Pak. J. Weed Sci. Res. 12(3): 157-161, 2006.

# COMPARATIVE EFFICACY OF DIFFERENT HERBICIDES TO CONTROL GRASSY WEEDS IN WHEAT

**Muhammad Ashiq[1], Noor Muhammad and Noor Ahmad**

## ABSTRACT

*Two herbicide molecules viz. fenoxaprop (Puma super 75 EW, Graminicide 69 EW and Brake 10 EC @ 426 g a.i. ha$^{-1}$) and clodinafor (Topik 15 WP and Topcide 15 WP @ 37.05 and 44.46 g a.i. ha$^{-1}$) were tested during Rabi 2003-4 and 2004-5 to investigate the comparative efficacy of their different formulations against monocot weeds in wheat. All the herbicides tested gave effective control of Avena fatua. Out of fenoxaprop formulations Brake 10 EC gave poor control of Phalaris minor. None of the fenoxaprop and clodinafop formulations was found effective against Poa annua and newly emerging weed Bromus japonicus. As regards grain yield, Topcide 15 WP was found as the best monocot weedicide. It gave 12.70% more fertile tillers and 36% more grain yield over the weedy check.*

**Key words**: Herbicides, comparative efficacy, formulations, wheat, grassy weeds

## INTRODUCTION

In addition to many other factors, the low yield of wheat is attributed to serious weed infestation. Losses due to weeds have been reported from 18 to 30% (Ashiq and Cheema, 2005). The total loss of wheat has been estimated at 2.57 million tons annually (Shad, 1987). Recently these loses have been estimated as high as 3-fold of the aforesaid figure and a national loss of 28 billions is attributed to weeds (Hassan and Marwat, 2001). Globally, yield losses due to weeds have been estimated at 13-14.6%, 20-21% in South Asia while 8.0-9.5% in the USA (CPC, 2002). Out of total import of herbicides in Pakistan i.e. Rs. 2.2 billion, 63% were used on wheat during 2004. Weeds not only reduce wheat yield but also deteriorate its quality and market value. Hence, weed control is very important for increasing wheat production. Use of herbicides has proved an effective tool to achieve the goal of self-sufficiency in wheat during the previous decade. From 1979 to 2006, more than a dozen herbicide molecules as single or combined form have been tested and more than 50 formulations have been approved for weed control in wheat. Out of these, 11 formulations have been approved for the control of monocot weeds in Punjab (Ashiq, 2006). Grassy weeds reduce wheat yield more drastically than dicot weeds. Frequent use of fenoxaprop has resulted into development of resistance in *Phalaris minor*. Powles and Holtum (1994) also reported that frequent use of fenoxaprop or clodinafop for 7-9 consecutive years leads to development of resistance against grassy weeds in wheat. *Phalaris minor* and *Avena fatua* have become problem weeds of wheat in Punjab. Weeds cannot effectively be managed merely through physical method, which not only is labour intensive but also capital intensive. As a matter of fact, with the rising cost of labour and power, the judicious use of herbicides is the only acceptable way for the effective weed management in wheat (Ashiq *et al*., 2003). All formulations of grassy weed killers do not control all

[1]Agronomic Research Institute, Ayub Agricultural Research Institute, Jhang Road, Faisalabad, Pakistan

monocot weeds effectively (Zimdahl, 1993; Mandal, 2000). Most of the monocot weed 6killers have been approved randomly for all monocot weeds irrespective of their comparative efficacy against individual weeds. Keeping in view the economic importance of grassy weeds, this study was designed to find out the comparative efficacy of different formulations of graminicides (fenoxaprop and clodinafop) for controlling monocot weeds in wheat

## MATERIALS AND METHODS

In order to study the efficacy of different herbicides, the present experiment was conducted during winter 2003-04 and 2004-05 at the research area of the Directorate of Agronomy, Ayub Agricultural Research Institute, Faisalabad. The experiment was laid out in Randomized Complete Block Design(RCBD) having three replications and a plot size of 8 x 2$m^2$ comprising eight rows spaced 25cm apart. Crop was sown during the 2$^{nd}$ week of November during one year and 3$^{rd}$ week of November during the 2$^{nd}$ year of study. Irrigation and fertilizer requirements were kept according to the recommendations of loamy soil. Herbicides were applied 40 days after sowing of wheat. Dicot weeds were fully controlled by spraying bromoxynil + MCPA (Buctril M 40 EC @ 1.25 L $ha^{-1}$) in the experimental unit and thus dicot weeds were not allowed to interfere with the results. Data on weed counts $m^{-2}$ before and 25 days after spray, number of tillers $m^{-2}$, fertile tillers $m^{-2}$, 1000 grain weight g and grain yield kg $ha^{-1}$ were recorded. The following herbicides were tested alongwith hand weeding. A weedy check or control treatment was also included in the experiment.

**Table-1. Treatments used for Weed Control during 2003-04 and 2004-05.**

| Trade name | Formulation dose $ha^{-1}$ | Common name | Dose g a.i $ha^{-1}$ |
|---|---|---|---|
| Puma Super 75EW | 1.50 L | fenoxaprop-p-ethyl | 426 |
| Gramicide 69 EW | 1.25 L | fenoxaprop-p-ethyl | 426 |
| Brake 10 EC | 1.00 L | fenoxaprop-p-ethyl | 426 |
| Topil 15 WP | 250g | clodinafop propargyl | 37.05 |
| Topcide 15 WP | 300 g | clodinafop propargyl | 44.46 |
| Hand weeding (twice) | | | |
| Weedy check | | | |

Previous years collected seeds of monocotyledonous weed species were disseminated in the experimental unit at the sowing time. The predominant grass species were little seed canarygrass *(Phalaris minor)*, wild oats *(Avena fatua)*, japanese brome *(Bromus japonicus)* and annual bluegrass *(Poa annua)*. In addition to these, other grassy weeds like *Lolium temulentum* (annual ryegrass) and rabbit foot grass *(Polypogon monspeliensis)* were also studied with respect to their variability and the controlling behaviour of above mentioned herbicides. As the year effect was non-significant data were pooled for each parameter and subjected to analysis of variance and the significant means were separated (Steel and Torrie, 1980).

## RESULTS AND DISCUSSION

### Efficacy % of herbicides

It is evident from the efficacy data that *Avena fatua* was effectively controlled by all the herbicides even better than hand weeding (Table-2). As regards the *Phalaris minor*, it was effectively controlled in case of by Puma super 75 EW and Gramicide 69 EW each @ 426 g a.i $ha^{-1}$, Topik 15 WP @ 37.05 g and Topcide 15 WP @ 44.46 g $ha^{-1}$ with their comparative efficacy of 95, 90 97 and 92%, respectively. It was ineffectively controlled by Brake 10 EC @ 426 g $ha^{-1}$ with efficacy of 60% only. Hence, it is deduced that formulation variation even of the same (fenoxaprop) molecule may lead to the variation in their efficacy against some weeds. The other molecules of the same group i.e. clodinafop in the form of Topik 15 WP and Topcide 15 WP gave better control of *Phalaris minor* than all formulations of fenoxaprop. These results are also in line with the findings of Nayyar et al. 2001. Individual *Phalaris minor* counts $m^{-2}$ data before and after the spray alongwith the relative efficacy are given in Table-3.

**Table-2. Comparative efficacy % of different herbicides against monocot weeds in wheat.**

| Treatments (g a.i. $ha^{-1}$) | *Phalaris minor* | *Avena fatua* | *Bromus japonicus* | *Poa annua* |
|---|---|---|---|---|
| Puma super 75EW@ 426 | 91 | 100 | 3 | 0 |
| Gramicide 69 EW @ 426 | 91 | 100 | 0 | 0 |
| Brake 10 EC @426 | 56 | 100 | 0 | 0 |
| Topil 15 WP @ 37 05 | 98 | 100 | 5 | 0 |
| Topcide 15 WP 44 46 | 97 | 100 | 0 | 0 |
| Hand weeding (twice ) | 92 | 100 | 100 | 100 |
| Weedy check | 0 | 5 | 20 | 6 |

**Table-3. *Phalaris minor* counts $m^{-2}$ before and 25 days after spray and mortality % as affected by different herbicides in Wheat.**

| Treatments (g a.i. $ha^{-1}$) | Before spray | After spray | Mortality % |
|---|---|---|---|
| Puma super 75EW@ 426 | 20 | 1 | 95 |
| Gramicide 69 EW @ 426 | 13 | 1 | 90 |
| Brake 10 EC @426 | 18 | 7 | 60 |
| Topil 15 WP @ 37.05 | 36 | 1 | 97 |
| Topcide 15 WP 44.46 | 28 | 2 | 92 |
| Hand weeding (twice ) | 39 | 1 | 97 |
| Weedy check | 41 | 50 | -- |

**Number of tillers $m^{-2}$**

Data regarding number of total tillers $m^{-2}$ (Table-4) indicated that all the herbicides were found safe on wheat. No phytotoxicity was recorded and hence number of total tillers in herbicidal treatments were found at par with the hand weeding. However, on an average, all the herbicides produced 8% more tillers than control/weedy check.

**Number of fertile tillers $m^{-2}$**

Maximum number of fertile tillers numbering 346 $m^{-2}$ were produced in Topcide which was followed by Puma super 75 EW and Topik 15 WP having 338 and 337 fertile tillers $m^{-2}$ (Table-4). Herbicidally treated experimental units produced 9% more fertile tillers than weedy check, which contributed a lot to the final grain yield. These results are also in accordance with Shad, 1987, who reported increased tillers with the application of herbicides in wheat.

**Table-4. Effect of different Herbicides on tillers ,1000-grain weight and grain yield of Wheat. (Average of the data 2003-04 and 2004-05)**

| Treatments (g a.i. $ha^{-1}$) | Tillers $m^{-2}$ | Fertile Tillers $m^{-2}$ | (%) increase | 1000 Grain wt. (g) | Grain Yield kg $ha^{-1}$ | Increase % Over control |
|---|---|---|---|---|---|---|
| Puma super 75EW@ 426 | 458b | 338 ab | 10.09 | 31.9 a | 4321 ab | 31.63 |
| Gramicide 69 EW @ 426 | 439 bc | 333 bc | 8.46 | 31.7 ab | 3982 bc | 21.29 |
| Brake 10 EC @426 | 438c | 322 c | 4.88 | 30.7 de | 3477 d | 5.90 |
| Topil 15 WP @ 37.05 | 449bc | 337 ab | 9.77 | 31.4 bc | 4026 bc | 22.63 |
| Topcide 15 WP 44.46 | 456bc | 346 a | 12.70 | 31.4 bc | 4477 a | 36.36 |
| Hand weeding (twice ) | 474 a | 334 b | 8.79 | 30.9 b | 3885 c | 18.33 |
| Weedy check | 414 d | 307 d | - | 30.3 e | 3283 d | - |
| | 18.70 | 11.29 | - | 0.474 | 344 | - |

**1000-grain weight (g)**

It is evident from the yield components (Table-4) that maximum 1000-grain weight of 31.9 g was recorded in Puma super, which was better even than hand weeding. Most of the herbicidal treatments gave statistically similar grain weight, but 4% more than weedy check.

**Grain yield (kg $ha^{-1}$)**

It is evident from the data that maximum grain yield of 4477 kg $ha^{-1}$ was produced by Topcide 15 WP @ 44.46 g a.i $ha^{-1}$ which was followed by Puma super 75 EW @ 426 g and Topik 15 WP @ 37.05 g a.i $ha^{-1}$ which yielded 4321 and 4026 kg $ha^{-1}$, respectively. It was further recorded that herbicidally treated units on an average produced 21% more yield than control and 6% more even than hand weeding. These results are also in accordance with Shad (1987) and Hamish and David (1991), who recorded higher grain yield of wheat in the herbicidal treated plots.

It was further recorded that out of other grassy weeds, *L. temulentum* was better controlled by clodinafop (Topik and Topcide) than fenoxaprop (Puma super, Gramicide and Brake) *P monspeliensis* was effectively controlled by all the formulations of fenoxaprop and clodinafop.

## CONCLUSION

*P minor* was easly controlled by clodinafop (Topik 15 WP @ 250 g and Topcide 15 WP than different formulations of fenoxaprop-p-ethyl. A wide difference of *P.minor* control was recorded within the different formulations of the fenoxaprop-p-ethyl. *A. fatua* was equally and effectively controlled by all the formulations of fenoxaprop and clodinafop. None of the fenoxaprop and clodinafop formulations was found effective against *P.annua* and newly emerging weed *B. japonicus*). The tillering capacity of wheat was not affected by any herbicide. rather improved by 8% as compared to the weedy check. Herbicides increased the number of fertile tillers by 9%, 1000-grain weight by 4% and grain yield by 21% more than control and in case of Topcide, yield was found 15% more even than the hand weeding.

## REFERENCES CITED

Ashiq. M; M M. Nayyar and J Ahmad 2003. Weed Control Handbook for Pakistan Directorate of Agronomy. Ayub Agricultural Research Institute, Faisalabad.

Ashiq, M. 2006. Checklist of Weeds & Weedicides. Directorate of Agronomy. Ayub Agricultural Research Institute, Faisalabad, Pakistan.

Ashiq, M. and Z.A.Cheema. 2005. Effective use of herbicides. Weed Science Allelopathy Laboratory. University of Agriculture, Faisalabad, Pakistan.

CPC 2002 Crop protection compendium. CAB International, Wallingforod, UK.

Hamish K and R.J David. 1991 The Agrochemicals handbook. 3rd ed. Royal Society of Chemistry Cambridge Road London.

Hassan, G. and K.B. Marwat 2001. Integrated Weed management in Agricultural Crops. Proc National Workshop on Technologies for Sustainable Agriculture Sep. 24-26, 2001.

Mandal, R C 2000. Weeds, Weedicides and Weed Control Principles and practices. Agro botanical publisher, Bikaner, India.

Nayyar, M M., M. Ashiq and J. Ahmad, 2001. Manual on Punjab Weeds part-I. Directorate of Agronomy, Ayub Agricultural Research Institute, Faisalabad.

Powles, S.B. and J.A. Holtum, 1994. Herbicide resistance in plants. Lewis Publishers, CRC. Press, Inc. Florida, USA

Saleem A. and Ibrar ul Haq, 2004. Pesticide Standardization in Punjab Govt. of the Punjab Agriculture Department, Lahore, Pakistan.

Shad R.A 1987. Advances in Weed Science, Pakistan Agricultural Research Council, P.O Box. 1031, Islamabad, Pakistan.

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

Zimdahl, R.L 1993 Fundamentals of Weed Science. Academic Press, A Division of Harcourt Brace & Company London New York, Boston, Toronto.