



Asian Journal of Plant Sciences

ISSN 1682-3974

science
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Efficacy of Different Herbicides for Controlling Broadleaf Weeds in Wheat

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Abstract: Field study was conducted to investigate the effectiveness of different herbicides against broadleaf weeds. Different herbicides significantly effected weeds density m^{-2} , number of broadleaf weeds m^{-2} , number of tillers m^{-2} , number of spikelets spike^{-1} , number of grains spike^{-1} , 1000-grains weight (g), biological yield (kg ha^{-1}) and grain yield (kg ha^{-1}). For controlling weeds, logran extra proved to be the best, giving 17.25 weeds m^{-2} as compared to 80.25 in weedy check plots. Similarly, maximum grain yield (3929 kg ha^{-1}) was recorded in logran extra treated plots followed by plots receiving stomp and alkanak with grain yield of 3155 and 3111 kg ha^{-1} , respectively. Minimum yield (1870 kg ha^{-1}) was recorded in weedy check plots.

Key words: Herbicides, broadleaf weeds, wheat

Introduction

The entire world depends upon the wheat production, as it is a major source of food. As a staple food, in Pakistan it meets the major dietary requirements. Besides food, wheat is also used for livestock and poultry feed. It is also known as the king of the cereals. Wheat supplies about 73% of the calories and protein of the average diet (Heyne, 1987). In Pakistan, total area under wheat crop during 1999-2000 was 8.46 million ha with grain production of 21.07 million tons and average yield of 2491 kg ha^{-1} (Anonymous, 2000). In Pakistan, wheat production per unit area is still very low then its potential yield, although Pakistan is among the top ten producers of wheat in the world average yield of wheat in Pakistan does not go beyond 30-35% of its optimum potential (Sarwar and Nawaz, 1985).

Among other factors responsible for low yield, weed reduces growth, yield and quality of the produce. The importance of weed infestation has been recognized since long time and control of weeds is a major component of management in the crop production system (Young and Ogg, 1994). Weeds cause one of the biggest problems in agriculture. They use the soil fertility, available moisture, nutrients and compete for space and sunlight with the crop plants which result in yield reduction. Weeds also deteriorate the quality of farm produce and hence reducing the market value. The losses on annual basis in wheat amount to more than 28 billion at national level and 2 billion in NWFP (Hassan and Marwat, 2001).

In view of the broadleaf weeds problem in wheat, this study was conducted to investigate the effectiveness of different herbicides for controlling weeds in wheat crop. The objectives were: to find out most economical herbicides for controlling broadleaf weeds and to study the response of wheat to the different herbicides.

Materials and Methods

Field study was conducted in Malkandher Research Farm, NWFP Agricultural University, Peshawar during the rabi season 2001-02. The experiment was laid out in randomized complete block (RCB) design with four replications. There were nine treatments in each replication with plot size $1.4 \times 5 \text{ m}^2$ and the row to row distance was maintained at 20 cm. The Ghaznavi- 98 variety was used at the rate of 120 kg ha^{-1} , on 22nd November, 2001. Standard agronomic practices were followed during the course of the experiment. The following treatments were included in the study:

Trade names	Common names	Time of application	Dose (kg a.i. ha^{-1})
Stomp	Pendimethalin	Pre-emergence	1.00
2,4-D 72 EC	2,4-D ester	Post-emergence	0.81
Logran extra 64 WG	Turbuturon + trisulfuron	Post-emergence	0.16
Buctril-M 40 EC	Bromoxynil + MCPA	Post-emergence	0.50
Agritox 50 DF	MCPA	Post-emergence	0.63
Sencor 70 WP	Metabenzthizoron	Pre-emergence	0.20
Boxer 80 EC	Prosulfocarb	Post-emergence	2.50
Boxer 80 EC	Prosulfocarb	Post-emergence	3.00
Boxer 80 EC	Prosulfocarb	Post-emergence	2.80
Alkanak 75 WP	Isoproturon+ Metasulfuron	Post-emergence	0.94
Weedy check	-----	-----	-

Data were recorded on the weeds density m^{-2} , number of broadleaf weeds m^{-2} , number of tillers m^{-2} , plant height (cm) at maturity, number of spikelets spike^{-1} , number of grains spike^{-1} , 1000-grains weight (g), biological yield (kg ha^{-1}) and grain yield (kg ha^{-1}).

Results and Discussion

Weeds density (m^{-2}): Analysis of the data showed that weed density (m^{-2}) was significantly ($P < 0.01$) affected by various herbicidal treatments (Table 1). Maximum number

Table 1: Effect of different herbicidal treatments on broadleaf weeds, yield and yield components of wheat

Treatments	Weeds density (m ⁻²)	Broadleaf weeds (m ⁻²)	Number of tillers m ⁻²	Plant height (cm)	Number of spikelets spike ⁻¹	Number of grains spike ⁻¹	1000 grains weight (g)	Biological yield (kg ha ⁻¹)	Grain yield (kg ha ⁻¹)
Stomp	40.50cd	39.00cd	316.5ef	72.00	15.52b	39.05e	31.50c-e	5228cd	3111b
2,4-D	56.25bc	51.75cb	219.0	71.70	15.63cd	38.67e	32.50b-e	4720b	1506f
Logran extra	17.25e	12.00e	466.5a	71.75	17.45ab	56.20a	40.75a	8998a	3929a
Buctril-M	28.50de	24.75de	322.0ef	71.67	16.73bc	48.25cd	37.50ab	6326b-d	3026bc
Agritox	43.50cd	38.25cd	357.5cd	71.45	17.48ab	51.45a-c	31.00de	6531bc	1923d-f
Sencor	62.25ab	57.75ab	340.0cd	71.87	17.48ab	47.88cd	32.25d-e	4927cd	2268de
Boxer	36.00ab	33.00cd	367.0de	72.00	17.98a	49.67b-d	32.75b-e	7637ab	3105b
Boxer	54.00bc	48.75bc	412.0cd	72.32	17.98a	56.30a	35.50a-d	7579ab	2489cd
Boxer	36.75de	33.75cd	359.5d	72.02	17.83ab	54.17ab	36.75a-c	4558bc	1894d-f
Alkanak	29.25de	26.25de	383.5dc	71.85	17.85a	44.70d	34.25b-d	7311ab	3155b
Weedy check	80.25a	72.75a	328.5ef	71.75	15.10d	36.72e	28.50e	4882cd	1870ef
LSD (0.05)	20.34	19.97	34.40	NS	1.10	5.10	5.69	1784	616.2

NS = Non-significant

Means not followed by the same letters are significantly different at 0.05 level of significance

of weeds (80.25 m⁻²) was recorded in weedy check plots and minimum number of weeds (17.25 m⁻²) was recorded in plots treated with logran extra. However, all other herbicides were statistically different from each other in controlling weeds. Because logran extra is broadleaf killer. So maximum number of broadleaf weeds was controlled. Similar results were reported by Phogate *et al.* (1991).

Number of broadleaf weeds m⁻²: The data (Table 1) showed that different herbicidal treatments had significant (P<0.01) effect on broadleaf weeds m⁻². Maximum (72.75) broadleaf weeds m⁻² were recorded in weedy check plots while minimum (12.0) were recorded in logran extra treated plots. Buctril, agritox and alkanak were equally effective against broadleaf weeds. Similar results were reported by Khan *et al.* (2002). They reported that all the broadleaf weed killers effectively controlled broadleaf weeds.

Number of tillers m⁻²: Statistical analysis of the data showed that number of tillers m⁻² was significantly affected by different herbicides (Table 1). The data revealed that maximum (466.5) tillers m⁻² was recorded in logran treated plots and minimum (316.5) tillers m⁻² was recorded in stomp treated plots. However, it was statistically similar to plots receiving 2,4-D, buctril-M and weedy check. All other herbicidal treatments were comparable with each other. Sohail *et al.* (1993) and Baldha *et al.* (1988) in analogy with those report these results. They reported that application of herbicides the number of tillers m⁻², significantly. Qureshi *et al.* (2002) also reported similar results. They reported that number of tillers m⁻² were significantly with the application of herbicides.

Number of spikelets spike⁻¹: Different herbicidal treatments in wheat showed that maximum (17.98) spikelets spike⁻¹ were recorded in each boxer treated plots and minimum (15.10) spikelets spike⁻¹ were recorded in

weedy check plots. However, all other treatments were statistically comparable to each other. Similar results were reported by Khan *et al.* (1999).

Plant height (cm): The wheat plant height (cm) at harvest maturity was found statistically non significant (Table 1). However, maximum plant height (72.32 cm) was recorded in boxer 80 EC @ 10.7 ml ha⁻¹ treated plots closely followed by boxer 80 EC @ 8.7 ml ha⁻¹ and stomp 330EC by producing 72.0 cm taller plants each. The minimum plant height of 71.45 cm was produced by agritox 50 DF. Plant height was somewhat similar in all the remaining treatments. The somewhat similar plant heights were probably due to the hereditary character of the wheat cultivar Ghaznavi-98. The results are corroborated by the work of Khalil *et al.* (1993). They reported that plant height was not effected by the herbicidal application.

Number of grains spike⁻¹: Data regarding number of grains spike⁻¹ showed that different herbicides had significant effect on number of grains spike⁻¹ (Table 1). Maximum (56.3) grains spike⁻¹ was recorded in boxer at high rate application and minimum number of grains spike⁻¹ was recorded in weedy check plots. All other treatments were comparable to each other. The reason of increasing number of grains was attributed to the effective weed control in those treatments. The wheat crop efficiently utilized all the available resources. Khalil *et al.* (2000) and Qureshi *et al.* (2002) in analogy with those report these results. They reported that herbicidal treatments significantly increased number of grains spike⁻¹.

1000 grains weight (g): Statistical analysis of the data revealed that 1000 grains weight was significantly effected by different herbicidal treatments (Table 1). The data revealed that maximum (40.75 and 37.50 g) 1000 grains weight was recorded in logran and buctril treated plots, respectively. While minimum (28.50 g) 1000 grains weight

was recorded in weedy check plots. The increased grain weight is attributed to the availability of resources to the wheat plant. Sohail (1993) reported similar results and Marinkovic *et al.* (1997) also reported the same results and concluded that broadleaf herbicides significantly increased the 1000 grains weight.

Biological yield (kg ha^{-1}): It is evident from results that the biological yield of wheat was significantly effected by different herbicidal treatments. Maximum (8998 kg ha^{-1}) biological yield was recorded in logran extra treated plots followed by boxer @ 8.75 ml ha^{-1} and boxer @ 10.5 ml ha^{-1} , which produced 7637 and 7589 kg ha^{-1} , respectively. Minimum (4720 and 4882 kg ha^{-1}) biological yield was observed in 2,4-D and weedy check plots, respectively. The increase in biological yield in boxer and logran treated plots is due to the effective control of weeds. Thus the crop plants efficiently used the available resources. Tanveer *et al.* (1999) and Sohail (1993) reported similar results.

Grain yield (Kg ha^{-1}): The data (Table 1) regarding grain yield of wheat showed that different herbicidal treatments significantly effect grain yield of wheat. Maximum (3929 kg ha^{-1}) grain yield was recorded in logran treated plots followed by alkanak, stomp and boxer @ 8.75 ml ha^{-1} , which produced 3155 , 3111 and 3105 kg ha^{-1} grain yield, respectively. Minimum (1506 and 1870 kg ha^{-1}) grain yield was recorded in 2,4-D and weedy check plots. The increase in grain yield in the herbicides treated plots were probably due to the efficient weed control and thus the crop was efficiently flourished and utilized all the available resources. Hashim *et al.* (2002) and Montazeri (1994) in analogy with those, report these results. They reported that herbicidal treatments significantly increased the grain yield in wheat.

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