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WEED MANAGEMENT IN WHEAT (*TRITICUM AESTIVUM* L.)

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Abstract

A field experiment was conducted to study the efficacy of different herbicides in wheat. The data revealed that spraying of sulfosulfuron @ 25 g a.i. ha^{-1} registered significantly lower weed population and dry matter of weeds than other treatments. The same treatment also registered statistically higher weed control efficiency (80.50%) than rest of the weed control treatments. Among weed control treatments spraying of sulfosulfuron @ 25 g a.i. ha^{-1}, recorded statistically higher grain and straw yield of 37.10 and 47.88 q ha^{-1}, respectively. The maximum net returns of Rs. 27005 was recorded with $\mathbf{T}_5$ i.e. application of sulfosulfuron @ 25 g a.i. ha^{-1}, which was significantly more than rest of the treatments except $\mathbf{T}_7$ *i.e.* application of metribuzin @ 175 g a.i. ha^{-1} and $\mathbf{T}_2$ *i.e.* weed free check, which was found at par with each other. The higher value benefit cost ratio of 1.91 was obtained with application of sulfosulfuron @ 25 g a.i. ha^{-1}.

Key words : Wheat, weed management, yield, economics**.**

Introduction

Wheat (*Triticum aestivum* L.) is the second most important crop after rice in India. The studies conducted in different places in India showed that continuous use of isoproturon has led to development of resistance in *Phalaris minor* due to release of cytochrome P450 mono-oxygenase enzyme in wheat crop (Walia *et al.*, 1997). Thus, application of new herbicides like sulfosulfuron, metribuzin, isoproturon and 2, 4-D alone and with combination effectively control both grassy as well as broad leaved weeds in wheat (Bharat and Kachroo, 2010). However, conclusive information is not available on relative efficacy of such herbicides and economics of different weed control methods. Keeping these in view, the present investigation was planned.

Materials and Methods

The field experiment was conducted at Agronomy Farm, College of Agriculture, Pune during *rabi* 2009-10. The experiment with nine treatments was laid out in Randomized Block Design with three replications. The nine treatments consisted of weedy check, weed free check, hand weeding at 30 DAS, post-emergence application of isoproturon @ 1000 g a.i. ha^{-1}, sulfosulfuron @ 25 a.i. ha^{-1}, 2, 4-D @ 750 g a.i. ha^{-1}, metribuzin @ 175 g a.i. ha^{-1}, isoproturon @ 500 g a.i. + 2, 4-D @ 375 g a.i. ha^{-1} and sulfosulfuron @ 12.5g a.i. + 2, 4-D 375g a.i. ha^{-1} at 30 DAS. The wheat variety *Trimbak* (NIAW-301) was sown @ 125 kg seed ha^{-1} at a spacing 22.5 cm between the lines, on 30th November, 2009 and harvested on 20th March, 2010. The soil of experiment field was clay loam in texture, low in available nitrogen, medium in phosphorous and high in available potassium. A full dose of FYM, phosphorus and potassium was applied as a basal application. The nitrogen was applied in two splits, ½ at sowing and ½ at after first irrigation (22 DAS). As per the treatments post-emergence herbicides were sprayed at 30 DAS through knapsack sprayer with flat fan nozzle using 500 litres of water ha^{-1}. Observation on weed population, and dry matter of weeds were recorded in each plot from 1m x 1m quadrant. The data of weed population and dry matter of weeds were subjected to square root transformation using formula $\sqrt{x+0.5}$, while

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weed control efficiency and weed index were transformed into angular transformation before statistical analysis.

Results and Discussion

The weed population differed significantly among various weed control treatments under study. At harvest, spraying of sulfosulfuron @ 25 g a.i. ha^{-1} registered significantly lower weed population (8.3 m^{-2}), whereas, weedy check recorded significantly highest weed population (42.6 m^{-2}) than remaining treatments. The significant lower weed population in application of sulfosulfuron @ 25 g a.i. ha^{-1} might be due to effective control of both grassy and broad leaved weeds. The significantly lower dry matter of weeds was recorded in treatment of application of sulfosulfuron @ 25 g a.i. ha^{-1} (4.13 g m^{-2}) than rest of the treatments; however, it was at par with hand weeding at 30 DAS. Kumar *et al.* (2003) reported that reduced dry matter of various grasses and broad leaved weeds were due to application of sulfosulfuron might be due to reduced weed population,

Table 1 : Mean weed population, dry matter of weed, weed control efficiency and weed index and grain and straw yield as influenced by different treatments.

Treatment	Weed population (m^{-2})	Weed dry matter (g m^{-2})	WCE (%)	Weed index (%)	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})
T_1 - Weedy check	6.56* (42.6**)	28.65	-	37.80	25.10	28.96
T_2 - Weed free check	0.70 (0.0)	0.0	100* (90**)	0.0	40.38	53.58
T_3 - Hand weeding at 30 DAS	3.28 (10.3)	5.42	75.80 (60.54)	11.46	36.13	44.91
T_4 - Isoproturon @ 1000 g a.i. ha^{-1} PE at 30 DAS	4.05 (16.0)	15.03	62.51 (52.24)	21.60	31.63	37.18
T_5 - Sulfosulfuron @ 25 g a.i. ha^{-1} PE at 30 DAS	2.96 (8.3)	4.13	80.50 (63.81)	8.00	37.10	47.88
T_6 - 2, 4 - D @ 750 g a.i.ha^{-1} PE at 30 DAS	3.43 (11.3)	7.35	72.56 (58.43)	15.00	34.21	43.15
T_7 - Metribuzin @ 175 g a.i. ha^{-1} PE at 30 DAS	3.18 (9.6)	6.23	77.33 (61.56)	11.18	35.90	44.41
T_8 - Isoproturon @ 500 g a.i. + 2,4-D @ 375 g a.i. ha^{-1} PE at 30 DAS	3.58 (12.3)	9.20	71.08 (58.55)	14.82	33.81	42.46
T_9 - Sulfosulfuron @ 12.5 g a.i. + 2,4-D @ 375 g a.i. ha^{-1} at 30 DAS	3.71 (13.3)	12.23	68.73 (56.00)	17.49	33.26	38.86
C.D. at 5%	0.16	1.29	1.75	3.53	1.25	1.77

* Original values, ** Transform values.

Table 2 : Mean cost of cultivation, gross and net monetary returns and benefit cost ratio as influenced by different treatments.

Treatment	Cost of cultivation (Rs. ha^{-1})	Gross monetary returns (Rs. ha^{-1})	Net monetary returns (Rs. ha^{-1})	Benefit cost ratio
T_1 - Weedy check	28501	38229	9728	1.34
T_2 - Weed free check	36235	61646	25411	1.70
T_3 - Hand weeding at 30 DAS	31118	54764	23646	1.76
T_4 - Isoproturon @ 1000 g a.i. ha^{-1} PE at 30 DAS	29373	48193	18820	1.64
T_5 - Sulfosulfuron @ 25 g a.i. ha^{-1} PE at 30 DAS	29601	56607	27005	1.91
T_6 - 2, 4 - D @ 750 g a.i. ha^{-1} PE at 30 DAS	29013	52321	23308	1.80
T_7 - Metribuzin @ 175 g a.i. ha^{-1} PE at 30 DAS	29339	54738	25400	1.86
T_8 - Isoproturon @ 500 g a.i. + 2,4-D @ 375 g a.i. ha^{-1} PE at 30 DAS	29192	51574	22382	1.76
T_9 - Sulfosulfuron @ 12.5 g a.i. + 2,4-D @ 375 g a.i. ha^{-1} at 30 DAS	29306	50677	21371	1.73
C.D. at 5%	-	1811	1811	-

which resulted lower dry matter of weeds. At harvest, spraying of sulfosulfuron @ 25 g a.i. ha^{-1} registered statistically higher weed control efficiency (80.50%) than rest of the weed control treatments. The weed index was the lower in treatment $\mathbf{T_5}$ *i.e.* application of sulfosulfurn @ 25 g a.i. ha^{-1} (8.0) among weed control treatments, however, it was at par with $\mathbf{T_3}$ *i.e.* hand weeding at 30 DAS and $\mathbf{T_7}$ *i.e.* application of metribuzin @ 175 g a.i. ha^{-1}. Dawson *et al.* (2008) reported that minimum values of weed dry weight and maximum values of weed control efficiency were registered with sulfosulfuron @ 25 g ha^{-1} followed by isoproturon + 2,4-D and isoproturon alone.

The maximum and significantly higher grain and straw yield of 40.38 and 53.58 q ha^{-1}, respectively were recorded with weed free check than rest of the treatments. The second best treatment was spraying of sulfosulfuron @ 25 g a.i. ha^{-1}, which recorded statistically higher grain and straw yield of 37.10 and 47.88 q ha^{-1}, respectively than remaining treatments, however, grain yield was found to be at par with $\mathbf{T_3}$ and $\mathbf{T_7}$. The higher values of grain yield with these treatments may be ascribed to marked decrease weed population and weed dry weight and thereby better growth and increased the productive tillers and yield attributes. Singh *et al*. (2009) found that application of sulfosulfuron (25 g ha^{-1}) have a significant impact on growth and yield attributes, which resulted higher grain yield of 3.53 t ha^{-1} and being at par with one hand weeding at 30 DAS.

The cost of cultivation was higher with weed free check (Rs. 36,235 ha^{-1}). This was closely followed by one hand weeding at 30 DAS (Rs. 31,118 ha^{-1}). The weed free check gave maximum gross monetary returns of Rs. 61,646 ha^{-1}, which was significantly superior over rest of the treatments. The next best treatment was spraying of sulfosulfuron @ 25 g a.i. ha^{-1}, which gave maximum and statistically higher gross monetary returns of Rs. 56,607 ha^{-1} than all other treatments. The maximum net returns of Rs. 27005 was recorded with $\mathbf{T_5}$ *i.e.* application of sulfosulfuron @ 25 g a.i. ha^{-1}, which was significantly more than rest of the treatments except $\mathbf{T_7}$ *i.e.* application of metribuzin @ 175 g a.i.ha^{-1} and $\mathbf{T_2}$ *i.e.* weed free check, which was found at par with each other. The higher value benefit cost ratio of 1.91 was obtained with application of sulfosulfuron @ 25 g a.i. ha^{-1}. The minimum benefit cost ratio was registered in weedy check (1.34). Yadav *et al.* (2008) reported that among the weed control treatments, application of sulfosulfuron @ 25 g a.i. ha^{-1} gave significantly higher net monetary returns and benefit cost ratio. Similar finding were reported by Wani *et al.* (2005), Dawson *et al.* (2008) and Singh *et al.* (2009).

Thus, by large, from economic point of view, it can advocated that the spraying of sulfosulfuron @ 25 g a.i. ha^{-1} as a post-emergence herbicide in wheat crop could be used for obtaining higher yield, net monetary returns and benefit : cost ratio.

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