

PERFORMANCE OF SOME GRASS KILLERS AGAINST *Avena fatua* AND THEIR EFFECT ON YIELD AND YIELD COMPONENTS OF WHEAT IN SOUTHERN PUNJAB.

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ABSTRACT

Two grass herbicides viz. clodinafop-propargyl (Topik15WP) and fenoxaprop-ethyl (Puma Super 75 EW) at varying levels were used to investigate the control of *Avena fatua*; a predominant rabi weed of wheat crop in Southern region of Punjab, Pakistan. An experiment comprising six treatments and three replications was conducted at District Dera Ghazi Khan during 2004-05 and District Rajanpur during 2005-06 using Randomized Complete Block Design. The treatments consisted of weedy check, Puma Super 75 EW @ 0.625, 0.925 and 1.25 L ha⁻¹ and Topik 15 WP @ 200 and 250 g ha⁻¹ was applied as post-emergence. The data recorded showed very promising results. Maximum control of weed population was achieved with the application of Puma Super 75 EW @ 1.25 L ha⁻¹ and Topik15 WP @ 200 g ha⁻¹ at both the sites leading to increased wheat growth and yield as a result of reduced competition between wild oats and wheat. The Puma Super 75 EW @ 1.25 L ha⁻¹ increased wheat yield by 18% and Topik 15 WP 200 g ha⁻¹ by 16% at D.G. Khan district while at Rajanpur district Puma Super 75 EW resulted in 32% and Topik 15 WP 29% increase in grain yield. These findings indicated that *Avena fatua* losses to wheat crop in Southern Punjab can be minimized significantly by using appropriate dose of any of the two available narrow-leaved herbicides used in the experiment. However, Puma Super 75 EW proved to be superior to Topik 15 WP during the two consecutive years studies. The study clearly indicated that enhanced rate (i.e. 1.25 L ha⁻¹) of Puma Super 75 EW and reduced rate of Topik 15 WP (i.e. 200 g ha⁻¹) application as post emergence applications can minimize the losses caused by *A. fatua* to wheat crop in the Southern Punjab.

Key Words: Wheat, wild oats, Weed Infestation, grass herbicides, Southern Punjab, Pakistan.

INTRODUCTION

Wheat is an important cereal and staple food crop of Pakistan. Every effort is being made to meet the wheat requirements of the country. There is a lot of pressure on this crop as people are habitual to eat wheat bread three times a day. Weeds are a serious menace to wheat production as these not only reduce quantity of crop, but also hinder in harvesting and deteriorate the quality of wheat crop. Weeds compete with crops mainly for light, nutrients, water and CO₂ for canopy development and other growth

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requirements (Anderson, 1983). Weeds utilize three to four times more nitrogen, potassium and magnesium than a weed free crop (Schwezel and Thomas, 1971).

Among weed flora, grassy weeds are more difficult for the farmers to differentiate the weed plants because of its mimicry especially at their initial growth stages. Seedlings of *Avena fatua* are identical to wheat seedlings in appearance in addition to its life cycle which is also closely linked with that of wheat. *A. fatua* is also a grassy weed infesting wheat crop that belongs to grass family (Poaceae). It is most prominent annual weed of wheat fields greatly affecting production in southern Punjab and other regions of the country. It is highly competitive with wheat and causes severe reduction in yield which may range from 10 to 73 % (Tiwari et al., 1988). To control grassy weeds manually on a large scale is extremely cumbersome as it has almost similar morphology as that of wheat crop. Seefeldt et al. (1995) reported that identification of narrow-leaved weeds impedes in manual control due to which herbicide application is necessary.

Puma Super 75 EW and Topik 15 WP are most commonly used narrow-leaved herbicides in the region but there are several reservations on the use of these herbicides as high application often involves the heavy expenditures and causes environmental hazard in addition to adverse effects on wheat crop. Similarly, low application could result the problem of low or no control of weeds and weed resistance etc. Hassan et al. (2005b) investigated the effect of different graminicides used at varying levels and concluded that lesser dose of Topik15WP is required for the control of wild oat as compared to Puma Super 75 EW.

In view of the aforesaid facts, a study was planned to evaluate the performance of two narrow-leaved herbicides i.e. Puma super 75 EW and Topik15WP against the menace of *A. fatua* in wheat fields of Southern Punjab where almost tropical environment prevails during the wheat growth season and is of prime importance for the farming community of the area

MATERIALS AND METHODS

The study was carried out at farmer's fields for two consecutive years, i.e. 2004-05 and 2005-06. During first year, the study was conducted at Mauza Kot Chutta, District Dera Ghazi Khan, Pakistan and at Mauza Wang of District Rajanpur, Pakistan during the second year. The experiment was laid out in Randomized Complete Block Design (RCBD) having three replications. The treatments consisted of (1) Weedy check (2) Topik 15 WP @ 200 g ha⁻¹ (3) Topik 15 WP @ 250 g ha⁻¹ (4) Puma Super 75 EW @ 0.625 L ha⁻¹ (5), Puma Super 75 EW @ 0.925 L ha⁻¹, and (6) Puma Super 75 EW @ 1.25 L ha⁻¹. Wheat variety Uqab 2000 was used as test crop and sown on December 3, 2004 by keeping net plot size of 5 x 10m² during first year whereas Inqilab-91 was used as a test crop during the second year and sown on November 11, 2005 by keeping net plot size of 4 x 9m². Plots were sown to wheat with drill by keeping row to row distance of 22.5 cm. Fertilizer application was made @ 114-114-62 NPK kg ha⁻¹ at the time of sowing during both the seasons. The application of herbicides was made after one month of sowing as per requirement of the treatments and weed population data were recorded two weeks after the application of herbicides. Total five irrigations were applied in each season to experimental wheat field at both sites. The data recorded at maturity regarding growth, yield and yield components were subjected to statistical analysis (Steel and Torrie, 1980) and treatment means were tested by least significance difference test at 5% probability level. All other agronomic practices were kept normal and uniform. The physiochemical characteristics of both sites are given in the Table 1.

Table-1. Physio-chemical characteristics of the experimental sites.

Soil Characteristics	Kot Chutta	Mauza Wang
Organic matter	0.30 %	0.28%
Available P	2.72 mg kg ⁻¹	2.76 mgkg ⁻¹
Soil pH	7.2	7.5
Soil texture	sandy loam	clay loam

Table-2. Effect of grassy herbicides on density m⁻² of *A. fatua* at two experimental sites during the years 2004/05 and 2005/06.

Treatments	Kot Chuta	Mauza Wang
Weedy check	42 (-)	34 (-)
Topik @ 200 g ha ⁻¹	05 (88)	05 (85)
Topik @ 250 g ha ⁻¹	07 (83)	05 (85)
Puma Super @ 0.625 L ha ⁻¹	08 (81)	06 (82)
Puma Super @ 0.925 L ha ⁻¹	07 (83)	07 (79)
Puma Super @ 1.25 L ha ⁻¹	03 (93)	04 (88)

Note. The data presented in the parentheses is the % reduction of *A. fatua* with respect to weedy check

Table-3. Effect of grassy herbicides on growth and yield components of wheat at Kot Chutta, district Dera Ghazi Khan during Rabi 2004-05.

Plant Characteristics	Topik 15WP (g ha ⁻¹)		Puma Super 75 EW (L ha ⁻¹)			Weedy Check	LSD _{0.05}
	200	250	0.625	0.925	1.25		
Plant height (cm)	76a*	72c	74b	74b	79a	64d	5.79
Fertile tillers (m ⁻²)	238a	232b	235b	228c	240a	225c	6.76
Grains spike ¹	31b	32a	31b	32a	30b	32a	6.01
1000 grains wt (g)	35.4a	35.0a	35.4a	33.5b	36.7a	28.4c	2.61
Yield (kg ha ⁻¹)	2611a	2598b	2578b	2444c	2642a	2243d	22.05

* Any two means not sharing a common letter across rows differ significantly by LSD test at P≤0.05.

Table-4. Effect of narrow-leaved herbicides on growth and yield components of wheat crop at Mauza Wang, district Rajanpur during rabi 2005-06.

Plant Characteristics	Topik 15WP (g ha ⁻¹)		Puma Super 75 EW (L ha ⁻¹)			Weedy check	LSD _{0.05}
	200	250	0.625	0.925	1.25		
Plant height (cm)	84a*	78b	80b	82a	86a	70c	6.53
Fertile tillers (m ⁻²)	246a	238ab	240a	234c	244a	224d	6.76
Grains spike ⁻¹	31ab	34a	33a	34a	30b	32a	4.93
1000 grains wt (g)	37.0a	34.0b	34.0b	35.0b	39.2a	30.4c	2.78
Yield (kg ha ⁻¹)	2821c	2751b	2692b	2784b	2869a	2179c	151.11

* Any two means not sharing a common letter across rows differ significantly by LSD test at P≤0.05.

RESULTS AND DISCUSSION

Weed Control

It is evident from the data of two seasons presented in Table-2 that maximum reduction of *A. fatua* density m⁻² i.e. 93% and 88% was obtained where Puma Super 75 EW was applied @ 1.25 L ha⁻¹ followed by the plots where Topik 15 WP @ 200 g ha⁻¹ was applied and wild oats reduction was 88% and 85%, respectively as compared to weedy check during 1st and 2nd years. Topik 15WP proved to be economical but the best wild oats control was achieved by the application Puma Super 75EW @1.25 L ha⁻¹ which was comparable with Topik 15WP. The maximum population of *A. fatua* was recorded in weedy check plots. These results are in line with Khan *et al.*, (2006) and Rajput *et al.*, (1993), who reported the highest *A. fatua* counts in weedy check and maximum growth and grain yield of wheat in plots treated with Puma Super 75 EW. Similarly, Muhammad *et al.*, (2006) stated that Puma Super 75 EW @ 1.25 L ha⁻¹ gave maximum control of narrow-leaved weeds in wheat out of varying herbicides applied at different doses.

Plant height at maturity (cm)

Data regarding plant height recorded at maturity stage during 1st and 2nd years of study showed statistically significant results and were presented in Tables 3 and 4, respectively. With the decrease in *A. fatua* population, plant height increased and it was minimum in the weedy check plots during both the years of studies, which clearly depicted that weeds competed with crop plants for resources such as nutrients, sunlight, water, space etc thus adversely affecting the growth of main crop. The maximum plant height was recorded in plots where Puma Super 75 EW @ 1.25 L ha⁻¹ was applied during both the years of study. These results are in accordance with Zaki *et al.*, (1988), who recorded that plant height decreased with the increase of competition for resources.

No. of fertile tillers (m⁻²)

Data regarding fertile tillers were recorded at physiological maturity. The statistical analysis showed that differences among treatment means to be significant for both the years of study. Maximum fertile tillers (240 m⁻²) were recorded in plot where Puma Super was sprayed @ 1.25 L ha⁻¹ during 1st year and 244 m⁻² were recorded during 2nd year where Topik was applied @ 200 g ha⁻¹. These results depicted that

maximum weed control enhanced the production of fertile tillers m^{-2} which subsequently contributed towards the increase in wheat yield. These results are in agreement with the work of Hassan *et al.*, (2003) who obtained an increase in tillering with the application of different herbicides.

No. of grains per spike

The data regarding number of grains spike⁻¹ showed that there was variation among the treatments though not up to the level of significance during both the seasons. Data indicated that weeds control treatments could not produce significant effect on number of grains spike⁻¹ as number of grains spike⁻¹ is more related to genotype and phenotypic characteristics of the plants (Tables-3 and 4).

1000 grains weight (g)

Data presented in Tables-3 and 4 clearly showed statistically significant effect of herbicides levels on 1000 grains weight. Maximum 1000 grains weight of 36.70 g was achieved in plots treated with Puma Super 75 EW @ 1.25 L ha⁻¹ followed by 35.42 g in plot receiving Topik 15 WP 200 g ha⁻¹ during 1st year of study. Similarly, the highest weight of 39.20 g and 37.00 g were recorded in plots sprayed with Puma Super 75 EW @ 1.25 ha⁻¹ and Topik 15 WP @ 200g ha⁻¹ in 2nd year. These results showed that Puma Super 75 EW at the highest rate (1.25 g ha⁻¹) as post-emergence helped in increasing the grain size and obtaining significant 1000 grain weight which finally contributed towards increased wheat grain yield.

Grain Yield (kg ha⁻¹)

Data regarding yield presented in Tables-3 and 4 for the year 2004-05 and 2005-06 showed significant differences among treatments in both the seasons. The highest yield of 2642 kg ha⁻¹ was recorded in plots where Puma Super 75 EW @ 1.25 L ha⁻¹ was applied compared with the lowest yield of 2243 kg ha⁻¹ in weedy check plot during 1st year of study. Similarly, maximum yield of 2869 kg ha⁻¹ was recorded in plots sprayed with Puma Super 75 EW @ 1.25 L ha⁻¹ against weedy check where only 2179 kg ha⁻¹ yield was obtained. Weedy check plots resulted in low yield for both the years, indicating that weeds utilize maximum resources of the main crop which ultimately reduced the crop yield. These results are in conformation with those of Gul Hassan *et al.*, (2005a), who applied Puma Super 75 EW and Topik 15 WP at different doses to control *Avena fatua* in wheat crop and reported that lesser dose of Topik 15 WP and higher dose of Puma Super 75 EW was required to control this weed.

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