

IMPORTANCE VALUE INDICES OF WEEDS INFESTING MAIZE CROP AT THE NEW DEVELOPMENTAL FARM OF THE UNIVERSITY OF AGRICULTURE PESHAWAR, PAKISTAN

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ABSTRACT

A field survey was carried out to highlight the most important and problematic weeds of maize crop at the New Developmental Farm of the University of Agriculture, Peshawar. The data were recorded on relative weed density (RWD), relative weed frequency (RWF) and Importance value indices (IVI) of weeds. Results showed that maize fields in the farm were mostly infested with *Trianthema portulacastrum*, *Digitaria sanguinalis*, *Echinochloa crus-galli*, *Sorghum halepense*, *Cynodon dactylon*, *Euphorbia prostrata*, *Xanthium strumarium*, *Rumex crispus*, *Cyperus rotundus* and *Digera arvensis*. The highest RWD (50.16%) and RWF (86.6%) were recorded for *Trianthema portulacastrum*. The lowest value of RWD was noted for *Cyperus rotundus* (0.38%) and lesser RWF (0.11%) for *Digitaria sanguinalis*. The data showed that the highest IV (69.38) was calculated for *Trianthema portulacastrum* while for *Digera arvensis* it was the lowest value (0.88). This study provided very helpful knowledge to the scientific community about weed flora to design a solid integrated weed management plane in maize crop in the target area.

Key words: Importance value index, *Zea mays*, relative weed density and frequency.

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INTRODUCTION

Maize considered the important cereal crops of Khyber Pakhtunkhwa, known botanically as *Zea mays* L. belongs to family Gramineae or Poaceae. Maize is annual cross pollinated crop having strong erect and thick stalk having nodes and internodes. It serves as

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food, fodder and feed in addition to being a source of raw material for the industry. Maize is the third most important crop in Pakistan grown both for fodder and grain purposes. Total area under maize cultivation in Pakistan was 1.0873 million ha having an average yield of 3990 kg ha⁻¹ with the total annual production of 4.3383 million tons, while in the province of Khyber Pakhtunkhwa maize was cultivated on 0.4753 million ha with an average yield of 1868 kg ha⁻¹ and total annual production of 0.8878 million tons (MNFSR, 2014). The obtained yield of maize ha⁻¹ is still very low as compared to other maize producing countries worldwide. A number of factors responsible for low yield; however, weeds are considered to be the most important yield reducing factor.

Weed infestation in maize crop is one of the serious problems in both irrigated and rainfed areas across Pakistan. Weeds capture the soil fertility, moisture and other necessary nutrients. Moreover weeds shares space and light with crop plants that resulted in yield reduction (Khan *et al.*, 2004). Uncontrolled and heavy weeds infestation in many fields can reduce the yield up to 80% (Khatam *et al.*, 2013). Past researches confirmed that if the weeds are not controlled in critical crop weed competition period in grain then the yield losses reaching between 35 and 70% (Khatam *et al.*, 2013). Weeds found in maize crop classified as broad leaves, grasses and sedges. Weeds and labour shortage for their removal are two critical constraints for maize growing farmers. Weeds not only reduced the crop yield but also deteriorate the quality of grain and hence reduce the market value (Ali *et al.*, 2003; Abdullah *et al.*, 2007). It would be sound feature that weed management should get better if we apply appropriate herbicides as well as practice good planting method.

Keeping in view of the importance of the weed problem in maize, the survey was conducted at the research fields of New Developmental Farm, The University of Agriculture Peshawar with the objectives to find out the most aggressive weed species of maize crop and to caution the farmer about these weed species and its losses.

MATERIALS AND METHODS

The field survey was carried out at the New Developmental Research Farm, The University of Agriculture Peshawar. The total area of the experiment was 400 m⁻². The weeds were randomly sampled from the experimental fields of maize crop using a quadrat of size 33 cm x 33 cm randomly thrown at 112 different sites. Weed density, weed frequency data were recorded for each and every weed of maize fields which were converted to the secondary data of relative weed density (RWD), relative weed frequency (RWF) and Importance values

(IV) by using the following formulae. Based on the IVIs, weeds were ranked in order of their importance.

$$\text{Density} = \frac{\text{Total number of individual species in all quadrates}}{\text{Total number of quadrates thrown}}$$

$$\text{RWD} = \frac{\text{No. of weeds of a particular species in a single quadrate} \times 100}{\text{Total number of weeds species in that quadrate}}$$

$$\text{Frequency} = \frac{\text{No. of quadrates in which a species occurred} \times 100}{\text{Total number of quadrates}}$$

$$\text{RWF} = \frac{\text{No. of quadrates where a weed species occurred} \times 100}{\text{Total number of thrown quadrates}}$$

$$\text{IVI} = \frac{\text{Relative weed density} + \text{Relative weed frequency}}{2}$$

The collected weed samples were identified at the Herbarium of the Weed Science Department, The University of Agriculture, Peshawar, and also with the help of the Department of Botany, University of Peshawar. During the survey, the data were noted on the mentioned parameters as adopted from the procedure of Hussain *et al.* (2004).

RESULTS AND DISCUSSION

Relative weed density (%)

The results on relative weed density (RWD) of a particular species are shown in Table-1. The statistical analysis of the data showed that the surveyed fields were mostly infested with *Trianthema portulacastrum*, *Digitaria sanguinalis*, *Echinochloa crus-galli*, *Sorghum halepense*, *Cynodon dactylon*, *Euphorbia prostrata*, *Xanthium strumarium*, *Rumex crispus*, *Cyperus rotundus* and *Digera arvensis*. While the dominant weed species of the maize field were *Trianthema portulacastrum*, *Digiteria sanguinalis* and *Echinochloa crus-galli*. The study also expressed that maximum species of the field were broad leaf weeds with least number of sedges.

The relative weed density of dominated species (50.16%) was recorded for *Trianthema portulacastrum* followed by *Digitaria sanguinalis* (42.16%). While, the lowest relative weed density was calculated for *Cyperus rotundus* (0.38) in the maize fields. The infestation of weeds depends on the frequent rainfall i.e. when rainfall is higher the infestation of the species will be more. Mohandoss *et al.* (2002) also reported the above weed species in his trial. In earlier studies Muhammad *et al.* (2009) also found 34 broad leaf, sedges and grassy weed species in maize crop that resulted in maize yield reduction.

Relative weed frequency (%)

The relative weed frequency of weeds is the best way of indication for the prevalence of weed species in the studied area. On the basis of the data provided the highest relative frequency was computed for *Trianthema portulacastrum* (88.6%) followed by *Echinochloa crus-galli* (67.17%); while, the lowest (0.94%) relative frequency was recorded for *Digera arvensis*. The remaining weeds included in the Table-2 were of minor phytosociological status and relatively unimportant as far as maize production in the target area is concerned. Khokhar et al. (2007) and Saeed et al. (2010) also reported the frequent occurrence of *Trianthema portulacastrum* in their experiments. In a similar study, Khan et al. (2012) also narrated the highest weed frequency for broad leaved weeds as compared to grassy weeds.

Table-1. Relative weed density and relative weed frequency for the individual weed species of maize crop at NDF, the University of Agriculture Peshawar.

Weed Species	RWD (%)	RWF (%)
<i>Trianthema portulacastrum</i>	50.16	88.6
<i>Digiteria sanguinalis</i>	42.16	0.01
<i>Echinochloa crus-galli</i>	4.53	67.17
<i>Sorghum halepense</i>	1.79	28.46
<i>Cynodon dactylon</i>	1.52	23.10
<i>Euphorbia prostrata</i>	1.96	41.06
<i>Xanthium strumarium</i>	1.81	40.17
<i>Rumex crispus</i>	0.95	8.92
<i>Cyperus rotundus</i>	0.38	2.27
<i>Digera arvensis</i>	0.67	0.94

Importance value indices

The importance value index (IVI) is important for understanding the status of a given weed specie in a weeds community. The data in Table-2 exhibits the highest importance value index (69.38%) was recorded for *Trianthema portulacastrum* followed by *Euphorbia prostrata* (23.5%), while the lowest IVI (0.88%) for *Digera arvensis* and the second lowest by *Cyperus rotundus* (3.5%). These results are supported by those of Saeed et al. (2010) who observed the highest IVI for *Trianthema portulacastrum* in their investigations.

Table-2. Importance value indices wise ranking of the weeds of maize crop in the NDF, The University of Agriculture Peshawar.

Weed Species	IVI	Ranking
<i>Trianthema portulacastrum</i>	69.38	1
<i>Digitaria sanguinalis</i>	19.08	2
<i>Echinochloa crus-galli</i>	34	3
<i>Sorghum halepense</i>	15.63	4
<i>Cynodon dactylon</i>	12.83	5
<i>Euphorbia prostrata</i>	23.5	6
<i>Xanthium strulacamarium</i>	21.04	7
<i>Rumex crispus</i>	4.93	8
<i>Cyperus rotundus</i>	1.5	9
<i>Digera arvensis</i>	0.88	10

CONCLUSION

There was a diverse weed flora present in maize fields indicating that maize is vulnerable to weed infestation and competition, as indicated by the IVIs of the weeds. Hence an integrated weed management of these weeds is suggested.

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