

WEED FLORA OF SUGARCANE IN DISTRICT BANNU, KHYBER PAKHTUNKHAWA, PAKISTAN

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ABSTRACT

A survey was conducted to highlight the weed flora of sugarcane crop in district Bannu, Khyber Pakhtunkhawa Province, Pakistan during the year 2011. The relative density of weeds was determined using the Oosting scale method. This study explored 73 weed species belonging to 65 genera and 27 families in sugarcane fields in district Bannu. Out of the 27 weed families, three were monocots (with 13 genera and 13 species) and 24 were dicots (with 52 genera and 60 species). The most common families in terms of abundance and number of species infesting sugarcane crop were Asteraceae (12 genera and 12 species), Poaceae (11 genera and 11 species), Papilionaceae (5 genera and 5 species), Solanaceae (4 genera and 5 species), Malvaceae (4 genera and 4 species), Amaranthaceae (3 genera and 5 species), Euphorbiaceae (3 genera and 3 species), Polygonaceae (2 genera and 4 species), Plantaginaceae (2 genera and 2 species), Verbenaceae (2 genera and 2 species), Chenopodiaceae (1 genera and 3 species), and Convolvulaceae (1 genera and 2 species). The rest of the families were represented by only one species each. According to the Oosting scale, *Cynodon dactylon*, *Echinochloa crus-galli*, *Eclipta alba*, *Enneapogon avenaceus*, *Leptochloa panicea* were the most abundant weed species in sugarcane fields followed by *Amaranthus viridis*, *Alopecurus nepalensis*, *Carduus argentatus*, *Cirsium arvense*, *Cyperus rotundus*, *Dichanthium annulatum*, *Eleusine indica*, *Oxalis corniculata*, *Parthenium hysterophorus*, *Phalaris minor*, *Polygonum barbatum*, *Sorghum halepense* which were reported as significantly reducing sugarcane yields in the locality and only judicious management of these species may enable the sugarcane growers to harvest bumper yields of their crop.

Keywords: Bannu, Oosting scale, sugarcane, weeds.

INTRODUCTION

Sugarcane (*Saccharum officinarum* L.) is a member of Poaceae. It is one of the most important cash crops of Pakistan. The national average yield of sugarcane (54 t ha⁻¹) is much lower than that of world average (65 t ha⁻¹) (Anonymous, 2008). The reasons for low yield include conventional planting methods, costly inputs, heavy weed

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infestation, improper land preparation, illiteracy, less support price, lack of coordination between growers and mill owners, natural calamities, shortage of irrigation water, delayed harvesting, attack of insect pests and diseases, poor management of crop and salinity. Among these reasons, the weed infestation is a major cause of low sugarcane yield (Baloch *et al.*, 2002; Malik and Gurmani, 2005). Sugarcane being a long duration crop, its yield potential is affected more than 20-25% due to weeds (Khan *et al.*, 2004).

Weeds are strong competitors to cereal crops because of their profuse growth in many environmental conditions. The stronger the growth of a weed species the most competitive and dominant it will be in the crop. Weeds decrease crop yields by competing with the crop plants for water, nutrients and light. In addition, some weeds are allelopathic which further aggravate the losses in the crops. Hussain *et al.* (1998) reported weeds flora of Hazro, Hashim and Marwat (2002) from district Abbotabad, Hussain *et al.* (2004) from Chitral, Khan *et al.* (2004) from Bannu, Akhtar and Hussain (2007) from Swat and Wazir *et al.* (2007) from district Karak in Pakistan. Generally, 1 kg of weed biomass corresponds to a loss of 1 kg in crop plants biomass (Rao, 2000).

District Bannu is situated at a distance of 190 km, in the South of Peshawar and lies between 32.43° to 33.06° N and from 70.22° to 70.07° E. It is bordering in the north and west the tribal areas and in the East by district Karak, while in the South by district Lakki Marwat. Almost all the people of this district speak Pashto and of them live in villages and only small number in urban areas. Important crops of district Bannu are wheat, maize, rice, gram, sugarcane and fodder and grain sorghum.

MATERIALS AND METHODS

The present study was conducted during 2011. The weeds were collected from sugarcane fields. Specimen collection and preservation were made according to standard protocols. Several field trips (regularly twice in a month) were arranged during 2011 to the experimental area. The collected specimens were pressed, dried, and mounted on herbarium sheets. The specimens were then identified. The identification was also confirmed using Flora of Pakistan and other related literature (e.g. Stewart 1972; Nasir and Ali, 1971-95). Results were re-checked and compared with literature (e.g. Rubina, 1998; Ali and Fefevre, 1996; Khalid, 1995).

Weed species distribution

The distribution of specimens was calculated by using Oosting (1956) scale.

Table-1. Oosting (1956) Scale

S.No.	Class	Rarity
1.	Class I	Very Rare
2.	Class II	Rare
3.	Class III	Infrequent
4.	Class IV	Abundant
5.	Class V	Very abundant

Areas surveyed

Trips were arranged during the year of 2011 to 25 different sites (Table-2) of district Bannu to explore and collect important weed flora found in the fields cultivated with sugarcane. A total of 73 weed species were collected, digitally photographed and evaluated through their morphological traits.

Table-2. Different sites within district Bannu from where the different weed species were collected

1. Nurar	14. Metta Khel
2. Mandew	15. Amandi
3. Mandan	16. Sokari
4. Surani	17. Mamash khel
5. Bharat	18. Jhando Khel
6. Khujary	19. Baist Khel
7. Kakki	20. Ismial Khel
8. Ismail Khel	21. Banda Mirabas
9. Mira Khel	22. Bazar Ahmad Khan,
10. Mama Khel	23. Shahbaz Azmat Khel
11. NarJafar Khan	24. Kalla Khel Masti khel
12. Shamshi Khel	25. Manjakhel/Ghoriwala
13. Mira Khel	-

RESULTS AND DISCUSSION

As a whole about 73 weed species belonging to 27 families were collected, identified and arranged alphabetically along with family names and local names, and preserved. Among the 27 families: 3 of

monocot (having 13 genera and 13 species) and 24 of dicot (having 52 genera and 60 species). According to percentage data (Table-3), the most important families in terms of species representation were Asteraceae; having 12 genera and 12 species, followed by Poaceae; 11 genera and 11 species, Papilionaceae; 5 genera and 5 species, Solanaceae; 4 and 5, Amaranthaceae; 3 and 5, Malvaceae; 4 and 4, Polygonaceae; 2 and 4, Euphorbiaceae; 3 and 3, Chenopodiaceae; 1 and 3, Plantaginaceae; 2 and 2 and Convolvulaceae; 1 and 2. The remaining 16 families (i.e., Verbenaceae, Asphodelaceae, Aizaaceae, Boraginaceae, Brassicaceae, Cyperaceae, Gentianaceae, Lamiaceae, Nyruginaceae, Oxalidaceae, Primulaceae, Ranunculaceae, Rubiaceae, Tiliaceae, Typhaceae and Umbelliferae) were represented by only 1 genus and 1 species each (Table-4).

Presence of weed specie's families (%)

The family Asteraceae was found to be the largest in sugarcane field having 16.438% weeds species infestation, followed by Poaceae with 15.068% weeds species. Amaranthaceae, Papilionaceae and Solanaceae were all at third position, all having 6.849% of weed species presence. Malvaceae and Polygonaceae stood fourth having 5.479% weeds species. Euphorbiaceae and Chenopodiaceae each having 4.109%, whereas Plantaginaceae and Convolvulaceae both having 2.739% weed species presence. The remaining 16 families had 1.369% weeds species presence (Table-5).

Distribution of the weed specie's pattern in sugarcane

According to Oosting (1956) scale, weeds (viz. *Cynodon dactylon* (L.) Pers., *Echinochloa crus-galli* (L.) Pers., *Eclipta alba* (L.) Hassk. Beauv, *Enneapogon avenaceus* and *Leptochloa panicea* (Retz) Ohwi) were found very abundant (Class V) in sugarcane field; while *Amaranthus viridis* L., *Alopecurus nepalensis* Trin Ex, *Carduus argentatus* L., *Cirsium arvense* (L.) Scop, *Cyperus rotundus* L., *Dichanthium annulatum* Forssk, *Eleusine indica* (L.) Gaertn, *Oxalis corniculata* L., *Parthenium hysterophorus* L., *Phalaris minor* Retz, *Polygonum barbatum* L., *Sorghum halepense* (L.) Pers. occurred in class IV. *Achyranthes aspera* L., *Achyranthes japonica* (Miq) Nakai, *Alternanthera sessilis* (L.) R.Br. Ex.Dc, *Boerhavia procumbens* Banks ex Roxb, *Chenopodium album* L., *Chenopodium murale* L., *Convolvulus arvensis* L., *Conyza bonariensis* (L.) Cronquist, *Euphorbia helioscopia* L., *Medicago sativa* L., *Melilotus parviflora/indica* (L.) All., *Phyla nodiflora* L., *Phyllanthus niruri* L., *Physalis angulata* L., *Poe bulbosa* L., *Polygonum biaristatum* Aitch and Hemsl, *Rumex dentatus* (Meisn) Rech.f., *Sonchus asper* (L.) Hill, *Vicia hirsute* (L.) S.F. Gray.Nat. and *Xanthium strumarium* L. were all found infrequent (class III) while the remaining weed species were found to be very rare (Table-3).

Table-3. Oosting (1956) scale of weed species found in sugarcane fields in district Bannu.

S.No.	Botanical Name	Family	Oosting Scale
1	<i>Abutilon indicum</i> (L.) Sweet	Malvaceae	II
2	<i>Achyranthes aspera</i> L.	Amaranthaceae	III
3	<i>Achyranthes japonica</i> (Miq) Nakai <i>A. bidentata</i> Blume	Amaranthaceae	III
4	<i>Alopecurus nepalensis</i> Trin Ex	Poaceae	IV
5	<i>Alternanthera sessilis</i> (L.) R.Br.Ex.Dc	Amaranthaceae	III
6	<i>Amaranthus blitoides</i> S. Watson	Amaranthaceae	I
7	<i>Amaranthus viridis</i> L.	Amaranthaceae	IV
8	<i>Anagallis arvensis</i> L.	Primulaceae	II
9	<i>Asphodelus tunifolius</i> Car.	Asphodelaceae	I
10	<i>Astragalus hamosus</i> L.	Papilionaceae	II
11	<i>Avena fatua</i> L.	Poaceae	I
12	<i>Brassica campestris</i> L.	Brassicaceae	II
13	<i>Boerhavia procumbens</i> Banks ex Roxb	Nyctaginaceae	III
14	<i>Carduus argentatus</i> L.	Asteraceae	IV
15	<i>Chenopodium album</i> L.	Chenopodiaceae	III
16	<i>Chenopodium ambrosioides</i> L.	Chenopodiaceae	I
17	<i>Chenopodium murale</i> L.	Chenopodiaceae	III
18	<i>Cirsium arvense</i> (L.) Scop	Asteraceae	IV
19	<i>Convolvulus arvensis</i> L.	Convolvulaceae	III
20	<i>Convolvulus spicatus</i> Hallier F	Convolvulaceae	II
21	<i>Conyza bonariensis</i> (L.) Cronquist	Asteraceae	III
22	<i>Corchorus depressus</i> (L.) Stocks	Tiliaceae	I
23	<i>Cynodon dactylon</i> (L.) Pers	Poaceae	V
24	<i>Cyperus rotundus</i> L.	Cyperaceae	IV
25	<i>Dichanthium annulatum</i> Forssk	Poaceae	V
26	<i>Echinops echinatus</i> L.	Astraceae	II
27	<i>Echinochloa crus-galli</i> (L.) P. Beauv	Poaceae	V
28	<i>Eclipta alba</i> (L.) Hassk.	Asteraceae	V
29	<i>Eleusine indica</i> (L.) Gaertn	Astraceae	IV
30	<i>Enneapogon avrnuceus</i> (Lindl.) C.E.Hubbard	Poaceae	V
31	<i>Erythraea ramosissima</i> DC, Prodr	Gentianaceae	II
32	<i>Euphorbia helioscopia</i> L.	Euphorbiaceae	III
33	<i>Fumaria parviflora</i> Lamarck	Rubiaceae	I
34	<i>Galium tricorne</i> Stokes	Boraginaceae	II
35	<i>Helianthus annuus</i> L.	Asteraceae	I
36	<i>Hibiscus trionum</i> L.	Malvaceae	I
37	<i>Lathyrus aphaca</i> L.	Papilionaceae	I
38	<i>Launaea procumbens</i> Pravin Kawale	Astraceae	II
39	<i>Leptochloa panicea</i> (Retz) Ohwi	Poaceae	V

S.No.	Botanical Name	Family	Oosting Scale
40	<i>Malvastrum coromandelianum</i> (L.) Garcke	Malvaceae	II
41	<i>Medicago sativa</i> L.	Papilionaceae	III
42	<i>Melilotus parviflora/ indica</i> (L.) All	Papilionaceae	III
43	<i>Nicotiana plumbaginifolia</i> Viv.	Solanaceae	II
44	<i>Oxalis corniculata</i> L.	Oxalidaceae	IV
45	<i>Parthenium hysterophorus</i> L.	Astraceae	IV
46	<i>Phyla nodiflora</i> Linn	Verbenaceae	III
47	<i>Phalaris minor</i> Retz	Poaceae	IV
48	<i>Phyllanthus niruri</i> L.	Euphorbiaceae	III
49	<i>Physalis angulata</i> L.	Solanaceae	III
50	<i>Plantago lanceolata</i> L.	Plantaginaceae	II
51	<i>Poe bulbosa</i> L.	Poaceae	III
52	<i>Polygonum barbatum</i> L.	Polygonaceae	IV
53	<i>Polygonum biaristatum</i> Aitch and Hemsl	Polygonaceae	III
54	<i>Polygonum plebejum</i> R.Br	Polygonaceae	II
55	<i>Portulaca oleracea</i> L.	Aizaaceae	II
56	<i>Panunclus muricatus</i> L.	Ranunculaceae	II
57	<i>Ricinus communis</i> Linn.	Euphorbiaceae	II
58	<i>Rumex dentatus</i> (Meisn) Rech.f	Polygonaceae	III
59	<i>Salvia plebeia</i> R.Br	Lamiaceae	II
60	<i>Setaria pumila</i> (Poir.) Poam	Poaceae	II
61	<i>Sida cardifolia</i> L.	Malvaceae	II
62	<i>Solanum nigrum</i> L.	Solanaceae	I
63	<i>Solanum surattense</i> Burm. f	Solanaceae	I
64	<i>Sonchus asper</i> (L.) Hill	Asteraceae	III
65	<i>Sorghum halepense</i> (L.) Pers	Poaceae	IV
66	<i>Taraxacum officinale</i> F.H Wiggers	Asteraceae	II
67	<i>Torilis nodosa</i> (L.) Gaertner	Umbelliferae	II
68	<i>Typha orientallis</i> C. Presl	Typhaceae	II
69	<i>Verbena officinalis</i> L.	Verbenaceae	II
70	<i>Veronica agrestis</i> L.	Plantaginaceae	II
71	<i>Vicia hirsute</i> (L.) S.F. Gray.Nat.	Papilionaceae	III
72	<i>Withania somnifera</i> L.	Solanaceae	II
73	<i>Xanthium strumarium</i> L.	Asteraceae	III

Table-4. Genera and species distribution in different weed species families.

S.No.	Family name	Total plants	Total genera	Total species
1	Asteraceae	12	12	12
2	Poaceae	11	11	11
3	Amaranthaceae	5	3	5
4	Papilionaceae	5	5	5
5	Solanaceae	5	4	5
6	Malvaceae	4	4	4
7	Polygonaceae	4	2	4
8	Chenopodiaceae	3	1	3
9	Euphorbiaceae	3	3	3
10	Convolvulaceae	2	1	2
11	Plantaginaceae	2	2	2
12	Verbenaceae	2	2	2
13	Asphodelaceae	1	1	1
14	Aizaaceae	1	1	1
15	Boraginaceae	1	1	1
16	Brassicaceae	1	1	1
17	Cyperaceae	1	1	1
18	Gentianaceae	1	1	1
19	Lamiaceae	1	1	1
20	Nyctaginaceae	1	1	1
21	Oxalidaceae	1	1	1
22	Primulaceae	1	1	1
23	Ranunculaceae	1	1	1
24	Rubiaceae	1	1	1
25	Tiliaceae	1	1	1
26	Typhaceae	1	1	1
27	Umbelliferae	1	1	1
Total	27	73	65 genera	73 species

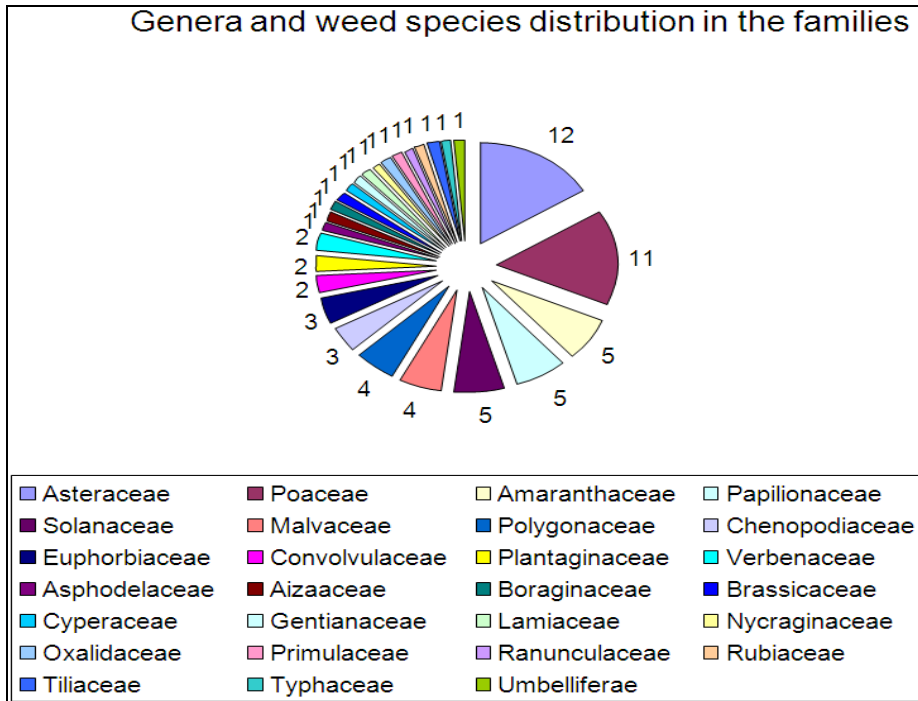


Figure 1. Graphic representation of genera and species distribution in the families.

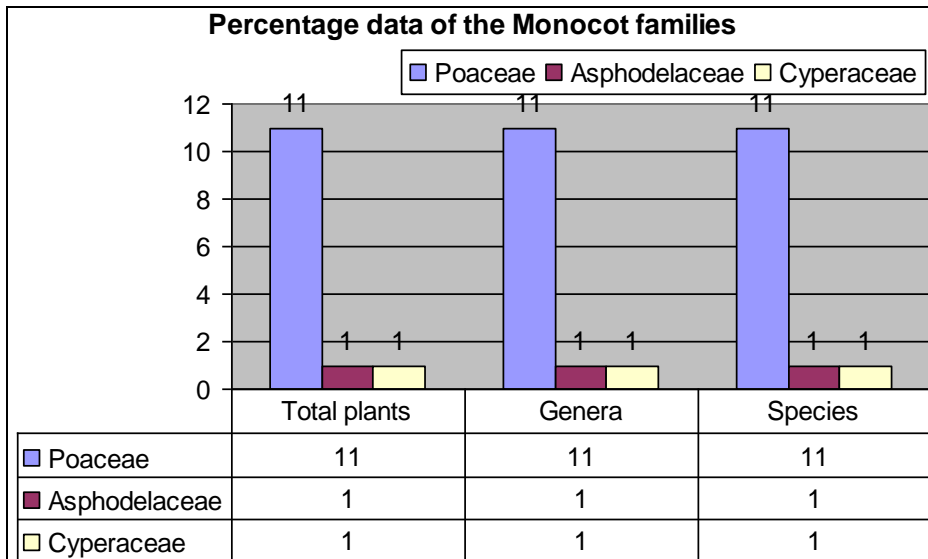


Figure 2. Graphic representation of Percentage data of Monocot families.

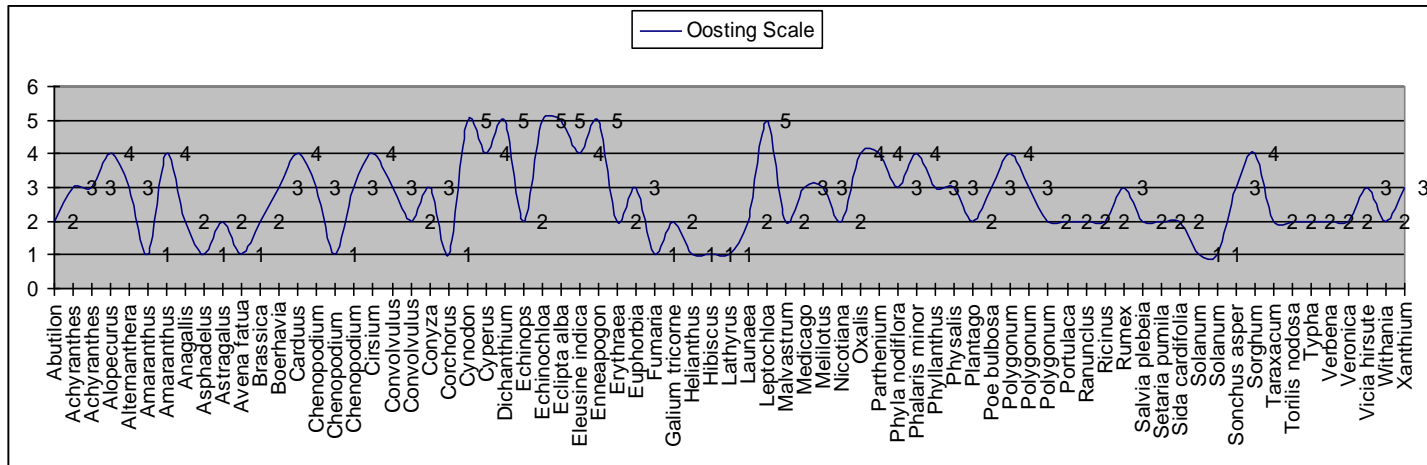


Figure 3. Oosting (1956) scale of weeds found in sugarcane fields in district Bannu in 2011.

Table-5. Percentage of the families.

S.No.	Family	Total plants	Percentage
1.	Asteraceae	12	16.438
2.	Poaceae	11	15.068
3.	Amaranthaceae	5	6.849
4.	Papilionaceae	5	6.849
5.	Solanaceae	5	6.849
6.	Malvaceae	4	5.479
7.	Polygonaceae	4	5.479
8.	Chenopodiaceae	3	4.109
9.	Euphorbiaceae	3	4.109
10.	Convolvulaceae	2	2.739
11.	Plantaginaceae	2	2.739
12.	Verbenaceae	2	2.739
13.	Asphodelaceae	1	1.369
14.	Aizaaceae	1	1.369
15.	Boraginaceae	1	1.369
16.	Brassicaceae	1	1.369
17.	Cyperaceae	1	1.369
18.	Gentianaceae	1	1.369
19.	Lamiaceae	1	1.369
20.	Nyctaginaceae	1	1.369
21.	Oxalidaceae	1	1.369
22.	Primulaceae	1	1.369
23.	Ranunculaceae	1	1.369
24.	Rubiaceae	1	1.369
25.	Tiliaceae	1	1.369
26.	Typhaceae	1	1.369
27.	Umbelliferae	1	1.369
Total	27	73	100.000

Table-6. Percentage of the dicot families

S.No.	Family	Total plants	Genera	Species
1.	Asteraceae	12	12	12
2.	Amaranthaceae	5	3	5
3.	Papilionaceae	5	5	5
4.	Solanaceae	5	4	5
5.	Malvaceae	4	4	4
6.	Polygonaceae	4	2	4
7.	Chenopodiaceae	3	1	3
8.	Euphorbiaceae	3	3	3
9.	Convolvulaceae	2	1	2

S.No.	Family	Total plants	Genera	Species
10.	Plantaginaceae	2	2	2
11.	Verbenaceae	2	2	2
12.	Aizaaceae	1	1	1
13.	Boraginaceae	1	1	1
14.	Brassicaceae	1	1	1
15.	Gentianaceae	1	1	1
16.	Lamiaceae	1	1	1
17.	Nyctaginaceae	1	1	1
18.	Oxalidaceae	1	1	1
19.	Primulaceae	1	1	1
20.	Ranunculaceae	1	1	1
21.	Rubiaceae	1	1	1
22.	Tiliaceae	1	1	1
23.	Typhaceae	1	1	1
24.	Umbelliferae	1	1	1
Total	24 families	60 plants	52 genera	60 species

REFERENCES CITED

- Akhtar, N. and F. Hussain. 2007. Weeds of wheat fields in village Qambar, District Swat, Pakistan. *Pak. J. Weed Sci. Res.* 13(1): 31-35.
- Ali, A. and J. L. Fefever. 1996. Indigenous Knowledge of plants. A case study in Chitral, *Proc. Ethnobot. Workshop, Sep., NARC, Islamabad*, pp. 136-151.
- Anonymous. 2008. Fortnightly mill wise statement for 15-05-2008; Pakistan Sugar Mills Association, Islamabad, Pakistan, p. 1-4.
- Baloch, S.M., I.H. Shah, I. Hussain and K. Abdullah. 2002. Low sugar production in Pakistan Causes and Remedies. *Pak Sugar J.* 17(5): 13-14.
- Hussain, F., M. Z. Quershi and S. Shaukat. 1998. Studies on some weeds in wheat fields of district Attock. *Sarhad J. Agric.* 4:199-207.
- Nasir, E. and S.I. Ali. 1971-95. Flora of West Pakistan Department of Botany, University of Karachi, Karachi.
- Oosting, H.J. 1956. The study of plant communities. San Francisco: Freeman Publishing, Inc. 440 pp.
- Rao, V.S. 2000. Harmful effects caused by weeds. Principles of Weed Science. Oxford and IBH publishing Co. Pvt. Ltd. New Delhi & Calcutta. Pp.1.
- Hashim, S. and K.B. Marwat. 2002. Invasive weeds a threat to the

- biodiversity. A case study from Abbottabad district, N-W Pakistan. *Pak. J. Weed Sci. Res.* 8(1-2): 1-2.
- Hussain, F., A. Murad and M.J. Durrani. 2004. Weed communities in the wheat fields of Mastuj, District Chitral, Pakistan. *Pak. J. Weed Sci. Res.* 10: 101-108.
- Khalid, S. 1995. Plants in danger. Fifth National Conference of plants Scientist, March, 28-30, NARC, Islamabad.
- Khan, N., I. Khan, M. A. Khan and H. Khan. 2004. Major Rabi and Kharif Weeds of agronomic crops of District Bannu. *Pak. J. Weed Sci. Res.* 10(1-2): 79- 86.
- Malik, K.B. and M.H. Gurmani. 2005. Cane Production Guide Dewan Farooque Sugarcane Research Institute Dewan City, District Thatta, Sind Pakistan.
- Rubina, A. R. 1998. Need of conservation of indangered medicinal Plants. *Proc. wild medicinal plants Resource of N. Pakistan.* May 11-12, PFI, Peshawar Pakistan.
- Stewart, R.R. 1972. Annotated catalogue of vascular plants in West Pakistan and Kashmir. Fakhri Printing Press, Karachi.
- Wazir, S. M., S. Saima, A. A. Dasti and M. Subhan. 2007. Ethnobotanical importance of salt range species of District Karak, Pakistan. *Pak. J. Plant. Sci.* 13: 27-29.