PHYTODIVERSITY AND ECOLOGICAL FEATURES OF WEED SPECIES OF SUFAID SUNG, PESHAWAR

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ABSTRACT

Field surveys were carried out to assess the phytodiversity, phenology, leaf size, leaf shape and life form of weed flora of village Sufaid Sung, Peshawar from March 2018 to June 2020. Overall, 95 plant species associated with 31 families have been recorded. Among them Poaceae (22 species), Asteraceae (10 species) followed by Amaranthaceae and Papilionaceae (6 species each), Brassicaceae and Polygonaceae (5 species each), Euphorbiaceae and Solanaceae (4 species each), Chenopodiaceae and Convolvulaceae (3 species each), Apiaceae, Caryophyllaceae, Cyperaceae, Malvaceae and Verbenaceae (2 species each) were the dominant plant families, while the rest of 16 families contributed a single species each. The dominant life form was therophytes (76 species) followed by hemicryptophytes (11 species) and geophytes (8 species). Leaf size of the flora showed that the most dominant leaf size class was mesophyll (38 species) followed by macrophyll and microphyll (18 species each), nanopohyll (15 species), leptophyll (5 species) and a single aphyllous species. Sixty eight species had simple leaves while 26 species had dissected leaves. The findings of the study reflects a detailed phytodiversity and ecological features of the weeds that may be important as reference work for the future ecological, weed management and conservational studies.

Keywords: Phytodiversity, ethnobotany, ecological features, weeds flora, Peshawar

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INTRODUCTION

Peshawar, the provincial capital of Khyber Pakhtunkhwa (KP), is located at 34° 01′ N Latitude and 71° 35′ E Longitude with an average elevation of 1086 ft. (Khan et al., 2019). Peshawar is situated in a sub-tropical zone with an average temperature range of 40 °C to 4 °C. Winter in Peshawar starts from mid-November to the end of March, followed by a short spring season till end of April. The summer months are May to September. The relative humidity varies from 46% in June to 76-85% in August. The yearly average rainfall is 403.9 mm. The highest precipitation is recorded in September having 114.6 mm which falls to 50 mm in June (Basit et al., 2019, Khan et al., 2013a).The district area is plain and fertile (Khan and Ali, 2019). Fine alluvium deposits are present in the middle regions of the district. Rich and perforated soil with a quite uniform combination of clay and sand make the region suitable for cultivation. It is blessed with fertile soil and considerable plant biodiversity because of the River Kabul (Usman et al., 2017).The major crops grown are wheat, sugarcane and maize along with the cultivation of different vegetables (Shah et al., 2006, Khan et al., 2011).

Sufaid Sung is the well-known village of District Peshawar located between latitude 34° 5.14′ and longitude 71° 27.33′ near Warsak Dam on the bank of River Kabul, bordered by Khyber agency, and is about 17 km away from the main city of Peshawar. Residents of the area are mostly engaged in agriculture and their livelihood is mostly farming.

Pronounced weeds diversity may have a positive impact on the functioning of agro-ecosystems. In current decades, weeds biodiversity in agricultural system has reduced mainly due to advancement of farming practices e.g. weeds control by highly effective herbicides. The weeds grow in the ordinary environment which is part of the vibrant ecosystem and compete with the crops for nutrients, space and light (Iqbal et al., 2017, Khan et al., 2017). Weeds are the main factor to reduce crop yield and is accountable for 18% grain losses in wheat and 10-60% losses in maize crop (Gurmani et al., 2020). Due to competition and race for natural resources and faster growth, the weeds are generally considered problematic (Saeed et al., 2020). Several weeds release allelopathic chemicals which can harm the growth and development of crops. Due to their abundant growth in different environmental conditions, the weeds are great competitors to cereal crops (Khan et al., 2017, Naveed et al., 2019). However, these yield losses largely depend on the type of weed flora, abundance, abiotic factors, and their ecological interactions. The floristic composition of weeds may vary with location and their environmental factors (Ibrahim et al., 2019, Uddin et al., 2018).

Therefore, the present study was aimed to enlist the weed flora and their major ecological features. Although different ecological studies have been carried out on weed flora by several researchers, the current study provides the first-ever report on weeds growing in the cultivated and uncultivated area of Sufaid Sung, Peshawar which will provide key information for proper identification and proper management.

MATERIAL AND METHODS

Field surveys were conducted to record the floristic composition, phenology, leaf size, leaf shape and life forms of weeds of Sufaid Sung, Peshawar, Khyber Pakhtunkhwa at regular intervals of different seasons from March 2018 to December 2020. This study was performed to explore and document the important weed species and wild relatives of the cash crops grown in the area. The research area was thoroughly visited in different seasons for the collection of their weed's flora. The equipment for research work was the map of the area, notebook, pencil, plant presser, old newspaper, polythene bags, knife, compass and digital camera. Three to five specimens were

collected for each plant species, sequentially marked and appropriately pressed. The old newspapers, blotters, and corrugated sheets were used for drying and pressing. Newspapers were regularly changed after everyday till the complete dryness of the collected plants. The collected plant species were identified with the help of taxonomists, available literature and the flora of Pakistan. Plants were categorized into their life forms and leaf size classes according to (Hussain, 1989). Leaf shapes and phenology were identified during collection in the fields. Identified plant specimens were submitted to the Herbarium, Department of Botany, University of Peshawar, Pakistan.

RESULTS AND DISCUSSION

Floristic list

A total of 95 weed species belonging to 31 families and 82 genera were collected from the research area. Out of 31 families, 27 were Dicotyledonous having 60 genera and 69 species (72.63%) and 2 families are monocotyledonous with 22 genera and 24species (25.26%).Two species belonging to two families were Pteridophytes. The dominating family was Poaceae with 22 species (23.19%) leg behind by Asteraceae with 10 species (10.5%) which in turn followed by Amaranthaceae and Papilionaceae with 6 species (6.3%) each while Brassicaceae and Polygonaceae contributed 5 species (5.3%). Euphorbiaceae and Solanaceae contributed 4 species (4.2%) each. Chenopodiaceae and Convolvulaceae contributed 3 species (3.2%) each. Apiaceae, Caryophyllaceae, Cyperaceae, Malvaceae, and Verbenaceae added 2 species (2.1%) while the rest of 16 families contributed 1 species (1.05%) each (Table-1,3,4). Similar results have been shown by Ali et al. (2015), Anwar et al. (2020), Hussain et al. (2015), Khan et al. (2013b).Anwar et al. (2020) reported that Poaceae, Asteraceae, and Amaranthaceae as the dominant families in weeds of maize crop in Swabi. Zeb et al. (2017) also reported Poaceae and Asteraceae as the dominant families.

Life form

The therophytes with 76 species (80%) were the dominant life form followed by hemicryptophytes containing 11 species (11.59%) which in turn followed by geophytes having 8 species (8.42%) (Table-2). Inayat et al. (2014) reported therophytes followed by hemicryptophytes from District Charsadda, Pakistan which agree with our present findings. Naila et al. (2017) also reported the highest diversity of therophytic weeds in garlic crop grown in Botanical Garden, University of Peshawar while Badshah et al. (2016) reported therophytes as an abundant life form in spring and summer plants of Parachinar, Kurram Agency. Hemicryprophytes and phanerophytes show the dominancy at high altitude (Hussain and Ishtiaq, 2009)

Leaf classes

With the help of Raunkiar's diagram, the leaf classes were analyzed. There are 6 types of leaf classes. The first one (leptophyll) is the smallest in size (25 sq. mm) and each class preceded to the next class is larger than the earlier class nine times. From the flora, the leaf size showed that mesophyll was the most dominant leaf size class which contain 38 species (40%) followed by macrophyll and microphyll with 18 species (18.95%) each. Nanopohyll represented 15 species (15.79%) and Leptophyll contributed by 5 species (5.26%) while one species was aphyllous. Simple leaf species were 68 (72.34%) while 26 species (27.66%) were with dissected leaves (Table-2).

Phenology

Phenological stages were recorded as pre-reproductive 12 species (12.63%), reproductive 69 species (72.63%), and post-reproductive 14 species (14.74%) as shown in Table-2. In exploring the flora of an area life form and leaf size spectra play a key role during studies. The study of life form and leaf size is an essential kind of

vegetation description (Khan et al., 2013). The climatic and human disturbance of a particular area can be investigated and showed by Life form and leaf size spectra (Haq et al., 2019).

Table 1. Phytodiversity and ecological features of weed species of Sufaid Sung, Peshawar

S.No	Plant species and botanical category	Life forms	Leaf sizes	Leaf shapes	Phenology
A.	**Pteridophytes**				
1.	Equisetaceae				
1.	*Equisetum arvense* L.	G	Ap	Ap	S3
2.	Pteridaceae				
2.	*Pteris vittata* L.	G	Mes	Dis	S1
B.	**Angiosperms**				
a.	**Monocots**				
3.	Cyperaceae				
3.	*Cyperus rotundus* L.	G	Mic	S	S2
4.	*Fimbristylis dichotoma* (L.)Vahl	G	Mes	S	S3
4.	Poaceae				
5.	*Avena fatua* L.	Th	Mes	S	S2
6.	*Bromus catharticus* Vahl	Th	Mes	S	S2
7.	*Bromus gracillimus* Bunge	Th	Mes	S	S3
8.	*Cynodon dactylon* (L.) Pers.	H	Mic	S	S2
9.	*Cenchrus ciliaris* L.	H	Mes	S	S2
10.	*Dactyloctenium aegyptium* (L.) Richt.	Th	Mic	S	S2
11.	*Desmostachya bipinnata* (L.) Stapf	H	Mes	S	S2
12.	*Dichanthium annulatum* (Forssk.) Stapf	H	Mes	S	S2
13.	*Digitaria ciliaris* (Retz.)Koeler	Th	Mic	S	S2
14.	*Eleusine indica* (L.) Gaertn.	H	Mes	S	S2
15.	*Eragrostis minor* Host	Th	Mic	S	S2
16.	*Hordeum murinum* L.	Th	Mes	S	S1
17.	*Imperata cylindrica* (L.)P.Beauv.	H	Mes	S	S2
18.	*Paspalum distichum* L.	H	Mes	S	S2
19.	*Phragmites karka* Hook. F.	G	Mac	S	S3
20.	*Phalaris minor* Retz.	Th	Mes	S	S2
21.	*Poa annua* L.	Th	Mic	S	S2
22.	*Polypogon monspeliensis* (L.) Desf.	Th	Mes	S	S2

23.	*Rostraria cristata* (L.) Tzvelev	Th	Mes	S	S2
24.	*Saccharum griffithii* Munro ex Hole	H	Mac	S	S3
25.	*Saccharum munja* Roxb.	H	Mac	S	S3
26.	*Setaria pumila* (Buse) B.K.Simon	Th	Mic	S	S2
b.	**Dicots**				
5.	Aizoaceae				
27.	*Trianthema portulacastrum* L.	Th	N	S	S2
6.	Amaranthaceae				
28.	*Achyranthes aspera* L.	Th	Mes	S	S2
29.	*Alternanthera pungens* Kunth	Th	Mic	S	S2
30.	*Amaranthus graecizans* L.	Th	Mic	S	S2
31.	*Amaranthus polygonoides* L.	Th	Mes	S	S3
32.	*Amaranthus viridis* L.	Th	Mic	S	S2
33.	*Digera muricata* (l.) Mart.	Th	Mes	S	S3
7.	Apiaceae				
34.	*Scandix pectin-veneris* L.	Th	Mes	Dis	S2
35.	*Torilis leptophylla* (L.) Rchb. f.	Th	Mic	Dis	S2
8.	Asteraceae				
36.	*Calendula arvensis* (Vaill.) L.	Th	Mes	S	S2
37.	*Cirsium arvense* (L.) Scop.	Th	Mac	Dis	S1
38.	*Cichorium intybus* L.	Th	Mac	S	S1
39.	*Conyza bonariensis (*L.) Cronquist	Th	Mes	S	S2
40.	*Conyza canadens* (L.) Cronquist	Th	Mes	S	S3
41.	*Eclipta alba* (L.) Hassk.	Th	Mes	S	S2
42.	*Lactuca serriola* L.	Th	Mac	Dis	S3
43.	*Silybum marianum* (L.) Gaertn.	Th	Mac	Dis	S2
44.	*Sonchus oleraceous* L.	Th	Mac	Dis	S2
45.	*Xanthium strumarium* L.	Th	Mac	Dis	S1
9.	Asclepiadaceae				
46.	*Calotropis procera* (Aiton)W.T.Aiton	H	Mac	S	S1
10.	Brassicaceae				
47.	*Brassica campestris* L.	Th	Mac	Dis	S2
48.	*Brassica tournefortii* Gouan	Th	Mac	Dis	S2
49.	*Coronopus didymus* (L.) Sm.	Th	N	Dis	S2
50.	*Raphanus raphanistrum* L.	Th	Mac	Dis	S3
51.	*Sisymbrium irio* L.	Th	Mac	Dis	S2
11.	Caryophyllaceae				

52.	*Cerastium glomeratum* Thuill.	Th	Mes	S	S2
53.	*Stellaria media* (L.) Cirillo	Th	N	S	S2
12.	Chenopodiaceae				
54.	*Chenopodium album* L.	Th	N	S	S1
55.	*Chenopodium ambrosioides* L.	Th	Mac	Dis	S2
56.	*Chenopodium murale* L.	Th	Mes	Dis	S2
13.	Cleomaceae				
57.	*Cleome viscosa* L.	Th	Mes	Dis	S2
14.	Cucurbitaceae				
58.	*Citrullus colocynths* (L.) Schrad.	Th	Mes	Dis	S2
15.	Convolvolaceae				
59.	*Convolvulus arvensis* L.	Th	Mes	Dis	S1
60.	*Ipomoea eriocarpa* R.Br.	Th	Mic	Dis	S2
61.	*Ipomoea hederacea* Jacq.	Th	Mes	Dis	S3
16.	Euphorbiaceae				
62.	*Euphorbia helioscopia* L.	Th	N	S	S2
63.	*Euphorbia hirta* L.	Th	Mic	S	S2
64.	*Euphorbia hypericifolia* L.	Th	Mes	S	S2
65.	*Euporbia prostata* Aiton	Th	L	S	S2
17.	Fumariaceae				
66.	*Fumaria indica* (Hausskn.)Pugsley	Th	Mes	Dis	S2
18.	Lamiaceae				
67.	*Lamium amplexicaule* L.	Th	Mic	Dis	S2
19.	Malvaceae				
68.	*Corchorus acutangulus* L.	Th	Mes	S	S2
69.	*Malvastrum coromandelianum* (L.) Garcke	Th	N	S	S2
20.	Nyctiginaceae				
70.	*Boerhavia procumbens* Banks ex Roxb.	Th	Mic	S	S2
21.	Oxalidaceae				
71.	*Oxalis corniculata* L.	Th	L	Dis	S2
22.	Papilionaceae				
72.	*Lathyrus aphaca* L.	Th	N	S	S2
73.	*Medicago polymorpha* L.	G	L	S	S2
74.	*Melilotus officinalis* (L.) Lam.	Th	N	S	S1
75.	*Sesbania sesban* (L.) Merr.	Th	N	S	S2
76.	*Trifolium resupinatum* L.	G	Mic	S	S1
77.	*Vicia sativa* Guss.	Th	N	S	S2

23.	Phyllanthaceae				
78.	*Phyllanthus niruri* L.	Th	N	S	S2
24.	Plantaginaceae				
79.	*Plantago lanceolata* L.	Th	Mac	S	S2
80.	*Veronica persica* Poir.	Th	N	Dis	S2
25.	Polygonaceae				
81.	*Emex spinosa* (L.) Campd.	Th	Mic	S	S2
82.	*Persicaria maculosa* Gray	Th	Mes	S	S2
83.	*Polygonum aviculare* L.	Th	L	S	S2
84.	*Polygonum hydropiper* L.	Th	Mes	S	S2
85.	*Rumex dentatus* L.	G	Mac	S	S1
26.	Primulaceae				
86.	*Anagallis arvensis* L.	Th	N	S	S2
27.	Ranunculaceae				
87.	*Ranunculus muricatus* L.	Th	Mes	Dis	S2
28.	Rubiaceae				
88.	*Galium aparine* L.	Th	N	S	S2
29.	Solanaceae				
89.	*Datura innoxia* Mill.	Th	Mac	S	S1
90.	*Physalis minima* L.	Th	Mes	S	S2
91.	*Solanum nigrum* L.	Th	Mes	S	S3
92.	*Withania somnifera* (L.)Dunal	H	Mes	S	S2
30.	Verbenaceae				
93.	*Verbena officinalis* L.	Th	Mic	Dis	S2
94.	*Phyla nodiflora* (L.) Greene	Th	N	S	S2
31.	Zygophyllaceae				
95.	*Tribulus terrestris* L.	Th	L	S	S3

Keys; The: therophytes, G: geophytes, H: hemicryptophytes, N: nanophylls, L: leptophylls, Ap: aphyllous, Mic: microphylls, Mes: mesophylls, Mac: macrophylls, S: simple, Dis: dissected, S1: pre-reproductive, S2: reproductive, S3: post-reproductive

Table 2. Summary of ecological characteristics of weeds of Sufaid Sung, Peshawar

Parameters	Classes	No of species	%age
Life Forms	Therophytes	76	80
	Hemicryptophytes	11	11.58
	Geophytes	8	8.42
		Total = 95	

Leaf Sizes	Mesophylls	38	40
	Macrophylls	18	18.95
	Microphylls	18	18.95
	Nanophylls	15	15.79
	Leptophylls	5	5.26
	Aphyllous	1	1.05
		Total=95	
Leaf Shapes	Simple	68	72.34
	Dissected	26	27.66
	Aphyllous	1	1.05
		Total=95	
Phenological stages	Pre-reproductive	12	12.63
	Reproductive	69	72.63
	Post-reproductive	14	14.74
		Total=95	

Table 3. Number of genera and species within the major groups of plants

Major groups	No. of genera	No. of species	Species %age
Pteridophytes	2	2	2.11
Monocots	22	24	25.26
Dicots	60	69	72.63

Table 4. Showing number of species of each family and their percentage

SNo.	Family	No. of species	Percentage
1.	Poaceae	22	23.16
2.	Asteraceae	10	10.5
3.	Amaranthaceae	6	6.3
4.	Papilionacee	6	6.3
5.	Brassicaceae	5	5.3
6.	Polygonaceae	5	5.3
7.	Euphorbiaceae	4	4.2
8.	Solanaceae	4	4.2
9.	Chenopodiaceae	3	3.2
10.	Convolvolaceae	3	3.2
11.	Cyperaceae	2	2.1
12.	Apiaceae	2	2.1
13.	Caryophyllaceae	2	2.1
14.	Malvaceae	2	2.1
15.	Verbenaceae	2	2.1
16.	Equisetaceae	1	1.05
17.	Pteridaceae	1	1.05
18.	Aizoaceae	1	1.05

19.	Asclepiadaceae	1	1.05
20.	Cleomaceae	1	1.05
21.	Cucurbitaceae	1	1.05
22.	Fumariaceae	1	1.05
23.	Lamiaceae	1	1.05
24.	Nyctiginaceae	1	1.05
25.	Oxalidaceae	1	1.05
26.	Phyllanthaceae	1	1.05
27.	Plantaginacea	1	1.05
28.	Primulaceae	1	1.05
29.	Ranunculaceae	1	1.05
30.	Rubiaceae	1	1.05
31.	Zygophyllaceae	1	1.05

CONCLUSION

The data shows a considerable amount of diversity in weeds distribution. However, diversity in cultivated areas is much lower than in uncultivated areas. This is possibly due to anthropogenic activities and use of different weeds control measures. Despite of their impact on crops and vegetable yield, weeds have medicinal and therapeutic uses. We recommend that these weeds can be used for their medicinal and therapeutic purposes. To achieve this goal, further ecological and ethnobotanical assessments are required. The present study will provide a reference and helping tool in such circumstances.

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