Pak. J. Bot., 43(6): 2817-2820, 2011.

FLORISTIC COMPOSITION, COMMUNITIES AND ECOLOGICAL CHARACTERISTICS OF WEEDS OF WHEAT FIELDS OF LAHOR, DISTRICT SWABI, PAKISTAN

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Abstract

Forty species related to 21 families were identified as the weeds of wheat from village Lahor, District Swabi during April 2005. Poaceae (7 spp), followed by Brassicaceae (5 spp), Caryophyllaceae, Asteraceae and Fabaceae (each with 4 spp) were the important families. The remaining families had single species. The most frequent species with more than 45% average frequency were *Anagallis arvensis* L., *Arenaria serphyllifolia* L., *Chenpodium album* L., *Fumaria indica* (Hausskn) H. N. Pugsley., *Melilotus indica* (L.) All., *Rumex dentatus* (Meissn) Rich., and *Veronica biloba* Linn. Based on importance value four communities viz., *Arenaria -Anagallis-Chenopodium, Fumaria-Rumex-Chenopodium, Fumaria-Chenopodium-Anagallis, Arenaria-Fumaria-Chenopodium* were deciphered. Caryophyllaceae, Fumariaceae, Chenopodiaceae, Fabaceae, Poaceae and Primulaceae were the dominant families on the basis of family importance values. The biological spectrum showed that there were 82.5% therophytes and 12.5% hemicryptophytes. Geophytes and chamaephytes were represented by one species each. Leaf spectra consisted of 42.5% microphylls, 35% nanophylls and 22.5% leptophylls. Biomass of the forbs was higher than the grasses. Species diversity was higher in Koz Mulk and Pani owing to crop rotation.

Introduction

Wheat is one of the major crops in the irrigated and Barani (non-irrigated) lands of District Swabi including village Lahor. Weeds are undesirable on account of their competitive and allelopathic behavior and providing habitats for harmful organisms. The yield per acre of wheat can be increased by agronomic practices including weed control. However, the authentic identification and distribution has always been a pre-requisite for weed management.

Weeds from wheat fields of different parts of the country, Quetta (Hussain *et al*., 1985), Dir (Ayaz *et al*., 1993), Sukkar (Qureshi & Bhatti, 2001), Chitral (Hussain *et al*., 2004), Mardan (Marwat *et al*., 2006), Swat (Naveed & Hussain, 2007), Rahim Yar khan (Waheed *et al*., 2009) and Toba Tek Singh (Qureshi *et al*., 2009) have been reported. Life form is primarily determined by hereditary selection, it may be regarded as an adjustment of the vegetative plant body and life history to the habitat (Nasir & Sultan, 2002). Leaf spectra determine the growth and adaptational behavior of species (Hussain *et al*., 1993; Murad *et al*., 1995 & Nasir & Sultan, 2002). Some weeds like *Fumaria indica* (Chughtai *et al*., 1986), *Euphorbia helioscopia* (Hussain *et al*., 1986), *Calendula arvensis* (Chughtai *et al*., 1987), *Cynodon dactylon* (Hussain & Khan, 1987), *Cannabis sativa* (Inam *et al*., 1989), *Coronopus didymus* (Hussain *et al*., 1991), *Rumex dentatus* (Hussain *et al*., 1997), *Desmostachya bipinnata* (Rukhsana *et al*., 1998) and *Cyperus rotundus* (Hamayun *et al*., 2005) are allelopathic, inhibiting germination and growth of the various crops. Keeping in view the importance of weeds, this study was conducted to report the current status of weed species their ecological characteristics including communities, family importance value, life form, leaf spectra, fresh biomass, diversity, richness and maturity. These findings might be of value to weed ecologists, agronomists and other agricultural scientists involved in their management.

Materials and Methods

Four localities viz., Pani, Budhu, Koz Mulk in irrigated area and one Mian Khan Koi in barani area, all within radius of 2-7 Km from village Lahor were quantitatively analyzed during April, 2005. The density and frequency of weed species were determined in ten randomly selected fields using 1x1 m^2 quadrats in each of the selected site following Hussain (1989). Each field had duplicate quadrats. The density and frequency were converted to relative values and summed up to obtain importance values (IV). Species importance values were summed to obtain family importance values (FIV) for each family. Fresh biomass was determined by harvesting weeds in five 1x1m quadrats. Species maturity was determined after Pichi-Sermolli, (1948), species diversity after Simposon (1949) and species richness after Margalef, (1957). Plants were identified with the help of Flora of Pakistan (Nasir & Ali, 1971-1995; Ali & Qaiser, 1995-2007).

Results

1. Floristic composition: A total of forty species related to 21 families were identified as weeds in the wheat fields from four different localities. Poaceae (7 Spp.) followed by Brassicaceae (5 Spp.), Caryophyllaceae, Asteraceae and Papilionaceae (each with 4 Spp.) were the important families. The remaining families had single species representation (Table 1). The greater number of species in Poaceae, Brassicaceae, Caryophyllaceae, Asteraceae and Fabaceae might be due to the aggressive growth, efficient seed dispersal, better competitive ability and enormous seed production. Of the 40 recorded species, Pani had 18, Budhu 28, Koz Mulk 21 and Mian Khan Koi 24 species (Table 2). Caryophyllaceae (87.88), Fumariaceae (61.61), Chenopodiaceae (54.75), Papilionaceae (49.78), Poaceae (42.06) and Primulaceae (41.79) were the dominant families on the basis of family importance values (FIV) followed by Polygonaceae (31.1), Brassicaceae (20.85) and Cannabinaceae (20.7). The rest of the families had low FIV (Table 3).

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Table 1. Phytosociological attributes and biological spectrum of the common weeds of the wheat of village Lahor District Swabi, during April 2005.

S.No	Name of species	Family	Localities/ Communities/IV				Biological spectrum	
			P	KM	MKK	B	LF	LS
			AAC	FRC	FCA	AFC		
1.	*Anagallis arvensis* Linn.	Primulaceae	25.08**	1.83	8.94***	5.94	Th	L
2.	*Arenaria serpyllifolia* L.	Caryophyllaceae	31.47*	6.44	3.21	10.49*	Th	L
3.	*Asphodelus tenuifolius* Cav.	Asphodelaceae	----	----	3.27	0.58	Th	Na
4.	*Avena fatua* Retz.	Poaceae	1.01	----	----	1.75	Th	Mic
5.	*Brassica compestris* L.	Brassicaceae	----	1.78	5.38	1.17	Th	Mic
6.	*Calendula arvensis* L.	Asteraceae	----	----	----	1.75	Th	Na
7.	*Canabis sativa* L.	Cannabinaceae	3.78	2.66	7.78	6.48	Th	Mic
8.	*Capsella bursa-pastoris* (L.) Medic.	Brassicaceae	----	----	----	1.17	Th	Na
9.	*Carthamus oxycantha* M.B.	Asteraceae	----	----	2.17	1.18	Th	Mic
10.	*Coronopus didymus* (L.) Sm.	Brassicaceae	3.78	6.41	----	----	Th	L
11.	*Chenpodium album* L.	Chenopodiaceae	22.07***	10.98***	12.39**	9.31***	Th	L
12.	*Cnicus arvensis* Hoffm.	Asteraceae	----	----	3.25	1.19	Th	Mic
13.	*Convolvulus arvensis* Linn.	Convolvulaceae	----	0.88	1.07	----	Th	Mic
14.	*Cynodon dactylon* (L.) Pers.	Poaceae	----	----	1.08	1.77	H	L
15.	*Cyperus rotundus* Linn.	Cyperaceae	----	----	----	1.19	G	L
16.	*Desmostachya bipinnata* (L.) Stapf.	Poaceae	----	----	3.19	----	H	Mic
17.	*Eruca sativa* Mill	Brassicaceae	----	----	----	0.58	Th	Mic
18.	*Euphorbia helioscopia* Linn.	Euphorbiaceae	5.07	7.04	2.17	----	Th	Na
19.	*Fumaria indica* (Hausskn) H. N. Pugsley.	Fumariaceae	12.85	15.36*	23.00*	10.40**	Th	L
20.	*Gallium aparine* L.	Rubiaceae	----	0.88	3.24	----	Th	L
21.	*Lepidium sativum* L.	Brassicaceae	----	----	----	0.58	Th	Mic
22.	*Lolium temulentum* L.	Poaceae	3.78	4.45	3.25	3.53	Th	Mic
23.	*Medicago laciniata*	Fabaceae	----	2.66	----	----	Th	L
24.	*Melilotus indica* (L.) All.	Fabaceae	19.52	7.55	3.26	8.58	Th	Na
25.	*Nicotiana tobaccum* L.	Solanaceae	----	----	----	0.60	Th	Na
26.	*Nonnea edgeworthii* D.C.	Boraginaceae	----	----	3.22	1.77	Th	Na
27.	*Papaver rhoes* Linn.	Papaveraceae	4.31	0.90	----	----	Th	Na
28.	*Polypogon monspeliansis* (L.) Desf.	Poaceae	8.06	2.66	----	5.38	H	Mic
29.	*Ranunculus muricatus* Linn.	Ranunculaceae	2.28	6.21	2.14	4.10	Th	Na
30.	*Rumex dentatus* (Meissn) Rich.	Polygonaceae	9.10	14.47**	1.07	6.46	Th	Mic
31.	*Saccharum spontaneum* L.	Poaceae	----	----	1.06	----	Ch	Na
32.	*Scandax pectin veneris* L.	Apiaceae	----	----	2.16	3.26	Th	Mic
33.	*Silene conoidea* Linn.	Caryophyllaceae	15.98	0.95	4.35	5.42	Th	Mic
34.	*Sorghum halpens* (L.) Perse.	Poaceae	----	----	1.11	----	H	Na
35.	*Spergulla arvensis* L.	Caryophyllaceae	----	----	----	0.63	Th	Mic
36.	*Stellaria media* (Linn.) Ctr.	Caryophyllaceae	8.06	0.88	----	----	Th	Na
37.	*Sonchus asper* (L.) Hill.	Asteraceae	----	0.88	----	----	H	Na
38.	*Trigonella incisa* (Bth.)Ali	Fabaceae	3.78	----	----	1.18	Th	Na
39.	*Veronica biloba* Linn.	Scrophulariaceae	20.04	9.13	----	8.56	Th	Mic
40.	*Vicia sativa* L.	Fabaceae	----	----	3.25	----	Th	Mic

AAC= ***Arenaria -Anagallis-Chenopodium*** community
FRC = ***Fumaria-Rumex-Chenopodium*** community
FCA =***Fumaria-Chenopodium-Anagallis*** community
AFC =***Arenaria-Fumaria-Chenopodium*** community
*First dominant, **Second dominant, ***Third dominant
P= Pani, KM= Koz mulk, MKK= Mian Khan Koi, B= Budhu

Table 2. Fresh Biomass (gm/sqm^2) of weeds plants in 5 sites of village Lahor district Swabi. Each value is a mean of five observations.

Pani			Budhu			Koz Mulk			Mian Khan Koi		
Forbs	Grasses	Total	Forbs	Grasses	Total	Forbs	Grass	Total	Forbs	Grasses	Total
9.98	3.54	13.52	11.76	3.82	15.58	12.82	2.34	15.16	14.22	1.94	16.16

2. Weed communities: Four communities viz., *Arenaria -Anagallis-Chenopodium* community in Pani, *Fumaria-Rumex-Chenopodium* community in Koz mulk, *Fumaria-Chenopodium-Anagallis* community in Mian Khan Koi and *Arenaria-Fumaria-Chenopodium* community in Budhu were recognized on the basis of importance values. Based on importance value the dominant weed species were *Arenaria serpyllifolia, Anagallis arvensis, Chenpodium album, Fumaria indica* and *Rumex dentatus. Melilotus indica, Veronica biloba, Brassica campestris, Cannabis sativa, Coronopus didymus, Euphorbia helioscopia, Lolium temulentum, Polypogon monspeliansis, Ranunculus muricatus* and *Silene conioidea* were other important species (Table 1).

Table 3. Families, No. of genera, No, of species and FIV. of the weeds in the wheat fields of village Lahor, District Swabi.

	Families	No. of genera	No. of species	FIV
1.	Apiaceae	1	1	5.42
2.	Asphodelaceae	1	1	3.85
3.	Asteraceae	4	4	10.42
4.	Boraginaceae	1	1	4.99
5.	Brassicaceae	5	5	20.85
6.	Cannabinaceae	1	1	20.7
7.	Caryophyllaceae	4	4	87.88
8.	Chenopodiaceae	1	1	54.75
9.	Convolvulaceae	1	1	1.95
10.	Cyperaceae	1	1	1.19
11.	Euphorbiaceae	1	1	14.28
12.	Fumariaceae	1	1	61.61
13.	Papaveraceae	1	1	5.21
14.	Fabaceae	4	4	49.78
15.	Poaceae	7	7	42.06
16.	Polygonaceae	1	1	31.1
17.	Primulaceae	1	1	41.79
18.	Ranunculaceae	1	1	14.70
19.	Rubiaceae	1	1	4.12
20.	Scrophulariaceae	1	1	37.73
21.	Solanaceae	1	1	0.60

3. Biological spectrum: The biological spectrum consisted of 82.5% therophytes (33 Spp.) and 12.5% hemicryptophytes (5 Spp.). Geophytes and chamaephytes were represented by one species each (Table 1). Leaf spectra showed that microphylls (42.5%), nanophylls (35%) and leptophylls (22.5%) were important (Table 1).

4. Fresh Biomass: Biomass of the forbs was higher than grasses in all the four localities (Table 3). This might be due to continuous ploughing and other eradication practices made for the control of weeds.

5. Weed diversity, richness and maturity: Species diversity was higher in Koz Mulk and Pani. Weed diversity increases under crop rotation compared to monoculture (Stevenson *et al*., 1997). Species richness of all localities, except Pani, was more or less similar. Species maturity of the two localities viz. Pani & Budhu was higher than the remaining localities (Table 4).

Table 4. Diversity, richness and maturity of the common weeds of the wheat of village Lahor district Swabi.

Locality	No. of species	Weed %age	Diversity	Spp. richness	Spp. maturity
Pani	18	45	9.56	2.83	36
Budhu	28	70	8.35	3.87	31
Koz mulk	21	52.5	10.43	3.54	28
Mian Khan Koi	24	60	5.06	3.71	20

Discussion and conclusion

Weeds compete with crop for water, nutrients and light; has been a matter of great concern for the growers (Rajput *et al*., 2008; Sultan & Nasir, 2007). The losses caused to agricultural crops by *Avena, Cyperus rotundus* and *Chenpodium album* are significant (Marwat *et al*., 2006). The weed species with high IVI and frequency might compete better to reduce growth and yield of associated crop. Some weeds are important due to their possible allelopathic effects on cultivated crop (Hussain, 1983). Weeds have specific characteristics that help their survival. These characteristics may be deep root system (*Desmostachya bipinnata*), different modes of propagation like suckers, bulbs and corms (*Desmostachya bipinnata, Cynodon dactylon* and *Cyperus rotundus*) and twining habit (*Convolvulus arvensis*). Such competitive characteristics enable them to consume large amount of habitat resources and deprive the crops. Most of the weeds are annual which propagate by seeds only. Soil always contains a seed reserve which is a constant source of weed emergence even under best agronomic practice (Hussain *et al*., 1989). Qureshi & Arain (2003) have reported that weeds like *Asphodelus tenuifolius, Avena fatua, Carthamus oxycantha* and *Convolvulus arvensis* have the same life span and are harvested with the wheat resulting in mixing of their seeds with wheat grains. Due to larger seed size, these seed cannot be separated from wheat seed. Such infested wheat grains are being used as wheat seeds resulting in their reappearance with wheat crop in the next growing season. The continuity of this phenomenon may increase the weed infestation and directly influence the crop production. These wide-ranging weeds have been reported from different areas of Pakistan (Ayaz *et al*., 1995; Qureshi & Bhatti, 2001; Jakhar *et al*., 2005; Hussain *et al*., 2004). Geophytes regenerate from bulbs, sucker and rhizomes and compete crop better than annuals. Most weeds with small population are unimportant but they share the habitat resources.

The present study suggests that a variety of weeds are infesting the wheat crop quite heavily in village Lahor, District Swabi that may cause losses to yield of wheat crop. For acquiring the better yield, it is necessary to take appropriate cultural, mechanical, biological and chemical measures for their control. This information about weed biology can be helpful for the selection of weed control methods.

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(Received for publication 06 July 2010)