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## Ecological prevalence of the weed species growing in maize and sugarcane fields of district Mardan, Pakistan

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### Abstract

The present study aimed to investigate the weed flora of maize and sugarcane fields of Tehsil Takht Bhai District Mardan Pakistan during June to December 2012. The floristic composition, life form, frequency and density of weeds of maize and sugarcane crops were determined using quadrat method. The results showed that sugarcane fields comprised 23 weed species distributed among 14 families. The frequently occurring weeds were *Cynodon dactylon* (85.00%), *Brachiaria eruciformis* (80.52%) and *Cyperus rotundus* (75.9%). *Brachiaria eruciformis* was recorded to be the most densely populated weed of surveyed sugarcane fields having density value of 35.67. Among the 23 recorded weed species 17 were therophytes, 2 species were hemicryptophytes, 3 species were geophytes and 2 species were chamaephytes. Whereas in the maize fields there were 25 weed species distributed among 11 families. The frequently occurring weeds species were *Sorghum halepense* (83.66%), *Cynodon dactylon* (69.12%) and *Digera muricata* (65.11%). *Sorghum halepense* was recorded to be the most densely populated weed species of surveyed maize fields with the density value of 28.20. Among the 25 recorded weed species 21 were therophytes, 3 species were geophytes and one species was each hemicryptophytes and chamaephytes. During this study the soil samples from respective sites were also collected and analyzed for pH, Electrical conductivity and percentage moisture which were found in the optimum range suitable for sugarcane and maize production. The present finding will help in future strategies of weed management of sugarcane and maize crops improvement. A more comprehensive study is suggested in future for investigation of weed flora in Mardan and surrounding districts of KPK.

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## Introduction

Weeds are out of place and injurious plants which interfere with the utilization of land and other resources such as nutrients, water, space and light and consequently pose damaging effects on crop production and human welfare. Weeds impose an enormous threat to agriculture (environmentally, economically, and socially) (Cheema *et al.*, 2005; Cheema, 2009). The losses due to weeds are approximately 20-40% in the province of KPK (Khyber Pakhtunkhwa) Pakistan (Anonymous, 2001). Weeds reduce yields, lower the quality of the crop and increase the cost of harvesting, threshing and cleaning (Shah *et al.*, 2004). Some weeds are poisonous and injurious to animals like sun spurge, blue pimpernel and Johnson grass (Martin *et al.*, 1990). The percent yield loss of sugarcane is 25-35% due to weeds in Pakistan. Critical weed period of weed-crop competition in sugarcane is 4-8 weeks after sowing (Makhdoom, 1988).

Several weeds have been put to certain economic uses since ages. *Cichorium intybus* roots are used for adding flavor to coffee powder. *Amaranthus viridis* and *Chenopodium album* are used as leafy vegetables. *Cynodon dactylon* and *Eclipta alba* weeds of grass land serve as food for animals. Weeds act as alternate host for predators and parasites of insect pests which feed on the weeds. Some weeds have medicinal properties e.g. *Phyllanthus niruri* used for jaundice (Ibrar *et al.*, 2003).

Weed flora varies due to climate, altitude, adaphic factors, topography and agronomic practices, thus it becomes of prime importance to identify and know the biological characteristics of weeds (Hadi *et al.*, 2009). Different environmental conditions determine the specific weed spectrum, composition and population of each region (Memon *et al.*, 2007).

Pakistan occupies latitude 30° 42' N and longitude 73° 08' E on the globe. The study area of Tehsil Takht Bhai (District Mardan) is situated at the latitude of 34° 16' 55" North and longitude of 71° 55' 42" East.

The climate of Tehsil Takht Bhai is sub-humid and semi and sub Tropical continental highland. The summer season is extremely hot (43.5°C). The coldest month temperature reaches 0.5°C. Most of the rainfall occurs in the month of July, August, December and January. Maximum rainfall is recorded for the months of July and August. The relative humidity is quite high throughout the year reaching 73.33% in December. Takht Bhai is known as one of the best agricultural area in the country. Its major crops include maize, tobacco, sugarcane, wheat, barley and mustard (Rabi). Weeds grow and are present in almost in every crop in the area.

The present study was undertaken to report the weed flora from sugarcane and maize fields of Tehsil Takht Bhai, district Mardan. The floristic composition, life form spectrum, frequency and density of weeds will be helpful to agronomist, ecologist and scientists involved in weed management for future studies, especially in Takht Bhai, Mardan.

## Materials and methods

For present study sugarcane and maize fields of Takht Bhai (Mardan) area were visited several times at different stages of crop that is from initial stages to maturity. Ten villages of Takht Bhai (Table 1) were selected at random for study and surveyed with a view to determine weed frequency, density and life form of each weed species. The quadrat method was used in present study. The size of quadrat used was 1 meter x 1 meter. Several quadrates were taken at each site and finally ten quadrates were selected for each site of each crop in one selected field.

### Ecological methods

The ecological methods were used for description of weed flora of sugarcane and maize fields. Both analytical and synthetic characters were taken into consideration. Some of these characters are as follows.

### Floristic composition

The fields of almost equal size were selected in these

villages at random. The weeds present in these fields were collected throughout the research period and floristic composition was determined in each quadrat, which involved the complete composition of the species.

Weeds were collected from the maize and sugarcane fields. Then dried, pressed and preserved for about three weeks to get them moisture free. The complete floristic composition was compiled by recording scientific names, common names, family, life form and leaf size of each species. The weed species were classified following Tanveer and Asghar (2003). Life form of different weeds was studied by taking Raunkiaer system of classification (1934). The system consisted of principle form classes including Phanerophytes (Ph), Chamaephytes (Ch), Hemi Cryptophytes (H), Cryptophytes (Cr) and Therophytes (Th).

*% Frequency*

For determine % frequency determination of weeds, 1-meter X 1-meter sized quadrat was used. From the formula given below the frequency was calculated.

$$\% \text{ frequency} = \frac{\text{No of quadrates in which the species occur}}{\text{Total no of quadrates studied}} \times 100.$$

*Density*

The density determination was carried with a view to determine the weed spectrum of each crop. 1 meter X 1 meter sized quadrat was used. The density was calculated from the formula given below.

$$\text{Density} = \frac{\text{Total no of individual of a species in all the sample plot}}{\text{Total no of sample plot studied}}$$

*Plant description methods*

The weeds were dried, preserved and mounted on herbarium sheets and were identified and described following the literature available (Stewart 1972; Nasir and Ali, 1970-1989; Ali and Qaiser, 1993-2003).

*Soil characteristics*

The analytical work carried out at the Department of Botany, Abdul Wali Khan University Mardan, determined the Percentage Moisture, pH Measurement and Electrical Conductivity.

**Results and discussion**

Weeds have a wide range of adaptation, viability and resistance to adverse environmental conditions because they are universal in their distribution. Even a well managed field may contain weeds to some extent.

**Table 1.** List of localities and number of quadrates of visited sugarcane and Maize fields.

Crop	Sites No.	Localities	No. of Quadrates
Sugarcane	1	HATHIAN	1-10
	2	SHER GARH	11-20
	3	JALALA	21-30
	4	GEOWARH	31-40
	5	GARHO	41-50
Maize	6	KAODARO	51-60
	7	SHAMILAT	61-70
	8	DARGIWALL	71-80
	9	NADIRAY	81-90
	10	GULSHAN ABAD	91-100

The distribution and population density of weeds depends upon local, geographical and agronomic practices. The data presented in tables depicts the weed spectrum, life form, frequency and density of weed species in the surveyed fields of some selected

villages of Takht Bhai.

The soil samples were collected and preserved in the polythene bags. The samples were analyzed in the lab of department of Botany Abdul Wali Khan

University Mardan. The percentage soil moisture ranged from 1.41 to 2.14 and conductivity ranged from 0.07% to 2.44 ms (Table 4).

*Weed flora of sugarcane fields*

In the sugarcane fields surveyed, 23 weed species were recorded. These species belong to 14 different families and out of these, 2 families were monocots

while remaining 12 families were dicots. The families in decreasing order of weed species were *Poaceae* (6 species), *Asteraceae* (3 species), *Malvaceae* (2 species), *Aizoaceae*, *Cyperaceae*, *Polygonaceae*, *Solanaceae*, *Euphorbiaceae*, *Convolvulaceae*, *Cucurbitaceae*, *Cannabaceae*, *Phyllanthaceae* and *Chenopodiaceae* (Each had one species).

**Table 2.** The floristic composition, life form, frequency and density of weeds in surveyed sugarcane fields of Takht Bhai Mardan.

Floristic Composition	Family	Life form*	Frequency %	Density
<i>Brachiaria eruciformis</i>	Poaceae	Th	80.52	35.67
<i>Dactyloctenium aegyptium</i>	Poaceae	Th	42.99	19.22
<i>Echinochloa colona</i>	Poaceae	Th	44.11	13.71
<i>Cynodon dactylon</i>	Poaceae	G	85.00	29.56
<i>Leptochloa panicea</i>	Poaceae	Th	55.32	9.11
<i>Setaria pumila</i>	Poaceae	Th	40.81	19.00
<i>Eclipta alba</i>	Asteraceae	Th	30.32	3.81
<i>Cichorium intybus</i>	Asteraceae	H	6.0	1.1
<i>Conyza aegyptica</i>	Asteraceae	Th	40.00	2.5
<i>Corchorus acutangulus</i>	Malvaceae	Th	35.52	2.75
<i>Malvastrum tricuspidatum</i>	Malvaceae	Ch	30.41	4.1
<i>Commelina banghalensis</i>	Commelinaceae	Th	11.20	4.19
<i>Cannabis sativa</i>	Cannabaceae	Th	11.21	4.11
<i>Chenopodium album</i>	Chenopodiaceae	Th	30.00	2.43
<i>Citrullus colocynthis</i>	Cucurbitaceae	H	13.99	6.21
<i>Cyperus rotundus</i>	Cyperaceae	G	75.91	23.68
<i>Convolvulus arvensis</i>	Convolvulaceae	G	45.12	4.45
<i>Euphorbia-hirta</i>	Euphorbiaceae	Th	32.11	5.00
<i>Physalis subglabrata</i>	Solanaceae	Th	21.07	5.10
<i>Phyllanthus niruri</i>	Phyllanthaceae	Th	15.81	6.34
<i>Polygonum plebeium</i>	Polygonaceae	Th	30.00	6.8
<i>Achyranthes aspera</i>	Amaranthaceae	Th	19.21	7.11
<i>Trianthema portulacastrum</i>	Aizoaceae	Th	60.12	14.36

Th= Therophytes, H= Hemi Cryptophytes, G= Geophytes, Ch=Chamaephytes.

Some weeds such as *Brachiaria eruciformis*, *Trianthema portulacastrum*, *Achyranthes aspera*, *Setaria pumila* have been reported from sugarcane and maize fields in other parts of the country (Shah and Khan, 2006; Muhammad *et al.*, 2009; Zafar *et al.*, 2010; Khan *et al.*, 2012a). The present study is also supported by the findings of Khan *et al.* (2012b)

in sugarcane fields of Bannu and Qureshi (2004) in sugarcane fields of Sukkhar.

*Cynodon dactylon* was the most frequent weed in the surveyed sugarcane field, having frequency value of 85.00%. Whereas *Cichorium intybus* was the less frequently weed specie having value of 6.0%. The

other remaining weed species have frequency value ranged from 11.20% to 80.52%. *Brachiaria eruciformis* was recorded to be the most densely populated weed of surveyed sugarcane fields, having a value of 35.67% whereas *Cichorium intybus* was the less densely populated weed specie having value of

1.10%. The other remaining weed species have density value ranged from 2.5 to 29.56. Among the 23 recorded weed species 17 were therophytes, 2 species were hemi cryptophytes 3 species were geophytes and 2 species were chamaephytes (Table 2).

**Table 3.** Floristic composition, life form, frequency and density of weeds in Maize.

Floristic Composition	Family	Life form	Frequency%	Density
<i>Digitaria sanguinalis</i>	Poaceae	Th	30.00	10.00
<i>Dactyloctenium aegyptium</i>	Poaceae	Th	39.45	15.22
<i>Brachiaria eruciformis</i>	Poaceae	Th	80.00	17.34
<i>Echinochloa colona</i>	Poaceae	Th	51.00	16.91
<i>Leptochloa paniceae</i>	Poaceae	Th	40.66	22.00
<i>Sorghum halepense</i>	Poaceae	H	83.66	28.20
<i>Setaria pumila</i>	Poaceae	Th	64.31	20.00
<i>Amaranthus viridis</i>	Amaranthaceae	Th	79.25	19.41
<i>Amaranthus albus</i>	Amaranthaceae	Th	39.25	4.38
<i>Amaranthus thunbergii</i>	Amaranthaceae	Th	35.61	6.11
<i>Amaranthus spinosus</i>	Amaranthaceae	Th	41.00	3.71
<i>Achyranthes aspera</i>	Amaranthaceae	Th	29.21	3.65
<i>Digera muricata</i>	Amaranthaceae	Th	65.11	27.21
<i>Parthenium hysterophorus</i>	Asteraceae	Th	61.75	19.00
<i>Eclipta alba</i>	Asteraceae	Th	25.11	3.45
<i>Xanthium strumarium</i>	Asteraceae	CH	31.05	2.51
<i>Chenopodium album</i>	Chenopodiaceae	Th	25.45	4.00
<i>Chenopodium album</i>	Chenopodiaceae	Th	25.45	4.00
<i>Brassica janceae</i>	Brassicaceae	Th	9.68	8.9
<i>Euphorbia hirta</i>	Euphorbiaceae	Th	19.24	8.00
<i>Cyperus rotundus</i>	Cyperaceae	G	72.81	19.81
<i>Cannabis sativa</i>	Cannabinaceae	Th	19.12	9.19
<i>Convolvulus arvensis</i>	Convolvulaceae	G	45.18	5.10
<i>Solanum nigrum</i>	Solanaceae	Th	39.19	7.99
<i>Trianthema portulacastrum</i>	Aizoaceae	Th	54.08	15.23

*Weed flora of Maize fields*

In maize fields surveyed, there were twenty five species distributed among 11 families of which 2 families were monocots while remaining 9 families were dicots. The families in decreasing order of weed species were *Poaceae* (8 species), *Amaranthaceae* (6 species), *Asteraceae* (3 species) while *Cyperaceae*, *Chemopodiaceae*, *Solanaceae*, *Euphorbiaceae*, *Convolvulaceae*, *Cannabinaceae*, *Aizoaceae* and

*Brassicaceae* were present with only a single species (Table 3).

*Cynodon dactylon*, *Cyperus rotundus*, *Chenopodiumalbum*, *Echinochloa crus gali* and *Cusnis prophetarum* had been reported in the maize field from other parts of the country (Muhammad *et al.*, 2007; Khan *et al.*, 2012a).

*Sorghum halepense* was the most frequent weed species occurring in surveyed maize fields, having a frequency of 83.66%, where as *Brassica juncea* was the less frequently weed specie having value of 9.68%. The other remaining weed species have frequency value ranged from 19.12% to 80.00%. *Sorghum*

*halepense* was recorded to be the most densely populated weed of surveyed maize fields, having a value of 28.20%. Whereas *Xanthium strumarium* was the less densely populated weed specie having value of 2.51%. The other remaining weed species have density value ranges from 3.45% to 27.21%.

**Table 4.** Analysis of the Soil Samples from selected sites for weeds collection.

Sample No.	Selected Fields	pH at 25°C	% Moisture	Conductivity (ms)
1	SUGAR CANE	7.2	1.66	0.07
2	SUGAR CANE	7.3	1.45	2.37
3	SUGAR CANE	8.36	2.14	2.08
4	SUGAR CANE	7.60	1.99	1.82
5	SUGAR CANE	7.37	1.72	1.48
6	MAIZE	7.88	1.79	1.88
7	MAIZE	7.55	1.82	1.93
8	MAIZE	8.21	2.11	2.44
9	MAIZE	7.72	1.41	1.73
10	MAIZE	8.11	2.00	1.75

Among the 25 recorded weed species 20 species were therophytes, 3 species were geophytes and one species was the hemi cryptophytes and chamaephytes.

### Conclusion

Having recorded the existing weed flora of maize crop in the locality, it became quite easier to formulate a long term weed management program. The dominant weed species, their families and percent contribution to the weed flora were also recognized. In addition, the year to year introduction of new species can easily be spotted because of having the record of the weed flora in the previous year. The results highlighted five dominant and major weeds in maize crop that have been a big menace in maize and sugarcane crop in the past. The four dominant weeds were *Amaranthus viridis*, *Cynodon dactylon*, *Cyperus rotundus*, and *Sorghum halepense*.

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