

## PERFORMANCE OF DIFFERENT HERBICIDES FOR THE CONTROL OF WILD OATS AND YIELD OF WHEAT CROP UNDER ARID CLIMATE OF PUNJAB, PAKISTAN

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### ABSTRACT

A field study was conducted at Adaptive Research Farm, Karor (District Layyah), during 2007-08, to evaluate the efficacy of different post emergence herbicides on narrow leave weed (*Avena fatua*) in wheat crop. The Experiments were laid out in Randomized complete block (RCBD) design with three replications and plot size was 8 m x 13 m during both the years. Four different herbicides viz. Topik @ 300 g ha<sup>-1</sup>, puma super @ 625 mL ha<sup>-1</sup>, Pujing @ 625 mL ha<sup>-1</sup> and fenoxaprop @ 625 mL ha<sup>-1</sup>. A control (untreated) treatment was also included in the trial. The observations i.e. number of weeds after spray/m<sup>2</sup>, Plant height (cm), number of tillers m<sup>-1</sup>, number of spikelets per spike, number of grains per spike and grain yield (kg ha<sup>-1</sup>) were recorded. All the herbicides significantly decreased weed population over control and maximum grain yield (4167 kg ha<sup>-1</sup>) was obtained where Topik @ 300 g ha<sup>-1</sup> was applied. It was however, statistically at par with the grain yield obtained by the application of Puma super @ 625 mL ha<sup>-1</sup> (4100kg ha<sup>-1</sup>), Pujing @ 625mL ha<sup>-1</sup> (3833 kg ha<sup>-1</sup>) and fenoxaprop @ 625 mL ha<sup>-1</sup> (3817 kg ha<sup>-1</sup>). It is thus recommended that Topic and Puma super may be applied @ 300 g and 625 mL ha<sup>-1</sup>, respectively for the control of narrow leave weeds of wheat.

**Key words:** Post emergence herbicides, narrow leave weeds, *Avena fatua*, wheat, arid, climate, Pakistan.

### INTRODUCTION

Wheat is an important cereal grain crop of the world. It is staple food of majority of the people and meets the diversified food requirements of both the urban and rural population of Pakistan. During 2008-09, it was grown on an area of 9.062 million ha<sup>-1</sup> with an annual production of 23.421 million tons of grains giving average yield of 2.60 tons ha<sup>-1</sup> (Anonymous, 2009). Although there are many

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reasons for low productivity of wheat but weed infestation is a basic and major component of low yield in crop production system. In Pakistan, it is estimated that annual losses caused by weeds may be 28 billions rupees (Marwat *et al.*, 2006). Because of the high competitive ability and high reproductive potential of weeds, it is imperative to check their infestation. Weeds compete with the crop plants for nutrients, moisture, space, light and many other growth factors which not only reduce crop yield but also deteriorate quality of farm produce and thereby reduce its market value (Cheema and Akhtar, 2005). The weed control has been practiced since the time immemorial by manual labour and/or animal drawn implements, but these practices were laborious, tiresome and expensive due to increasing cost of labour. The growing mechanization of farm operations and ever increasing labor wages has stimulated interest in the use of chemical weed control. Chemical weed control is the easiest and most successful alternative method. It is important to deal with wild oats early. That's because the time to protect your yield is before wild oats have done the damage.

Reports are available on the efficacy of different herbicides in wheat (Khan *et al.*, 1999; Khan *et al.*, 2001; Khan, *et al.*, 2002; Hassan *et al.*, 2003). The herbicide use in Pakistan is not widely practiced as in the agriculturally advanced nations. The interest around the testing of graminicides (Walia *et al.*, 1998; Ormeno and Diaz, 1998) indicates the problem posed by grasses, whereas the studies of Khan *et al.*, (2002) showed synergistic response on combined use. In another studies researchers obtained an effective control of weeds in wheat through chemicals (Khan *et al.*, 2003). The instant studies were undertaken to find out the most effective and economical herbicide (s) for control of narrow leave weed (wild oats) in wheat crop.

## MATERIALS AND METHODS

The trial was laid out in randomized complete block design with three replications. The net plot size was 12m × 17 m. The test wheat variety was Bhakkar 2002. Sowing was done on November 20, 2007. The treatments in the experiment were: T<sub>1</sub> = Control, T<sub>2</sub> = Topik (clodinafop propargyl) @ 300 gha<sup>-1</sup>, T<sub>3</sub> = Puma Super (fenaxaprop pethyl) @ 625 ml ha<sup>-1</sup>, T<sub>4</sub> = Pujing (Fenaxaprop-p-ethyl) @ 625 mL ha<sup>-1</sup> and T<sub>5</sub>- fenaxaprop @ 625 mL ha<sup>-1</sup>. Recommended dose of NPK (160-114-62 kg ha<sup>-1</sup>) fertilizers were applied in the form of urea, triple super phosphate and sulphate of potash, respectively. Nitrogen fertilizer was applied in three splits i.e. one-third nitrogen was applied at the time of seedbed preparation and was thoroughly mixed into soil by ploughing and planking. The second and third dose was top dressed at the time of 1<sup>st</sup> and 3<sup>rd</sup> irrigation, respectively. Weedicides were

sprayed with Knapsack spray machine using water @ 296 L ha<sup>-1</sup> along with recommended dose of each weedicide after 45 days of sowing. Canal water was used for irrigation. Sowing was done with the help of Rabi drill in good moisture conditions. All other agronomic practices (sowing and harvesting) were kept uniform for both the experimental sites. The observations on the following parameters i.e. No. of weeds after spray m<sup>-2</sup>, number of tillers m<sup>-2</sup>, plant height, number of spikelets spike<sup>-1</sup>, number of grains spike<sup>-1</sup> and grain yield were recorded during the course of study. Wheat crop growing and development stages for recording of parameters after sowing are as follows; germination m<sup>-2</sup> 15 days after sowing (DAS), Number of tillers m<sup>-2</sup> 40 DAS. Plant height after sowing of 150 days, Number of spikelets spike<sup>-1</sup> 150 days and yield contributing parameters after 150 days. The collected data were analyzed statistically using Fisher's analysis of variance technique and treatment means were compared by Least Significant Difference (LSD) test at 5% probability level (Steel *et al.*, 1997). The data were analyzed by the "MSTAT-C" statistical package on a computer (Freed and Eisensmith, 1986).

## RESULTS AND DISCUSSION

### Number of weeds m<sup>2</sup> after spray

Weedicides had statistically significant effect on number of weeds after spray in wheat (Table-1). The maximum value of No. of weeds after spray m<sup>-2</sup> (15.00) was observed in case of control (untreated) treatment followed by 2.60 and 2.33 in case of T<sub>5</sub>-fenaxaprop @ 625 mL ha<sup>-1</sup> and T<sub>4</sub>-Pujing (fenoxaprop-p-ethyl) @ 625 mL ha<sup>-1</sup>. There were no weeds in case of T<sub>2</sub>-Topik (Clodinafop propargyl) @ 300 g ha<sup>-1</sup> and T<sub>3</sub>-Puma Super (Fenoxaprop-p-ethyl) @ 625 mL ha<sup>-1</sup>. The present results of chemical weed control in wheat are in conformity with earlier findings of Hassan *et al.*, (2003).

### Plant height (cm)

Maximum plant height (93.27cm) was observed in T<sub>2</sub>-Topik (clodinafop propargyl) @ 300 g ha<sup>-1</sup> followed by T<sub>3</sub>-Puma super (fenoxaprop-p-ethyl) @ 625 mL ha<sup>-1</sup> (93.00cm) and minimum (88.58cm) was recorded in case of control. These results are in agreement with the plant height findings of Khan *et al.*, 2004.

### Number of tillers m<sup>-2</sup>

Productive tillers are the key component of grain yield in wheat crop. A perusal of data (Table-1) revealed that effect of weedicide was found significant on no. of tillers m<sup>-2</sup>. Maximum increase in number of tillers m<sup>-2</sup> (6.15 % more than control) was observed in case of T<sub>3</sub>-Puma Super (fenoxaprop-p-ethyl) @ 625 mL ha<sup>-1</sup> which was statistically equal with treatment T<sub>2</sub>-Topik (clodinafop propargyl) @ 300 g ha<sup>-1</sup> showing 5.34 % more than control. Next to these,

treatment T<sub>5</sub>-fenaxaprop @ 625 mL ha<sup>-1</sup> showed 2.72 % increase over control that was statistically similar with T<sub>4</sub>-Pujing (fenoxaprop-p-ethyl) @ 625 mL ha<sup>-1</sup> showing 2.56 % increase in No. of tillers m<sup>-2</sup> over control. Higher number of fertile tillers in herbicide treated plots was due to healthy stand of crop and better utilization of soil nutrients. Similar results were reported by Cheema and Akhtar (2005).

#### **Number of spikelets spike<sup>-1</sup>**

Weedicides had significant effect on spikelets spike<sup>-1</sup>. Mean maximum number of spikelets spike<sup>-1</sup> (14.80) were noted with T<sub>2</sub>-Topik (clodinafop propargyl) @ 300 g ha<sup>-1</sup>, followed by T<sub>3</sub>-Puma Supper (fenoxaprop-p-ethyl) @ 625 mL ha<sup>-1</sup> (14.60) showing 12.10 and 10.60 % increase over control, respectively. It was followed in descending order by treatments T<sub>4</sub>-Pujing (fenoxaprop-p-ethyl) @ 625 mL ha<sup>-1</sup> and T<sub>5</sub>-fenoxaprop-p-ethyl @ 625 mL ha<sup>-1</sup> which showed 5.53 and 5.07 % increase over control, respectively. Increased number of spikelets spike<sup>-1</sup> was reported by Khan *et al.*, (2003) due to the treatment in the herbicides.

#### **Number of grains spike<sup>-1</sup>**

Maximum number of grains spike<sup>-1</sup> (45.20) were observed with T<sub>2</sub>-Topik (clodinafop propargyl) @ 300 g ha<sup>-1</sup> and it gave 35.60 % increase in number of grains spike<sup>-1</sup> than control. It was followed in descending order by T<sub>3</sub>- Puma Super (fenoxaprop-p-ethyl) @ 625 mL ha<sup>-1</sup>, T<sub>4</sub>-Pujing (fenoxaprop-p-ethyl) @ 625 mL ha<sup>-1</sup> and T<sub>5</sub>-fenaxaprop @ 625 mL ha<sup>-1</sup> which increased No. of grains spike<sup>-2</sup> by 33.00, 18.60 and 16.60%, respectively, over control. These results are supported by earlier researchers (Hashim *et al.*, 2002) who reported that herbicidal treatments significantly increased the grains per spike in wheat crop.

#### **Grain yield (kg ha<sup>-1</sup>)**

Grain yield is a function of interplay of various yield components such as number of fertile tillers per unit area, number of grains per spike and 1000-grain weight. Weedicides affected grain yield significantly (Table-1). Treatment T<sub>2</sub>-Topik (clodinafop propargyl) @ 300 g/ha<sup>-1</sup> being the most effective which produced a 28.80 % increase in grain yield compared with control. Next to it, T<sub>3</sub>-Puma Super (fenoxaprop-p-ethyl) @ 625 mL ha<sup>-1</sup>, T<sub>5</sub>-fenaxaprop @ 625 mL ha<sup>-1</sup> and T<sub>4</sub>-Pujing (fenoxaprop-p-ethyl) @ 625 mL ha<sup>-1</sup> showed 26.80, 18.00 and 18.50 % more grain yield respectively, over control. These results are corroborated by the findings of Khan *et al.*, (2003) who obtained an effective control of weeds in wheat through chemicals. Similarly, Noor *et al.*, (2007) conducted a field study to variable behaviour of three formulations of fenoxaprop viz. Puma Super 75 EW (1250 and 625 mL), Pujing 10 EC (1000 and 500 mL ha<sup>-1</sup>) and Brake 10 EC (1000 and 500 mL ha<sup>-1</sup>). It was observed that higher

concentration of fenoxaprop formulation proved better for *Phalaris minor* and lower for *Avena* species in wheat crop.

### CONCLUSION

The present study revealed that Topik and Puma Super gave the maximum control of wild oats after spray and maximum grain yield of wheat. Thus, it is recommended to use Topik (clodinafop propargyl) and Puma Super (fenoxaprop-p-ethyl) @ 300 g and 625 mL ha<sup>-1</sup>, respectively to get maximum grain yield of wheat under the arid climate of Punjab, Pakistan.

**Table-1. Effect of different weedicides for the control of narrow leaves weed (wild oats) of wheat (*Triticum aestivum*) (Mean values).**

S.No	Treatments	No. of weeds after spray m <sup>-2</sup>	Plant height (cm)	No. of Tillers m <sup>-2</sup>	No. of Spikelet spike <sup>-1</sup>	No. of grains spike <sup>-1</sup>	Grain Yield (kg ha <sup>-1</sup> )
1	Control	15.00 a*	88.58 c	371.17 c	13.20 c	33.33 c	3233.00 c
2	Topik (clodinafop propargyl) @ 300 g ha <sup>-1</sup>	0.00 c	93.27 a	391.00 a	14.80 a	45.20 a	4167.00 a
3	Puma Super (fenaxaprop-p-ethyl) @ 625 mL ha <sup>-1</sup>	0.00 c	93.00 a	394.00 a	14.60 a	44.33 a	4100.00 a
4	Pujing (fenaxaprop-p-ethyl) @ 625 mL ha <sup>-1</sup>	2.33 b	91.53 b	380.70 b	13.93 b	39.53 b	3833.00 b
5	fenaxaprop @ 625 mL ha <sup>-1</sup>	2.66 b	90.73 b	381.30 b	13.87 b	38.87 b	3817.00 b
LSD 0.05		1.75	1.12	8.21	0.32	2.17	253.20

\*Means sharing a letter in common in the respective column do not significantly by LSD test at P ≤ 0.05

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