L	W	Simple
157.	<i>Centaurea calcitrapa</i> Linn.	Th	N	Dec	+	D	L	W	Incised
158.	<i>Chondrilla graminea</i> M.Bieb.	H	N	Dec	-	D	L	W	Incised
159.	<i>Chrysanthemum cinerariaefolium</i> Vis.	H	N	Dec	-	D	L	W	Incised
160.	<i>Cirsium acaule</i> (Linn.) Scop.	Th	Mac	Dec	+	D	L	W	Simple
161.	<i>Cirsium argyacanthum</i> D.C.	Th	Mac	Dec	+	D	L	W	Simple
162.	<i>Cichorium intybus</i> Linn.	Th	Mes	Dec	-	D	L	W	Simple
163.	<i>Cnicus benedictus</i> Linn.	Th	Mes	Dec	+	D	L	W	Simple
164.	<i>Conyza bonariensis</i> (L.) Cronquist.	Th	N	Dec	-	D	L	W	Simple
165.	<i>Conyza canadensis</i> (L.) Cronquist	Th	N	Dec	-	D	L	W	Simple
166.	<i>Conyza japonica</i> (Thunb.) Less. ex DC	Th	N	Dec	-	D	L	W	Simple
167.	<i>Conyza stricta</i> Willd.	Th	N	Dec	-	D	L	W	Simple
168.	<i>Cosmos bipinnatus</i> Cav.	Th	N	Dec	-	D	L	W	Comp
169.	<i>Cousinia buphthalmoides</i> Regel	Th	L	Dec	+	D	L	W	Simple
170.	<i>Cousinia mattfeldii</i> Bornm.	Th	Mic	Dec	+	D	L	W	Simple
171.	<i>Cousinia multiloba</i> DC	Th	L	Dec	+	D	L	W	Simple
172.	<i>Cousinia thomsonii</i> C. B. Clarke	Th	L	Dec	+	D	L	W	Simple

Table 1. (Cont'd.).

S. No.	Plant species	1	2	3	4	5	6	7	8
173.	<i>Crepis flexuosa</i> (Ledeb.) C. B. Clarke	Th	L	Dec	+	D	L	W	Simple
174.	<i>Crepis multicaulis</i> Ledeb	Th	L	Dec	+	D	L	W	Simple
175.	<i>Crepis sancta</i> (Linn.) Babc.	Th	N	Dec	-	D	L	W	Simple
176.	<i>Crepis thomsonii</i> Babc.	Th	N	Dec	-	D	L	W	Simple
177.	<i>Echinops echinatus</i> Roxb.	Th	Mac	Dec	+	D	L	W	Simple
178.	<i>Echinops cornigerus</i> DC	Th	Mes	Dec	+	D	L	W	Simple
179.	<i>Erigeron</i> sp.	Th	Mic	Dec	-	D	L	W	Simple
180.	<i>Erigeron acris</i> Linn.	Th	Mic	Dec	-	D	L	W	Simple
181.	<i>Erigeron alpinus</i> Linn.	Th	Mic	Dec	-	D	L	W	Simple
182.	<i>Erigeron canadensis</i> Linn.	Th	N	Dec	-	D	L	W	Simple
183.	<i>Erigeron uniflorus</i> Linn	Th	L	Dec	-	D	L	W	Simple
184.	<i>Filago germanica</i> Linn.	H	N	Dec	-	D	L	W	Simple
185.	<i>Gnaphalium luteo-album</i> Linn.	H	N	Dec	-	D	L	W	Simple
186.	<i>Gnaphalium thomsonii</i> Hook.f.	H	N	Dec	-	D	L	W	Simple
187.	<i>Inula obtusifolia</i> A. Kerner	Th	Mes	Dec	-	D	L	W	Simple
188.	<i>Koelpinia linearis</i> Pallas	Th	L	Dec	-	D	L	W	Simple
189.	<i>Lactuca clarkei</i> Hook.f.	Th	N	Dec	-	D	L	W	Simple
190.	<i>Lactuca dissecta</i> D. Don	H	N	Dec	+	D	L	W	Simple
191.	<i>Lactuca orientalis</i> (Boiss.) Boiss.	Th	N	Dec	-	D	L	W	Simple
192.	<i>Lactuca sativa</i> Linn.	Th	Mac	Dec	-	D	L	C	Simple
193.	<i>Lactuca serriola</i> Linn.	Th	Mes	Dec	-	D	L	W	Simple
194.	<i>Lactuca tatarica</i> (Linn.) C.A.Mey.	Th	Mes	Dec	-	D	L	W	Simple
195.	<i>Lactuca undulata</i> Ledeb.	Th	Mic	Dec	-	D	L	W	Simple
196.	<i>Lactuca viminea</i> (L.) J. & C. Presl.	H	N	Dec	-	D	L	W	Simple
197.	<i>Launaea polyclada</i> (Boiss.) Burkill	Th	N	Dec	-	D	L	W	Simple
198.	<i>Launaea procumbens</i> (Roxb.) Ramayya & Rajagopal	Th	N	Dec	-	D	L	W	Incised
199.	<i>Leontopodium leontopodium</i> (DC.) Hand.-Mazz.	H	N	Dec	-	D	L	W	Simple
200.	<i>Matricaria chamomilla</i> Linn.	Th	N	Dec	-	D	L	W	Incised
201.	<i>Matricaria disciformis</i> (C. A. Mey) DC	Th	N	Dec	-	D	L	W	Incised
202.	<i>Matricaria praecox</i> (M.Bieb.) DC.	Th	N	Dec	-	D	L	W	Incised
203.	<i>Myriactis wallichii</i> Less.	Th	N	Dec	-	M	S	W	Simple
204.	<i>Psychrogeton andryaloides</i> (Candolle) Novopokrovsky ex Krascheninnikov	H	L	Dec	-	D	L	W	Simple
205.	<i>Pulicaria gnaphalodes</i> (Vent.) Boiss.	H	N	Dec	-	D	L	W	Simple
206.	<i>Saussurea bracteata</i> Decne	H	L	Dec	-	D	L	W	Simple
207.	<i>Saussurea gnaphalodes</i> (Royle ex Candolle) Schultz	H	L	Dec	-	D	L	W	Simple
208.	<i>Saussurea falconeri</i> Hook.f.	H	L	Dec	-	D	L	W	Simple
209.	<i>Saussurea gilesii</i> Hemsley	H	L	Dec	-	D	L	W	Simple
210.	<i>Scorzonera codringtonii</i> (Rech.f.) Podl.	H	L	Dec	-	D	L	W	Simple
211.	<i>Scorzonera virgata</i> DC	H	L	Dec	-	D	L	W	Simple
212.	<i>Senecio dubitabilis</i> C. Jeffrey & Y. L. Chen	Th	N	Dec	-	D	L	W	Simple
213.	<i>Senecio kraschennikovii</i> Schischkin	Th	N	Dec	-	D	L	W	Simple
214.	<i>Seriphidium kurramense</i> (Qazilb.) Y.R. Ling	H	L	Dec	-	D	L	W	Incised
215.	<i>Seriphidium oliverianum</i> (J. Gay ex Besser) Bremer & Humphries ex Y. R. Ling	Ch	N	Dec	-	D	L	W	Incised
216.	<i>Solidago virgaurea</i> Linn.	H	N	Dec	-	D	L	W	Simple
217.	<i>Sonchus arvensis</i> Linn.	Th	Mes	Dec	-	M	S	W	Incised
218.	<i>Sonchus asper</i> (Linn.) Hill.	Th	Mes	Dec	-	M	S	W	Incised
219.	<i>Sonchus maritimus</i> Linn.	Th	N	Dec	-	M	S	W	Incised
220.	<i>Sonchus oleraceus</i> Linn.	Th	N	Dec	-	M	S	W	Incised
221.	<i>Tagetes erecta</i> Linn.	Th	N	Dec	-	D	L	W	Incised
222.	<i>Taraxacum dealbatum</i> Handel-Mazzett	G	N	Dec	-	M	L	W	Simple
223.	<i>Taraxacum officinale</i> Weber.	G	Mes	Dec	-	M	L	W	Simple
224.	<i>Taraxacum stenolepium</i> Hand.-Mazz.	G	N	Dec	-	M	L	W	Simple
225.	<i>Tragopogon gracilis</i> D. Don	H	N	Dec	-	D	L	W	Simple
226.	<i>Tricholepis tibetica</i> J. D. Hooker & Thomson ex C. B. Clarke	H	N	Dec	-	D	L	W	Simple
227.	<i>Tussilago farfara</i> Linn.	G	Mac	Dec	-	M	L	W	Simple
228.	<i>Xanthium strumarium</i> Linn.	Th	Mes	Dec	+	D	L	W	Simple
<b>24. Family Berberidaceae</b>									
229.	<i>Berberis orthobotrys</i> Bien. ex Aitch	NP	N	Dec	+	D	L	W	Simple
230.	<i>Berberis lycium</i> Royle	NP	N	Dec	+	D	L	W	Simple
231.	<i>Berberis pseudoumbellata</i> subsp. <i>gilgitica</i> Jafri.	NP	N	Dec	+	D	L	W	Simple
<b>25. Family Betulaceae</b>									
232.	<i>Betula utilis</i> D. Don.	MP	Mes	Dec	-	D	L	W	Simple
<b>26. Family Boraginaceae</b>									
233.	<i>Arnebia euchroma</i> (Royle ex Benth) I.M. Johnston	H	N	Dec	-	D	L	W	Simple
234.	<i>Arnebia hispidissima</i> (Lehm.) A. DC.	H	Mes	Dec	-	D	L	W	Simple
235.	<i>Arnebia guttata</i> Bunge	H	N	Dec	-	D	L	W	Simple

Table 1. (Cont'd.).

S. No.	Plant species	1	2	3	4	5	6	7	8
236.	<i>Arnebia linearifolia</i> A. DC.	H	N	Dec	-	D	L	W	Simple
237.	<i>Cynoglossum glochidiatum</i> Wall ex Benth.	H	N	Dec	-	D	L	W	Simple
238.	<i>Cynoglossum lanceolatum</i> Forssk.	H	Mic	Dec	-	D	L	W	Simple
239.	<i>Eritrichum canum</i> var. <i>canum</i> (Benth & Royle) Kit.	H	N	Dec	-	D	L	W	Simple
240.	<i>Eritrichum nanum</i> subsp. <i>villosum</i> (Ledeb) Brand	H	L	Dec	-	D	L	W	Simple
241.	<i>Heliotropium dasycarpum</i> Ledeb.	H	L	Dec	-	D	L	W	Simple
242.	<i>Lappula barbata</i> (M. Bieb) Gurke	Th	L	Dec	-	D	L	W	Simple
243.	<i>Lindelofia anchlussoides</i> (Lindl) Lehm.	H	Mic	Dec	-	D	L	W	Simple
244.	<i>Lindelofia stylosa</i> (Kar & Kir) Brand	H	Mic	Dec	-	D	L	W	Simple
245.	<i>Lindelofia longiflora</i> (Benth) Baill	H	N	Dec	-	D	L	W	Simple
246.	<i>Mattiastrum himalayense</i> (Klotzsch) Brand	Ch	L	Dec	-	D	L	W	Simple
247.	<i>Mattiastrum tibeticum</i> (C.B. Clark) Brand	Ch	L	Dec	-	D	L	W	Simple
248.	<i>Myosotis alpestris</i> subsp. <i>asiatica</i> Vestergren ex Hulten.	H	Mic	Dec	-	D	L	W	Simple
249.	<i>Myosotis arvensis</i> (Linn.) Hill.	H	N	Dec	-	D	L	W	Simple
250.	<i>Nonea edgeworthii</i> A. DC.	H	N	Dec	-	D	L	W	Simple
251.	<i>Onosma hispida</i> Wall ex G. Don	H	N	Dec	-	D	L	W	Simple
252.	<i>Rochelia stylaris</i> Boiss.	Th	N	Dec	-	D	L	W	Simple
<b>27. Family Brassicaceae</b>									
253.	<i>Arabis amplexicaulis</i> Edgew.	Th	N	Dec	-	D	L	W	Incised
254.	<i>Arabis fruticulosa</i> C. A. Mey	H	N	Dec	-	D	L	W	Simple
255.	<i>Arabis tibetica</i> Hook. f. & Thoms	H	N	Dec	-	D	L	W	Simple
256.	<i>Brassica campestris</i> Linn.	Th	Mac	Dec	-	D	L	C	Incised
257.	<i>Capsella bursa-pastoris</i> (L.) Medic.	Th	Mes	Dec	-	M	L	W	Incised
258.	<i>Chorispora macropoda</i> Trautv.	Th	N	Dec	-	D	L	W	Simple
259.	<i>Chorispora siberica</i> (Linn) DC	Th	N	Dec	-	D	L	W	Incised
260.	<i>Conringia planisiliqua</i> Fisch & Mey	Th	Mes	Dec	-	D	L	W	Simple
261.	<i>Coronopus didymus</i> (Linn.) Smith.	Th	L	Dec	-	M	L	W	Incised
262.	<i>Descurainia sophia</i> (Linn.) Webb & Berth	Th	N	Dec	-	D	L	W	Incised
263.	<i>Draba cachemirica</i> Gandoger.	Th	N	Dec	-	D	L	W	Simple
264.	<i>Draba korshinskyi</i> (O. Fedtschenko) Pohle	H	L	Dec	-	D	L	W	Simple
265.	<i>Draba lanceolata</i> Royle	H	L	Dec	-	D	L	W	Simple
266.	<i>Draba melanopus</i> Komarov	H	L	Dec	-	D	L	W	Simple
267.	<i>Draba nemorosa</i> Linn	Th	L	Dec	-	D	L	W	Simple
268.	<i>Draba stenocarpa</i> Hook.f. & Thoms.	Th	L	Dec	-	D	L	W	Simple
269.	<i>Draba tibetica</i> Hook. f. & Thoms	H	L	Dec	-	D	L	W	Simple
270.	<i>Lepidium sativum</i> Linn.	Th	N	Dec	-	D	L	W	Simple
271.	<i>Lepidium apetalum</i> Willdenow	Th	N	Dec	-	D	L	W	Simple
272.	<i>Malcolmia africana</i> (Linn.) R. Br.	Th	L	Dec	-	D	L	W	Simple
273.	<i>Malcolmia cabulica</i> (Boiss.) Hook. f. & Thoms.	Th	N	Dec	-	D	L	W	Simple
274.	<i>Matthiola flavida</i> Boiss.	Ch	Mes	Dec	-	D	L	W	Simple
275.	<i>Nasturtium officinale</i> R. Br.	G-Hyd	N	E	-	Aq	L	W	Incised
276.	<i>Neslia apiculata</i> Fisch., C.A. Mey. & Ave'-Lall	Th	L	Dec	-	D	L	W	Simple
277.	<i>Raphanus raphanistrum</i> Linn.	Th	N	Dec	-	D	L	C	Incised
278.	<i>Raphanus sativus</i> Linn. var. <i>sativus</i>	Th	Mac	Dec	-	D	L	C	Incised
279.	<i>Rorippa islandica</i> (Oed.) Borbas.	Th	N	Dec	-	M	L	W	Simple
280.	<i>Sisymbrium brassiciforme</i> C.A. Mey	Th	L	Dec	-	D	L	W	Incised
<b>28. Family Callitrichaceae</b>									
281.	<i>Callitriche palustris</i> Linn	G-Hyd	L	Dec	-	Aq	S	W	Simple
<b>29. Family Campanulaceae</b>									
282.	<i>Asyneuma strictum</i> Wendelbo	H	L	Dec	-	D	L	W	Simple
283.	<i>Codonopsis clematidea</i> (Schrenk) C. B. Clarke	Th	N	Dec	-	Wet	S	W	Simple
284.	<i>Codonopsis rotundifolia</i> Benth.	H	Mes	Dec	-	Wet	S	W	Simple
<b>30. Family Canabinaceae</b>									
285.	<i>Canabis sativa</i> Linn.	Th	N	Dec	-	D	L	W	Comp
<b>31. Family Capparidaceae</b>									
286.	<i>Capparis spinosa</i> Linn.	H	Mes	Dec	+	D	L	W	Simple
287.	<i>Cleome ariana</i> Hedge & Lamond	Th	N	Dec	-	D	L	W	Simple
<b>32. Family Caprifoliaceae</b>									
288.	<i>Lonicera asperifolia</i> (Decne.) Hook. f. & Thoms.	Ch	N	Dec	-	D	L	W	Simple
<b>33. Family Caryophyllaceae</b>									
289.	<i>Arenaria griffithii</i> Boiss	Ch	L	E	+	D	L	W	Simple
290.	<i>Arenaria neelgerrensis</i> Wight & Arn.	Th	L	Dec	-	D	L	W	Simple
291.	<i>Arenaria serpyllifolia</i> Linn.	Th	N	Dec	-	D	L	W	Simple
292.	<i>Cerastium cerastioides</i> (L.) Britton.	Th	Mes	Dec	-	D	S	W	Simple
293.	<i>Cerastium glomeratum</i> Thuill	Th	L	Dec	-	D	L	W	Simple
294.	<i>Cerastium thomsonii</i> Hook.	H	L	Dec	-	D	L	W	Simple

Table 1. (Cont'd.).

S. No.	Plant species	1	2	3	4	5	6	7	8
295.	<i>Dianthus anatolicus</i> Boiss.	H	N	Dec	-	D	L	W	Simple
296.	<i>Dianthus angulatus</i> Royle ex Bth.	H	N	Dec	-	D	L	W	Simple
297.	<i>Dianthus crinatus</i> Sm	H	N	Dec	-	D	L	W	Simple
298.	<i>Gypsophila floribunda</i> (Kar. & Kir.) Turez & Ledeb	Th	N	Dec	-	D	L	W	Simple
299.	<i>Lepyrodictilis holosteoides</i> C.A. Mey.	Th	N	Dec	-	D	L	W	Simple
300.	<i>Minuartia hybrida</i> (Vill.) Schischkin.	Th	N	Dec	-	D	L	W	Simple
301.	<i>Minuartia kashmirica</i> (Edgew.) Mattf.	H	L	Dec	-	D	L	W	Simple
302.	<i>Saponaria griffithiana</i> Boiss.	H	L	Dec	-	D	L	W	Simple
303.	<i>Silene arenosa</i> C.Koch.	Th	N	Dec	-	D	L	W	Simple
304.	<i>Silene conoidea</i> L.	Th	N	Dec	-	D	L	W	Simple
305.	<i>Silene gonosperma</i> ssp. <i>himalayensis</i> (Rohrb) Bocquet	H	L	Dec	-	D	L	W	Simple
306.	<i>Silene kunawurensis</i> Bth.	H	L	Dec	-	D	L	W	Simple
307.	<i>Silene moorcroftiana</i> Wall.	H	L	Dec	-	D	L	W	Simple
308.	<i>Stellaria alsinoides</i> Boiss & Buhse	Th	L	Dec	-	D	L	W	Simple
309.	<i>Stellaria media</i> (L.) Vill.	Th	N	Dec	-	D	L	W	Simple
310.	<i>Stellaria uliginosa</i> Murr	H	N	Dec	-	D	L	W	Simple
311.	<i>Vaccaria pyramidata</i> Medik.	Th	N	Dec	-	D	L	W	Simple
<b>34. Family Chenopodiaceae</b>									
312.	<i>Atriplex tatarica</i> Linn.	Th	N	Dec	-	D	L	W	Simple
313.	<i>Atriplex schugnanica</i> Iljin	Th	N	Dec	-	D	L	W	Simple
314.	<i>Beta vulgaris</i> Linn.	Th	Mac	Dec	-	D	L	C	Simple
315.	<i>Chenopodium album</i> Linn.	Th	N	Dec	-	D	L	C	Simple
316.	<i>Chenopodium ambrosioides</i> Linn.	Th	L	Dec	-	M	L	W	Simple
317.	<i>Chenopodium botrys</i> Linn.	Th	L	Dec	-	D	L	W	Simple
318.	<i>Chenopodium foliosum</i> Aschers.	Th	N	Dec	-	D	L	W	Simple
319.	<i>Chenopodium murale</i> Linn.	Th	N	Dec	-	D	L	W	Simple
320.	<i>Haloxylon griffithii</i> (Moq.) Boiss.	Ch	L	E	-	D	L	W	Simple
321.	<i>Haloxylon griffithii</i> (Paulsen) Hedge subsp. <i>griffithii</i>	Ch	L	E	-	D	L	W	Simple
322.	<i>Kochia stellaris</i> Mocq	Th	L	Dec	-	D	L	W	Simple
323.	<i>Kochia prostrata</i> (Linn.) Schard.	Th	L	Dec	-	D	L	W	Incised
324.	<i>Krascheninnikovia ceratoides</i> (Linn.) Guldenst	H	N	Dec	-	D	L	W	Simple
325.	<i>Salsola tragus</i> Linn.	Th	L	E	+	D	L	W	Simple
<b>35. Family Convolvulaceae</b>									
326.	<i>Convolvulus arvensis</i> Linn.	Th (Cl)	Mes	Dec	-	D	L	W	Simple
<b>36. Family Crassulaceae</b>									
327.	<i>Rhodiola coccinea</i> (Royle) Boriss	Ch	Mes	Dec	-	D	L	W	Simple
328.	<i>Rhodiola heterodonta</i> (Hook.f., & Thomson) Boriss.	G	N	Dec	-	D	L	W	Simple
329.	<i>Rosularia alpestris</i> (Kar & Kir) Boriss	Ch	Mes	Dec	-	D	L	W	Simple
330.	<i>Rosularia rosulata</i> (Edgew.) H.Ohba	Ch	Mes	Dec	-	D	L	W	Simple
331.	<i>Sedum ewersii</i> Ledeb.	G	N	Dec	-	D	L	W	Simple
<b>37. Family Cucurbitaceae</b>									
332.	<i>Citrullus lanatus</i> (Thunb.) Mats. & Nakai	Th	Mes	Dec	-	D	L	C	Comp
333.	<i>Cucurbita maxima</i> Duch ex Lam.	Th	Mac	Dec	-	D	L	C	Comp
334.	<i>Cucumis sativus</i> Linn.	Th	Mes	Dec	-	D	L	C	Comp
<b>38. Family Cuscutaceae</b>									
335.	<i>Cuscuta europaea</i> Linn.	P	Aph	Ap	-	D	L	W	Aph
336.	<i>Cuscuta reflexa</i> Roxb.	P	Aph	Ap	-	D	L	W	Aph
<b>39. Family Elaeagnaceae</b>									
337.	<i>Elaeagnus angustifolia</i> Linn.	MP	Mes	Dec	+	D	L	C	Simple
338.	<i>Hippophae rhamnoides</i> subsp. <i>turkestanica</i> Rousi	MP	N	Dec	+	D	L	W	Simple
<b>40. Family Euphorbiaceae</b>									
339.	<i>Euphorbia falcata</i> Linn.	Th	N	Dec	-	D	L	W	Simple
340.	<i>Euphorbia osyridea</i> Boiss.	Ch	N	E	-	D	L	W	Simple
341.	<i>Euphorbia pamirica</i> Prokh	H	L	Dec	-	D	L	W	Simple
342.	<i>Euphorbia peplus</i> Linn.	Th	L	Dec	-	D	L	W	Simple
343.	<i>Euphorbia</i> Sp.	H	N	Dec	-	D	L	W	Simple
344.	<i>Euphorbia wallichii</i> Hk.f.	Th	N	Dec	-	D	L	W	Simple
<b>41. Family Fumariaceae</b>									
345.	<i>Corydalis govantiana</i> Wall ex Trend.	G	L	Dec	-	Wet	S	W	Incised
346.	<i>Fumaria indica</i> (Hausskn.) Linn.	Th	L	Dec	-	D	L	W	Incised
<b>42. Family Gentianaceae</b>									
347.	<i>Centaurium meyeri</i> (Bunge.) Druce.	Th	N	Dec	-	D	L	W	Simple
348.	<i>Gentiana kurroo</i> Royle	Th	L	Dec	-	Wet	L	W	Simple
349.	<i>Jaeschkea oligosperma</i> (Griseb.) Knobloch	Th	N	Dec	-	Wet	L	W	Simple
350.	<i>Swertia speciosa</i> D. Don.	G	N	Dec	-	Wet	L	W	Simple

Table 1. (Cont'd.).

S. No.	Plant species	1	2	3	4	5	6	7	8
<b>43. Family Geraniaceae</b>									
351.	<i>Geranium pratense</i> Linn.	Th	Mes	Dec	-	Wet	S	W	Comp
352.	<i>Geranium rotundifolium</i> Linn.	Th	N	Dec	-	M	S	W	Comp
353.	<i>Geranium wallichinum</i> D. Don ex Sweet.	Th	Mes	Dec	-	Wet	S	W	Comp
<b>44. Family Grossulariaceae</b>									
354.	<i>Ribes alpestre</i> Decne.	NP	N	Dec	-	Wet	L	W	Comp
355.	<i>Ribes orientale</i> Desf.	NP	Mes	Dec	-	D	L	W	Comp
<b>45. Family Hippuridaceae</b>									
356.	<i>Hippuris vulgaris</i> Linn.	G	N	Dec	-	Aq	L	W	Simple
<b>46. Family Hypericaceae</b>									
357.	<i>Hypericum scabrum</i> Linn.	H	N	Dec	-	D	L	W	Simple
<b>47. Family Juglandaceae</b>									
358.	<i>Juglans regia</i> Linn.	MP	Mac	Dec	-	D	L	C	Comp
<b>48. Family Lamiaceae</b>									
359.	<i>Alajja rhomboidea</i> (Benth.) Ikonn. Gal.	G	N	Dec	-	D	L	W	Simple
360.	<i>Dracocephalum nutans</i> Linn.	G	N	Dec	-	D	L	W	Simple
361.	<i>Lamium amplexicaule</i> Linn.	Th	N	Dec	-	Wet	L	W	Simple
362.	<i>Marrubium vulgare</i> Linn.	Ch	Mes	Dec	-	D	L	W	Simple
363.	<i>Mentha longifolia</i> (Linn.) Linn.	G	Mes	Dec	-	Aq	L	W	Simple
364.	<i>Mentha royleana</i> Benth.	G	N	Dec	-	Aq	L	W	Simple
365.	<i>Nepeta cataria</i> Linn.	Ch	Mes	Dec	-	D	L	W	Simple
366.	<i>Nepeta discolor</i> Royle ex Bth	H	N	Dec	-	D	L	W	Simple
367.	<i>Nepeta glutinosa</i> Benth.	Th	Mic	Dec	-	Wet	L	W	Simple
368.	<i>Nepeta kokanica</i> Regel	Th	N	Dec	-	D	L	W	Simple
369.	<i>Nepeta laevigata</i> (D. Don) Hand. Mazz.	G	Mes	Dec	-	D	L	W	Simple
370.	<i>Nepeta paulsenii</i> Briq.	Th	N	Dec	-	D	L	W	Simple
371.	<i>Nepeta subincisa</i> Benth.	H	N	Dec	-	D	L	W	Simple
372.	<i>Nepeta longibracteata</i> Benth.	H	Mic	Dec	-	D	L	W	Simple
373.	<i>Nepeta raphanorhiza</i> Benth.	Th	N	Dec	-	D	L	W	Simple
374.	<i>Ocimum basilicum</i> Linn.	Ch	N	Dec	-	D	L	C	Simple
375.	<i>Ocimum sanctum</i> Linn.	Th	Mes	Dec	-	D	L	C	Simple
376.	<i>Otostegia limbata</i> (Bth.) Boiss.	Ch	N	Dec	+	D	L	W	Simple
377.	<i>Salvia aegyptiaca</i> L.	Ch	N	Dec	-	D	L	W	Simple
378.	<i>Salvia nubicola</i> Wall ex Sweet	Ch	Mes	Dec	-	D	L	W	Simple
379.	<i>Salvia rhytidea</i> Benth.	Ch	N	Dec	-	D	L	W	Simple
380.	<i>Scutellaria multicaulis</i> Boiss.	H	L	Dec	-	D	L	W	Simple
381.	<i>Thymus linearis</i> Benth subsp. <i>hedgei</i> Jalas.	Ch	N	Dec	-	D	L	W	Simple
382.	<i>Thymus linearis</i> Benth subsp. <i>linearis</i> Jalas.	H	N	Dec	-	D	L	W	Simple
383.	<i>Ziziphora clinopodioides</i> Lam.	H	L	Dec	-	D	L	W	Simple
384.	<i>Ziziphora tenuior</i> Linn.	Th	L	Dec	-	D	L	W	Simple
<b>49. Family Lentibulariaceae</b>									
385.	<i>Utricularia australis</i> R. Br. (insectivorous)	G	L	Dec	-	Aq	S	W	Incised
<b>50. Family Linaceae</b>									
386.	<i>Linum usitatissimum</i> Linn.	Th	N	Dec	-	D	L	C	Simple
<b>51. Family Malvaceae</b>									
387.	<i>Abutilon bidentatum</i> Hochst ex A. Rich.	Th	Mes	Dec	-	D	L	W	Simple
388.	<i>Alcea rosea</i> (Linn.) Cav.	H	Mac	Dec	-	D	L	W	Comp
389.	<i>Malva neglecta</i> Wall.	Th	Mes	Dec	-	D	L	W	Comp
390.	<i>Malva parviflora</i> Linn.	Th	N	Dec	-	D	L	W	Simple
<b>52. Family Meliaceae</b>									
391.	<i>Melia azedarach</i> Linn.	MP	Mic	Dec	-	D	L	C	Comp
<b>53. Family Moraceae</b>									
392.	<i>Morus alba</i> Linn.	MP	Mac	Dec	-	D	L	C	Simple
393.	<i>Morus nigra</i> Linn.	MP	Mac	Dec	-	D	L	C	Simple
<b>54. Family Oleaceae</b>									
394.	<i>Fraxinus xanthoxyloides</i> Wall ex G. Don.	NP	Mic	Dec	-	D	L	W	Comp
<b>55. Family Onagraceae</b>									
395.	<i>Epilobium angustifolium</i> Linn.	Th	Mes	Dec	-	D	L	W	Simple
396.	<i>Epilobium cylindricum</i> D. Don.	Th	N	Dec	-	D	L	W	Simple
397.	<i>Epilobium hirsutum</i> Linn.	Th	N	Dec	-	Wet	L	W	Simple
<b>56. Family Paeoniaceae</b>									
398.	<i>Paeonia emodi</i> Wall. ex Royle	G	N	Dec	-	Wet	S	W	Comp
<b>57. Family Papaveraceae</b>									
399.	<i>Papaver nudicaule</i> Linn.	H	L	Dec	-	D	L	W	Incised
400.	<i>Papaver somniferum</i> Linn.	Th	Mac	Dec	-	D	L	C	Simple

Table 1. (Cont'd.).

S. No.	Plant species	1	2	3	4	5	6	7	8
<b>58. Family Papilionaceae</b>									
401.	<i>Astragalus amherstianus</i> Royle ex Benth.	H	L	Dec	+	D	L	W	Comp
402.	<i>Astragalus candolleanus</i> Royle ex Bth	H	L	Dec	-	D	L	W	Comp
403.	<i>Astragalus chlorostachys</i> Lindl.	Th	N	Dec	-	D	L	W	Simple
404.	<i>Astragalus corrugatus</i> Bertol.	Th	N	Dec	-	D	L	W	Comp
405.	<i>Astragalus falconeri</i> Bunge	H	L	Dec	-	D	L	W	Comp
406.	<i>Astragalus gilgitensis</i> Ali	H	Mic	Dec	+	D	L	W	Comp
407.	<i>Astragalus grahammianus</i> Royle ex Bth.	Ch	L	Dec	-	D	L	W	Comp
408.	<i>Astragalus lasiosemius cushion</i>	Ch	N	Dec	+	D	L	W	Comp
409.	<i>Astragalus laspurensis</i> Ali	H	L	Dec	-	D	L	W	Comp
410.	<i>Astragalus subumbellatus</i> Klotzsch.	H	N	Dec	+	D	L	W	Comp
411.	<i>Astragalus peduncularis</i> Royle ex Bth.	H	L	Dec	-	D	L	W	Comp
412.	<i>Astragalus psilocentros</i> Fisch.	H	L	Dec	+	D	L	W	Comp
413.	<i>Astragalus nivalis</i> Kar & Kir	H	L	Dec	-	D	L	W	Comp
414.	<i>Astragalus tibetanus</i> Benth ex Bunge	H	L	Dec	+	D	L	W	Comp
415.	<i>Chesneya depressa</i> (Oliver.) Popov	H	L	Dec	-	D	L	W	Simple
416.	<i>Cicer macranthum</i> M. Popov	H	L	Dec	+	D	L	W	Comp
417.	<i>Cicer microphyllum</i> Benth	H	L	Dec	+	D	L	W	Comp
418.	<i>Colutea paulsenii</i> Feryh.	NP	N	Dec	-	D	L	W	Simple
419.	<i>Crotolaria prostrata</i> Roxb ex D.Don.	H	L	Dec	-	D	L	W	Simple
420.	<i>Glycyrrhiza glabra</i> Linn.	G	Mes	Dec	-	D	L	W	Simple
421.	<i>Hedysarum falconeri</i> Baker	H	Mes	Dec	-	M	L	W	Simple
422.	<i>Lotus corniculatus</i> var. <i>tennifolius</i> Linn.	H	L	Dec	-	D	L	W	Simple
423.	<i>Lotus corniculatus</i> var. <i>corniculatus</i> Linn.	H	L	Dec	-	D	L	W	Simple
424.	<i>Lespedeza</i> Sp.	Th	N	Dec	-	D	L	W	Simple
425.	<i>Medicago lupulina</i> Linn.	Th	N	Dec	-	D	L	W	Comp
426.	<i>Medicago polymorpha</i> Linn.	Th	N	Dec	-	D	L	W	Comp
427.	<i>Medicago sativa</i> Linn.	H	N	Dec	-	D	L	C	Comp
428.	<i>Melilotus officinale</i> (Linn.) Desr.	Th	N	Dec	-	D	L	W	Comp
429.	<i>Melilotus indica</i> (Linn.) All.	Th	N	Dec	-	D	L	W	Comp
430.	<i>Oxytropis mollis</i> Royle ex Bth	H	L	Dec	+	D	L	W	Comp
431.	<i>Oxytropis tatarica</i> Camb ex Bunge	H	L	Dec	-	D	L	W	Comp
432.	<i>Pisum sativum</i> Linn.	Th	Mic	Dec	-	D	L	C	Simple
433.	<i>Sophora mollis</i> (Royle.) Baker	NP	N	Dec	-	D	L	W	Simple
434.	<i>Trifolium pratense</i> Linn.	G	N	Dec	-	M	L	W	Simple
435.	<i>Trifolium repens</i> Linn.	G	N	Dec	-	M	L	W	Simple
436.	<i>Trifolium resupinatum</i> Linn.	Th	Mes	Dec	-	M	L	C	Simple
437.	<i>Vicia monantha</i> Retz.	Th (Cl)	N	Dec	-	M	L	W	Simple
438.	<i>Vicia sativa</i> L.	Th (Cl)	N	Dec	-	M	L	W	Simple
<b>59. Family Parnassiaceae</b>									
439.	<i>Parnassia nubicola</i> Planch ex Clarke.	Th	Mes	Dec	-	Aq	L	W	Simple
<b>60. Family Plantaginaceae</b>									
440.	<i>Plantago lanceolata</i> Linn.	Th	Mic	Dec	-	D	L	W	Simple
441.	<i>Plantago major</i> Aitch.	G	Mac	Dec	-	Aq	L	W	Simple
<b>61. Family Platanaceae</b>									
442.	<i>Platanus orientalis</i> Linn.	MP	Mac	Dec	-	D	L	C	Comp
<b>62. Family Plumbaginaceae</b>									
443.	<i>Acantholimon kokandense</i> Bunge	Ch	L	Dec	+	D	L	W	Simple
444.	<i>Acantholimon longiscapum</i> Bokhari.	Ch	L	Dec	+	D	L	W	Simple
445.	<i>Acantholimon lycopodioides</i> (Girad) Boiss	Ch	L	Dec	+	D	L	W	Simple
446.	<i>Psylliostachys suworowii</i> (Regel.) Roshk.	Th	Mac	Dec	-	D	L	W	Simple
<b>63. Family Polygonaceae</b>									
447.	<i>Aconogonon tortuosum</i> (D. Don) Hara	H	Mes	Dec	-	D	L	W	Simple
448.	<i>Atraphaxis pyrifolia</i> Bunge	NP	Mes	Dec	+	D	L	W	Simple
449.	<i>Atraphaxis spinosa</i> Linn.	Ch	L	Dec	+	D	L	W	Simple
450.	<i>Bistorta affinis</i> (D. Don) Green	Ch	N	Dec	-	D	L	W	Simple
451.	<i>Bistorta vivipara</i> (Linn) S. F. Gray	H	N	Dec	-	D	L	W	Simple
452.	<i>Fallopia convolvulus</i> (L.) A. Löve	Th	N	Dec	-	D	L	W	Simple
453.	<i>Fallopia dumetorum</i> (Linn.) Holub	Th	Mes	Dec	-	D	L	W	Simple
454.	<i>Oxyria digyna</i> (L.) Hill.	Th	N	Dec	-	M	L	W	Simple
455.	<i>Persicaria barbata</i> (Linn.) Hara var <i>gracilis</i> (Danser) Hara	Th	N	Dec	-	D	L	W	Simple
456.	<i>Persicaria chinensis</i> (Linn.) H. Gross	Th	N	Dec	-	D	L	W	Simple
457.	<i>Persicaria glabra</i> (Willd.) M. Gomes	H	N	Dec	-	D	L	W	Simple
458.	<i>Persicaria hydropiper</i> (Linn.) Spach	G-Hyd	Mes	Dec	-	Aq	L	W	Simple
459.	<i>Persicaria maculosa</i> S.F. Gay	Th	Mic	Dec	-	Aq	L	W	Simple
460.	<i>Persicaria nepalensis</i> (Meiss.) H. Gross	Th	N	Dec	-	D	L	W	Simple

Table 1. (Cont'd.).

S. No.	Plant species	1	2	3	4	5	6	7	8
461.	<i>Persicaria orientalis</i> (Linn.) Spach	Th	N	Dec	-	D	L	W	Simple
462.	<i>Polygonum afghanicum</i> Meiss.	Th	L	Dec	-	D	L	W	Simple
463.	<i>Polygonum aviculare</i> Linn.	Th	L	Dec	-	D	L	W	Simple
464.	<i>Polygonum paronychioides</i> C.A. Mey & Hohen	H	L	Dec	-	D	L	W	Simple
465.	<i>Polygonum rottboellioides</i> Jaub	Th	L	Dec	-	D	L	W	Simple
466.	<i>Polygonum sp</i>	Th	N	Dec	-	D	L	W	Simple
467.	<i>Rheum emodi</i> Wall.ex Meissn.	G	Mac	Dec	-	D	L	W	Comp
468.	<i>Rheum tibeticum</i> Maxim	G	Mac	Dec	-	D	L	W	Simple
469.	<i>Rumex hastatus</i> D. Don	Ch	Mes	Dec	-	D	L	W	Simple
470.	<i>Rumex longifolius</i> DC.	Th	Mes	Dec	-	D	L	W	Simple
471.	<i>Rumex nepalensis</i> Spreng.	H	Mes	Dec	-	M	L	W	Simple
	<b>64. Family Portulacaceae</b>								
472.	<i>Portulaca oleracea</i> Linn.	Th	N	Dec	-	D	L	C	Simple
	<b>65. Family Primulaceae</b>								
473.	<i>Androsace baltistanica</i> Y. Nasir	H	N	Dec	-	D	L	W	Comp
474.	<i>Androsace mucronifolia</i> Watt	Ch	N	Dec	-	D	L	W	Comp
475.	<i>Primula elliptica</i> Royle.	H	N	Dec	-	M	L	W	Simple
476.	<i>Primula macrophylla</i> D. Don.	H	Mes	Dec	-	M	L	W	Simple
	<b>66. Family Punicaceae</b>								
477.	<i>Punica granatum</i> Linn.	NP	Mes	Dec	-	D	L	C	Simple
	<b>67. Family Ranunculaceae</b>								
478.	<i>Anemone polyanthes</i> D. Don	H	Mes	Dec	-	M	L	W	Incised
479.	<i>Aconitum heterophyllum</i> Wall ex Royle	H	Mes	Dec	-	M	L	W	Incised
480.	<i>Aconitum rotundifolium</i> Kar et Kar.	H	Mes	Dec	-	M	L	W	Incised
481.	<i>Aconitum violaceum</i> Jacquem. ex Stapf	H	Mes	Dec	-	M	L	W	Incised
482.	<i>Clematis graveolens</i> Lindl.	NP (Cl)	N	Dec	-	D	L	W	Comp
483.	<i>Clematis grata</i> Wall.	NP (Cl)	N	Dec	-	D	L	W	Comp
484.	<i>Clematis orientalis</i> Linn.	NP (Cl)	N	Dec	-	D	L	W	Comp
485.	<i>Delphinium nordhagenii</i> Wendelbow.	Ch	Mic	Dec	-	D	L	W	Incised
486.	<i>Ranunculus arvensis</i> Linn.	Th-	N	Dec	-	Aq	L	W	Incised
		Hyd							
487.	<i>Ranunculus lobatus</i> Jacquem. ex Camb.	G-Hyd	L	Dec	-	Aq	L	W	Incised
488.	<i>Ranunculus natans</i> C. A. Mey.	Th-	N	Dec	-	Aq	L	W	Incised
		Hyd							
489.	<i>Thalictrum alpinum</i> Linn.	Th	N	Dec	-	M	L	W	Incised
490.	<i>Thalictrum vaginatum</i> Royle	H	N	Dec	-	M	L	W	Simple
	<b>68. Family Resedaceae</b>								
491.	<i>Reseda odorata</i> Linn.	Th	L	Dec	-	D	L	W	Incised
	<b>69. Family Rosaceae</b>								
492.	<i>Agrimonia eupatoria</i> Linn.	H	N	Dec	-	D	L	W	Comp
493.	<i>Cotoneaster affinis</i> var. <i>bacillaris</i> (Lindl.) Schneider.	MP	Mes	Dec	-	D	L	W	Simple
494.	<i>Cotoneaster microphylla</i> Wall.ex Lind	NP	L	Dec	-	D	L	W	Simple
495.	<i>Cotoneaster nummularia</i> Fisch.& C.A. Mey	NP	N	Dec	-	D	L	W	Simple
496.	<i>Crataegus songarica</i> K. Koch.	MP	Mes	Dec	-	D	L	W	Comp
497.	<i>Malus domestica</i> Linn.	MP	Mac	Dec	-	D	L	C	Simple
498.	<i>Potentilla biflora</i> Wild. ex Schlecht	H	Mes	Dec	-	D	L	W	Comp
499.	<i>Potentilla bifurca</i> Linn.	Ch	Mes	Dec	-	D	L	W	Comp
500.	<i>Potentilla cuneifolia</i> Bertol	Ch	Mes	Dec	-	D	L	W	Comp
501.	<i>Potentilla gelida</i> C. A. Mey.	Ch	Mes	Dec	-	D	L	W	Comp
502.	<i>Potentilla dryandanthoides</i> (Juz) Viroshilov	Ch	N	Dec	-	D	L	W	Comp
503.	<i>Potentilla multifida</i> Linn	H	Mes	Dec	-	D	L	W	Comp
504.	<i>Potentilla ornithopoda</i> Tausch var. <i>ornithopoda</i> .	Th	N	Dec	-	D	L	W	Simple
505.	<i>Potentilla pamirica</i> Th. Wolf.	Th	N	Dec	-	D	L	W	Simple
506.	<i>Potentilla salesoviana</i> Steph	NP	L	Dec	-	D	L	W	Comp
507.	<i>Potentilla supina</i> Linn.	Ch	L	Dec	-	D	L	W	Simple
508.	<i>Pyrus communis</i> Linn.	MP	Mac	Dec	-	D	L	C	Simple
509.	<i>Prunus amygdalus</i> Batsch	MP	Mes	Dec	-	D	L	C	Simple
510.	<i>Prunus armeniaca</i> Linn.	MP	Mes	Dec	-	D	L	C	Simple
511.	<i>Prunus griffithii</i> (Boiss.) C.K. Schneid	NP	Mes	Dec	-	D	L	W	Simple
512.	<i>Prunus jacquemontii</i> Hook. f.	NP	Mes	Dec	-	D	L	W	Simple
513.	<i>Prunus persica</i> (Linn.) Batsch.	MP	Mes	Dec	-	D	L	C	Simple
514.	<i>Rosa alba</i> Linn.	NP	Mes	Dec	+	D	L	C	Comp
515.	<i>Rosa webbiana</i> Wall.ex Royle	NP	N	Dec	+	D	L	W	Comp
516.	<i>Rubus fruticosus</i> Linn.	NP	Mes	Dec	+	D	L	W	Comp
517.	<i>Sibaldia cuneata</i> Kunze	Ch	Mic	Dec	-	D	L	W	Comp
	<b>70. Family Rubiaceae</b>								
518.	<i>Asperula oppositifolia</i> subsp. <i>cabaulica</i> Ehrend.	Th	N	Dec	-	D	L	W	Simple
519.	<i>Asperula oppositifolia</i> ssp. <i>pseudocynanchia</i> Ehrend.	Th	L	Dec	-	D	L	W	Simple
520.	<i>Galium aparine</i> Linn.	Th (Cl)	N	Dec	-	D	L	W	Simple
521.	<i>Galium asperifolium</i> Wall.	Th (Cl)	N	Dec	-	D	L	W	Simple

Table 1. (Cont'd.).

S. No.	Plant species	1	2	3	4	5	6	7	8
522.	<i>Galium boreale</i> Linn	Th (Cl)	L	Dec	-	D	L	W	Simple
523.	<i>Galium pauciflorum</i> Bunge	Th (Cl)	L	Dec	-	D	L	W	Simple
524.	<i>Galium tricornutum</i> Dandy.	Th (Cl)	N	Dec	-	D	L	W	Simple
<b>71. Family Salicaceae</b>									
525.	<i>Populus alba</i> Linn.	MP	Mes	Dec	-	M	L	C	Simple
526.	<i>Populus nigra</i> Linn.	MP	Mac	Dec	-	M	L	C	Simple
527.	<i>Salix acmophylla</i> Boiss.	MP	Mes	Dec	-	M	L	W	Simple
528.	<i>Salix capusii</i> Franchet	MP	Mes	Dec	-	M	L	W	Simple
529.	<i>Salix tetrasperma</i> Roxb.	MP	Mes	Dec	-	M	L	C	Simple
530.	<i>Salix viminalis</i> Linn	MP	Mes	Dec	-	M	L	W	Simple
531.	<i>Salix wilhelmsiana</i> M. Bieb	MP	Mes	Dec	-	M	L	W	Simple
<b>72. Family Saxifragaceae</b>									
532.	<i>Saxifraga flagellaris</i> Willd. ex Sternb	G	Mic	E	-	Wet	L	W	Simple
533.	<i>Bergenia ciliata</i> (Haw.) Sternb.	G	Mic	E	-	Wet	S	W	Simple
534.	<i>Bergenia himalaica</i> Boriss.	G	Mic	E	-	Wet	S	W	Simple
<b>73. Family Scrophulariaceae</b>									
535.	<i>Antirrhinum majus</i> Linn.	Th	L	Dec	-	D	L	W	Simple
536.	<i>Euphrasia aristulata</i> Penn.	Th	L	Dec	-	Wet	S	W	Simple
537.	<i>Leptorhabdos parviflora</i> (Bth.) Bth.	Th	L	Dec	-	D	L	W	Simple
538.	<i>Linaria odora</i> (M.B.) Fisch	Th	L	Dec	-	D	L	W	Simple
539.	<i>Linaria volkii</i> Patzak	Th	L	Dec	-	D	L	W	Simple
540.	<i>Linaria vulgaris</i> Miller	Th	L	Dec	-	D	L	W	Simple
541.	<i>Pedicularis albida</i> Penn.	H(P)	Mes	Dec	-	Wet	L	W	Simple
542.	<i>Pedicularis brevifolia</i> D. Don	H(P)	Mes	Dec	-	Wet	L	W	Simple
543.	<i>Pedicularis pyramidata</i> Royle	H(P)	Mes	Dec	-	Wet	L	W	Simple
544.	<i>Scrophularia scoparia</i> Penn.	Th	N	Dec	-	D	L	W	Simple
545.	<i>Scrophularia stewartii</i> Penn.	H	Mic	Dec	-	D	L	W	Simple
546.	<i>Verbascum erianthum</i> Benth.	Th	Mic	Dec	-	D	L	W	Simple
547.	<i>Verbascum thapsus</i> Linn.	G	Mac	Dec	-	D	L	W	Simple
548.	<i>Veronica anagallis-aquatica</i> L	G	Mes	Dec	-	Wet	L	W	Comp
549.	<i>Veronica biloba</i> Linn.	Th	L	Dec	-	Wet	L	W	Simple
550.	<i>Veronica serpyllifolia</i> Linn.	Th	Mic	Dec	-	Wet	L	W	Comp
<b>74. Family Simarubaceae</b>									
551.	<i>Ailanthus altissima</i> (P. Mill.) Swingle.	NP	Mic	Dec	-	Wet	L	W	Comp
<b>75. Family Solanaceae</b>									
552.	<i>Datura stramonium</i> Linn.	Th	Mac	Dec	+	D	L	W	Simple
553.	<i>Hyoscyamus niger</i> Linn.	Th	L	Dec	+	D	L	W	Simple
554.	<i>Hyoscyamus pusillus</i> Linn.	Th	N	Dec	+	D	L	W	Simple
555.	<i>Lycopersicon esculentum</i> Miller	Th	Mic	Dec	-	D	L	C	Comp
556.	<i>Nicotiana tabacum</i> L	Th	Mac	Dec	-	M	L	C	Simple
557.	<i>Nicotiana rustica</i> Linn.	Th	Mac	Dec	-	M	L	C	Simple
558.	<i>Solanum melongena</i> Linn.	Th	Mac	Dec	-	D	L	C	Simple
559.	<i>Solanum nigrum</i> Linn.	Th	Mes	Dec	-	M	S	W	Simple
560.	<i>Solanum tuberosum</i> Linn.	G	Mes	Dec	-	D	L	C	Comp
<b>76. Family Tamaricaceae</b>									
561.	<i>Tamaricaria elegans</i> (Royle) Qaiser & Ali	NP	L	Dec	-	Aq	L	W	Simple
562.	<i>Tamarix dioica</i> Rox.ex Roth.	NP	L	Dec	-	Aq	L	W	Simple
<b>77. Family Thymelaeaceae</b>									
563.	<i>Daphne oleoides</i> Schrend.	NP	L	E	-	M	S	W	Simple
564.	<i>Diarthron vesiculosum</i> C. A. May	Th	L	Dec	-	D	L	W	Simple
565.	<i>Thymelaea passerina</i> (Linn.) Cosson & Germain.	Th	N	Dec	-	D	L	W	Simple
<b>78. Family Utricaceae</b>									
566.	<i>Pilea umbrosa</i> Blume	Th	N	Dec	-	D	S	W	Simple
<b>79. Family Verbenaceae</b>									
567.	<i>Vitex negundo</i> Linn	MP	Mic	Dec	-	D	L	W	Simple
<b>80. Family Violaceae</b>									
568.	<i>Viola serpens</i> Wall ex Roxb.	G	Mic	E	-	Wet	S	W	Simple
<b>81. Family Vitaceae</b>									
569.	<i>Vitis vinifera</i> Linn.	NP	Mac	Dec	-	D	L	C	Comp
<b>82. Family Zygophyllaceae</b>									
570.	<i>Peganum harmala</i> Linn.	H	N	Dec	-	D	L	W	Simple
571.	<i>Tribulus terrestris</i> Linn.	Th	L	Dec	+	D	L	W	Simple

**Key:**

1. **Life-form:** Th. Therophyte, G. Geophyte, H. Hemicryptophytes, Ch. Chamaephytes, NP. Nanophanerophytes, MP. Megaphanerophytes

2. **Leaf-size:** Aph. Aphyllous, L. Leptophyll, N. Naonophyll, Mic. Microphyll, Mes. Mesophyll, Mac. Macrophyll,

3. **Leaf persistence:** E. Evergreen, Dec. Deciduous

4. **Spiny nature:** += Spiny, -= Non spiny

5. **Habitat form:** Aq= Aquatic, M= Mesic, M= Moist, D= Dry

6. **Light Tolerance:** L. Light demanding =Heliophyte, S. Shade demanding= Sciophyte

7. **Cultivation Status:** W= Wild, C= Cultivated

8. **Leaf Type:** Incised. , Simple, Compound

**Table 2. Summary of floristic diversity of plants of Mastuj Valley in different major groups.**

Major group	Families		Genera		Species	
	No.	%	No.	%	No.	%
Pteridophyta	2	2.44	3	0.90	3	0.53
Gymnosperms	2	2.44	2	0.90	6	1.05
Monocots	13	15.85	54	16.17	98	17.16
Dicots	65	79.27	275	82.04	464	81.26
Total	82	100	334	100	571	100

**Table 3. Leading 14 plant families with highest number of species (A) and Genera (B) arranged in decreasing order of numbers from Mastuj Valley, District Chitral.**

S. No.	Family	Species	%	S. No.	Family	Genera	%
<b>A. Number of species</b>				<b>B. Number of genera</b>			
1.	Asteraceae	91	15.94	1.	Asteraceae	45	13.47
2.	Poaceae	58	10.16	2.	Poaceae	32	9.58
3.	Papilionaceae	38	6.65	3.	Brassicaceae	19	5.69
4.	Lamiaceae	26	4.55	4.	Apiaceae	18	5.39
5.	Rosaceae	26	4.55	5.	Papilionaceae	16	4.79
6.	Polygonaceae	25	4.38	6.	Lamiaceae	12	3.59
7.	Caryophyllaceae	23	4.02	7.	Boraginaceae	12	3.59
8.	Apiaceae	21	3.68	8.	Caryophyllaceae	11	3.29
9.	Boraginaceae	20	3.50	9.	Rosaceae	9	2.69
10.	Brassicaceae	20	3.50	10.	Scrophulariaceae	8	2.40
11.	Scrophulariaceae	16	2.80	11.	Polygonaceae	7	2.10
12.	Chenopodiaceae	14	2.45	12.	Chenopodiaceae	7	2.10
13.	Cyperaceae	13	2.28	13.	Ranunculaceae	6	1.80
14.	Ranunculaceae	13	2.28	14.	Cyperaceae	5	1.50
				15.	Solanaceae	5	1.50
The remaining families have less than 13 species				The remaining families have less than 5 genera			

**Biological spectrum:** Biological spectra are characteristic of the prevailing environmental and habitat conditions of any area. Plants assume life form according to the climatic conditions for their survival. It was seen that biological spectrum (Tables 1 & 4) was dominated by therophytes (234 spp., 40.98%), followed by hemicryptophytes (154 spp., 26.97%), geophytes (82 spp., 14.36%), chamaephytes (44 spp., 7.71%), nanophanerophytes (31 spp, 5.43%) and megaphanerophytes (24 spp., 4.20%). There were two shoot parasitic species of *Cuscuta* and three root parasitic plants belonging to genus *Pedicularis*. The present findings agree with Shah & Hussain (2007), Sher & Khan (2007) and Ajaib *et al.* (2008). Devi & Sharma (2004) and Alelign *et al.* (2007) also reported the dominance of therophytes in their study. The arrangement of life-form of a species in a natural series is known as biological spectrum and is based on life-form and leaf spectra. It represents climatic, microclimatic and bioclimatic habitat conditions of particular area (Cain, 1950; Cain & Castro, 1959). Biological spectra are useful in comparing geographically widely separated plant communities and are also regarded as indicator of prevailing environment. Occurrence of similar biological spectrum in different regions indicates similar climatic conditions. Biological spectrum may be materially changed due to introduction of therophytes like annual weeds, due to biotic influences like agricultural practices and grazing, deforestation and trampling etc. The life-form of a plant species is a constant characteristic but sometimes it varies with different environmental conditions and species go through different life-form stages in its life cycle from seed to maturity (Ajaib *et al.*, 2008). The life-

form of the vegetation is the product of their genetic pool and tolerance towards the climatic variation. Life-form reflects the environmental and biotic influences prevailing in a particular locality. In the present study therophytes, hemicryptophytes and geophytes were the major floristic elements. This agrees with the prevailing environmental condition of the Mastuj Valley. In harsh and arid alpine climates annual plants flush out during short spring, thereby quickly completing the life cycle so as to avoid the dry desiccating season. The hemicryptophytes reduce their body size and spread on the soil to avoid heat, strong winds that are characteristic for such climates. Geophytes, too, appear during short spring and remain dormant by virtue of their underground perennating parts under unfavourable seasons. In alpine regions shrubs and trees are rarely represented. In the present study the few recorded phanerophytic plants are mostly cultivated trees near the settlement as they may be fruit, shade or fuel wood species. Species of *Salix*, *Prunus*, *Pyrus*, and walnut etc are valuable fruit plants. Some shrubby plants recorded in the present study are either cushion plants like species of *Acantholimon*, *Arenaria*, *Juniper*, or woody chamaephytes. The only tree in the mountainous habitat is *Juniperus excelsa* that has decreased over the years due to heavy demand as fuel wood and its slow regeneration. At higher altitudes above 4000 m there is no shrub or tree species. There is short growing season that is frequently windy. The degraded vegetation generally supports the therophytic and hemicryptophytic type of vegetation. Sher & Khan (2007) also reported that therophytes were dominant (86 spp., 38.65 %) in Chagharzai Valley, District Buner.

**Table 4. Summary of ecological characteristics of plant species of Mastuj Valley, District Chitral, Pakistan.**

S. No.	Parameters	No. of species	(%)
<b>Life form classes</b>			
1.	Therophytes	231	40.98
2.	Geophytes	85 (Including one Insectivorous plant)	14.36
3.	Hemicryptophytes	154 (Including 3 root parasites)	26.97
4.	Chamaephytes	44	7.71
5.	Nanophanerophytes	31	5.43
6.	Megaphanerophytes	24	4.20
	Shoot Parasite	02	0.35
<b>Total</b>		<b>571</b>	<b>100</b>
<b>Leaf size classes</b>			
1	Aphyllous	5	0.88
2.	Leptophylls	142	24.87
3.	Nanophylls	234	40.98
4.	Microphylls	52	9.11
5.	Mesophylls	106	18.56
6.	Macrophylls	32	5.6
<b>Total</b>		<b>571</b>	<b>100</b>
<b>Leaf persistence</b>			
	Phyllous	5	0.88
1.	Deciduous	529	92.64
2.	Evergreen	37	6.48
<b>Total</b>		<b>571</b>	<b>100</b>
<b>Spiny nature</b>			
1.	Non-spiny	526	92.12
2.	Spiny	45	7.88
<b>Total</b>		<b>571</b>	<b>100</b>
<b>Habitat Form</b>			
1.	Aquatic	23	4.03
	Moist	25	4.38
2.	Mesic	66	11.56
	Dry	457	80.04
<b>Total</b>		<b>569</b>	<b>100</b>
<b>Light Tolerance</b>			
1.	Heliopyhtes	540	94.57
2.	Sciophytes	31	5.43
<b>Total</b>		<b>571</b>	<b>100</b>
<b>Cultivated/wild</b>			
1.	Wild	523	91.59
2.	Cultivated	48	8.41
<b>Total</b>		<b>571</b>	<b>100</b>
<b>Leaf Type</b>			
	Aphyllous	5	0.88
1.	Simple	427	74.78
2.	Incised	63	11.03
3.	Compound	76	13.31
<b>Total</b>		<b>571</b>	<b>100</b>

**Leaf size spectrum:** The leaf size classification and their spectrum are shown in Tables 1 and 4. It is evident that nanophylls were leading leaf-size class with 234 (40.98%). It was followed by leptophylls (142 spp., 24.87%), mesophylls 106 (18.56%), microphylls (52 spp., 9.11%) and a small fraction, i.e., 32 (5.60%) of macrophylls. Five species were aphyllous. Leaf-size spectra, together with biological spectrum, leaf persistence, and other features of plants can be used in the classification of communities and association of plant grouping and assemblages. The leaf-size knowledge is also helpful in understanding the physiological processes of plants and plant communities. The dominance of small leaved species, i.e., nanophylls (40.98 %) and leptophylls (24.87 %) is well in coordination arid climate with severe cold freezing winters. Devi & Sharma (2004), Alelign *et al.* (2007), Parswan *et al.* (2010), Durrani *et al.* (2005, 2010) and Sher & Khan (2007) also reported dominance of therophytes, hemicryptophytes and chamaephytes and our findings are supported by all these studies.

The present study suggests further extensive and intensive exploration for the collection of plants. There are many species such as *Artemisia*, *Juniperus*, many members of Asteraceae and Rosaceae that need special attention. Peer *et al.* (2001, 2007) reported *Juniperus semiglobosa* from the same area. This species has not been reported in the Flora of Pakistan. The present study also recorded same species from this valley. It is also recommended that a complete illustrated flora with taxonomic treatment along with keys for identification, figures and diagrams must be written.

#### Acknowledgement

This research was financed by Higher Education Commission Islamabad to Prof. Dr. Farrukh Hussain through Project No. 20-352/R&D/05, to which we are highly thankful. We are thankful to unknown reviewer (s) for their valuable suggestion that improved the quality of the paper.

#### References

- Addo-Fordjour, P., A.K. Anning, E. J. D. Belford and D. Akonnor. 2008. Diversity and conservation of medicinal plants in the Bomaa community of the Brong Ahafo region, Ghana. *J. Med. Pl. Res.*, 2(9): 266-233.
- Ajaib, M., Z. Khan, N. Khan and M. Wahab. 2010. Ethnobotanical studies on useful shrubs of District Kotli, Azad Jammu & Kashmir, Pakistan. *Pak. J. Bot.*, 42(3): 1407-1415.
- Alelign, A., D. Teketay, Y. Yemshaw and S. Edwards. 2007. Diversity and status of regeneration of woody plants on the peninsula of Zegie, northwestern Ethiopia. *Tropical Ecol.*, 48(1): 37-49.
- Ali, S.I. and M. Qaiser. 1993-2012 (Continued). Flora of Pakistan. No.194-201. University of Karachi.
- Ali, S.I. and Y. Nasir. 1989-1991. Flora of Pakistan. No.191-193. University of Karachi.
- Almeida, Jr, E.B., F.S.S. Filho, E.L. Araujo and C.S. Zickel. 2011. Structural characterization of the woody plants in restinga of Brazil. *J. Ecol. Nat. Environ.*, 3(3): 95-103.
- 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.
- Cain, S.A. 1950. Life form and phytoclimates. *Bot. Rev.*, 16: 1-32.
- Cain, S.A. and G.M.D. Castro. 1959. Manual of Vegetation Analysis. Harper & Brothers, New York.
- Costa, C., F.S. de Araujo and L.W. Lima-Verde. 2007. Flora and life form spectrum in an area of deciduous thorn woodland (caatinga) in northeastern Brazil. *J. Arid. Environ.*, 68(2): 237-247.
- Devi, N.B. and B.M. Sharma. 2004. Life-form analysis of the macrophytes of the Loktak Lake, Manipur, India. In: A. Kumar. 2004. *Biodiversity and Environment*, pp. 139-148.
- Devineau, J.L. and A. Fournier. 2007. Integrating environmental and sociological approaches to assess the ecology and diversity of herbaceous species in a Sudan type savanna (Bondoukuy, Western Burkina Faso). *Flora*, 202(5): 350-370.
- Durrani, M.J., A. Razaq, S.G. Muhammad and F. Hussain. 2010. Floristic diversity, ecological characteristics and ethnobotanical profile of plants of Aghberg rangelands, Baluchistan, Pakistan. *Pak. J. Pl. Sci.*, 16(1): 29-36.
- Durrani, M.J., F. Hussain and S. Rehman. 2005. Ecological characteristics of plants of Harboi rangeland, Kalat, Pakistan. *Jour. Tropical & Subtropical Botany*, 13: 130-138.
- Estrella, M.D.L., F.J. Cabezas, C. Aedo and M. Velayos. 2006. Checklist of the Caesalpinoideae (Leguminosae) of Equatorial Guinea (Annobon, Bioko and Rio Muni). *Bot. J. Linn. Soc.*, 151(4): 541-562.
- Hussain, F. 1989. Field and Laboratory Manual of Plant Ecology. University Grants Commission, Islamabad.
- Hussain, F. and A. Murad. 2004. Weed communities in the potato fields of Mastuj, District Chitral. *Sci. Khyber*, 17: 201-206.
- Hussain, F.M., J. Durrani, A. Murad and P. Sanaullah. 2004a. Distribution of some weeds in the potato fields of Mastuj, District Chitral, Pakistan. *Pak. J. Pl. Sci.*, 10(1): 25-29.
- Hussain, F., A. Murad and M.J. Durrani. 2004b. Weed communities in the wheat fields of Mastuj, District Chitral, Pakistan. *Pak. J. Weed Sci. Res.*, 10: 101-108.
- Hussain, F., I. Iqbal and M.J. Durrani. 2000. Vegetation studies of Ghalegay Hills, District Swat, Pakistan. *Pak. J. Pl. Sci.*, 6(1-2): 1-10.
- Hussain, F., S.M. Shah and H. Sher. 2007. Traditional resource evaluation of some plants of Mastuj, District Chitral, Pakistan. *Pak. J. Bot.*, 37(2): 339-354.
- Hussain, F., S.M. Shah and Lal Badshah. 2012. Floristic and vegetation diversity of some aquatic habitats of Mastuj Valley, Hindikush region, District Chitral, Pakistan. *Pak. J. Pl. Sci.*, 18(1): 55-68.
- Hussain, F., A. Murad and Q. Marwat. 1994. Distribution and population of weeds in the maize fields of Mastuj, District Chitral. *Pak. J. Weed Sci.*, 7: 42-48.
- Kotresha, K., S.V. Kambhar and N.S. Harihar. 2011. Floristic composition of woody species in Karnatak College, Dharwad (KCD), Karnataka, India. *Life Sci. Leaflets*, 18: 656-669.
- Marwat, Q. and R.A. Qureshi. 2000. A checklist of the vascular plants found in upper Siran reserved and Guzara forests, District Manshera, Pakistan. *Pak. J. Pl. Sci.*, 6(1-2): 43-57.
- Nasir, E. and S.I. Ali. 1970-1989. Flora of Pakistan. No. 1-190. Pakistan Agriculture Research Council, Islamabad.
- Nusbaumer, L., L. Gautier, C. Chatelain and R. Spichiger. 2005. Structure et composition floristique de la Forêt Classée du Scio (Côte d'Ivoire). Etude descriptive et comparative. *Candollea*, 60(2): 393-443.
- Parswan, K., J.P. Mehta and Subodh. 2010. Floristic composition and biological spectrum of vegetation of alpine meadows of Kedarnath: Garhwal Himalayas. *Nature & Sci.*, 8(7): 109-115.

- Peer, T., A. Millinger, J.P. Gruber and F. Hussain. 2001. Vegetational and altitudinal zonation in relation to the impact of grazing in steppe lands of Hindu Kush Range (N. Pakistan). *Phytocoenologia*, 31: 477-498.
- Peer, T., J.P. Gruber, A. Millinger and F. Hussain. 2007. Phytosociology, structure and diversity of the steppes vegetation in the mountains of Northern Pakistan. *Phytocoenologia*, 37: 1-65.
- Raunkiaer, C. 1934. The Life form and Plants and Statistical Plant Geography. Oxford, Clarendon Press.
- Saima, S., A.A. Dasti, Q. Abbas and F. Hussain. 2009. Floristic diversity during monsoon in Ayubia National Park, District Abbottabad, Pakistan. *Pak. J. Pl. Sci.*, 16(1): 43-50.
- Shah, S.M., F. Hussain and M. Ibrar. 2006. Floristic composition, Life form and Leaf size spectra of summer plants of Mastuj, District Chitral. *PUTAJ Science*, 13: 167-179.
- Shah, S.M., F. Hussain and M. Khan. 2013 a. Growth behavior, sex ratio and fruit out of *Juniperus excelsa* in Mastuj Valley, District Chitral, Khyber Pakhtunkhwa, Pakistan. *Int. Jour. Biosciences*, 3(2): 146-151.
- Shah, S.M., F. Hussain and M. Khan. 2013b. Phytosociological studies on alpine vegetation of Mastuj Valley, Hindukush range, Pakistan. *Int. Jour. Biosciences*, 3(2): 152-157.
- Shah, S.M. and F. Hussain. 2012. Ethnomedicinal plant wealth of Mastuj Valley, Hindukush range District Chitral, Pakistan. *Jour. Med. Pl. Res.*, 6(26): 4328-4337.
- Sher, Z. and Z. Khan. 2007. Floristic composition, life-form and leaf spectra of the vegetation of Chagharzai Valley, District Buner. *Pak. J. Pl. Sci.*, 13(1): 55-64.
- Sher, Z., F. Hussain and L. Badshah. 2014. Biodiversity and ecological characterization of the flora of Gadoon Rangeland, District Swabi, Khyber Pukhtunkhwa, Pakistan. *Iran. J. Bot.*, 20(1): 96-108.
- Shukla, R.P. 2009. Patterns of plant species diversity across Terai landscape in northeastern Uttar Pradesh, India. *Tropical Ecol.*, 50(1): 111-123.
- Ssegawa, P. and D.N. Nkuutu. 2006. Diversity of vascular plants on Ssesse islands in Lake Victoria, central Uganda. *African J. Ecol.*, 44(1): 22-29.

(Received for publication 22 December 2013)