Pak J. Weed Sci. Res. 12(4): 249-255, 2006

TOLERANCE OF WILD OATS BIOTYPES TO DIFFERENT OAT KILLERS AND THEIR IMPACT ON SOME AGRONOMIC AND PHYSIOLOGICAL TRAITS OF WHEAT

Imtiaz Khan[1] , Gul Hassan and Muhammad Ishfaq Khan

ABSTRACT

Field experiment was initiated at Agricultural Research Farm. NWFP Agricultural University, Peshawar during Rabi 2004-05 to figure out the tolerance of different wild oats biotypes to herbicides. The experiment was laid out in randomized complete block design under a split-plot arrangement, with three replications. The experiment comprised of four wild oats biotypes assigned to the main plots, while 3 herbicides and a weedy check (Sencor, Isoproturon and Affinity) were kept in sub-plots. The Ghaznavi-98 variety of wheat in a sub-plot size of 5x 1m^2 was used. The data were recorded on tillers plant^{-1}, wheat plant height at maturity (cm), wheat spike length (cm), grain yield (t ha^{-1}) and the protein content (%) in grain. The statistical analyses of data exhibited non-significant differences for tolerance of biotypes to herbicides in all the morphological and agronomic traits. while herbicides and their interaction with biotypes were significant for all the traits examined except wheat plant height and protein content (%) in grain. As a consequence of phytotoxic effect on weeds, the herbicides increased grain yield and yield components. The herbicide Affinity out yielded rest of the herbicides. In general, the highest grain yield was harvested in Affinity treated plots across all the wild oats biotypes. The interaction of biotypes with the herbicides exhibited a differential competitive ability or tolerance to different herbicides. It is thus recommended that judicious thinking is desired to control different biotypes infesting farmers' fields, because wild oat (Avena fatua L.) is one of the most troublesome weeds in the weed community. The Pakistani prairies are a semiarid region prone to soil erosion, and appears to be an appropriate site to adopt conservation tillage practices. Due to the environmental concerns and the development of herbicide resistance, it would be desirable to integrate all aspects of crop management systems, rather than solely rely on herbicides, to manage wild oat problems.

Key words: Wild oat, biotypes, herbicides.

INTRODUCTION

Production losses due to weed in wheat may occur from initial stages to the last stage of maturity, harvest, threshing, winnowing and storing of wheat grains. Weeds of wheat such as, wild oats and *Phalaris minor* mimic wheat morphologically, hence weeds could not be segregated from the crop, consequently could not be removed manually

[1] Department of Weed Science, Faculty of Crop Protection Sciences, NWFP Agricultural University, Peshawar-Pakistan
Email: imtiazagri@yahoo.com
Corresponding author cell# +92-3339245603

during the early growth stages. Weed plants are more resistant, hardy and making faster growth than wheat. Because until the wheat plants establish, weeds bind over the plants and wheat fails to capture the space and weed deprive it from nutrients, solar radiation, space and moisture. Some weed species, nourish insects pests and diseases and provide shelter to them.

Wild oats causes yield reductions directly by competing with the crop for moisture, light, and nutrients. Such losses occur early in the growing season. Most of the yield losses occurs before the crop is 45 to 50 days old. In addition to yield losses, wild oat may cause dockage at the elevator, increased tillage, reduced yields from delayed seeding, and increased expenditures for herbicides. Compared to herbicides used to control broadleaf weeds in small grains, effective wild oat control herbicides are expensive. Wild oat infests 28 million acres of land in the United States only. Wild oat is extremely competitive and difficult to control because it has delayed germination. It shatters its seed before most crops are harvested. Its growth habit is similar to that of wheat, barley, and domesticated oats (Paterson, 1998).

Wild oat plants rarely produce more than 200 seed, but viable seed are produced rapidly, generally within 7 to 10 days after heading. The twisted, bent awn that rises from the back of each seed is straightened and rewound repeatedly by moist conditions and often serves as a mechanism for covering freshly shattered seed (Radford *et al.*, 1980).

In view of the importance of the wild oats as a serious weed of the country and its huge losses to wheat, the experiment was conducted to investigate the impact of varying wild oats densities on wheat with the following objectives.

a. To investigate the tolerance of different wild oats biotypes to different herbicides.
b. To judge different wild oats killers and their effect on the yield and yield components of wheat.
c. To decipher the interaction of biotypes with different wild oats killers.

MATERIALS AND METHODS

Field experiment was conducted at Agricultural Research Farm, NWFP Agricultural University, Peshawar during the Rabi season 2004-5. The seed of Ghaznavi-98 wheat variety was seeded at the rate of 120 kg ha^{-1}. N is applied as broadcast with first irrigation. Peshawar lies between 71° 27' and 72° 47' east longitude and 33° 40' and 34° 31' north latitude. It is located at 317 m height above sea level. The experimental site has mean soil pH 7.47 with 22.79, 55.69 and 21.52 % clay, silt and sand, respectively. The number of rows in each sub-plot were 5 m long spaced at 25 cm. The wild oats biotypes were sown right after wheat sowing. All the recommended cultural practices were carried out uniformly in all the treatments during the experiment.

The detail of the experimental materials are as under.

A. **Wild oats biotypes (main plots)**

Peshawar

D.I.Khan (White)

Mardan

Malakand

B. Herbicides (sub-plots)

i. Isoproturon (1.25 kg i.e. ha^{-1})

ii. Sencor (1.25 kg i.e. ha^{-1})

iii. Affinity (1.75 kg ha^{-1})

iv. Weedy check

The data recorded individually for each parameter were subjected to the ANOVA technique by using MSTATC computer software and the significant means was separated by using Fisher's Protected LSD test (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Wheat tillers $plant^{-1}$

Statistical analysis of the data showed that herbicides and interaction of herbicides with biotypes had significant effect on wheat tillers $plant^{-1}$, while the biotypes do not differ significantly (Fig.1). The data show that among the wild oats biotypes, maximum (5.85) wheat tiller $plant^{-1}$ were recorded in Mardan biotypes while minimum (5.39) wheat tillers $plant^{-1}$were recorded in Peshawar wild oats. Among the herbicides, the maximum (7.45 and 6.28) wheat tillers $plant^{-1}$were recorded in Affinity and Sencor, respectively, while minimum (3.50) wheat tillers $plant^{-1}$ were recorded in weedy check treatment. For interaction of wild oats biotypes with the herbicides, the maximum (8.03) wheat tillers $plant^{-1}$ were recorded in D.I.Khan white x Affinity and all other biotypes treated with same herbicide and D.I.Khan biotype treated with Sencor. The minimum wheat tillers $plant^{-1}$(2.93) were recorded in D.I.Khan white x weedy check treatment and all the biotypes involving weedy check (Figure-1). Sohail *et al.* (1993) and Baldha *et al.* (1998) reported similar results. They reported that application of herbicides significantly influenced the number of tillers $plant^{-1}$.

Wheat plant height (cm) at maturity

Statistical analysis of the data showed that wild oats biotypes, herbicides and their interaction with wild oat biotypes had non-significant effect on wheat plant height (Fig.2). The data show that among the wild oats biotypes, maximum (61.38 cm) plant height at maturity was recorded in Mardan biotype while minimum (61.03 cm) plant height at maturity was recorded in Peshawar wild oat plots. Among the herbicides maximum (61.86 cm) plant height at maturity was recorded in Affinity and Isoproturon (61.45 each) treated plots, while minimum (60.92 cm) plant height at maturity was recorded in Sencor treatment. For interaction of wild oats biotypes with the herbicides, the maximum (62.20 cm) plant height at maturity was recorded in Malakand x Affinity, although it was statistically comparable with several other interactions, while minimum plant height (60.07) was recorded in Peshawar X Sencor (Figure-2). The results are corroborated by the work of Khalil *et al.*, (1999). They reported that plant height was not affected by the herbicidal applications in wheat.

Wheat spike length (cm)

Statistical analysis of the data showed that herbicides and their interaction with biotypes had significant effect on wheat spike length while wild oats biotypes had non-significant influence on wheat spike length (cm). The data (Figure-3.) show that among the wild oats biotypes, maximum (7.42 cm) wheat spike length was recorded in Malakand biotypes while minimum (7.37 cm) wheat spike length was recorded in Peshawar wild oats. Among the herbicides means maximum (8.27 cm) wheat spike length was recorded in Affinity, while minimum (6.32) wheat spike length was recorded in weedy check treatment. For interaction of wild oats biotypes with the herbicides, the maximum (8.38) wheat spike length was recorded in Malakand x Affinity , which was however statistically at par with all other biotypes involving Affinity. Minimum wheat spike length (6.22) was recorded in Malakand x weedy check treatment and its statistically comparable all biotypes under weedy check (Figure-3). These results are in greater similarity to the work of Khalil *et al.*, (1999). They reported that the application of post-emergence herbicides in wheat crop increases the spike length.

Grain yield (t ha^{-1})

It is evident from Figure-4. that the grain yield (t ha^{-1}) had significant response to herbicides and wild oats biotypes. The data show that among the wild oats biotypes, maximum (1.17 t ha^{-1}) grain yield was harvested in Mardan biotype while minimum (0.82 t ha^{-1}) grain yield was recorded in D.I.Khan (white) wild oat plot (Fig.4). Among the herbicides means maximum (1.42 t ha^{-1}) grain yield was recorded in Affinity, while minimum (0.60 t ha^{-1}) grain yield was observed in the Weedy check (Figure-4). For interaction of wild oats biotypes with the herbicides, the maximum (1.57 t ha^{-1}) grain yield was recorded in Mardan x Affinity. Minimum grain yield (0.50 t ha^{-1}) was harvested in D.I.Khan white x weedy check.

These findings are corroborated with the earlier work of Koscelny and Peeper (1997), Spandl *et al.*, (1997), Salarzai *et al.*, (1999) and Stevensen *et al.*, (2000) who reported increase in wheat yield due the application of various herbicides and consequently a reduced weed density in wheat.

Wheat grain Protein content (%)

It is evident from the data in Figure 5 that the grain protein content response was non-significant due to wild oats biotypes, herbicides and their interaction. The data show that among the wild oats biotypes, maximum (9.67) protein in grain was found in Mardan and Malakand biotypes while minimum (8.81) protein in grain was recorded by analysis in D.I.Khan white wild oat plot. Among the herbicides means maximum (10.64) protein in grain yield was recorded in Affinity, while minimum (8.21) protein was observed in the Weedy check (Figure-5). For interaction of wild oats biotypes with the herbicides, the maximum (11.50) protein in grain was recorded in Mardan x Affinity interaction, while minimum protein (8.04) was recorded in D.I.Khan white, Mardan x Weedy check. Our results are similar with earlier work of Bowden and Friesen (1967) who reported that wild oats reduced the number of tillers per plant, but did not significantly affect the protein content of the harvested grain.

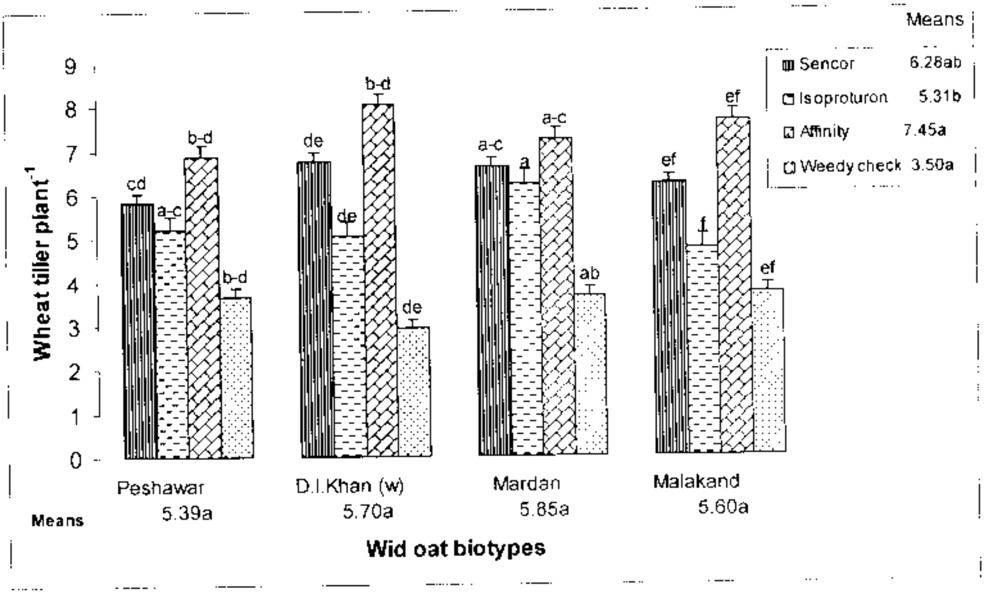

Figure. 1. Wheat tillers plant^{-1} as affected by different wild oats biotypes and herbicides.

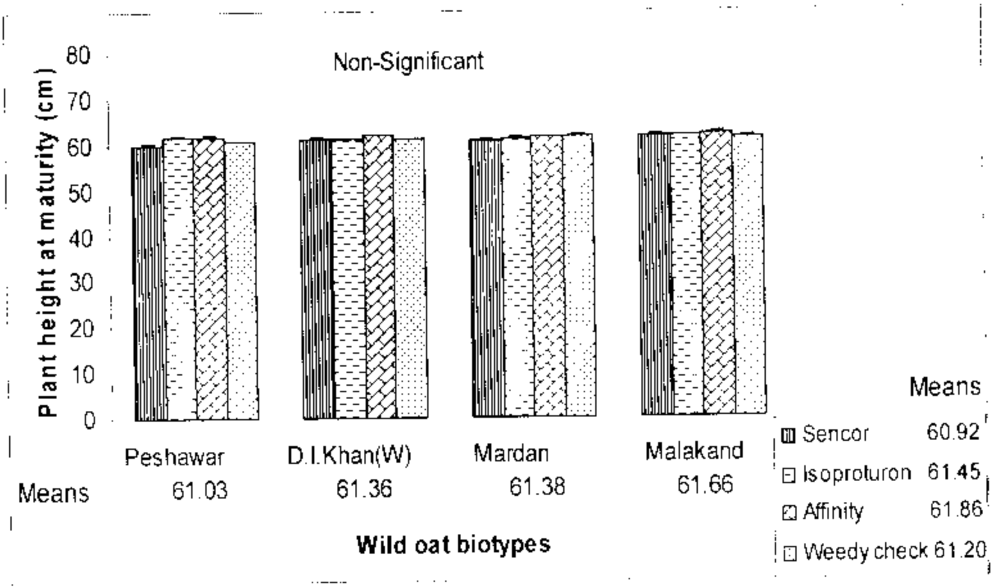

Figure. 2. Plant height at maturity (cm) as affected by different wild oats biotypes and herbicides

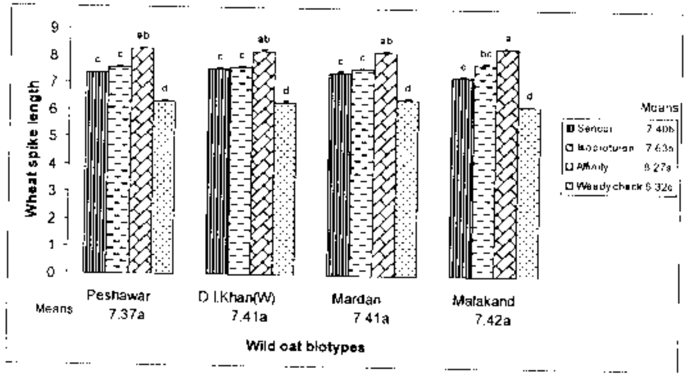

Figure. 3. Wheat spike length as affected by different wild oats biotypes and herbicides.

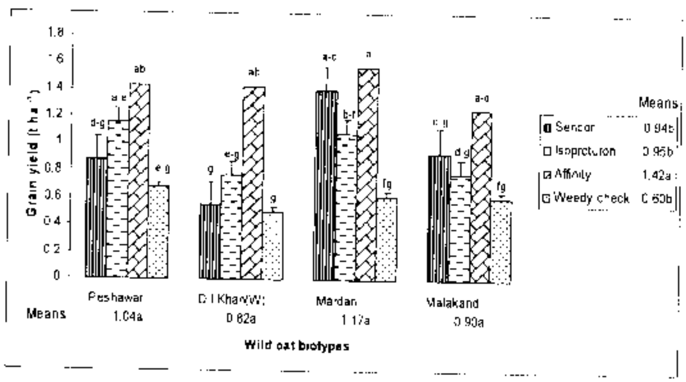

Figure. 4. Grain yield (t ha^{-1}) as affected by different wild oats biotypes and herbicides

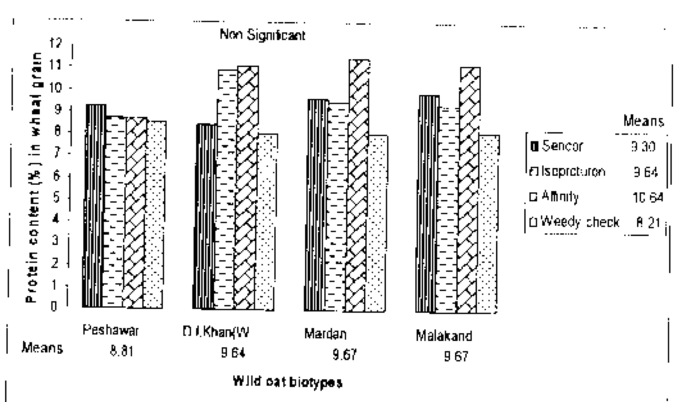

Figure. 5. Protein content (%) in wheat grain as affected by different wild oats biotypes and herbicides

REFERENCES CITED

Baldha, N.M., J.C. Patel, D.D. Malavia and H. D. Kavani. 1998. Efficacy of herbicides on weed control in irrigated wheat. Indian J. Weed Sci. 20(1): 89-90.

Bowden, B. A. and G. Friesen. 1967. Competition of wild oats (*Avena fatua* L.) in wheat and flax. Weed Res. 7 (4): 349–359.

Khalil, S., Z.K. Amir, A.R. Baloch and P.Shah.1999. Effect of row spacing and herbicdes application on some agronomic characters of wheat. Sarhad J.Agric. 15 (6):535-540.

Koscelny, J. A and T.F. Peeper.1997. Herbicides for winter-hardy wild oat (*Avena fatua*) control in winter wheat (*Triticum aestivum*). Weed Tech.11(1):35-38.

Paterson, J.G. 1976. The distribution of *Avena* spp naturalized in Western Australia J. Appl. Ecol. 13: 257-64

Radford, B.J., B.J.Wilson, O.Cartledge and F.B. Watkins. 1980. Effect of wheat seeding rate on wild oat competition. Australian J. Experimental Agric. and Animal Husbandry 20, 77-81.

Salarzai A., U. Maqsood, A. Wajid, N. Shawani and M. Ahmad. 1999. Effect of different herbicides on weed population and yield of wheat (*Triticum aestivum*). Pak. J. Biol. Sci. 2(2): 350-351

Steel, R.G. D. and J.H. Torrie. 1980. Principles and procedures of statistics a biological yield approach, 2nd ed. McGraw Hill Book Co., Inc. New York, USA.

Stevenson F.C., A.M. Johnston, S.A. Brandt and S.L.Townley.2000. An assessment of reduced herbicide and fertilizer inputs on cereal grain yield and weed growth. American J. of Alternative Agric.15 (2): 60-67.

Sohail, N. 1993. Efficacy of weedicides to control broadleaf weeds in wheat. M.Sc. Thesis, Deptt of Agron. Univ. Agric. Faisalabad, Pakistan.

Spandl, E., B.R. Durgan and D.W. Miller.1997. Wild oat (*Avena fatua*) Weedy Check in spring wheat (*Tritium aestivum*) and barley (*Hordeum vulgare*) with reduced rates of post emergence herbicides. 11(3): 591-597.