

## ASSESSMENT OF WEED PROBLEMS IN WHEAT CROP OF PESHAWAR PAKISTAN

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### ABSTRACT

*Diagnostic study is an essential factor for organizing a suitable weed management package for a specific area. The selection of a paramount weed management strategy is based on the knowledge of the existing weed flora in the crop fields, consequently helping make the right decision at the right time. In this connection, surveys were conducted in the mid and late seasons of wheat crop during 2008-09, in district Peshawar Khyber Pakhtunkhwa Pakistan. A questionnaire was utilized to interview the farming community; however, personal observations were also a part of the surveys to practically confirm the farmers' indigenous knowledge. A sum of 100 farmers from 5 villages (20 farmers from each village) was randomly interviewed. In this way, a total of 31 major weeds were reported in wheat crop in Peshawar region which included *Avena fatua*, *Anagallis arvensis*, *Carthamus oxyacantha*, *Cirsium arvense*, *Convolvulus arvensis*, *Euphorbia helioscopia*, *Medicago denticulata*, *Melilotus indica*, *Phalaris minor*, *Silybum marianum*, *Rumex crispus*, *Ammi visnaga*, *Fumaria indica*, and *Lathyrus aphaca* etc. Farmers had diverse judgments on problems to wheat production in their respective fields. According to farmers' insight, 91% of them reported yield reduction in wheat due to the major weeds in range of 20-50%, though 9% of them stated less than 20% yield losses. Moreover, 65% of the farmers reported weeds as an imported constraint in wheat production; whereas the percentages of other constraints viz; lack of irrigation water, fake/ineffective agrochemicals, lack of quality seeds, and environmental severe-ness were 23, 51, 32, 20 and 25%, respectively. To cope with the weed menace almost 42% farmers reported mechanical weed control method, 70% farmers reported chemical weed control method (using Puma super, Topik, Isoproturon, Affinity, and Buctril super herbicides). In asking for the weed infestation during the last decade, 43% of the farmers stated increase in weed infestation, 28% reported decrease and 60% described that weed infestation has remained the same in the last decade. For grain yield of wheat, 55% of the farmers reported yield in the range of 2001-2500 kg ha<sup>-1</sup>, 21% reported between 1501-2000 kg ha<sup>-1</sup>, and 10% farmers stated from 2501 to 3000 kg ha<sup>-1</sup>. Finally it could be decided that weeds are a big menace in wheat as per farmers' perception, which need to be tackled on scientific grounds.*

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## INTRODUCTION

Before going to make any decision about a solution to a problem we need to survey the area to document the indigenous knowledge of the community and also to visually confirm the existing situation. Wheat crop is grown at all the agro ecological zones of Pakistan and is the backbone of the agriculture and economy of the country. The importance of wheat can be guessed from the fact that it occupies 9.046 m ha in irrigated and rainfed areas of Pakistan with production of 24.0329 m tons; whereas the acreage and production in Khyber Pakhtunkhwa (KP) are 0.7695m ha and 1.2045 m t, respectively (MINFA, 2009). Wheat (*Triticum aestivum* L.) keeps a unique position among the cultivated crops. Firstly, it is grown on an area larger than the area under any other crop. Secondly, it provides more carbohydrates and proteins in the world diet than any other crop. Thirdly, the world trade in wheat exceeds trade in all other crops combined. Wheat plays a central role in Pakistan's food economy, both in terms of production and consumption. Because of the importance of wheat, successive governments of Pakistan since Independence have intervened heavily in wheat markets, procuring wheat at administratively set prices to support farmer incomes and subsidizing wheat sales to flour mills or directly to consumers with the objective of stabilizing prices at levels affordable to consumers (Cornelisse and Naqvi, 1987; Dorosh and Valdes, 1990).

Wheat yields ha<sup>-1</sup> are unfortunately lower than that of our neighboring countries and actual farm yields are about 30-35% of the potential yields. Weed interference is one of the most important but less noticed factors, contributing towards lowering the yields of wheat (Hassan and Marwat, 2001). With the advent of new short stature varieties, weeds competition has become even more severe. Weeds not only reduce the crop yield, deteriorate the quality of farm produce but also trim down the market value of wheat. Weed management increases the cost of production and thus it is necessary to devise such methods which could reduce the cost of production as well as save time and labor (Khan and Marwat, 2006).

Our population is increasing at one of the fastest rate in the world. Our food production should fulfill the food requirements of our population. It is impossible to increase the area horizontally because the cultivated area is already squeezing. Vertical increase is possible because of having enough room to get the potential yield of even the existing varieties of wheat. Weed competition is the key constraint for the wheat yields because insects and diseases are no more important

problems in wheat production these days. The smuts and rusts are controlled due to incorporation of resistant genes (Workayehu, 2000). Thus the only pest left is the weeds, which are impeding our efforts. It is now a challenge for the weed scientists to divert the resources towards the wheat yield components which are otherwise going towards weeds. There is a need of targeted weed control practices more precisely, both for economic and environmental reasons.

The indigenous knowledge of the farming community is never known to the decision and policy makers. Therefore it becomes inevitable to survey the wheat growing regions of KP and gather considerable information regarding weed problems in wheat crop. Farmers generally use the herbicides like Topik, Puma super, Affinity, Buctril super for weed control in wheat crop. The importance of chemical weed control can not be ignored as far as weed management is concerned (Taj *et al.*, 1986). The surveys were conducted with the objectives to document the farmers' indigenous knowledge regarding weed problems in wheat, to visually observe the situation in fields, to search out the constraints of wheat production and to plan for weed management program in light of the information gathered for future strategies in wheat.

## **MATERIALS AND METHODS**

During the wheat crop season 2008-09, diagnostic studies were carried out in district Peshawar to assess the damage level and the concept of local farming community about the weeds problem and the management tools they use. The problem weeds in the wheat crop and their possible impact on wheat crop were personally observed as well. The farmers were interviewed by using a specific format of a questionnaire. The surveys were conducted in 5 representative villages, interviewing a total of 100 farmers (20 farmers from each village were contacted).

Among the villages two were from eastern Peshawar i.e. Tarnab and Taru, two from western Peshawar i.e. Achini and Pushtakhara, and the fifth village investigated was the northern Palosi village. The visits to the representative fields of the farmers verified the problem weeds in wheat crop in the respective localities. The format of the questionnaire is given in Appendix-1 below.

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 present in various areas of the country. The results were rechecked and compared with literature of Leenhouts (1968), Nasir and Ali (1971), Smith (1971) and Wazir *et al.* (2007). Local farmers were also interviewed for their view point about the

problematic weeds which occurred in wheat crops. The primary data was transformed into secondary after the completion of the data collected. In this regard, the arrangement of the reported weed species was done in chronological order and the figures were converted to percentages and other relevant terms.

## **RESULTS AND DISCUSSION**

In order to assess the indigenous knowledge of the local farming communities regarding the various farming problems along with the weeds menace, the villages of Tarnab, Taru, Achini, Pushtakhara, and Palosi in the district of Peshawar were investigated using a questionnaire as given in the Appendix-I below. The most important parameters of the study are hereby discussed in detail.

### **Major weeds of wheat crop**

It is quite necessary to have the list of the major weeds in a locality in order to plan a long term weed management strategy for the economic crops of the region (Hashim and Marwat, 2002). The major weeds that infested wheat crop in the district of Peshawar were *Avena fatua*, *Anagallis arvensis*, *Carthamus oxyacantha*, *Cirsium arvense*, *Convolvulus arvensis*, *Euphorbia helioscopia*, *Medicago denticulata*, *Melilotus indica*, *Phalaris minor*, *Silybum marianum*, *Rumex crispus*, *Fumaria indica*, and *Lathyrus aphaca* etc. as shown in Table-1. The percentages of the respondents are also mentioned along with the botanical names of the weeds. The research should always be farmers' problems oriented so that an immediate solution to the existing issues could be addressed and that the research endeavors are not squandered (Hussain et al., 1985).

### **Yield losses in wheat due to weeds**

The yield losses due to weeds are generally more than the combined losses caused by insects and pathogens together (Hassan and Marwat, 2001). Actually the impact of weeds is always obscure and it becomes visible when the critical time is gone; whereas that of insects and pathogens is visible at all times. This is the reason the weeds are mostly ignored and on contrary the insects and pathogens attacks are given proper heed. Nevertheless, the yields still are given lower. In this connection, when the farmers were interviewed in the locality, they reported different magnitudes of yield losses due to weeds. About 41% farmers reported 20-30% yield losses in wheat due to weeds infestation; however 38% of them stated 31-40% yield losses. More interestingly, 12% of the respondents mentioned 41-50% yield losses in wheat due to weeds, though 9% of them reported less than 20% yield losses as given in Table 2. It is a sort of great concern that the farming community roughly provided information on yield losses which were even up to 50% in wheat crop, and the actual losses

may even be more than that. Weed competition is a fact and it does take place in all agricultural crops. Generally one kilogram of weed biomass will correspond to one kilogram of yield loss (Rao, 2000).

### **Important constraints of wheat production**

Agriculture as a whole has got a number of obstacles including various biotic and abiotic factors. Environmental factors like harsh rainfalls, winds, hails, extreme temperatures etc. have been catastrophic to agricultural productions in past in the country. Wheat production being a basic part of the country's agriculture has been obliterated several times by severe environmental conditions in past. In addition, factors like lack of quality seeds, ineffective or fake agrochemicals, lack of irrigation water, weeds, and other social, political and economic factors are involved in the occasional deterioration of wheat production (Ikram, 2000). In the diagnostic study, the farmers were asked about wheat production constraints that may play role in yield reduction of wheat. The common constraints mentioned in the questionnaire were infestation of weeds, lack of quality seeds, agrochemicals, lack of irrigation water and others. About 65% of the farmers reported weeds as an imported constraint in wheat production. Moreover, Lack of irrigation water, fake/ineffective agrochemicals, lack of quality seeds, environmental severe-ness, and other factors were stated as 23, 51, 32, 20 and 25%, respectively (Table-2). In this fashion, Kumar and Mruthyunjaya (1992) worked on different factors for analyzing their effects on wheat productivity in India.

### **Weeds control strategies used by the farmers**

The results of the survey indicated that the weed control measures used by the farmers were totally based on the traditions, economics and social factors. Moreover, the farmers heavily lacked scientific use of the herbicides. Among the farmers interviewed (Table-2), some 42% reported mechanical weed control method, 70% farmers reported chemical weed control method most of them using Puma super, Topik, Isoproturon, Affinity, and Buctril super herbicides for weed control in the target areas. Khan *et al.* (2004) reported that it is not good to ignore the chemicals for weed management strategies, though the herbicides should be applied at the proper time, in proper manner with proper dose. The mechanical weed control methods encompassed sickling, hand pulling, hoeing etc. However, 23% respondents utilized weed control methods other than mechanical and chemical methods.

### **Weed infestation scenario**

It is important to find out whether the weed infestation in a locality is escalating with the passage of time or declining or remains steady and stable.

**Table-1. Major weeds of wheat crop in District of Peshawar during 2008-09.**

S.No.	Major weeds of wheat crop	Weed Family	*Number of respondents (%)
1.	<i>Ammi visnaga</i>	Umbelliferae	60
2.	<i>Anagallis arvensis</i> L.	Primulaceae	68
3.	<i>Avena fatua</i> L.	Poaceae	89
4.	<i>Carthamus oxyacantha</i> L.	Asteraceae	60
5.	<i>Chenopodium album/murale</i> L.	Chenopodiaceae	77
6.	<i>Cirsium arvense</i> (L.) Scop.	Asteraceae	82
7.	<i>Convolvulus arvensis</i> L.	Convolvulaceae	80
8.	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	61
9.	<i>Eragrostis pilosa</i> (L.) P. Beauv.	Poaceae	35
10.	<i>Euphorbia helioscopia</i> L.	Euphorbiaceae	70
11.	<i>Euphorbia prostrata</i> L.	Euphorbiaceae	31
12.	<i>Fumeria indica</i> Husskin	Fumariaceae	70
13.	<i>Galium aparine</i> L.	Rubiaceae	69
14.	<i>Lathyrus aphaca</i> L.	Papilionaceae	51
15.	<i>Lolium</i> sp.	Poaceae	22
16.	<i>Malcolmia africana</i> (L.) R.Br.	Brassicaceae	47
17.	<i>Malva neglecta</i> Wallr	Malvaceae	42
18.	<i>Medicago denticulata</i> L.	Papilionaceae	62
19.	<i>Melilotus indica</i> (L.) All.	Papilionaceae	65
20.	<i>Peganum harmala</i> L.	Zygophyllaceae	40
21.	<i>Phalaris minor</i> Retz.	Poaceae	76
22.	<i>Plantago lanceolata</i> L.	Plantaginaceae	22
23.	<i>Poa annua</i> L.	Poaceae	20
24.	<i>Ranunculus muricatus</i> L.	Ranunculaceae	19
25.	<i>Rumex dentatus</i> (Meisn.) Rech.f.	Polygonaceae	77
26.	<i>Setaria</i> sp.	Poaceae	25
27.	<i>Silybum marianum</i>	Asteraceae	75
28.	<i>Sisymbrium irio</i> L.	Brassicaceae	18
29.	<i>Verbena officinalis</i> L.	Verbenaceae	18
30.	<i>Vicia hirsuta</i> (L.) S.F.Gray	Papilionaceae	56
31.	<i>Withania coagulans</i> Dunal.	Solanaceae	15

\*The number and percentage of the respondents are same, as a total of 100 farmers were interviewed.

The farmers were asked about the weeds infestation situation in the last ten years. About 43% of the farmers stated increase in weed infestation in the last decade. The held the fake herbicides responsible for the gradual increased weed infestation. On the other hand, 28% of the respondents reported that weeds have decreased over the past ten years. This is because the farmers have understood how to tackle the weeds. Conversely, 60% described that weed infestation has remained the same in the last decade. The declared

that the infestation increases when there are high rainfalls, otherwise it mostly remains constant year to year. The government should take initiatives to tackle the situation on scientific grounds. Ashfaq *et al.* (2001) has worked on the welfare effects of government interventions in the wheat economy of Pakistan.

### **Local wheat yields**

The most important and central thing of all research endeavors in case of wheat crop is the grain yield. Therefore, it was also kept as apart of the questionnaire to interview each and every farmers regarding the grain yields the get from the wheat production activities. The farmers reported the yield in mounds or kilograms in unit areas like kanals, or jaribs or acres etc. The respective values were then converted to kg ha<sup>-1</sup>. Among the farmers who were interviewed, 55% reported their grain yields of wheat in the range of 2001-2500 kg ha<sup>-1</sup>. This was the maximum percentage of the farming community. Furthermore, 21% farmers reported yields between 1501 and 2000 kg ha<sup>-1</sup>, 10% farmers stated in between 2501-3000 kg ha<sup>-1</sup>, and 7% told their yields as more than 3000 kg ha<sup>-1</sup>. These were the peasants who got highest yields among the investigated farming community; however, most of them were progressive farmers and they always exploited the latest technologies. The overall average yields in the country are still lower than most of the nations in the world. Marwat (2002) however reiterated that weeds are the major source of yield reduction in wheat crop resulting in loss of billions of rupees at national as well as provincial level.

### **CONCLUSION**

Conducting surveys is quite necessary to personally observe weed infestation in wheat crop in the target locality in addition to documenting the farmers' indigenous knowledge, because most farmers do not identify some weeds for which the visual observation becomes essential. A total of 31 major weeds were reported in wheat crop in Peshawar region. Farmers had diverse opinions on constraints to wheat production in their respective fields. Weeds were the major issue in this regard rendering 20-50% yield losses in wheat. Majority of the farmers (70%) manage weeds through herbicides. Moreover 43% of them were of the view that weed infestation has escalated during the last decade. The farmers' majority expressed grain yield of wheat in the range of 1500-3000 kg ha<sup>-1</sup>. Weeds are thus a big nuisance in wheat production. Progressive farmers are more willing to rich investing in yield enhancing technologies if they could be assured that it could translate in to more revenue. Small farmers though have little or no cash to spare. Such study is helpful in networking the information among the farmers and researchers and this approach

should be encouraged in the future as well. A panel of experts including Botanists and Weed Scientists should arrange workshops and field days regarding the management and identification of newly introduced weeds.

**Table-2. Yield losses, production constraints in wheat crop in district of Peshawar during 2008-09.**

S.No	Yield losses due to weeds	
	Entries/points	*Number of respondents (%)
1.	<20	9
2.	20-30	41
3.	31-40	38
4.	41-50	12
Wheat production constraints		
1.	Lack of irrigation water	23
2.	Infestation of weeds	65
3.	Fake/ineffective agrochemicals	51
4.	Lack of quality seeds	32
5.	Environmental severe-ness	20
6.	Others (insects, diseases, etc.)	25
Weeds control strategies		
1.	Mechanical methods	42
2.	Herbicides	70
3.	Cultural methods	39
4.	Other methods	23
Weed infestation scenario		
1.	Increased	43
2.	Decreased	28
3.	Remained same	60
Local wheat yields		
1.	<1000 kg ha <sup>-1</sup>	2
2.	1001-1500 kg ha <sup>-1</sup>	5
3.	1501-2000 kg ha <sup>-1</sup>	21
4.	2001-2500 kg ha <sup>-1</sup>	55
5.	2501-3000 kg ha <sup>-1</sup>	10
6.	>3000 kg ha <sup>-1</sup>	7

\* The number and percentage of the respondents are same, as a total of 100 farmers were interviewed.



## APPENDIX-I

## QUESTIONNAIRE

1. S. No. \_\_\_\_\_ Village \_\_\_\_\_ Date \_\_\_\_\_
2. Name of respondent \_\_\_\_\_ Gender M/F \_\_\_\_\_
3. Education \_\_\_\_\_ Age \_\_\_\_\_ Household size \_\_\_\_\_
4. Tenure: (a) Owner (b) Owner-cum-tenant (c) Tenant (d) Leasee
5. Major Rabbi crops \_\_\_\_\_ Major weeds \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
6. Major Kharif crops \_\_\_\_\_ Major weeds \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
7. Do you grow Wheat? Y/N If not, why? \_\_\_\_\_
8. Wheat sowing time \_\_\_\_\_ Best sowing time \_\_\_\_\_
9. Rain fed /Irrigated \_\_\_\_\_ Estimated wheat grain yield \_\_\_\_\_
10. Major weeds in wheat in order of severity; (a) \_\_\_\_\_ (b) \_\_\_\_\_ (c) \_\_\_\_\_  
 (d) \_\_\_\_\_ (e) \_\_\_\_\_ (f) \_\_\_\_\_ (g) \_\_\_\_\_ (h) \_\_\_\_\_
11. Last grown Crop \_\_\_\_\_ Next Crop \_\_\_\_\_
12. Crop Rotation with Wheat Y/N If yes What \_\_\_\_\_
13. Inter Cropping Y/N If yes, which crop? \_\_\_\_\_
14. What are major constraints related to wheat production?  
 (a) Weeds (b) Quality seeds (c) Agrochemicals (d) water for irrigation (e) tax  
 (f) Others \_\_\_\_\_
15. Uses of weeds. As Fodder/medicine/fuel/others \_\_\_\_\_
16. If weeds are a problem what are the estimated yield losses due to weeds?  
 \_\_\_\_\_
17. Do you control weeds? Y/N If yes, how?  
 Chemical method Y/N what herbicides? \_\_\_\_\_  
 Other weed control method \_\_\_\_\_
18. Which method do you consider the best \_\_\_\_\_ why \_\_\_\_\_
19. How you see the weeds problem over the past 10 years?  
 Increasing/ decreasing/ same.
20. If increasing/decreasing which weed(s)  
 (a) \_\_\_\_\_ (b) \_\_\_\_\_ (c) \_\_\_\_\_ (d) \_\_\_\_\_
21. Any new and unidentified weed (newly introduced ones); (a) \_\_\_\_\_  
 (b) \_\_\_\_\_ (c) \_\_\_\_\_ (d) \_\_\_\_\_ (e) \_\_\_\_\_

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