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EFFICACY OF SOME NEW HERBICIDAL MOLECULES ON GRASSY AND BROADLEAF WEEDS IN WHEAT-II

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ABSTRACT

Field study was conducted at Malkandher Research Farm, NWFP Agricultural University, Peshawar during Rabi 2002-03 to investigate the effectiveness of different herbicides including new molecules tribenuron-methyl and thifensulfuron- methyl against grasses and broadleaf weeds. The experiment was laid out in randomized complete block design with 4 replications. The experiment comprised of 11 herbicides and a weedy check. The herbicidal treatments were post emergence applications of Rocket 15 WDG (thifensulfuron-methyl) @ 0.037, Rocket 75 WDG (thifensulfuron-methyl) @ 0.05, Tribenuron-methyl 50 WDG (tribenuron-methyl) @ 0.05, Logran Extra 64 WDG (triasulfuron + terbutryn) @ 0.15, Buctril-M 40 EC (bromoxynil + MCPA) @ 0.45, Isoproturon 50 WP (isoproturon) @ 0.01, Affinity 50 WDG (carfentrazone ethyl ester) @ 0.013, Agritox 50 DF (MCPA) @ 0.49, and Aim 40 WP (chlorfluazuron) @ 0.96 kg a.i ha^{-1}. Ghaznavi-98 variety of wheat in plot size of 5x 1.5 m^2 was planted during the third week of October 2002. Data were recorded on the weed density after application of herbicides, number of spikes m^{-2}, number of grain spike^{-1} and grain yield (t ha^{-1}). For controlling weeds, Affinity proved to be the best, giving only 18.25 as compared to 250.5 weeds m^{-2} in weedy check plots. Similarly, the maximum grain yield was recorded in Affinity 50 WDG, Buctril-M 40EC and Logran Extra 64 WDG with grain yield of4.133, 3.866 and 3.599 t ha^{-1}, respectively. Minimum yield (2.133 t ha^{-1}) was recorded in the weedy check plots.

Key words: Weed density, herbicides, yield components, grain yield, wheat.

INTRODUCTION

Wheat (*Triticum aestivum* L.) is classified in the tribe Hordae, genus *Triticum* and family Poaceae. Like other grasses it produces several tillers plant^{-1} depending upon soil fertility, crowding and environmental conditions.

Wheat is used as a major food source all over the world and is also known as the "King of cereals". It is the staple food of Pakistan and meets the major dietary requirements. The cultivation of wheat seed is simple and adaptable to varied soil and climatic conditions. Besides food, wheat is also used for livestock and poultry feed. A large population of the world consumes wheat in a number of ways. Wheat supplies about 73% of the calories and proteins of the average diet (Heyne, 1987). Weeds reduce the crop yield and deteriorate the quality of produce hence reduce the market value of

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wheat. Weed management increases the cost of production and thus it is necessary to devise such methods which could reduce not only the cost of production but also save time and labor. Among the weed control methods, the chemical control is one of the recent origin that is being emphasized in modern agriculture (Taj *et al.*, 1986). It has been estimated that crop losses due to weed competition throughout the world as a whole are greater than those resulting from the combined effects of insects and diseases. There are thus, several reasons for entirely eliminating weeds if possible from the crop environment. As a matter of fact, with the rising costs of labor and power, the use of herbicides will be the only acceptable method of weed control in future. The infested situations need the development of package of weed management technology, helpful to minimize the weed competition losses in our country. The control of weeds is basic requirement and major component of management in the production systems (Young *et al.*, 1996 and Norris, 1982).

Weeds are one of the biggest threats to agriculture. They use the soil fertility, available moisture, nutrients and compete for space and sunlight with crop plant, which result in yield reduction. Annual losses in wheat amount to more than Rs 28 billion at the national level and Rs 2 billion in N.W.F.P. (Hassan and Marwat, 2001)

The major weeds competitive with wheat crop in N.W.F.P include *Avena fatua, Phalaris minor, Poa annua, Ciirsium arvense, Convolvulus arvensis, Ammi visnaga, Chenopodium album, Fumaria indica, Carthamus oxycantha, Galuim aparine* and *Euphorbia helioscopia.*

Eradication and destruction of weeds has been practiced by man since the time immemorial by manual labor or animal drawn implements. These practices were hard, laborious and expensive due to increasing cost of labor. The growing mechanization of farm operations and ever increasing labor wages have stimulated interest in the use of chemical weed control. However, non-judicious use of herbicides can do harm rather benefit in productivity. The choice of best herbicides, proper time of application and proper usage of herbicides are the important considerations for lucrative returns. (Fayad *et al.*, 1998)

In view of the importance of the chemical control of weeds and the vital importance of wheat as food for human beings and the relevance to the national economy, an experiment was conducted to investigate the efficacy of different herbicides for controlling weeds in wheat crop.

MATERIALS AND METHODS

An experiment was conducted at Malakandher Research Farm, N.W.F.P Agricultural University, Peshawar during the Rabi season 2002-03 to investigate the efficacy of various herbicides. The experiment was laid out in Randomized complete block (RCB) design with four replications. Twelve treatments were assigned to each replication randomly. The plot size was kept at 5 x 1.5 m^2. The herbicides were applied about four weeks after emergence of the crop. The detail of the treatments is furnished in Table-1.

Table-1. Detail of herbicidal treatments used in the experiment

Sr.No.	Trade Name	Common Name	Rate (kg a.i.ha^{-1})
1.	Weedy check	-------------	----------
2.	Rocket 15% WP	thifensulffuron-methyl	0.037
3.	Rocket 15% WP	thifensulffuron-methyl	0.05
4.	Rocket 15% WP	thifensulffuron-methyl	0.07
5.	Rocket 15% WP	thifensulffuron-methyl	0.05
6.	Tribenuron-methyl 75 WDG	tribenuron-methly	0.05
7.	Logran Extra 64 WDG	Triasulfuron + terbutryn	0.15
8.	Buctril-M40EC	Bromoxynil + MCPA	0.45
9.	Isoproturon 50 WP	Isoproturon	0.01
10.	Affinity 50 WDG	Carfentrazone ethyl ester	0.013
11.	Agritox 50 DF	2-methyl 4-chloro phenoxy acetic acid	0.49
12.	Aim 40 WP	Chlorfluazuron	0.296

All the herbicidal treatments were applied in post-emergence with the help of a knapsack sprayer. While spraying the herbicides, all the precautionary measures were kept in mind to avoid any danger due to the misuse of the herbicides.

During the course of studies data were recorded on weed density after application of herbicides. number of spikes m^{-2}, number of grain spike^{-1} and grain yield (t ha^{-1}). The data were subjected to the analysis of variance technique and the significant means were separated by the LSD test (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Statistical analysis of the data regarding weeds density m^{2} after application of herbicides revealed that there was a significant effect of different herbicides on weeds density m^{-2} (Table 2). The data showed that minimum weeds density m^{-2} (18.25) was recorded in Affinity 50WDG treated plots. It was however, statistically at par with Buctril-M40EC (18.75) and Logran Extra 64 WDG (28.50). Maximum (250.5) weeds density m^{2} was recorded in weedy check plots. For controlling weeds, Buctril-M 40EC and Affinity 50 WDG best controlled the weeds and decreased their density m^{-2} when applied at post-emergence stage of wheat crop. The efficacy of Rocket 15 WP, Tribenuron-methyl 75 WDG, Isoproturon 50 WDG, Agritox 50 DF and Aim was statistically comparable to one another. These results are in conformity with those of Phogate *et al.*, 1991, who reported that application of herbicides reduced broadleaf as well as grassy weeds by 90-94%. These results are also in great analogy with the work of Balyan *et al.*, 1993 and Singh (1997). They reported that grassy weeds were effectively controlled when herbicides were applied 28-35 days after sowing.

Statistical analysis of the data showed that number of spikes m^{-2} were significantly affected by different herbicidal treatments (Table-2). Among the herbicidal treatments, maximum number of spikes m^{-2} were recorded in Affinity 50 WDG, Logran

Extra 64 WDG and Buctril-M 40EC treated plots with 309.8, 302.1and 286.5 spike m^{-2}, respectively. The minimum (236.3, 243.9 and 250.4) number of spikes m^{-2} were recorded in weedy check, Rocket 15 WP and Aim 40 WP treated plots, respectively. The maximum number of spikes m^{-2} were recorded in Affinity 50WDG treated plots due to its phytotoxic effects on weeds. In the experiment, degree of weed control had direct impact on number of spikes m^{-2}. As the weeds density decreased, the number of spikes m^{-2} increased. 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 produced higher number of spike m^{-2}.

Data regarding number of grains $spike^{-1}$ showed that different herbicides had significant effect on number of grains $spike^{-1}$ (Table 2). The data in Table-2 show that maximum grains $spike^{-1}$ were recorded in Affinity 50WDG (64.0), Buctril-M 40EC (60.65) and Logran Extra 64 WDG. Minimum (44.9) number of grains $spike^{-1}$ were recorded in weedy check plots. The herbicides like Rocket 15 WP, Tribenuron-methyl 75 WDG and Agritox 50 DF produced number of grains that were comparable to weedy check. The values were 49.7, 48.2 and 50.0 grains $spike^{-1}$, respectively. The reason of increased number of grains $spikes^{-1}$ is attributed to the effective weed control in these treatments and consequently wheat crop efficiently utilized all the available resources. Sohail (1993) has communicated the analogous findings in wheat. He reported that herbicidal treatments significantly increased number of grains $spike^{-1}$. Moreover, these results are also similar to the work of Baldha *et al.,* (1998) and Bernal, (1982) who reported the phytoxicity of Isoproturon on wheat. Recent findings of Khan et al., 2002, Qureshi *et al.*, (2002), Hassan *et al.*, (2003) and Tunio *et al.*, (2004) also support our inferences.

The data regarding grain yield of wheat showed that different herbicidal treatments had significant effect on grain yield of wheat (Table-2). Maximum (4.133 t ha^{-1}) grain yield was recorded in Affinity 50WDG treated plots, which was statistically at par with Buctril-M40EC and Logran Extra 64WDG having 3.867 and 3.600 t ha^{-1} grain yield, respectively. Minimum (2.133 and 2.266 t ha^{-1}) grain yield was recorded in weedy check and Rocket 15 WP treated plots. However, the yield of Isoproturon 50 WDG (2.398), Aim 40 WP (2.533), Agritox 50 DF (2.266) and Rocket 15WP (2.800) was comparable with the Weedy check (Table-2). The increase in grain yield in the herbicide treated plots was probably due to the efficient weed control and thus the crop efficiently flourished by utilizing all the available resources. Hashim et al. (2002) and Montazari (1994) also reported the analogous results. They reported that herbicidal treatments significantly increased the grain yield in wheat. Thus Affinity 50 WDG and Logran Extra 64 WDG proved to be the best herbicides, giving efficient weed control and maximum grain yield in wheat. Efficient weed control had direct impact on grain yield of wheat. As the weeds density decreased in herbicidal treated plots, the grain yield was increased as a consequence. It is thus, concluded that the newly introduced sulfonylurea herbicides like tribenuron-methyl and thifensulfuron-methyl failed to surpass the already available herbicides in grain yield. Further research on comparison of these new herbicides with standard herbicides is recommended.

Table-2. Weed density after application, Number of spike m^{-2}, Number of grains $spike^{-1}$ and Grain yield ($t\ ha^{-1}$) as affected by different herbicidal applications.

Herbicides	Density after application of herbicides	Number of spikes m^{-2}	Number of grains $spike^{-1}$	Grain yield ($t\ ha^{-1}$)
Weedy check	250.5 a	236.3 e	44.9 g	2.133 c
Rocket15 WP	70.0 b	261.1 cde	51.2 defg	2.800 bc
Rocket15 WP	60.25 bc	260.5 cde	56.8 bcd	2.266 c
Rocket15 WP	71 b	243.9 de	49.7 efg	2.400 c
Rocket75WDG	45.75 cd	272.1 a-e	53.0 cdef	2.666 bc
Tribenuron-methyl 75 WDG	60.75 bc	265.5 b-e	48.2 fg	2.533 c
Logran Extra 64 WDG	28.50 de	286.5 abc	58.4 abc	3.600 ab
Buctril-M4 EC	18.75 e	302.1 ab	60.6 ab	3.867 a
Isoproturon 50 WP	55.25 bc	262.4 cde	55.2 bcde	2.398 c
Affinity 50 WP	18.25 e	309.8 a	63.90 a	4.133 a
Agritox 50DF	68 bc	276.8 a-d	50.0efg	2.266 c
Aim 40WP	56.25 bc	250.4 cde	53.4 cdef	2.533 c
$LSD_{0.05}$	22.35	38.29	6.67	0.967

Means not followed by the same letter (s) in the respective category are significantly different at LSD test at 5 % level of probability

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