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AN INVESTIGATION OF THE MAJOR WHEAT WEEDS IN DIFFERENT ZONES OF DERA ISMAIL KHAN

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ABSTRACT

On account of huge yield losses, weed infestation is a serious threat in wheat crops throughout the country. A comprehensive survey to find out the major weeds in wheat in Dera Ismail Khan was carried out during the crop season of 2012-13. Wheat fields at seed farms of Rakhmanghan, RakhZandani, Rata Kulachi and adjacent farmer's fields to each seed farm were investigated. Data was collected at the peak growth stage of weeds and the quadratic method was used to record relative density (RD), relative frequency (RF), relative crowding coefficient (RCC) and importance value index (IVI). The results revealed that the major and most problematic weed of wheat at all the locations was *Avena fatua* (wild oat) on account of having maximum IVI at Rakh Manghan (78.51 & 77.44), Rata Kulachi (77.82 & 77.54) and Rakh Zandani (77.51 & 77.53) seed Farms and Farmer's fields respectively. *Rumex dentatus* (dock)and *Convolvulus arvensis* (Lehli)were the second and third abundantly occurring weeds at almost all the seed farms and farmer fields on account of having the second and third highest IVI values at all the locations. Therefore *Avena fatua* (wildoat), *Rumex dentatus* (dock) and *Convolvulus arvensis* (lehli) seed were collected to find out the yield losses through further experimentation.

Keywords: Weeds, wheat, crop

INTRODUCTION

Wheat is the most prominent, edible grain and major cereal crop (Arif *et al*., 2006). On account of more land areas, higher yield and utmost position in food and grain tradeoff, it is known as "King of Cereals". Pakistan ranked 5th in world wheat production, and in 2013-14 it was cultivated on an area of 9.20 million hectares with total production of 25.98 million (M) tons and an average yield of 2.66 Mtons ha^{-1}(Anonymous, 2014).

The influx of weeds is a serious threat in wheat and if not properly controlled, might reduce yield by 25-30% (Khan *et al*., 2011).Weed management is of primary concern because weeds compete for soil fertility, use of available moisture, nutrients, space and sunlight with crop plants. Weeds also reduce the quality of the products and ultimately its market value (Din *et al*., 2013).

Wheat production might reduce due to different factors like weed species, crop stand and environmental factors. Among these, reduction due to weeds is of great importance because crop and weed competition always depends upon the density of weed species. Weeds reduce wheat yield by reducing the tillers, which is the earliest, most important formed yield component (Khan & Marwat, 2006). Increased weed density linearly significantly reduces the wheat yield, whereas an increase in seed rate can suppress the weed biomass (Khan *et al*., 2009). Different wheat cultivars have different competitive ability against weeds due to having different canopy

architecture (Olesen*et al*., 2006). Similarly, different weed species also have different competitive abilities (Siddiqui *et al*., 2010).

The data obtained in this survey provide information, like weed composition, weed biomass, weed density and weed frequency, regarding the entire weed flora of wheat crops in the district. The survey was carried out to enlist the major wheat weeds on account of their importance value index in different locations of the Dera Ismail Khan (D.I.Khan).

MATERIALS AND METHODS

A survey was conducted during the middle of crop season (February/March) in the years 2012-13 to practically view the infestation of various weeds in wheat crops at various locations of the District Dera Ismail Khan. It is the southernmost district of the Khyber Pakhtun Khwa (KPK), Pakistan lying between 31°.15' and 32°.32', north latitude and 70°.11', and 71°.20', east longitude. The locations comprised of various Government seed farms (RakhManghan, RattaKulachi and RakhZandani) and farmer's fields located near each government seed farm. Various weed population related parameters like relative density, relative frequency, and relative canopy coverage and the importance value index of different weeds were calculated using the quadratic method. Relative density, relative frequency, relative canopy coverage and importance value index were calculated using the following formulae as suggested by Odum, 1971.

RD = Number of weeds of particular in a quadrate/ Total number of weeds in that quadrate * 100

RF = Number of quadrate in which a particular specie occurs/Total number of quadrats thrown * 100

RCC = Number canopy coverage of specie in a quadrate/Total canopy coverage of all species in quadrate * 100

IVI = RD + RF + RCC

RESULTS AND DISCUSSION

Weeds Survey in Seed Farm RakhManghan and Adjacent Farmer Fields

The weeds survey conducted at the seed farm RakhManghan and adjacent farmer fields showed that the weed species found were *Avena fatua, Rumex dentatus, Convolvulus arvensis, Melilotusindica, Chenopodium album, Medicago denticulate, Malva paryiflora* and *Carthamus oxycantha*.The data recorded for RD, RF, RCC and IVI of various weeds during the survey at Seed Farm RakhManghanand adjacent farmer fields are presented in Table 1. Table 1 depicts that the IVI of the *Avena fatua* washighest (78.51±1.91, 77.44±1.54) in comparison to other weeds at the seed farm and farmer fields respectively. *Avena fatua* also exhibited maximum RD (23.60±1.82, 22.60±2.07), RF (21.07±0.57, 20.64±1.49) and RCC (33.83±1.08, 34.19±1.41) as compared to other weed species. *Medicago denticuleta* and *Rumex dentatus* ranked 2ndat seed farm and farmer fields respectively and depicted 55.12±4.04 and54.65±1.70 IVI values. The weed species *Rumex dentatus* at seed farm and *Carthamus oxycantha* at farmer fields ranked 3rd followed by *Convolvulus arvensis* (Table 1). *Malva parviflora* and *Carthamus oxycantha* showed lowest values of IVI, RD, RF and RCC at seed farm and farmer fields respectively, in comparison to other weeds which were intermediate in between these species and *Avena fatua*. The *Avena fatua (wild oat)* has also been previously reported as a major weed of wheat by

various researchers like Khan *et al*. (2013), Anjum & Bajwa (2007), and Usman *et al*. (2010). *Avena fatua* is a grassy weed and due to excessive and repeated use of grass killer herbicides it has developed too much resistance to these herbicides. *Rumex dentatus* is a broad leaf weed and due to its higher biomass, it is a very competitive weed, thus causing severe yield losses (Din *et al*., 2013). These results are in complete agreement with the previous findings of Usman *et al*., (2010) who also reported *Avena fatua* and *Rumex dentatus* as the major wheat weeds of D.I.Khan. These weeds have established themselves in cultivated fields and effect crop growth and yield (Nasir & Sultan, 2004).

Table 1. Relative density (RD), relative frequency (RF), relative canopy coverage (RCC) and importance value index (IVI) of weed species in Rakh Manghan Seed Farm and adjacent farmer fields, D.I.Khan.

Name of weed	Seed Farm Rakh Manghan				Adjacent farmer fields			
	RD	RF	RCC	IVI	RD	RF	RCC	IVI
Avena fatua	22.57±1.80	21.04±1.45	34.21±1.52	77.82±3.36	22.45±1.77	20.98±1.37	34.11±1.50	77.54±1.37
Rumex dentatus	22.32±1.52	21.18±1.58	10.96±0.26	54.46±2.73	22.24±1.42	21.08±1.70	10.82±0.37	54.14±2.40
Convolvulus arvensis	19.28±1.50	13.56±1.31	5.50±1.64	38.34±1.80	19.15±1.78	13.50±1.16	5.60±1.42	37.83±3.70
Melilotus indica	12.42±1.75	15.04±1.20	27.34±1.69	54.80±2.96	8.82±1.64	11.42±1.72	11.30±1.31	31.54±1.14
Chenopodium album	6.44±1.63	5.24±2.03	2.90±1.16	14.42±4.27	12.44±1.63	15.24±1.06	27.32±1.61	55.00±3.08
Medicago denticulata	9.14±1.55	11.42±1.75	11.36±1.40	31.92±2.10	6.48±1.57	5.08±1.77	2.94±0.88	14.50±2.34
Malva parviflora	3.64±1.63	4.58±1.67	3.44±1.48	11.66±2.70	3.62±1.30	4.52±1.64	3.42±1.34	11.56±2.55
Carthamus oxycantha	3.57±1.41	7.46±1.69	4.55±1.36	15.59±3.04	3.58±1.33	7.46±1.49	4.46±1.50	15.50±2.82

Weeds Survey in Seed Farm RattaKulachi and Adjacent Farmer Fields

The mean values pertaining to various weed population parameters evaluated during the survey at the seed farm Rata Kulachi and adjacent farmer fields are presented in (Table 2). It was recorded that *Avena fatua* was the most abundantly occurring weed and has the highest importance value index of 77.82±3.36 and 77.54±1.37 at the seed farm of Rata Kulachi and nearby farmer fields respectively. The relative density, relative frequency and relative crowding coefficient of *Avena fatua* was also highest both at seed farms and farmer fields in comparison to other weed species (Table 2). *Medicago denticulata* and *Rumex dentatus*, having IVI values of 55.12±4.04 and 54.47±4.06, ranked 2nd at seed farms, whereas *Chenopodium album* and *Rumex dentatus* had the highest IVI values at farmer fields compared to other weed species. *Vicia sativa* has the lowest density, frequency, crowding coefficient and importance value index at both the locations as compared to other weeds. The most abundant occurrence of *Avena fatua* might be attributed to the consecutive wheat cultivations in the same field and thus, lowers the quality of field crops on account of its competition for nutrient resources. *Medicago denticulate, Rumex dentatus and Chenopodium album* are the broad leaf weeds and due to their higher biomass and

Table 2. Relative density (RD), relative frequency (RF), relative canopy coverage (RCC) and importance value index (IVI) of weed species in Rata Kulachi Seed Farm and adjacent farmer fields, D. I. Khan.

Name of weed	Seed Farm Rata Kulachi				Adjacent farmer fields			
	RD	RF	RCC	IVI	RD	RF	RCC	IVI
Avena fatua	22.57±1.80	21.04±1.45	34.21±1.52	77.82±3.36	22.45±1.77	20.98±1.37	34.11±1.50	77.54±1.37
Rumex dentatus	22.32±1.52	21.18±1.58	10.96±0.26	54.46±2.73	22.24±1.42	21.08±1.70	10.82±0.37	54.14±2.40
Convolvulus arvensis	19.28±1.50	13.56±1.31	5.50±1.64	38.34±1.80	19.15±1.78	13.50±1.16	5.60±1.42	37.83±3.70
Melilotus indica	12.42±1.75	15.04±1.20	27.34±1.69	54.80±2.96	8.82±1.64	11.42±1.72	11.30±1.31	31.54±1.14
Chenopodium album	6.44±1.63	5.24±2.03	2.90±1.16	14.42±4.27	12.44±1.63	15.24±1.06	27.32±1.61	55.00±3.08
Cyprus rotundus	9.14±1.55	11.42±1.75	11.36±1.40	31.92±2.10	6.48±1.57	5.08±1.77	2.94±0.88	14.50±2.34
Vicia sativa	3.64±1.63	4.58±1.67	3.44±1.48	11.66±2.70	3.62±1.30	4.52±1.64	3.42±1.34	11.56±2.55
Melilotus parviflora	3.57±1.41	7.46±1.69	4.55±1.36	15.59±3.04	3.58±1.33	7.46±1.49	4.46±1.50	15.50±2.82

population, they are more competitive for nutrients and space resources in comparison to other weeds. Therefore, proper management is needed. These results coincide with the previous findings of Nasir &Sultan (2004), who also reported these weeds as major yield reducing weeds in wheat crops. Din *et al*.,(2013) also concluded during their study that the broad leaf weed *Rumex dentatus* causes severe yield losses on account of its higher biomass.

Weeds Survey in Seed Farm RakhZandani and Adjacent Farmer Fields

The weeds survey carried out at RakhZandani seed farm and adjacent farmer fields depicted that the most common occurring weeds were *Avena fatua, Rumex dentatus, Convolvulus arvensis, Melilotus indica, Chenopodium album, Melilotus parviflora, Malva parviflora* and*Vicia sativa.* A few other weeds were also recorded, but due to inconsistency and very low population, these were ignored. The relative density, frequency, crowding coefficient and IVI of these weeds were calculated (Table 3) andshowed that the highest IVI of 77.51±3.09 was recorded for *Avenafatua* at the seed farm, whereas at farmer fields its IVI was 77.53±3.32, in comparison to other weed species. *Rumex dentatus* and *Melilotus indica* ranked 2nd at the seed farm followed by *Convolvulus arvensis,* whereas *Rumex dentatus* and *Convolvulus arvensis* ranked 2nd at farmer fields (Table 3) on

Table 3. Relative density (RD), relative frequency (RF), relative canopy coverage (RCC) and importance value index (IVI) of weed species in Rakh Zandani seed farm and adjacent farmer fields, D.I.Khan.

Name of weed	Seed Farm Rakh Zandani				Adjacent farmer fields			
	RD	RF	RCC	IVI	RD	RF	RCC	IVI
Avena fatua	22.32±1.69	21.28±1.34	33.90±1.48	77.51±3.09	22.41±1.75	21.15±1.42	33.96±1.41	77.53±3.32
Rumex dentatus	22.22±1.27	21.12±1.36	10.78±0.37	54.12±2.15	22.00±1.52	21.06±1.58	10.73±0.26	53.79±2.73
Convolvulus arvensis	19.24±1.52	13.48±1.30	5.42±1.57	38.14±2.10	12.54±1.81	15.08±1.08	27.32±1.40	54.94±1.68
Melilotus indica	12.54±1.81	15.12±1.08	27.32±1.40	54.98±3.68	8.78±1.59	11.42±1.75	11.28±1.28	31.48±1.09
Chenopodium album	8.86±1.63	11.42±1.75	11.22±1.31	31.50±1.38	3.50±1.48	7.40±1.44	4.32±1.44	15.22±1.48
Melilotis parviflora	3.50±1.43	7.40±1.53	4.52±1.38	15.42±2.98	19.38±1.58	13.50±1.26	5.38±1.55	38.26±2.08
Malva Parviflora	3.62±1.43	4.60±1.71	3.46±1.30	11.68±2.73	3.56±1.48	4.48±1.89	3.46±1.18	11.50±1.79
Vicia sativa	6.46±1.55	5.10±1.83	2.96±0.76	14.52±2.20	6.48±1.55	5.06±1.66	2.90±0.70	14.44±2.15

account of the importance value index. The relative density, frequency and crowding coeffecients of *Avena fatua, Rumex dentatus, Melilotus indica* and *Convolvulus arvensis* were also higher in comparison to other weed species. The lowest IVI, RD, RF and RCC was recorded for *Malva parviflora* both at the seed farm and farmer fields. These findings are in agreement with the previous results of Armin & Asghripour, (2011) who reported that wild oat density reduces wheat yield by reducing fertile tillers and spikes per square meter. Similarly Khan *et al*., (2007) reported that in addition to yield losses, wild oats also reduce the grain protein contents in wheat. The results are also in line with the previous findings of Nasir & Sultan, (2004) and Chhokar *et al*., (2007).

CONCLUSION

The findings depicted that there were significant differences in relative density, frequency, crowding coefficients and ultimately, in the importance value index of different weed species at various locations. Grassy and broadleaf weeds were found in the survey and it is

obvious that *Avena fatua*, *Rumex dentatus*, *Convolvulus arvensis* and *Medicago denticulate* are causing yield losses in the study area.

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