

## DISTRIBUTION AND CHECKLIST OF WEEDS IN MAIZE CROP OF FRONTIER REGION BANNU, KHYBER PATUNKHWA, PAKISTAN

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### ABSTRACT

*Having a comprehensive knowledge of the existing weed flora of a locality in a particular crop helps decide an effective weed management strategy. Maize crop is though a good competitor, nevertheless it cannot cope with a number of competitive weeds at a time. Therefore, the present research study was aimed at studying and documenting the distribution of prominent weeds in maize crop of F.R Bannu, Pakistan in maize growing season of the year 2009. A total of 40 weed species were recorded as problematic to maize crop inflicting ruthless yield losses. These documented weeds belong as a whole to 21 different families in which Amaranthaceae was found to be the most dominant one contributing up to 19% of the weed flora of the studied crop. It was followed by Asteraceae, Zygophyllaceae and Poaceae each with 14% infestation. Therefore, these four families contribute together to 61% of the weed flora of maize crop. As far as the distribution pattern of the weeds was concerned, there were five dominant weeds viz: Amaranthus viridis, Cynodon dactylon, Cyperus rotundus, Heliotropium eichwaldii and Spargula pentandra. The rest of the weeds were however occasional and did not have consistent and dominant distribution. The distribution of weed species was therefore a diverse and quite importance for the botanists and weed scientists to formulate a long term weed management strategy in the locality in light of the weed flora recorded in maize crop.*

**Key words:** Bannu Pakistan, distribution, maize, checklist, weeds.

### INTRODUCTION

Frontier Region (F.R.) Bannu is a small administrative unit in the Federally Administered Tribal Areas (FATA) of Pakistan. The region is named after Bannu district which lies to the east and surrounded by the borders of district Karak and Frontier Region Lakki Marwat in the north, and by North Waziristan Agency in the west. According to the Khyber Pakhtunkhwa (KP) Bureau of Statistics for the year 2007-08, maize is one of the major crops grown on about 790 hectares in the FR Bannu area. The average maize yield is lower in Pakistan as

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compared to other maize growing countries. The reasons for low yields are many; however, one of the most serious but less noticed cause is the weed infestation. The losses due to weeds are approximately 20-40% in the province of Khyber Pakhtunkhwa (Anonymous, 2001). Weeds are perceived by many farmers as being the greatest cause of yield loss in agricultural crops (Owen, 1998).

Weed-crop interaction is a complex field of study and is as old subject as the advent of agriculture itself. There is always a weed-crop competition for resources which is mostly won by weeds, as they are better adapted to different agro-ecological environments. Weeds compete with crop for space, sunlight, moisture and nutrients, thus decrease the crop yield.

Competitiveness of the crop is affected by its plant spacing, leaf size, plant height and time of emergence (Hamayun, 2003). Weeds' competitiveness is also dependent on weed species density and duration, causing considerable yield losses in maize (Dalley et al., 2006). Weeds are reportedly capable of reducing corn grain yield by 35-70% if not managed in time (Ford and Pleasant, 1994) and uncontrolled weed growth brings about 83% decline in average grain yield of maize (Usman et al., 2001).

According to the data of Bayer Crop Science (BCS) Pakistan, *Cyperus rotundus*, *Trianthema portulacastrum*, *Cynodon dactylon*, *Chenopodium album* and *Echinochloa colona* are the main weeds responsible for significance yield losses in maize (BCS, 2011). According to KP Bureau of Agriculture statistics for the year 2007-08, maize was cultivated in district Bannu on an area of 4910 ha, with total production of 8940 tons and average yield was 1821 kg ha<sup>-1</sup>; making the production capita<sup>-1</sup> as 10 kg. The percent share of Bannu district in KP on basis of area under maize cultivation was 1.06% and on basis of maize production was 1.07. The respective figures for F.R. Bannu were 7900 ha, 13240 tons, 1676 kg ha<sup>-1</sup>, 40 kg capita<sup>-1</sup>, 1.68% share with FATA in cultivated maize area and 1.85% share in maize production during the year 2007-08. Saeed et al. (2010) declared *Trianthema portulacastrum* as a strong competitor with maize crop and that it causes substantial yield losses in maize depending on its plant spacing and weed density. Fernandez et al. (2002) found reciprocal competition effects between bermudagrass (*Cynodon dactylon*) and maize.

In light of the information gathered there was a need to explore, identify and document the weed flora in maize fields of F.R. Bannu. Therefore the study was conducted in order to pave the way for proper weed management decisions in future.

## **MATERIALS AND METHODS**

### **Study Area**

The study was conducted in 12 various villages of F.R. Bannu i.e. Mian Gul Khel, Gulab Khel, Sanzar Khel, Meri Khel, Waligi, Qamar Killa, Hatikhan Khel, Patol Khel, Musa Khel, Painda Khel, Said Khel and Bezan Khel areas of the region.

### **Species collection and preservation**

Plant specimens were collected during the months of October and November 2009. Before starting the research work general information about the area was collected. Afterwards, personal visits were conducted in different localities of the F.R. Bannu. The collected weeds were preserved in news papers, placed in proper positions and left to completely dry. After drying all the plants were mounted on standard herbarium sheets with proper identification and taxonomy.

### **Identification of species**

Identification was done on the basis of habitat (the type of plant community), plant habit (describing the form of the plant i.e. tree, shrub, vine, herb), frequency (whether the plant is rare, occasional, frequent or common), and plant description (flower/fruit color and fragrance, leaf orientation and aroma).

The identification of unknown plant material was accomplished with the use of dichotomous keys, published plant descriptions, illustrations and photographs, and comparison with properly identified herbarium specimens. The use of microscope was helpful for the observation of many diagnostic features. The results were rechecked and compared with literature of Leenhouts (1968). The collected specimens were identified through available literature as well (Stewart, 1972; Nasir and Ali, 1971-2007). Local farmers were also interviewed to document their indigenous knowledge about the problematic weeds of maize crop in the locality.

### **Species distribution**

The distribution of the documented specimens was calculated by using the Oosting scale (Oosting, 1956). Under this scale, the distribution pattern of the weed flora was made into five varying categories i.e. 1. Very rare, 2. Rare, 3. Infrequent, 4. Abundant, and 5. Very abundant.

## **RESULTS AND DISCUSSION**

As the objective of the study was to identify weed species and their distribution in maize crop of the study area, study of weed communities in the maize crop was carried out in 12 maize growing localities in F.R Bannu. A total of 39 weed species belonging to 21 angiosperm families were recorded from the study areas (Table-1). Highest percentage of the weed species was recorded from Maingul

Khel (14 species) followed by Gulab Khel (4 species); while the rest of the localities possessed 22 species as a whole. *Amarantaceae* was found to be the most dominant family in the weed flora of the studied crop with a percentage of (19%) followed by *Asteraceae*, *Zygophyllaceae* and *Poaceae* (14%). The rest of the families with their respective percentages are showed in Fig. 1. The distribution patterns of the documented weed flora along with their botanical names, families, places of collection and their individual rating on Oosting scales are given in Table-1. The identification process was accomplished using the dichotomous keys, taking help from the published plant descriptions, illustrations and photographs, and also by comparing with properly identified herbarium specimens. A considerable amount of help was taken from the literature of Leenhouts (1968), Stewart (1972), and Nasir and Ali (1971-2007). The personal points of views of the local farming community were also quite useful.

The five most dominant and widespread weed species with in the weed communities of maize crop in the study area were *Amaranthus viridis*, *Cynodon dactylon*, *Cyperus rotundus*, *Heliotropium eichwaldii* and *Spergula pentandra*. The rest of the dominant species were occasional.

*Cyperus rotundus* is one of the most invasive weeds known, having spread out to a worldwide distribution in tropical and temperate regions. It has been called "the world's worst weed" as it is known as a weed in over 90 countries, and infesting over 50 crops worldwide. Its existence in a field significantly reduces crop yield, both because it is a tough competitor for ground resources, and because it is allelopathic, the roots releasing substances harmful to the crop plants. *Amaranthus viridis* species have an extended period of germination, rapid growth, and high rates of seed production. The species of *Amaranthus* are considered invasive and noxious weeds. *Cynodon dactylon* is a fast growing and tough weed, making it popular and useful for lawn and turf, as when damaged it will recover quickly. It is a highly desirable turf grass in warm temperate climates, particularly for those regions where its heat and drought tolerance enables it to survive where few other grasses do. It is also highly aggressive, crowding out most other grasses and invading other habitats. *Spergula pentandra* is abundant on roadside and waste places. Most species of *Heliotropium* grow in areas with an arid and semi-arid climate, mostly on dry soils, gypsum hills, sandy and gravelly deserts, disturbed soils, eroded slopes, as weeds in cultivated lands and wastelands, along riversides (Akhani, 2007). Shah and Khan (2006) provided a checklist of noxious weeds in various crops of District Mansehra, Khyber Pakhtunkhwa Pakistan.

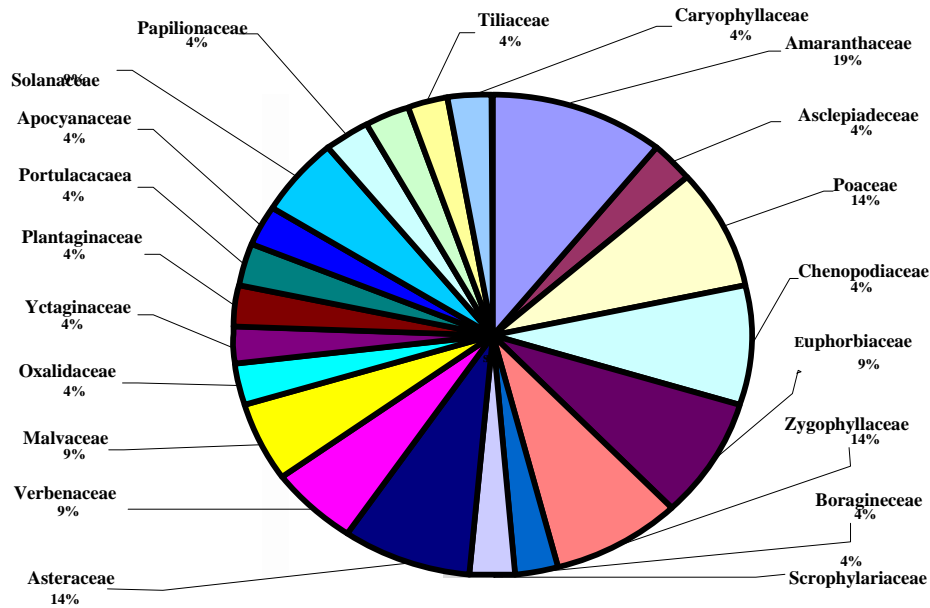
**Table-1. Distribution of weeds in maize crops of F.R. Bannu.**

S.No	Botanical name	Family	Locality (F.R. Bannu)	Abundance (Oosting scale)
1.	<i>Aerva tomentosa</i>	Amaranthaceae	Said Khel	1
2.	<i>Alternanthera sessilis</i>	Amaranthaceae	Gulab Khel	3
3.	<i>Amaranthus viridis</i>	Amaranthaceae	Miangul Khel	4
4.	<i>Calotropis procera</i>	Asclepiadaceae	Gulab Khel	1
5.	<i>Cenchrus ciliaris</i>	Poaceae	Miangul Khel	3
6.	<i>Chenopodium murale</i>	Chenopodiaceae	Patol Khel	2
7.	<i>Chrozophora plicata</i>	Euphorbiaceae	Said Khel	1
8.	<i>Citrullus colocynthis</i>	Cucurbitaceae	Gulab Khel	1
9.	<i>Convolvulus arvensis</i>	Convolvulaceae	Miangul Khel	2
10.	<i>Conyza bonariensis</i>	Asteraceae	Said Khel	1
11.	<i>Corchorus anticorus</i>	Tiliaceae	Musa Khel	3
12.	<i>Cynodon dactylon</i>	Poaceae	Sanzar Khel	5
13.	<i>Cyperus rotundus</i>	Cyperaceae	Miangul Khe	5
14.	<i>Datura Alba</i>	Convolvulaceae	Painda Khel	1
15.	<i>Digera arvensis</i>	Amaranthaceae	Qamarkilla	3
16.	<i>Euphorbia pilulifera</i>	Euphorbiaceae	Bezan Khel	1
17.	<i>Euphorbia prostrata</i>	Euphorbiaceae	Meri Khel	3
18.	<i>Fagonia cretica</i>	Zygophyllaceae	Miangul Khel	2
19.	<i>Heliotropium eichwaldii</i>	Boraginaceae	Miangul Khel	4
20.	<i>Kickxia incana</i>	Scropholariaceae	Waligi	1
21.	<i>Launaea procumbens</i>	Asteraceae	Miangul Khe	3
22.	<i>Lippia nodiflora</i>	Verbenaceae	Musa Khel	1
23.	<i>Malva neglecta</i>	Malvaceae	Patol Khel	1
24.	<i>Oxalis corniculata</i>	Oxalidaceae	Musa Khel	1
25.	<i>Parthenium hysterophorus</i>	Nyctaginaceae	Bezan Khel	1
26.	<i>Peganum harmala</i>	Zygophyllaceae	Miangul Khel	2
27.	<i>Plantago lenceolata</i>	Plantaginaceae	Miangul Khel	2
28.	<i>Portulaca oleracea</i>	Portulacaceae	Sanzar Khel	3
29.	<i>Rhazya stricta</i>	Apocynaceae	Miangul Khel	1
30.	<i>Sesbania sesban</i>	Papilionaceae	Patol Khel	1
31.	<i>Solanum surantense</i>	Solaneceae	Miangul Khel	1
32.	<i>Sorghum halepense</i>	Poaceae	Miangul Khel	2
33.	<i>Spergula pentandra</i>	Caryophyllaceae	Hatikhan Khel	4
34.	<i>Taraxacum officinale</i>	Asteraceae	Waligi	1
35.	<i>Tribulus terrestris</i>	Zygophyllaceae	Gulab Khel	3
36.	<i>Trichosanthes dioca</i>	Cucurbitaceae	Patol Khel	1
37.	<i>Verbena officinale</i>	Verbinaceae	Patol Khe	1
38.	<i>Withania somnifera</i>	Solanaceae	Gulab Khel	1
39.	<i>Xanthium strumarium</i>	Asteraceae	Miangul Khel	1

**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 crop in the past. The five dominant weeds were *Amaranthus viridis*, *Cynodon dactylon*, *Cyperus rotundus*, *Heliotropium eichwaldii* and *Spergula pentandra*.



**Figure 1. Percentage contribution of plant families in the formation of the weed flora.**

#### REFERENCES CITED

- Akhani, H. 2007. Diversity, biogeography, and photosynthetic pathways of *Argusia* and *Heliotropium* (Boraginaceae) in South-West Asia with an analysis of phyto-geographical units. Bot. J. Linnean Soc. 2007, 155, 401–425.
- Ali, A. and J.L. Fefevre. 1996. Indigenous knowledge of plants: a case study in Chitral. Proc. Ethnobot. Workshop, Sep. 16-24, NARC Islamabad. Pp. 136-151.
- Anonymous. 2001. Losses due to weeds in major crops of NWFP. Plant Physiol. Sec., Agric. Res. Instt., Tarnab, Peshawar, Pakistan.
- BCS. 2011. [http://www.bayercropscience.com.pk/BCSWeb/www/BCS/PK\\_Internet.nsf/id/EN\\_Maize?open&ccm=100010](http://www.bayercropscience.com.pk/BCSWeb/www/BCS/PK_Internet.nsf/id/EN_Maize?open&ccm=100010) (Visited on September 15, 2011).

- Dalley, C.D., M.L. Bernards and J.J. Kells. 2006. Effect of weed removal timing and spacing on soil moisture in corn (*Zea mays*). Weed Technol. 20(2): 399-409.
- Fernandez, O.N., O. R. Vignolio and E.C. Requesens. 2002. Competition between corn (*Zea mays*) and bermudagrass (*Cynodon dactylon*) in relation to the crop plant arrangement. Agronomie. 22: 293-305.
- Ford, G.T. and M.T. Pleasant. 1994. Competitive abilities of six corn (*Zea mays* L.) hybrids with our weed control practices. Weed Technol. 8(1): 124-128.
- Hamayun, M. 2003. Effect of spacing and weed free periods on the productivity of maize (*Zea mays* L.). Pak. J. Weed Sci. Res. 9(3-4): 179-184.
- Leenhouts, P.W. 1968. A guide to the practice of herbarium taxonomy. Regnum Vegetabile, Vol. 58. International Bureau for Plant Taxonomy and Nomenclature of the International Association for Plant Taxonomy, Utrecht, Netherlands.
- Nasir, E. and S. I. Ali. 1971-2007. Flora of West Pakistan. NARC Islamabad. Department of Botany, University of Karachi, Karachi.
- Oosting, H.J. 1956. The study of plant communities. 2<sup>nd</sup> Ed. W.H. Freeman and company, San Francisco. 440 p.
- Owen, M.D.K. 1998. Producer attitudes and weed management. In J. L. Hatfield, D. D. Buhler and B. A. Stewart, eds. Integrated Weed and Soil Management. Chelsea, MI: Ann Arbor Press. Pp. 43-59.
- Rubina, A.R. 1998. Need of conversation for endangered Medicinal Plants, Proceeding of Wild Medicinal Plants Resources of Northern Pakistan, May 11-12, PFI, Peshawar, Pakistan.
- Saeed, M. K.B. Marwat, G. Hassan, M.A. Khan and I.A. Khan. 2010. Interference of Horse purslane (*Trianthema portulacastrum*) with Maize (*Zea mays* L.) at different densities. Pak. J. Bot. 42(1): 173-179.
- Shah, G. M. and M.A. Khan. 2006. Check List of Noxious Weeds of District Manshera. Pakistan. Pak. J. Weed Sci. Res. 12(3): 213-219.
- Stewart, R.R. 1972. Flora of Pakistan, An annotated catalogue of the vascular plants of West Pakistan and Kashmir Fakhri Printing Press. Karachi, pp. 360-364.
- Usman, A., K.A. Elemen, A. Bala and A. Umar. 2001. Effect of weed interference and nitrogen on yields of a maize/rice intercrop. Intl. J. Pest Manag. 47(4): 241-246.
- Wazir, S. M., A. A. Dasti, and J. Shah. 2004. Common Medicinal plants of Chapursan Valley, Gojal II, Gilgit. Pak. J. Weed Sci. Res. 15(1): 41-43.