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WEED COMMUNITIES OF WHEAT CROP UNDER DIVERSE *EDAPHOGROPGHY* OF DISTRICT KHAIRPUR, PAKISTAN

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Abstract

The wheat crop of Pakka, Kacha and Saline soils were surveyed during 1999-2000 for weed analysis. The soils of these three groups were mean of pH 7.2, EC 1.7 dS/m^{-1} with clay loam texture at Pakka (Camborthids) soil; pH 7.20, EC 1.63 dS/m^{-1} with silt loam texture under Torrifluvents (Kacha) soils; while pH 10.6, EC 6.17 dS/m^{-1} with clay loam texture was under Solarthids (Saline) soil. A total of 35 weed species belonging to 30 genera and 15 angiospermic families were recorded during 1999-2000. There were 25 weed species under Camborthids followed by 23 species under Torrifluvents and 16 species under Solarthids soils.

Three weed communities viz. 1) *Melilotus-Lathyrus-Polypogon* in Pakka soil series, 2) *Medicago-Chenopodium-Phalaris* in Kacha soil series and 3) *Spergula-Spinacia-Frankenia* in Saline soil series were recognized during the period. Moreover *Chenopodium-Phalaris-Avena* in Pakka series; *Polypogon-Chenopodium-Melilotus* in Kacha series; and *Rumex-Phalaris-Cressa* in Saline series were established as second communities in these areas.

Introduction

Wheat (*Triticum aestivum* Linn.), an important cereal rabi crop is a dietary mainstay for approximately one-third of the total world population (Johnson, 1984). Being staple food, wheat plays an important role in the economy of Pakistan, hence occupies a central position in agriculture policy making. Although the country has harvested a bumper crop of 21 million tons during 1999-2000 (Khattak *et al*., 2001), the average per hectare yield of wheat is 2.06 tons, which is far behind the average yield in India of 2.71 tons per hectare (Anon., 1997). The Khairpur district contributes about 11% total wheat production of Sindh province with a production of 293,724 metric tons (Anon., 2000). The poor management, agriculture inputs, drought, water logging and salinity and poor weed management are the major factors involved in low yield. Amongst all these factors, poor weed management is of great concern. The weeds are hidden enemies of crop as they compete with the crop for light, water, space and nutrients. In Pakistan weeds cause 18-30% yield loss in wheat (Anon., 1999-2000).

According to soil classification the soil of district Khairpur can be identified as Camborthids and Solarthids groups of Aridisols order and Torrifluvents and Ustipsamments groups of Entisols order (Rafiq, 1990). These diverse soil conditions favor the wheat cultivation as it is well adapted to different climatic as well as soil conditions (Maas, 1986). Similarly, weeds are found in soils differing widely in physical characters, moisture holding capacities and soil reaction. For example, *Puccinallia* spp., and *Agropyron repens* are best adapted to alkali soils. Similarly, *Cynodon dactylon*, *Digitaria sanguinalis*, *Pteridium* spp., and *Borreria* spp., inhabit acidic soils, while members of Chenopdiaceae, Asteraceae and Polygonaceae grow well in saline soils (Rao,

1980). This shows the great adaptability of weeds to wide range of soil environments. But the diversity of weed communities under diverse soil conditions has remained neglected by the weed researchers, especially under wheat crop. The present study reveals the diversity, extent and manifestation of weeds in wheat under different soil conditions of Khairpur district, Pakistan. The undertaken study will be helpful in weed management programmes.

Materials and Methods

Three wheat growing sites representing each soil group were surveyed during 1999-2000. The each soil group was assessed on the basis of texture and organic matter and identified with the help of soil classification of Pakistan (Rafiq, 1990). Ten soil samples at a depth of 30 cm were taken randomly from each plot per site. The samples were analysed for pH, EC, organic matter and texture. The mean pH, EC and organic matter % was calculated for each site. The pH and EC were taken using WPA digital pH meter and WPA CM 35 conductivity meter, respectively, while organic matter and texture were analysed by weight loss (Hesse, 1994) and by mechanical analysis (Bououcos, 1962), respectively.

The plant species were identified with the help of authentic available literature (Nasir & Ali, 1972-2000; Qaiser, 2001). Thirty quadrates each measuring of 2 x 2 m were randomly selected from three selected sites having different soil types. The density and frequency % of each individual weed was computed. Each weed community was proposed after the first three dominants in study areas (Qureshi & Bhatti, 2001).

Results

The soils of Khairpur district were mean of pH 7.2, EC 1.7 dS/m^{-1} with clay loam texture at Pakka (Camborthids) soil; pH 7.20, EC 1.63 dS/m^{-1} with silt loam texture under Torrifluvents (Kacha) soils; while pH 10.6, EC 6.17 dS/m^{-1} with clay loam texture was under Solarthids (Saline) soil.

The characters of various soil groups were mean of pH 7.2, EC 1.7 dS/m^{-1} with clay loam texture at Pakka (Camborthids) soil; pH 7.20, EC 1.63 dS/m^{-1} with silt loam texture under Torrifluvents (Kacha) soils; while pH 10.6, EC 6.17 dS/m^{-1} with clay loam texture was under Solarthids (Saline) soil (Table 1). A total of 35 weed species belonging to 30 genera and 15 angiospermic families were recorded during 1999-2000. There were 25 weed species under Camborthids followed by 23 species under Torrifluvents and 16 species under Solarthids soils (Table 2).

Three weed communities viz., 1) *Melilotus-Lathyrus-Polypogon* in Pakka soil series, 2) *Medicago-Chenopodium-Phalaris* in Kacha soil series and 3) *Spergula-Spinacia-Frankenia* in Saline soil series were recognized during the report period. Moreover *Chenopodium-Phalaris-Avena* in Pakka series; *Polypogon-Chenopodium-Melilotus* in Kacha series; and *Rumex-Phalaris-Cressa* in Saline series were established as second communities in these areas.

The dominant weed species of these communities in various ranges were *Spergula arvensis, Medicago polymorpha, Melilotus indica, Chenopodium album, Polypogon fugax, Lathyrus aphaca, Phalaris minor, Avena fatua* and *Frankenia pulverulenta*. The most frequent weed species was *Avena fatua* with frequency % of 90, followed by *Melilotus indica, Polypogon fugax, Chenopodium album, Phalaris minor, Chenopodium murale* and *Rumex dentatus* with the frequency % ranging from 58.43-81.88 (Table 2).

Table 1. Showing different soil characteristics in District Khairpur.

No.	Locality	pH	EC dS/m^{-1}	O.M %	Texture	Soil series
1.	Layari	7.4	2.1	0.5	Clay Loam	Pakka
	Kumb	7.2	1.4	0.5	Clay Loam	Pakka
	Talpur	7.1	1.6	0.7	Clay Loam	Pakka
	Mean	**7.2**	**1.7**	**0.57**	**Clay Loam**	**Pakka**
2.	Razi Dero	7.1	1.9	0.5	Silt Loam	Kacha
	Ripri	7.2	1.4	0.4	Silt Loam	Kacha
	Sardar Joon Bhatiyun	7.3	1.6	0.4	Silt Loam	Kacha
	Mean	**7.20**	**1.63**	**0.43**	**Silt Loam**	**Kacha**
3.	Kotdiji	9.6	5.9	0.3	Clay Loam	Saline
	Tandomasti	11.1	6.3	0.2	Clay Loam	Saline
	Nangreja	10.6	6.3	0.3	Clay Loam	Saline
	Mean	**10.43**	**6.17**	**0.27**	**Clay Loam**	**Saline**

The number of weeds under Camborthids (*Pakka series*) and Torrifluvents (*Kacha series*) were more or less equal due to their adoptability as well as great diversity to these soils due to the presence of canal water and frequent and increased use of fertilizers. The weeds of Torrifluvents (*Kacha series*), however, were found more vigorous than those of Camborthids and Solarthids soils. The nutrient rich rivrian deposits may be the cause of their vigorness.

Discussion

It is a general consideration that some weed species are basophiles (pH 7.4-8.5) growing on alkali soils, acidophilus (pH 4.5-6.5) growing on acidic soils and neutrophils (pH 6.5-7.5) growing well under neutral pH soils while the several weeds also exhibit the saline soil conditions (pH >8.5) and are called halophils (Bououcos, 1964). On these basis the observed weeds can be classified as neutrophils and halophils under camborthid/torrifluvent and Solarthids soils. Though the grassy weeds, at a glance, were seen crowded in the wheat fields but however, the analysis showed the dominance of broad-leaved weeds at community level. It is because, the grassy weeds are either surpassing or equal to the wheat plants (Memon, 2000; Qureshi & Bhatti, 2001) and a single plant of a grass can produce more than 20 tillers with individual ears thus looking dominant while the most of broad leaved weeds form underneath communities and produce branches either reduced or without branching. On the other hand, the grassy weeds may be more competitive to the crop as their roots penetrate up to the same depth as occupied by the crop plants thus they are direct shareholders of crop plants for nutrients and they also exhibit the longer life duration almost equal to the crop thus their competition remains to the whole life periods.

The *Phragmites*, a surpassing perennial weed mainly propagates by its creeping rhizomes, is an indicator of saline soils. Gorham (1992) has reported that *Phragmites* can tolerate salinity up to 41 dS/m^{-1} thus is included in the list of halophitic grasses. *Phragmites* can grow well under moderate as well as in high salinities but reduction in tiller rate has been observed. The *Spergula* an annual underneath weed with succulent leaves is well known in saline soils. It forms about 75.95% weed population of saline soils, produces more than 5000 seeds/plant and matures before the crop harvesting thus shedding almost all the seeds in crop lands and emerges as huge population in coming season.

Table 2. Important values of weeds of wheat crop under different soil series in district Khairpur.

S. No	Weed species	Family	Soil series/Density %			Freq %
			Pakka	Kacha	Saline	
1	*Anagalis arvensis* Linn.	Primulaceae	5.27	4.35	---	36.66
2	*Alhagi maurorum* Medik.	Fabaceae	15.46	7.71	2.3	41.10
3	*Asphodelus temuifolius* Cavan	Liliaceae	9.11	---	---	29.60
4	*Avena fatua* Linn.	Poaceae	32.29	8.19	4.7	90.00
5	*Brassica campestris* Linn.	Brassicaceae	6.61	---	---	35.09
6	*Chenopodium album* Linn.	Chenopodiaceae	41.22	58.9**	1.22	70.85
7	*Chenopodium ambrioides* Linn	Chenopodiaceae	2.07	---	---	6.50
8	*Chenopodium murale* Linn.	Chenopodiaceae	---	22.81	8.89	60.31
9	*Cirsium arvense* (L.) Scop.	Asteraceae	3.49	10.52	---	25.10
10	*Convolvulus arvensis* Linn.	Convolvulaceae	23.24	2.1	---	32.80
11	*Cressa critica* Linn.	Convolvulaceae	---	---	13.78	9.85
12	*Cynodon dactylon* Linn.	Poaceae	4.01	12.3	9.98	45.10
13	*Cyprus rotundus* Linn.	Cypraceae	0.78	9.1	---	12.76
14	*Desmostachya bipinnata* Linn	Poaceae	4.18	11.7	8.77	53.32
15	*Echinops echinatus* Roxb.	Asteraceae	---	1.29	---	6.50
16	*Euphorbia hirta* Linn.	Euphorbiaceae	2.5	4.51	---	11.25
17	*Euphorbia prostrata* Ait.	Euphorbiaceae	3.71	3.38	---	25.19
18	*Frankenia pulverulenta* Linn.	Frankeniaceae	---	---	25.62***	23.91

Table 2 (Cont'd.)

S. No	Weed species	Family	Soil series/Density %			Freq %
			Pakka	Kacha	Saline	
19	*Lathyrus aphaca* Linn.	Fabaceae	43.29**	8.6	---	31.91
20	*Medicago polymorpha* Linn.	Fabaceae	---	68.78*	---	15.18
21	*Melilotus alba* Medik.	Fabaceae	2.07	7.7	---	12.10
22	*Melilotus indica* (L.) All.	Fabaceae	61.83*	13.15	4.39	81.88
23	*Phalaris minor* Retz.	Poaceae	29.66	41.3***	21.05	66.97
24	*Phragmites karka* (Retz) Trin.	Poaceae	---	6.19	8.63	22.88
25	*Phyla nodiflora* (Linn.) Green.	Verbenaceae	2.75	10.5	---	4.51
26	*Polygonum plebejum* R.Br.	Polygonaceae	---	9.1	---	15.18
27	*Polypogon fugax* Nees.	Poaceae	43.1***	31.34	10.59	78.33
28	*Rumex dentatus* linn.	Polygonaceae	16.6	---	22.06	58.43
29	*Sonchus oleraceus* Linn.	Asteraceae	1.04	---	---	3.52
30	*Solanum nigrum* Linn.	Solanaceae	2.05	---	---	5.91
31	*Spergula arvensis* Linn.	Caryophyllaceae	---	---	75.95*	38.91
32	*Spinacia oleracea* Linn.	Chenopodiaceae	---	6.3	27.66**	33.32
33	*Suaeda fruticosa* (Linn.) Forsk.	Chenopodiaceae	---	---	8.86	7.93
34	*Vicia feba* Linn.	Fabaceae	2.08	---	---	5.98
35	*Vicia sativa* Linn.	Fabaceae	1.09	---	---	7.89

* First dominant, ** Second dominant, *** Third dominant respectively.

The weeds like *Cressa cretica, Echinops echinatus, Phragmites karka, Polygonum plebejum, Spergula arvensis, Spinacia oleracea* and *Suaeda fruticosa* were not observed in Camborthid (*Pakka*) soils. Likewise weeds of Salorthid (saline) soils such as *Spergula arvensis*, *Cressa critica* and *Frankenia pulverulenta* were also not seen in *Kacha* soils. The species like *Anagalis arvensis*, *Avena fatua*, *Convolvulus arvensis*, *Lathyrus aphaca*, *Vicia* spp., and *Euphorbia* spp., do not exist under Solarthids (*Saline*) soils and species like *Phragmites karka*, *Cressa critica* and *Frankenia pulverulenta* were not found to exist under Camborthids (*Pakka*) soils. Although the physical soil conditions of Camborthids and Solarthids mainly are similar except some changes in salt content but, however, the weed communities of both are quite different from each other.

The weeds cause great losses to wheat crop thus their control is necessary. This information regarding different weed communities under different soils can be helpful to weed control methods.

References

Anderson, W.P. 1983. *Weed science principles*, 2nd Eds. West pub.Co.St.Paul, Minn, USA.12-13.

Anonymous. 1997. *Quarterly Bulletin of statistics.* F.A.O. [Food & Agriculture organization], 10.

Anonymous. 1999-2000. *Agriculture statistics of Pakistan*, Ministry of food Agriculture & Livestock.

Anonymous. 2000. *Economic Survey of Pakistan*, Directorate of Agriculture Statistics, Sindh Bureau of Statistics.

Bououcos, G.J. 1962. Hydrometer method improved for making particle size analysis of soil. *Agron. J*., 54: 464-465.

Gorham, J. 1992. Grass responses to salinity. In: *Desertified grasslands: Their Biology and Management*. The Linnaean Society of London.

Hesse, P.R. 1994. *A Textbook of Soil Chemical Analysis.* CBS Publishers & Distributors. Delhi India.

Johnson V.A. 1984. World wheat production. PP 1-5. In: *Genetic improvement in yield of wheat* (Ed.): E.L. Smith. CSSA Special publication No. 13.

Khattak, I., G. Hassan, I. Ahmed and M. Hassan. 2001. Evaluation of some elite breeding lines of wheat under rain fed conditions of Kohat. *Sarhad. J. Agri*., 17 (4).

Maas, E.V 1986. Salt tolerance of plants. *Appl. Agri. Res*., 1: 12-36.

Memon, R.A. 2000. DAWN. Economic & Business review. April 18-23, iii.

Nasir, E. and S.I. Ali, S.I. (Eds.) 1972-2000. *Flora of Pakistan* (*Fascicle series, 1-202).*

Qaiser, M. 2001. *Flora of Pakistan*, (Eds.): S.I. Ali. & M. Qaiser, (*Fascicle series, 204-205*).

Qureshi, R. and G.R. Bhatti. 2001. Determination of weed communities of wheat (*Triticum aestivum* L.) fields of district Sukkur. *Pak. J. Bot.*, 33(1): 109-115.

Rafiq, M., M. Ahmed, M.E. Akhter and M.I. Nizami. 1990. Soil resources and soil related problems in Pakistan. In: *Proc. International Symposium on Applied soil physics in stress environments*, Islamabad, Pakistan. 22-26 January 1989. Islamabad; Pakistan Agriculture Research Council.

Rao, V.S 1980. *Principles of weed science.* Oxford & IBH publishing Co. New Delhi. India.

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