

PHYTOCLIMATIC SPECTRUM OF WEEDS FLORA OF TOORMANG VALLEY, DIR LOWER, KOH-E-HINDUKUSH RANGE, PAKISTAN

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ABSTRACT

Four season's data of floristic structure and biological spectrum of Toormang Valley, Dir lower was explored during 2018-2019. The flora comprised 238 species, 164 genera associated with 60 families. The most prevailing family was Asteraceae with 42 species (17.64%), trailed by Rosaceae 16 (6.72%), Brassicaceae 13 (5.46%), Solanaceae 11 (4.62%), Papilionaceae 10 (4.20%), Apiaceae, and Poaceae each with 9 (3.78%), Lamiaceae 8 (3.36%), Boraginaceae, Euphorbiaceae and Moraceae each contributed by 7 species (2.94%), Amaranthaceae and Cucurbitaceae each consisted of 6 species (2.52%), Caryophyllaceae and Chenopodiaceae each with 5 (2.10%) while rest of 23 families contributed by 1 species each (0.42%). The largest genera were *Euphorbia* (6 species), followed by *Sonchus* and *Medicago* (4 species) each. Therophytes were the dominant with 102 species (42.85%), followed by nanophanerophytes with 27 (11.34%), hemicryptophytes with 25 (10.50%), chamaephytes with 20 (8.40%), microphanerophytes with 18 (7.56%), megaphanerophytes with 16 (6.72%), geophytes with 15 (6.30%), mesophanerophytes with 14 (5.88%) and parasite with 1 species (0.42%). The observations on leaf size revealed that microphyll was the prevailing class with 73 species (30.67%), followed by mesophyll 69 (28.99%), nanophyll 60 (25.21%), leptophyll 23 (9.66%), macrophyll 8 (3.36%), megaphyll 4 (1.68%) and aphyllous with 1 species (0.42%). Simple lamina species 154 while 5 species had spiny lamina shape.

Keywords: Weeds flora, phytoclimatic spectrum, Toormang valley

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INTRODUCTION

The Valley is situated in Lower Dir, in the Northwest of Khyber Pakhtunkhwa, Pakistan, and is restricted by a vast series of Koh-e-Hindukush Range. It is situated between 34-37 to 35-7 North latitude and 71-31 to 72-14 East longitudes. The Valley is bounded by Wari in the North, Khall, and Rabat in the West, Laram hills in the South, and Swat in the East. The climate of the Valley is influenced by different ecological and topographic features. The high peaks of the mountains receive snowfall during December, January, and February. The summer is pleasant and short while winter is the harsh season of the year. Agriculture and forests are the main sources of the economy of the indigenous peoples. Flora is the plant species of a given geographical area, whereas vegetation is an ecological term and determines the plant population, size, distribution, and relative importance (RI). (Ali, 2008). Changing environmental situations such as acid rain, soil erosion are alarming threats to flora (Hussain, 2003) while, on the other hand, the floristic configuration is a consideration of phytodiversity, environmental and biotic effects. So, studies on the local flora constantly provide accurate information. Leaf size and life form spectrum are key physiognomic characteristics commonly used in the analysis of vegetation. The biological spectrum determines the micro and macroclimatic conditions of a geographical area (Shimwell, 1971). Many studies have been described therophytes as indicator species of a particular desert-type climate (Samreen *et al.*, 2016). Shah *et al.* (2013) reported the floristic characteristics of each species from a humid forest situated in an inaccessible area of Pakistan. Hussain *et al.* (2015) conducted research work on Phytodiversity and ecological physiognomies of the flora of Mastuj, Chitral, and reported the highest percentage of therophytes followed by hemicryptophytes and geophytes. Seraj *et al.* (2014) determined the Raunkiaerian life form at Asir Mountain of Saudi Arabia and described that

therophytes were the prevailing class followed by chaemophytes. Alsherif *et al.* (2013) prepared the Raunkierian life form of the Khuliais area, Saudi Arabia, and found that therophytes were the dominant class with the highest percentage of species followed by chaemophytes and hemicryptophytes. Khan *et al.* (2012) reported that leaf spectra of plants study show the dominance of microphyll followed by nanophyll and leptophyll from Tehsil Takht-e-Nasrati, Karak, Pakistan. The highest percentage of microphyll followed by leptophyll, nanophyll & megaphyll shows that the studied area is under severe biotic stress due to overgrazing and deforestation (Sher and Khan, 2007). The literature study revealed that the research area is virgin regarding its floristic and ecological characteristics.

MATERIALS AND METHODS

Four season's floristic data of the valley was collected during the year 2018-2019 by walking method (Nazar *et al.*, 2008). Plant specimens were collected, pressed, dried, and mounted on standard herbarium sheets. Plants were identified with the help of Flora of Pakistan (Nasir and Ali, 1970-1989; Ali and Nasir, 1989-1992; Ali and Qaiser, 1995-2015) and verified from the Herbarium, University of Malakand. An alphabetical family-wise list of plants was prepared. The voucher specimens were submitted to the herbarium, Department of Botany, UOM. The tools used during research work were a knife, polythene bags, old newspapers, plant presser, map of the area, notebook, and pencil.

RESULTS AND DISCUSSION

Floristic and ecological attributes

The study of the floristic composition of vegetation is crucial for conservation management by providing habitats for wildlife and contributing to the ecologically sustainable management of natural resources (Ahmad and Ehsan, 2012). The flora of the Valley consisted of 238 species, 164 genera from sixty (60) families. It comprised of 53 dicots, 4 monocots, 01 gymnosperm, and 2 pteridophyte families. Pteridophyte had 3 genera (1.82%) while, gymnosperms has 1 genus (0.60%). There were 11

genera of monocots (6.70%) and 149 genera of dicots (90.85%). Leading families were Asteraceae 42 species (17.64%) followed by Rosaceae 16 species (6.72%), Brassicaceae 13 species (5.46%), Solanaceae 11 species (4.62%), Papilionaceae 10 species (4.20%), Apiaceae, and Poaceae each with 9 species (3.78%), followed by Lamiaceae contributed by 8 species (3.36%). Boraginaceae, Euphorbiaceae, and Moraceae each contributed by 7 species (2.94%) while, Amaranthaceae and Cucurbitaceae each consisted of 6 species (2.52%). Caryophyllaceae and Chenopodiaceae had 5 species (2.10%) each, Aspleniaceae and Salicaceae each consists of 4 species (1.68%) while Fagaceae, Oleaceae, Ranunculaceae, Rutaceae, and Urticaceae each contributed by 3 species (1.26%), which is followed by Alliaceae, Asclepiadaceae, Cannabaceae, Ebenaceae, Fumariaceae, Malvaceae, Mimosaceae, Pinaceae, Polygonaceae, and Zygophyllaceae contributed 2 species each (0.84%). The rest of the 23 families contributed by 1 species each (0.42%). (Table 3, Fig. 2) The current reports match with Haq *et al.* (2010) and Ravanbakhsh *et al.* (2014) who described that the Asteraceae and Rosaceae are the leading families in their research geographical zone. Similarly, many other authors also documented that Asteraceae was the leading family in their research zones (Ali *et al.*, 2016; Badshah *et al.*, 2016; Inayat *et al.*, 2014; Khan *et al.*, 2011, 2013, 2014; Ganji, 2016; Hussain *et al.*, 2015; Shah *et al.*, 2013; Sher *et al.*, 2014; Ullah and Ullah, 2016). The flora of the research area included wild 196 (82.35%) and cultivated plant species 42 (17.64%). The largest genera were *Euphorbia* (6 species) followed by *Sonchus*, *Chenopodium*, and *Pyrus* (4 species each). There were 5 thorny species (2.10%) and 233 (97.89%) non-thorny species. Based on habitat 115 species (48.31%) were found in dry conditions, 35 species (17.64%) in wet, 42 species (17.64%) in cultivated, and 46 species (19.32%) in both dry and wet conditions. The observations on leaf size revealed that the most prevailing class was microphyll with 73 species (30.67%) followed by mesophyll 69

species (28.99%), nanophyll 60 species (25.21%), leptophyll 23 species (9.66%), macrophyll 8 species (3.36%), megaphyll 4 species (1.1.68%) and aphyllous contributed by 1 species (0.42%). The majority of the species 154 (64.70%) had simple lamina while 5 species have spiny lamina shape. The study area has four distinct seasons with mild summer and harsh winter. The seasonal distinction in flora was verified, with the highest species richness in the summer and spring seasons. Summer flora had 135 species (30.57%), spring with 182 species (30.08%), and autumn had 130 species (21.48%). The lowest species richness 108 (17.35%) were recorded in winter. Our results are strongly correlated with the findings of other researchers such as; Ullah and Badshah (2017) reported the highest number of species in the summer season from Jelar Valley Dir Upper. Similarly, the highest percentage of species were recorded in the spring and summer seasons from Chail Valley Swat and Darazinda D.I. Khan (Ali *et al.*, 2016; Samreen *et al.*, 2016).

Biological spectrums

The phytoclimate determines the biological spectrum of the vegetation of a geographical zone (Khan *et al.*, 2013). The life form of plant species of an area reflects tolerance towards the climatic variations and their genetic makeup (Hussain *et al.*, 2015). The characteristics of the flora and vegetation are reflected by the biological spectra and environmental gradients. Raunkiaer (1934) suggested classification of the life form based on the position of perennating buds during unfavorable environmental conditions. Using this criterion, it was observed that therophytes were the most abundant life with 102 species (42.85%) followed by nanophanerophytes represented by 27 species (11.34%), hemicryptophyte with 25 species (10.50 %), and Chamaephytes having 20 species (8.40%). Microphanerophytes were represented by 18 species (7.56%), megaphanerophytes with 16 species (6.72 %), geophytes with 15 species (6.30), mesophanerophytes with 14 species (5.88%), and parasite 1 species (0.42) stayed the next prevailing life

forms. (Table 5, Fig. 3). Badshah *et al.* (2016) and Naveed *et al.* (2012) reported that therophytes and nanophanerophytes were the dominant life form classes in their study areas. The dominance of therophytes in this area is due to extreme climatic conditions, overgrazing, and human interference. (Rafay *et al.*, 2013).

Seasonal variation

The current observations show that the highest number of plants species (185) were found in the summer season with therophytes, 64 species (34.59%), the most prevailing life form, followed by nanophanerophytes with 24 (12.97%), hemicryptophytes with 21 species (11.35%), Chamaephytes and microphanerophytes each with 18 species (9.72%), megaphanerophytes with 16 species each 8.64%), mesophanerophytes with 14 species (7.56%), geophytes with 14 species (7.56%), and parasite were represented by 1 species (0.54%). Therophytes were also dominant in the spring season represented by 58 species (32.95%), followed by nanophanerophytes 25 species (14.20%), microphanerophytes 18 species (10.22%), hemicryptophytes 17 species (9.65%), megaphanerophytes 16 species (9.90%), Chamaephytes 15 species (8.52%), mesophanerophytes 14 species (7.95%), geophytes 12 species (6.81%), and parasite represented by 1 species (0.56%). During Autumn therophytes consist of 31 species (24.03%), nanophanerophytes 23 species (17.82%), microphanerophytes 18 species (13.95%), megaphanerophytes 16 species (12.40%), mesophanerophytes 14 species (11.11%), hemicryptophytes 13 species (10.07%), Chamaephytes 11 species (8.52%), geophytes 2 species (1.55%), and parasite include 1 species (0.77%), while, the lowest numbers of species were noted in winter. (Table 1, Fig. 4). Our current investigations are supported by Badshah *et al.* (2016) who described that therophytes were the highest in number during spring and summer seasons from Parachinar, Kurram Agency, Pakistan.

Leaf size spectrum

The observation of the leaf size explains the plant's biological processes and their communities. Leaf size and biological spectra are used in the classification and association of communities (Ali *et al.*, 2016). It is useful for the understanding of physiological processes of plant species and their communities (Oosting, 1956) as well as the leaf-sized classes are important for studying the associations. Our findings on leaf size exhibited that macrophyll was the most leading class with 73 species (30.68%), followed by mesophyll 69 species (28.99%), nanophyll 60 species (25.22%), leptophyll 23 species (9.66%), macrophyll 8 species (1.26%), megaphyll 4 species (1.68%), and aphyllous comprised by 1 species of *Cuscuta reflexa* Roxb, (0.42%). (Table 5, Fig.7). Our results are in line with the findings of Khan *et al.* (2013), Shah *et al.* (2013), Khan *et al.* (2011), Amjad. (2012) and Khan *et al.* (2014).

Seasonal variation

In summer, mesophyll was the prevailing leaf size class contributed by 58 species (31.35%), followed by microphyll 55 species (29.72%), nanophyll 48 species (25.94%), leptophyll 18 species (9.72%), macrophyll 4 species (2.16%), megaphyll and aphyllous by 1 species each (0.54%). In spring microphyll were dominant form consisted of 53 species (30.81%), followed by mesophyll 49 species (28.48%), nanophyll 44 species (25.58%), leptophyll 13 species (7.55%), macrophyll 8 species (4.65%), megaphyll 4 species (2.32%), and aphyllous contributed by 1 species (0.58%). In autumn mesophyll was the dominant form consisted of 45 species (34.88%), followed by nanophyll 33 species (25.58%), microphyll 31 species (24.03%), leptophyll 14 species (10.85%), macrophyll 3 species (2.32%), megaphyll 2 species (1.55%), and aphyllous contributed by 1 species (0.77%). While mesophyll was also dominant in winter contributed by 37 species (33.94%), followed by microphyll with 32 species (29.35%), nanophyll with 24 species (22.01%), leptophyll with 8 species (7.33%), macrophyll with 6 species (5.50%),

megaphyll and aphyllous contributed by 1 species each (0.91%). (Table 2, Fig. 5).

Lamina shape

The shape of leaf lamina of different plant species revealed that 154 species (64.70%) have simple lamina shape, followed by compound and dissected lamina each have 37 species (15.54%), spiny 5 species (2.10%), needles lamina shape consist 2 species (0.84%), while in 3 species lamina shape is absent. (Table 5, Fig. 6) The lamina shapes of the plant species were also reported from Jelar Valley, Upper Dir (Ullah and Badshah., 2017), from Darazinda DI. Khan (Samreen *et al.*, 2016) and from Chail Valley, Swat. (Ali *et al.*, 2016).

Habit and Habitat

Among the flora, herbs were dominant comprises 167 species (70.16%), followed by shrub 48 species (18.06%) and trees were contributed by 28 species (11.76%). (Table 5, Fig. 9) The highest numbers of 115 species (48.31%) were found growing in dry conditions, followed by 46 species (19.32%) growing in both dry and wet conditions, 42 species were found growing on agricultural land, while 35 species were found growing on the wetland. (Table 5, Fig. 8). The research area is under high anthropogenic pressure as indigenous peoples rely on fuelwood and forest timber. Ultimately, this rapid deforestation resulting indisturbing themico and micro-habitats (Ali *et al.*, 2016).

Conclusion

The present results revealed that the flora of the valley consisted of 238 species, 164 genera from 60 families. It included 53 dicots, 04 monocot families, 01 family of Gymnosperms, and 2 Pteridophyte families. Pteridophyte had 3 genera (1.82%) while; Gymnosperms had 01 genus (0.60%). There were 11 genera of monocots (6.70%) and 149 genera of dicots (90.85%). Leading families were Asteraceae 42 species (17.64%), Rosaceae 16 species (6.72%), Brassicaceae 13 species (5.46%), Solanaceae 11 species (4.62%), and Papilionaceae 10 species (4.20%). The largest genera regarding

the number were *Euphorbia* (6 species), *Sonchus*, *Chenopodium*, *Medicago*, and *Pyrus* (4 species each). The dominant life form based on species richness was therophytes with 102 species (42.85%), followed by nanophanerophytes with 27 species (11.34%). Leaf size spectra showed that the macrophyll was the most dominant leaf size class with 73 species (30.67%), followed by mesophyll 69 species (28.99%). The current study provides baseline observations and information of Toormang flora and further study is recommended for the exploration of quantitative analysis of the vegetation.

Table 1: Seasonal variation in the life form

S.N o.	Life form	Spring	%age	Summer	%age	Autumn	%age	Winter	%age
1.	Therophytes	58	32.95 %	64	34.59 %	31	24.03 %	22	20.72 %
2.	Hemicryptophytes	17	9.65%	21	11.35 %	13	10.07 %	4	3.77%
3.	Nanophanerophytes	25	14.20 %	24	12.97 %	23	17.82 %	18	16.98 %
4.	Chamaephytes	15	8.52%	18	9.72%	11	8.52%	9	8.49%
5.	Microphanerophytes	18	10.22 %	18	9.72%	18	13.95 %	17	16.03 %
6.	Megaphanerophytes	16	9.09%	16	8.64%	16	12.40 %	16	15.09 %
7.	Geophytes	12	6.81%	9	4.86%	2	1.55%	5	4.71%
8.	Mesophanerophytes	14	7.95%	14	7.56%	14	11.11 %	14	13.20 %
9.	Parasite	1	0.56%	1	0.54%	1	0.77%	1	0.94%
		176		185		129		106	99.93 %

Table 2: Seasonal variation of Leaf size spectra

Leaf size spectra	Spring	%	Summer	%	Autumn	%	Winter	%
Microphyll	53	30.81%	55	29.72%	31	24.03%	32	29.35%
Mesophyll	49	28.48%	58	31.35%	45	34.88%	37	33.94%
Nanophyll	44	25.58%	48	25.94%	33	25.58%	24	22.01%
Leptophyll	13	7.55%	18	9.72%	14	10.85%	8	7.33%
Macrophyll	8	4.65%	4	2.16%	3	2.32%	6	5.50%
Megaphyll	4	2.32%	1	0.54%	2	1.55%	1	0.91%
Aphyllous	1	0.58%	1	0.54%	1	0.77%	1	0.91%
	172	99.97%	185		129	99.98%	109	99.95%

Table 3: Floristic list and ecological characteristic of flora of the valley

S. No.	Species	Family	Habit	Habitat	Life Form	Leaf Size Spectrum	Lamina Shape	Seasonality			
								A	W	Sp	SM
1.	<i>Alisma plantago-aquatica</i> L.	Alismataceae	H	W	Hem	N	S	-	-	-	+
2.	<i>Sagittaria trifolia</i> . L.	Alismataceae	H	W	G	Mes	Dis	-	-	+	+
3.	<i>Allium sativum</i> L.	Alliaceae	H	Cu	G	Mes	S	-	-	+	-
4.	<i>Allium cepa</i> L.	Alliaceae	H	Cu	G	Mes	S	-	-	+	-
5.	<i>Narcissus tazetta</i> L.	Amaryllidaceae	H	D	G	Mes	S	-	+	-	-
6.	<i>Colocasia esculenta</i> (L.) Schott.	Araceae	H	Cu	G	Meg	S	-	+	+	-
7.	<i>Avena sativa</i> L.	Poaceae	H	D	Th	Mic	S	-	-	+	-
8.	<i>Cymbopogon commutatus</i> (Steud.) Stapf.	Poaceae	H	WD	Ch	Mic	S	+	+	+	+
9.	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	H	WD	Hem	Mic	S	+	+	+	+

S. No.	Species	Family	Habit	Habitat	Life Form	Leaf Size Spectrum	Lamina Shape	Seasonality			
								A	W	SP	SM
10.	<i>Hordeum murinum</i> L.	Poaceae	H	Cu	Ch	Np	S	-	+	-	+
11.	<i>Hordeum vulgare</i> L.	Poaceae	H	Cu	Hem	Mic	S	-	-	+	+
12.	<i>Oryza sativa</i> L.	Poaceae	H	Cu	G	Mic	S	-	-	+	+
13.	<i>Sorghum halepense</i> (L.) Pers	Poaceae	H	D	Hem	Mic	S	-	-	+	+
14.	<i>Triticum aestivum</i> L.	Poaceae	H	Cu	Th	Mic	S	-	+	-	+
15.	<i>Zea mays</i> L.	Poaceae	S	Cu	Th	Mes	S	+	-	-	+
16.	<i>Justicia adhatoda</i> (L.) Huth.	Acanthaceae	S	W	Np	Mes	S	+	+	+	+
17.	<i>Strobilanthes urticifolia</i> Wall. ex Kuntze.	Acanthaceae	H	W	Np	N	S	+	-	-	+
18.	<i>Adiantum capillus-veneris</i> L.	Adiantaceae	H	W	G	N	Dis	+	+	+	+
19.	<i>Achyranthes aspera</i> L.	Amaranthaceae	H	D	Th	N	S	+	-	-	-
20.	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	Amaranthaceae	H	D	Th	Mic	S	-	-	+	-
21.	<i>Amaranthus caudatus</i> L.	Amaranthaceae	H	W	Th	Mic	S	+	-	-	+
22.	<i>Amaranthus spinosus</i> L.	Amaranthaceae	H	WD	Th	Mic	S	-	-	-	+
23.	<i>Amaranthus viridis</i> L.	Amaranthaceae	H	D	Th	N	S	+	-	-	-
24.	<i>Celosia argentea</i> L. var. <i>cristata</i> (L.) Schinz.	Amaranthaceae	H	WD	Th	N	S	-	-	-	+
25.	<i>Ammi visnaga</i> (L.) Lam.	Apiaceae	H	D	Ch	Lp	Dis	-	+	+	+
26.	<i>Coriandrum sativum</i> L.	Apiaceae	H	Cu	Th	Lp	Dis	+	-	-	+
27.	<i>Daucus carota</i> L.	Apiaceae	H	Cu	G	Mes	Comp	-	+	+	-
28.	<i>Eryngium caeruleum</i> M.Bieb.	Apiaceae	H	D	Hem	N	S	+	-	+	-
29.	<i>Eryngium bourgatii</i> Gouan.	Apiaceae	H	D	Np	Meg	S	+	-	+	-
30.	<i>Foeniculum vulgare</i> Mill.	Apiaceae	H	D	Th	N	Dis	+	-	-	+
31.	<i>Seseli libanotis</i> (L.) W.D.J.Koch.	Apiaceae	H	D	Th	Lp	Comp	+	-	-	+
32.	<i>Scandix pecten-veneris</i> L.	Apiaceae	H	WD	Th	Mic	Comp	-	+	+	-
33.	<i>Trachyspermum ammi</i> (L.)	Apiaceae	H	D	Th	Lp	Comp	-	-	+	+

S. No.	Species	Family	Habit	Habitat	Life Form	Leaf Size Spectrum	Lamina Shape	Seasonality			
								A	W	SP	SM
	Sprague.										
34.	<i>Nerium oleander</i> L.	Apocynaceae	S	D	Np	Mes	S	+	+	+	+
35.	<i>Hedera nepalensis</i> K. Koch.	Araliaceae	H	D	Np	Mes	S	+	+	+	+
36.	<i>Phoenix sylvestris</i> (L.) Roxb.	Aracaceae	T	WD	Mic	Mic	Comp	+	+	+	+
37.	<i>Asplenium adiantum-nigrum</i> L.	Aspleniaceae	H	W	Hem	N	Comp	+	+	+	+
38.	<i>Asplenium trichomanes</i> L.	Aspleniaceae	H	W	Hem	Lp	Comp	+	+	+	+
39.	<i>Asplenium septentrionale</i> (L.) Hoffm.	Aspleniaceae	H	W	Hem	Lp	Comp	+	-	+	+
40.	<i>Ceterach dalhousiae</i> (Hook.) C. Chr.	Aspleniaceae	H	W	Hem	N	Comp	+	+	+	+
41.	<i>Calotropis procera</i> (Aiton.) Dryand.	Asclepiadaceae	S	D	Np	Mac	S	+	+	+	+
42.	<i>Periploca aphylla</i> Decne.	Asclepiadaceae	S	D	Ch	Ap	Abs	+	+	+	+
43.	<i>Achillea millefolium</i> L.	Asteraceae	H	D	Hem	Lp	Dis	-	-	-	+
44.	<i>Anaphalis adnata</i> Wall.ex DC.	Asteraceae	H	WD	Th	Mes	S	-	-	-	+
45.	<i>Artemisia absinthium</i> L.	Asteraceae	S	D	Th	N	Dis	+	-	-	+
46.	<i>Artemisia scoparia</i> Waldst. & Kitam.	Asteraceae	H	W	Th	N	Dis	+	-	-	+
47.	<i>Artemisia biennis</i> Willd.	Asteraceae	H	W	Hem	Mic	Dis	+	-	+	+
48.	<i>Calendula arvensis</i> M. Bieb.	Asteraceae	H	WD	Th	Mic	S	-	-	+	-
49.	<i>Calendula officinalis</i> L.	Asteraceae	H	D	Th	Mes	S	+	+	+	+
50.	<i>Carduus edelbergii</i> Rech.fil.	Asteraceae	H	D	Th	Mac	Sp	-	+	+	-
51.	<i>Carthamus oxyacantha</i> M.Bieb.	Asteraceae	H	D	Th	Mic	S	-	-	+	-
52.	<i>Carthamus tinctorius</i> L.	Asteraceae	H	D	Ch	Mes	S	-	-	+	-
53.	<i>Centaurea calcitrapa</i> L.	Asteraceae	H	D	Th	Mes	Dis	-	-	+	+
54.	<i>Chrysanthemum cinerariaefolium</i>	Asteraceae	H	WD	Th	Mic	S	-	-	+	-

S. No.	Species	Family	Habit	Habitat	Life Form	Leaf Size Spectrum	Lamina Shape	Seasonality			
								A	W	SP	SM
	(Trevir.) Vis.										
55.	<i>Cirsium falconeri</i> (Hook.f.) Petr.	Asteraceae	H	D	Hem	Mes	Sp	+	-	+	-
56.	<i>Conyza bonariensis</i> (L.) Cronquist.	Asteraceae	H	W	Th	N	S	+	-	-	+
57.	<i>Conyza Canadensis</i> (L.) Cronquist.	Asteraceae	H	WD	Th	N	S	-	-	-	+
58.	<i>Conyza aegyptiaca</i> (L.) Dryand. ex Aiton.	Asteraceae	H	D	Ch	Mes	S	+	-	-	+
59.	<i>Cosmos bipinnatus</i> Cav.	Asteraceae	H	D	Th	N	Comp	+	-	-	+
60.	<i>Erigeron multicaulis</i> Wall. ex DC.	Asteraceae	H	D	Th	Mic	S	-	-	-	+
61.	<i>Filago hurdwarica</i> (Wall. ex DC.) Wagenitz.	Asteraceae	H	D	Th	N	S	+	-	-	+
62.	<i>Galinsoga parviflora</i> Cav.	Asteraceae	H	CU	Th	Lp	S	-	-	-	+
63.	<i>Gnaphalium affine</i> D. Don.	Asteraceae	H	D	Hem	Mes	S	+	-	+	-
64.	<i>Helianthus annuus</i> L.	Asteraceae	S	D	Th	Mes	S	-	-	+	+
65.	<i>Lactuca serriola</i> L.	Asteraceae	H	WD	Th	Mes	Dis	-	-	+	+
66.	<i>Lactuca sativa</i> L.	Asteraceae	H	WD	Th	Mes	Dis	+	+	+	+
67.	<i>Launaea nudicaulis</i> (L.) Hook.f.	Asteraceae	H	D	Hem	Mes	S	-	-	-	+
68.	<i>Onopordum acanthium</i> L.	Asteraceae	H	D	Th	Mes	Dis	-	-	+	+
69.	<i>Parthenium hysterophorus</i> L.	Asteraceae	H	WD	Mic	Mic	S	+	-	+	+
70.	<i>Scorzonera virgata</i> DC.	Asteraceae	H	D	Th	Mes	S	-	-	-	+
71.	<i>Senecio chrysanthemoideus</i> DC.	Asteraceae	H	D	Th	Mes	S	-	-	+	+
72.	<i>Serratula pallida</i> DC.	Asteraceae	H	WD	G	N	Dis	-	-	-	+
73.	<i>Sonchus oleraceus</i> (L.) L.	Asteraceae	H	WD	Th	Mic	Dis	-	-	-	+
74.	<i>Sonchus auriculata</i> L.	Asteraceae	H	D	Th	Mic	Dis	-	-	-	+
75.	<i>Sonchus asper</i> (L.) Hill.	Asteraceae	H	D	Th	Mic	Dis	-	-	-	+

S. No.	Species	Family	Habit	Habitat	Life Form	Leaf Size Spectrum	Lamina Shape	Seasonality			
								A	W	SP	SM
76.	<i>Sonchus arvensis</i> L.	Asteraceae	H	D	Th	Mic	Dis	-	-	-	+
77.	<i>Seriphidium brevifolium</i> (Wall. ex DC.) Ling & Y.R. Ling.	Asteraceae	H	D	Np	Mes	Dis	+	+	+	+
78.	<i>Silybum marianum</i> (L.) Gaertn.	Asteraceae	H	WD	Ch	Mic	Sp	-	-	+	+
79.	<i>Taraxacum officinale</i> (L.) Weber ex F.H. Wigg.	Asteraceae	H	D	Th	Mic	S	+	-	+	+
80.	<i>Phagnalon niveum</i> Edgew.	Asteraceae	H	W	Ch	N	S	+	-	+	+
81.	<i>Tagetes minuta</i> L.	Asteraceae	H	D	Th	N	Dis	-	-	-	+
82.	<i>Tragopogon gracilis</i> D. Don.	Asteraceae	H	D	Hem	Mic	S	-	-	+	+
83.	<i>Tussilago farfara</i> L.	Asteraceae	H	WD	G	Mes	S	-	-	+	+
84.	<i>Xanthium strumarium</i> L.	Asteraceae	H	WD	Th	Mes	S	-	-	-	+
85.	<i>Impatiens edgeworthii</i> Hook. f.	Balsaminaceae	H	W	Th	Mic	S	-	-	-	+
86.	<i>Berberis lycium</i> Royle.	Berberidaceae	S	D	Np	N	Sp	+	+	+	+
87.	<i>Anchusa arvensis</i> (L.) M.Bieb.	Boraginaceae	H	D	Th	Mic	S	-	-	+	
88.	<i>Arnebia hispidissima</i> (Lehm.) A.D.C.	Boraginaceae	H	D	Th	N	S	-	-	+	-
89.	<i>Cynoglossum lanceolatum</i> Forssk.	Boraginaceae	H	D	Th	Mic	S	-	+	+	-
90.	<i>Heliotropium strigosum</i> Willd.	Boraginaceae	H	WD	Th	Mic	S	+	-	-	+
91.	<i>Heliotropium europaeum</i> L.	Boraginaceae	H	WD	Th	Mic	S	-	-	+	-
92.	<i>Lithospermum arvense</i> L.	Boraginaceae	H	D	Th	N	S	-	-	+	-
93.	<i>Myosotis caespitosa</i> Schultz.	Boraginaceae	H	D	Hem	Mic	S	-	-	-	+
94.	<i>Buddleja crispa</i> Benth.	Buddlejaceae	S	D	Np	Mic	S	+	+	+	+
95.	<i>Brassica campestris</i> L.	Brassicaceae	H	CU	Th	Mac	S	-	+	+	-
96.	<i>Brassica rapa</i> L.	Brassicaceae	H	CU	Th	Mic	Dis	-	-	+	-
97.	<i>Cardana draba</i>	Brassicaceae	H	D	Np	Mic	S	-	-	+	-

S. No.	Species	Family	Habit	Habitat	Life Form	Leaf Size Spectrum	Lamina Shape	Seasonality			
								A	W	SP	SM
	(L.) Desv.										
98.	<i>Coronopus didymus</i> (L.) Sm.	Brassicaceae	H	W	Th	Mic	Dis	+	+	-	-
99.	<i>Eruca sativa</i> Mill.	Brassicaceae	H	W	Np	Mic	S	-	+	+	-
100	<i>Lepidium ruderales</i> L.	Brassicaceae	H	D	Th	N	S	-	-	-	+
101	<i>Lepidium didymum</i> L.	Brassicaceae	H	WD	Hem	Lp	S	-	-	+	+
102	<i>Nasturtium officinale</i> R.Br.	Brassicaceae	H	W	Th	N	S	-	-	+	-
103	<i>Persicaria glabra</i> (Willd.) M. Gomez.	Brassicaceae	H	W	Np	Mic	S	-	-	+	+
104	<i>Rorippa palustris</i> (L.) Besser.	Brassicaceae	H	D	Th	N	S	-	-	+	-
105	<i>Raphanus sativus</i> L.	Brassicaceae	H	W	Th	N	Comp	+	+	+	+
106	<i>Sisymbrium irio</i> L.	Brassicaceae	H	D	Th	N	Dis	-	-	+	+
107	<i>Thlaspi perfoliatum</i> L.	Brassicaceae	H	WD	Th	Mic	S	-	+	+	+
108	<i>Cannabis sativa</i> L.	Cannabaceae	H	WD	Th	Mic	S	-	-	+	+
109	<i>Celtis caucasica</i> Willd.	Cannabaceae	T	D	Mic	Mic	S	+	+	+	+
110	<i>Canna indica</i> L.	Cannaceae	H	WD	Ch	Meg	S	-	-	+	+
111	<i>Arenaria serpyllifolia</i> L.	Caryophyllaceae	H	W	Th	Lp	S	+	-	-	+
112	<i>Spergula arvensis</i> L.	Caryophyllaceae	H	D	Hem	Lp	S	-	-	-	+
113	<i>Stellaria media</i> (L.) Vill.	Caryophyllaceae	H	W	Ch	N	Dis	-	-	+	+
114	<i>Silene conoidea</i> L.	Caryophyllaceae	H	W	Th	Mic	S	-	+	+	-
115	<i>Silene viscosa</i> (L.) Pers.	Caryophyllaceae	H	W	Th	Mic	S	-	-	+	+
116	<i>Opuntia dillenii</i> (Ker Gawl.) Haw.	Cactaceae	S	D	Np	N	Abs	+	+	+	+
117	<i>Convolvulus arvensis</i> L.	Convolvulaceae	H	WD	Th	N	S	-	-	+	+
118	<i>Cuscuta reflexa</i> Roxb.	Cuscutaceae	H	WD	P	Lp	Abs	+	+	+	+
119	<i>Chenopodium album</i> L.	Chenopodiaceae	H	WD	Th	N	S	-	+	+	-
120	<i>Chenopodium ambrosioides</i> L.	Chenopodiaceae	H	W	Th	Lp	S	-	-	+	-
121	<i>Chenopodium murale</i> L.	Chenopodiaceae	H	WD	Th	Lp	S	+	-	-	-
122	<i>Dysphania botrys</i> (L.)	Chenopodiaceae	H	WD	Th	Mic	S	-	-	+	+

S. No.	Species	Family	Habit	Habitat	Life Form	Leaf Size Spectrum	Lamina Shape	Seasonality			
								A	W	SP	SM
	Mosyakin & Clemants.										
123	<i>Spinacia oleracea</i> L.	Chenopodiaceae	H	CU	Th	Mic	S	-	+	+	-
124	<i>Cucumis sativus</i> L.	Cucurbitaceae	H	CU	Th	Mac	Dis	+	-	+	-
125	<i>Cucumis melo</i> L.	Cucurbitaceae	H	CU	Th	Mic	S	+	-	+	-
126	<i>Cucurbita pepo</i> L.	Cucurbitaceae	H	CU	Th	Meg	Dis	+	-	+	-
127	<i>Cucurbita maxima</i> Duchesne.	Cucurbitaceae	H	CU	Th	Mac	Dis	-	-	+	-
128	<i>Luffa cylindrica</i> (L.) M.Roem.	Cucurbitaceae	H	CU	Th	Mac	Dis	-	+	+	-
129	<i>Momordica charantia</i> L.	Cucurbitaceae	H	CU	Th	Mes	Dis	+	-	+	-
130	<i>Diospyros kaki</i> L.f.	Ebenaceae	T	D	Mes	Mes	S	+	+	+	+
131	<i>Diospyros lotus</i> L.	Ebenaceae	T	D	Meg	Mic	S	+	+	+	+
132	<i>Euphorbia granulata</i> Forssk.	Euphorbiaceae	H	D	Hem	Lp	S	+	-	-	-
133	<i>Euphorbia helioscopia</i> L.	Euphorbiaceae	H	D	Th	N	S	-	-	+	-
134	<i>Euphorbia prostrata</i> Ait	Euphorbiaceae	H	D	Th	N	S	-	-	+	-
135	<i>Euphorbia heterophylla</i> L.	Euphorbiaceae	H	D	Th	Mic	S	-	-	+	+
136	<i>Euphorbia hirta</i> L.	Euphorbiaceae	H	D	Ch	N	S	-	-	+	+
137	<i>Euphorbia serrata</i> L.	Euphorbiaceae	H	D	Th	N	S	-	-	+	-
138	<i>Ricinus communis</i> L.	Euphorbiaceae	S	WD	Np	Mac	S	+	+	+	+
139	<i>Quercus baloot</i> Griff.	Fagaceae	T	D	Mes	Mic	S	+	+	+	+
140	<i>Quercus incana</i> Bartram.	Fagaceae	T	D	Mes	Mic	S	+	+	+	+
141	<i>Quercus dilatata</i> Royle.	Fagaceae	T	D	Mes	Mic	S	+	+	+	+
142	<i>Fumaria indica</i> (Hauskn.) Pugsley.	Fumariaceae	H	WD	Th	N	Dis	-	-	+	+
143	<i>Vicia sativa</i> L.	Fumariaceae	H	D	Th	N	Comp	-	-	+	+
144	<i>Juglans regia</i> L.	Juglandaceae	T	D	Mes	Mic	Comp	+	+	+	+
145	<i>Ajuga bracteosa</i> Wall. ex Benth.	Lamiaceae	H	D	Hem	Mic	S	+	-	+	+
146	<i>Ajuga parviflora</i> Benth.	Lamiaceae	H	D	Th	Mes	S	+	+	-	+
147	<i>Mentha arvensis</i> L.	Lamiaceae	H	W	G	N	S	+	-	+	+

S. No.	Species	Family	Habit	Habitat	Life Form	Leaf Size Spectrum	Lamina Shape	Seasonality			
								A	W	SP	SM
148	<i>Mentha longifolia</i> L.	Lamiaceae	H	W	Hem	N	S	+	-	+	+
149	<i>Ocimum basilicum</i> L.	Lamiaceae	S	D	Ch	N	S	+	+	+	+
150	<i>Salvia lanata</i> Roxb.	Lamiaceae	H	D	Th	Mes	S	+	+	-	+
151	<i>Salvia moorcroftiana</i> Wall. ex Benth.	Lamiaceae	H	D	Th	Mac	S	-	-	+	+
152	<i>Salvia nubicola</i> Wall. ex Sweet.	Lamiaceae	H	D	Th	Mes	S	+	+	-	+
153	<i>Punica granatum</i> L.	Lythraceae	T	D	Mes	N	S	+	+	+	+
154	<i>Abelmoschus esculentus</i> (L.) Moench.	Malvaceae	H	CU	Th	Mes	Sp	+	-	-	+
155	<i>Malva neglecta</i> Wallr.	Malvaceae	H	D	Th	Mic	S	-	+	+	-
156	<i>Melia azedarach</i> L.	Meliaceae	T	D	Meg	Mic	Comp	+	+	+	+
157	<i>Acacia modesta</i> Wall.	Mimosaceae	T	D	Mic	Lp	Comp	+	+	+	+
158	<i>Acacia nilotica</i> (L.) Delile.	Mimosaceae	T	D	Mic	Lp	Comp	+	+	+	+
159	<i>Broussonetia papyrifera</i> L.	Moraceae	T	WD	Meg	Mes	S	+	+	+	+
160	<i>Ficus carica</i> L.	Moraceae	T	D	Meg	Mes	S	+	+	+	+
161	<i>Ficus palmata</i> Forssk.	Moraceae	T	D	Meg	Mes	S	+	+	+	+
162	<i>Ficus sarmentosa</i> Buch. -Ham. Ex Sm.	Moraceae	T	D	Meg	Mes	S	+	+	+	+
163	<i>Morus alba</i> L.	Moraceae	T	D	Meg	Mes	S	+	+	+	+
164	<i>Morus macroura</i> Miq.	Moraceae	T	D	Meg	Mes	S	+	+	+	+
165	<i>Morus nigra</i> L.	Moraceae	T	D	Meg	Mes	S	+	+	+	+
166	<i>Psidium guajava</i> L.	Myrtaceae	T	D	Mes	Mes	S	+	+	+	+
167	<i>Eucalyptus camaldulensis</i> Dehnh.	Myrtaceae	T	D	Meg	N	S	+	+	+	+
168	<i>Mirabilis jalapa</i> L.	Nyctaginaceae	H	D	Np	Mes	S	+	-	+	+
169	<i>Jasminum officinale</i> L.	Oleaceae	H	D	Np	Mic	Comp	+	+	+	+
170	<i>Jasminum humile</i> L.	Oleaceae	H	WD	Np	Mic	Comp	+	+	+	+
171	<i>Olea ferruginea</i> Wall. ex Aitch.	Oleaceae	T	D	Mes	Mic	S	+	+	+	+
172	<i>Papaver somniferum</i> L.	Papaveraceae	H	D	Th	Mes	Dis	-	-	+	+

S. No.	Species	Family	Habit	Habitat	Life Form	Leaf Size Spectrum	Lamina Shape	Seasonality			
								A	W	SP	SM
173	<i>Lathyrus aphaca</i> L.	Papilionaceae	H	WD	Th	Mic	Comp	-	-	+	-
174	<i>Medicago denticulata</i> Willd.	Papilionaceae	H	WD	Th	N	Comp	-	-	+	+
175	<i>Medicago polymorpha</i> L.	Papilionaceae	H	WD	Th	N	Comp	-	+	+	-
176	<i>Medicago minima</i> L.	Papilionaceae	H	WD	Th	N	Comp	-	+	+	-
177	<i>Medicago lupulina</i> L.	Papilionaceae	H	D	Th	N	Comp	-	-	+	+
178	<i>Phaseolus vulgaris</i> L.	Papilionaceae	H	CU	Ch	Mes	Comp	-	-	-	+
179	<i>Phaseolus lunatus</i> L.	Papilionaceae	H	CU	Ch	Mes	Comp	-	-	+	-
180	<i>Pisum sativum</i> L.	Papilionaceae	H	CU	Th	Mic	Comp	- +	-	+	-
181	<i>Trifolium repens</i> L.	Papilionaceae	H	WD	Hem	N	Comp	-	-	+	+
182	<i>Trifolium resupinatum</i> L.	Papilionaceae	H	CU	Hem	Mic	Comp	-	-	+	+
183	<i>Pinus roxburghii</i> Sarg.	Pinaceae	T	D	Mes	Lp	N	+	+	+	+
184	<i>Pinus wallichiana</i> A.B. Jacks.	Pinaceae	T	D	Meg	Lp	N	+	+	+	+
185	<i>Platanus orientalis</i> L.	Platanaceae	T	WD	Meg	Mes	Dis	+	+	+	+
186	<i>Rumex dentatus</i> L.	Polygonaceae	H	W	Ch	Mes	S	+	-	-	+
187	<i>Rumex hastatus</i> D. Don.	Polygonaceae	H	W	Ch	N	Dis	+	+	-	+
188	<i>Ranunculus arvensis</i> L.	Ranunculaceae	H	WD	G	N	Dis	-	-	+	-
189	<i>Ranunculus muricatus</i> L.	Ranunculaceae	H	WD	G	N	Dis	-	-	+	+
190	<i>Ranunculus sceleratus</i> L.	Ranunculaceae	H	WD	G	N	Dis	-	-	+	+
191	<i>Ziziphus sativa</i> Gaertn.	Rhamnaceae	T	D	Meg	N	S	+	+	+	+
192	<i>Ziziphus jujuba</i> Mill.	Rhamnaceae	T	D	Mes	Mic	S	+	+	+	+
193	<i>Ziziphus oxyphylla</i> Edgew.	Rhamnaceae	T	D	Np	N	S	+	+	+	+
194	<i>Cotoneaster microphyllus</i> Wall. ex Lindl.	Rosaceae	H	WD	Np	Lp	S	+	+	+	+
195	<i>Cotoneaster nummularia</i> Fisch & Mey.	Rosaceae	H	WD	Np	N	S	+	+	+	+
196	<i>Eriobotrys japonica</i>	Rosaceae	T	D	Mic	Mes	S	+	+	+	+

S. No.	Species	Family	Habit	Habitat	Life Form	Leaf Size Spectrum	Lamina Shape	Seasonality			
								A	W	SP	SM
	(Thunb.) Lindl.										
197	<i>Prunus persica</i> (L.) Batsch.	Rosaceae	T	CU	Mic	Mes	S	+	+	+	+
198	<i>Prunus domestica</i> L.	Rosaceae	T	CU	Mic	Mes	S	+	+	+	+
199	<i>Prunus armeniaca</i> L.	Rosaceae	T	CU	Mic	Mes	S	+	+	+	+
200	<i>Pyrus baccata</i> L.	Rosaceae	T	WD	Mic	Mes	S	+	+	+	+
201	<i>Pyrus communis</i> L.	Rosaceae	T	CU	Mic	Mes	S	+	+	+	+
202	<i>Pyrus malus</i> L.	Rosaceae	T	CU	Mic	Mes	S	+	+	+	+
203	<i>Pyrus pashia</i> Buch. -Ham. ex D. Don.	Rosaceae	T	CU	Mic	Mes	S	+	+	+	+
204	<i>Rosa alba</i> L.	Rosaceae	S	CU	Np	N	Comp	+	+	+	+
205	<i>Rosa webbiana</i> Wall. ex Royle.	Rosaceae	S	WD	Np	N	Comp	+	+	+	+
206	<i>Rosa indica</i> L.	Rosaceae	S	CU	Np	N	Comp	+	+	+	+
207	<i>Rubus ellipticus</i> Sm.	Rosaceae	S	D	Np	N	Comp	+	+	+	+
208	<i>Rubus fruticosus</i> L.	Rosaceae	S	D	Mes	N	Comp	+	+	+	+
209	<i>Rubus ulmifolius</i> Schott.	Rosaceae	S	D	Mes	N	Comp	+	+	+	+
210	<i>Citrus indica</i> Yu. Tanaka.	Rotaceae	S	CU	Mic	Mes	S	+	+	+	+
211	<i>Citrus limetta</i> Risso.	Rotaceae	S	CU	Mic	Mes	S	+	+	+	+
212	<i>Citrus sinensis</i> (L.) Osbeck.	Rotaceae	S	CU	Mic	Mes	S	+	+	+	+
213	<i>Salix tetrasperma</i> Roxb.	Salicaceae	T	W	Mic	Mic	S	+	+	+	+
214	<i>Salix alba</i> L.	Salicaceae	T	W	Meg	Mic	S	+	+	+	+
215	<i>Populus alba</i> L.	Salicaceae	T	W	Mes	Mes	S	+	+	+	+
216	<i>Populus nigra</i> L.	Salicaceae	T	W	Meg	Mic	S	+	+	+	+
217	<i>Dodonaea viscosa</i> (L.) Jacq.	Sapindaceae	S	D	Np	N	S	+	+	+	+
218	<i>Ailanthus altissima</i> (Mill.) Swingle.	Simaroubaceae	T	D	Mic	Mic	Comp	+	+	+	+
219	<i>Atropa acuminata</i> Royal. ex Lindl.	Solanaceae	H	D	Th	Mes	S	-	-	-	+
220	<i>Capsicum annuum</i> L.	Solanaceae	S	CU	Th	Mic	S	+	-	-	+
221	<i>Capsicum frutescens</i> L.	Solanaceae	S	CU	Np	Mes	S	+	+	+	+
222	<i>Cestrum nocturnum</i> L.	Solanaceae	S	D	Ch	Mes	S	+	+	+	+
223	<i>Datura innoxia</i>	Solanaceae	H	D	Th	Mes	S	+	-	-	+

S. No	Species	Family	Habit	Habitat	Life Form	Leaf Size Spectrum	Lamina Shape	Seasonality			
								A	W	Sp	SM
	Mill.										
224	<i>Datura stramonium</i> L.	Solanaceae	H	D	Th	Mes	S	-	-	-	+
225	<i>Solanum nigrum</i> L.	Solanaceae	H	CU	Th	Mes	S	+	-	-	+
226	<i>Solanum tuberosum</i> L.	Solanaceae	H	CU	G	Mes	Comp	-	-	-	+
227	<i>Solanum surattense</i> Burm. F.	Solanaceae	H	CU	Hem	Mes	S	-	-	-	+
228	<i>Withania somnifera</i> (L.) Dunal.	Solanaceae	S	D	Ch	Mic	S	+	+	+	+
229	<i>Withania coagulans</i> (Stocks) Dunal.	Solanaceae	S	D	Ch	Mic	S	+	+	+	+
230	<i>Celtis australis</i> L.	Ulmaceae	T	D	Meg	Mic	S	+	+	+	+
231	<i>Celtis caucasica</i> Willd.	Ulmaceae	T	D	Mes	Mic	S	+	+	+	+
232	<i>Urtica dioica</i> L.	Urticaceae	H	W	Th	Mic	S	-	-	+	+
233	<i>Viola biflora</i> L.	Urticaceae	H	W	Th	Mic	S	-	-	+	+
234	<i>Viola canescens</i> Wall.	Urticaceae	H	D	Th	Mic	S	-	-	+	-
235	<i>Vitis vinifera</i> L.	Vitaceae	S	CU	Np	Mes	S	+	+	+	+
236	<i>Aloe vera</i> (L.) Burm.f.	Xanthorrhoeaceae	H	D	Ch	Mes	S	+	+	+	+
237	<i>Tribulus terrestris</i> L.	Zygophyllaceae	H	D	Hem	Lp	Comp	+	-	-	+
238	<i>Peganum harmala</i> L.	Zygophyllaceae	H	D	Th	Lp	Dis	-	-	+	-

Table 4: Key to abbreviations

Habit	Habitat	Life form classes	Leaf size spectrum	Lamina shape
H=Herb	D=Dry	Hem=Hemicryptophytes	Mac=Macrophyll	S=Simple
S=Shrub	W= Wet	Mic=Microphanerophyte	Mic =Microphyll	Dis =Dissected
T= Tree	CU=Cultivated	Mes=Mesophanerophyte	Mes=Mesophyll	Comp =Compound
	WD=Dry/Wet	Meg=Megaphanerophyte	Meg=Megaphyll	Abs=Abesent
	G=Geophytes	Th=Therophytes	Lp =Leptophyll	N=Needle
	P=Parasite	Ch=Chamaephytes	N=Nanophyll	Sp=Spiny
		Np=Nanophanerophyte	Ap=Aphyllous	

Table 5: Biological characteristics of the Valley

S. No.	Characteristics		
1	Vegetation	Number of Species	Percentage
	Families	60	-
	Genera	164	-
	Species	238	-
2	Habitat type	Number of Species	Percentage of species
	Dry places	115	48.31
	Cultivated	42	17.64
	Wet and dry places	46	19.32
	Wet places	35	14.70
3	Habit	Number of Species	Percentage of species
	Herbs	167	70.16
	Trees	43	18.06
	Shrubs	28	11.76
4	Seasonality	Number of Species	Percentage of species
	Summer	185	30.57
	Spring	182	30.08
	Autumn	130	21.48
	Winter	108	17.85
5	Life form classes	Number of Species	Percentage of species
	Therophytes	102	42.85
	Hemicryptophytes	25	10.50
	Nanophanerophytes	27	11.34
	Chamaephytes	20	8.40
	Microphanerophytes	18	7.56
	Megaphanerophytes	16	6.72
	Geophytes	15	6.30
	Mesophanerophytes	14	5.88
	Parasite	1	0.42
6	Leaf size spectrum	Number of Species	Percentage of species
	Microphyll	73	30.67
	Mesophyll	69	28.99
	Nanophyll	60	25.21
	Leptophyll	23	9.66
	Macrophyll	8	1.26
	Megaphyll	4	1.68
	Aphyllous	1	0.42
7	Lamina shape	Number of Species	Percentage of species
	Simple	154	64.70
	Compound	37	15.54
	Dissected	37	15.54
	Spiny	5	2.10
	Absent	3	1.26
	Needles	2	0.84

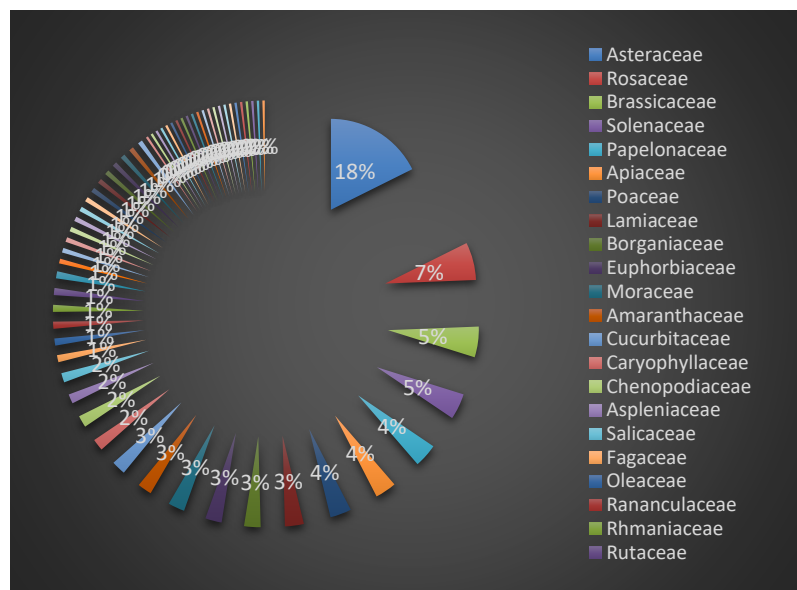


Fig 1. Percentage of plant species

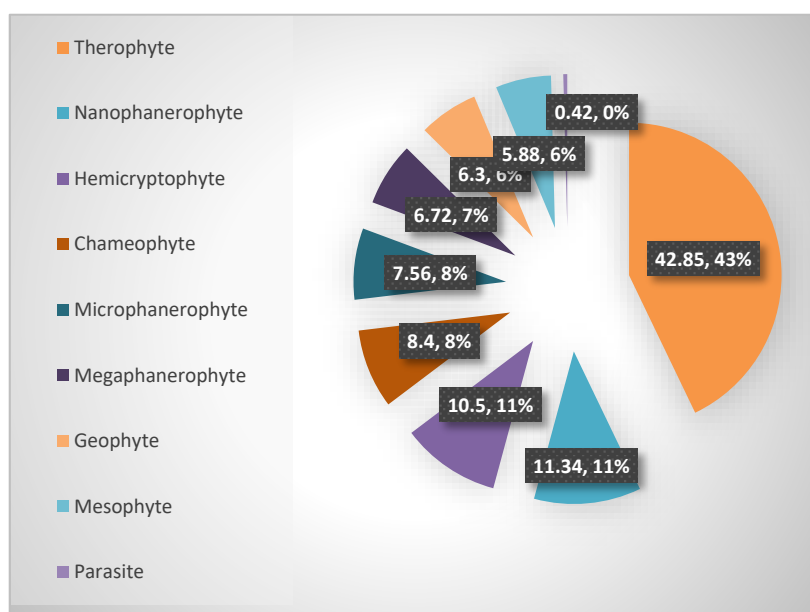


Fig 2. Life form classes

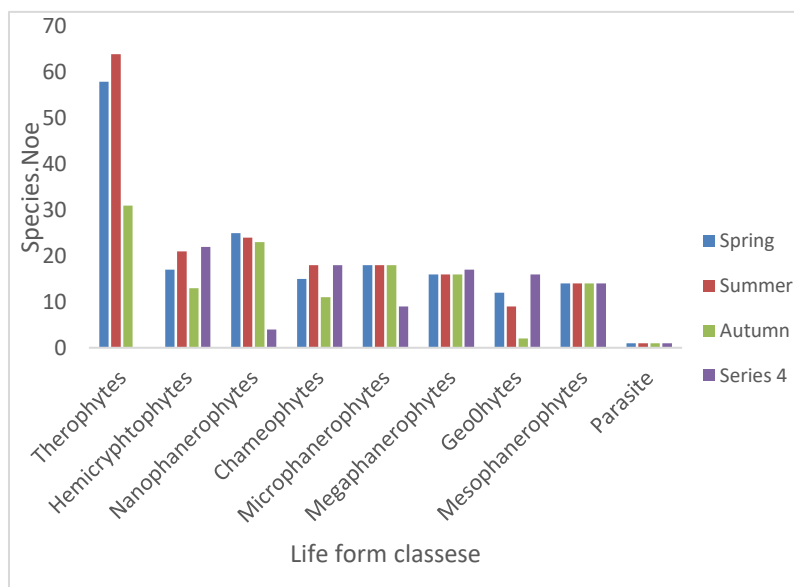


Fig 3. Seasonal variation in the life form of vegetation.

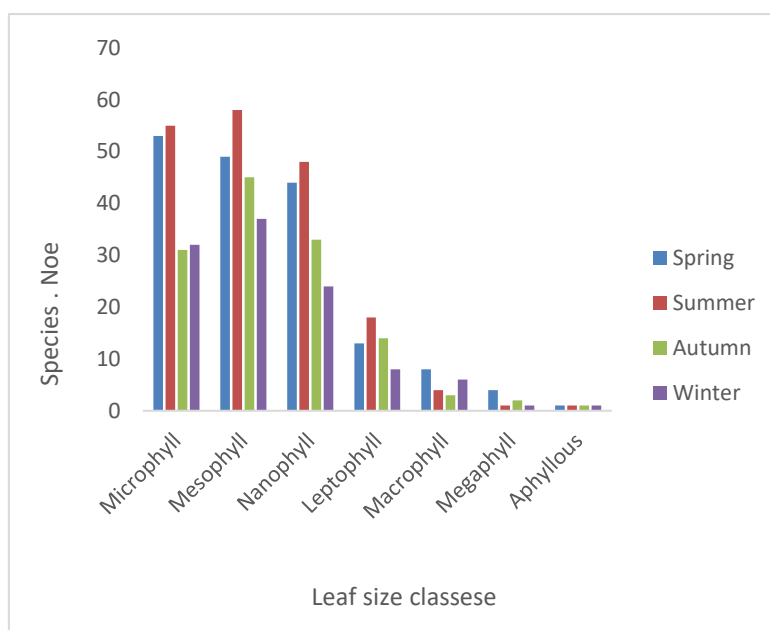


Fig 4. Seasonal variation in leaf size spectrum.

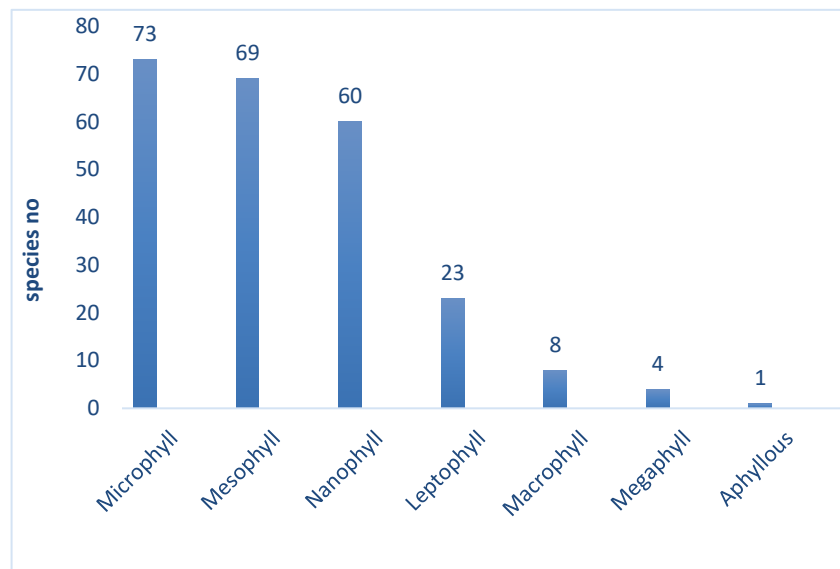


Fig 5. Percentage of species based on vegetation.

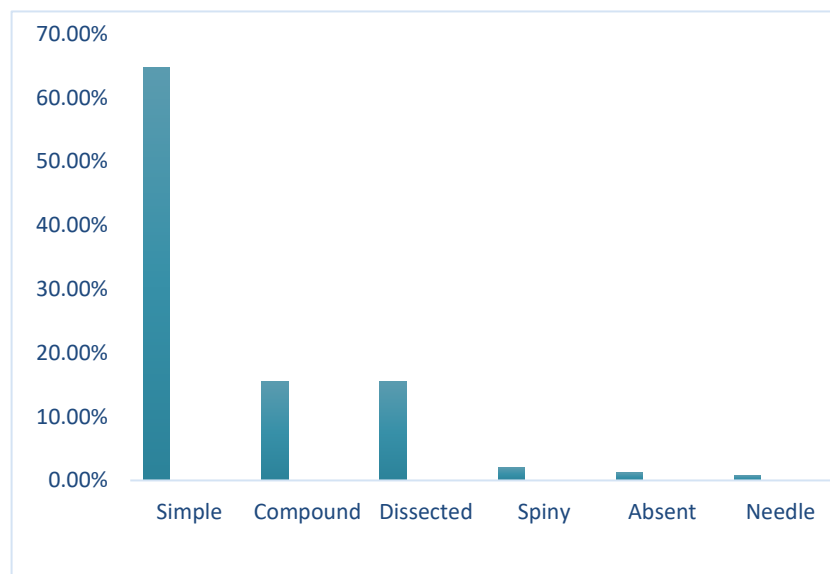


Fig 6. Leaf size spectrum of lamina shape.

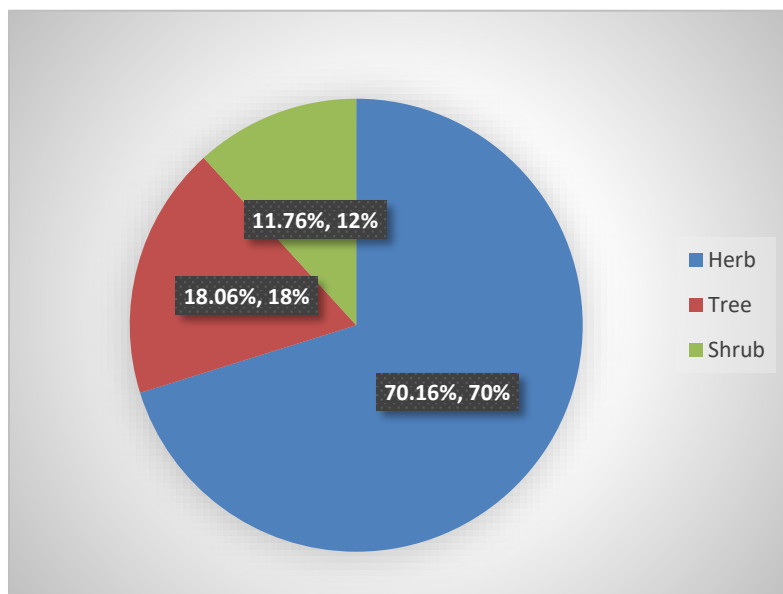


Fig 7. Percentage of species based on their habitat

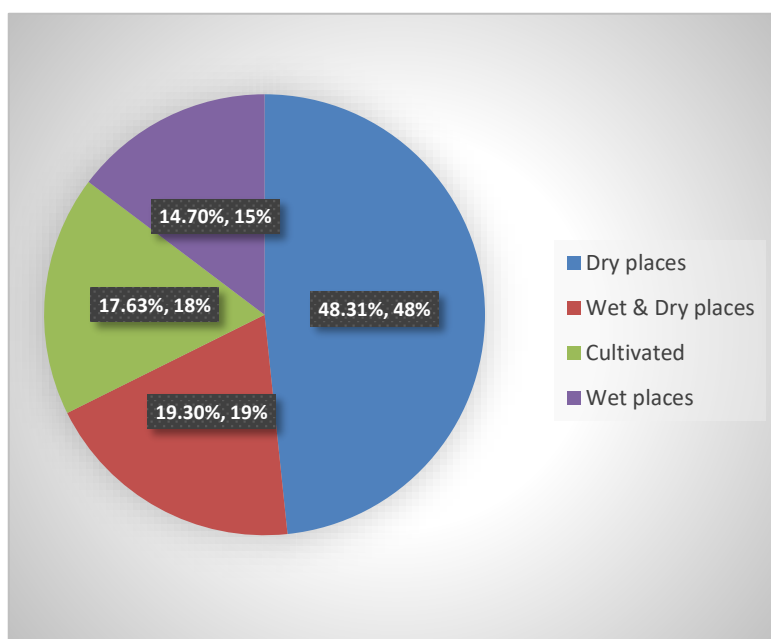


Fig 8. Percentage of species based on their habit

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