Short communication

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Effect of post-emergence herbicides on weeds and productivity of wheat

S.B. Vyavahare and R.L. Bhilare*

Mahatma Phule Krishi Vidyapeeth, College of Agriculture, Pune, Maharashtra 411 005

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Wheat (*Triticum aestivum* L.) is second most important staple crop after rice. It is predominant *Rabi* season crop of northern, central and upper peninsular region of the country. Among the various factors responsible for low productivity of wheat, weed infestation during early stages of growth is one of the major factors. Due to initial slow growth, it provides a congenial environment for weed growth. In wheat generally, first 30 to 40 days are highly critical from the point of crop weed competition. Mechanical weeding is costly, time consuming and sometimes not possible due to non-availability of labour. Under such a situation, chemical weed control offers a better alternative to manual weeding during early stage. Since, meagre information is available on the comparative efficiency of different herbicides for weed control, weeds before critical period of crop–weed competition.

An experiment was conducted during *Rabi* season of 2010-11 at Agronomy Farm, College of Agriculture, Pune. The experiment was laid out in randomized block design with three replications. The soil of the experimental field was clayey loam and low in total nitrogen, medium in available phosphorus and high in potassium. The ten treatments comprised different weed control methods, *viz*. T_1- One hand at 20 DAS and one hoeing at 40 DAS, T_2- Isoproturon 1000 g/ha at 30 DAS, T_3- Isoproturon at 750 g/ha + 2,4-D 563 g/ha at 30 DAS, T_4– Sulfosulfuron 22 g/ha at 30 DAS, T_5– Sulfosulfuron 16.5 g/ha + 2,4-D 563 g/ha at 30DAS, T_6– Metsulfuron methyl 6 g/ha at 30 DAS, T_7- Metsulfuron methyl 4.5 g/ha + 2,4-D 563 g/ha at 30 DAS and T_8- 2, 4-D 750 g/ha at 30 DAS T_9– Unweeded control, T_{10}- Weedy free check. The crop was fertilized with 120 kg N, 60 kg P_2O_5 and 40 kg K_2O/ha. A full dose of phosphorus and potassium were 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 per ha. The variety Triambak was sown at 22.5 cm apart by using seed rate of 125 kg/ha.

***Corresponding author:** bhilareraj28@gmail.com

The data with respect to weed population/m^2, dry matter of weed, weed control efficiency and weed index as affected by different treatments are represented in Table 1. The unweeded control registered significantly higher weed population (4.1/m^2) and dry matter of weeds *i.e.* 18.4 g/m^2 due to resulting from the luxuriant growth of the weeds in absence of any weed control treatments. Among the weed control treatments, application of sulfosulfuron 16.5 g/ha + 2,4-D 563 g/ha registered significantly lower weed population (7.6/m^2) and dry matter of weeds (3.1 g/m^2) than rest of the treatments. It was closely followed by treatment T_7 *i.e.* metsulfuron-methyl 4.5 g/ha + 2,4-D 563 g/ha and T_4 *i.e.* application of sulfosulfuron 22 g/ha. The significantly lower weed population and dry matter of weed in application of sulfosulfuron at 16.5 g/ha + 2,4-D 563 g/ha might be due to excellent efficacy against all grassy and non-grassy type of weeds. Kumar *et al.* (2003) found that sulfosulfuron reduced total population and dry weight of various grass and broad leaved weeds and it might be due to reduced weed population, which resulted lower dry matter of weeds. Bharat and Kacharoo (2010) observed that tank mix application of sulfosulfuron + 2,4-D (25 + 500 g/ha) or alone sulfosulfuron (25 g/ha) reduced the weed population.

The data presented in Table 1, revealed that spraying of sulfosulfuron 16.5 g/ha + 2,4-D 563 g/ha) observed significantly more weed control efficiency of 81.27% than rest of the treatments. The application of 2,4-D alone (T_8) showed statistically lower weed control efficiency (54.92%) than other herbicidal treatments. The statistically highest weed index was observed under unweeded control (34.90%) than rest of the treatments. Among weed control treatments, application of sulfosulfuron 16.5 g/ha + 2,4-D 563 g/ha resulted into statistically lowest weed index (7.84%), however, it was at par with treatment T_7 (metsulfuron methyl 4.5 g/ha + 2,4-D 563 g/ha) and T_6 (sulfosulfuron 22 g/ha). The significantly highest weed index observed in unweeded control treatment (34.90%), indicating more yield reduction due to more weed competition and unchecked weed growth. Pandey *et al*. (2005) reported that sulfosulfuron (25 g/

Table 1. Mean weed population, dry matter weed control efficiency and weed index as influenced by different treatments

Treatment	Weed population/m^2	Weed dry matter (g/m^2)	WCE (%)	Weed index (%)
T_1- One hand weeding at 20 DAS and one hoeing at 40 DAS	3.2* (10.0)**	4.7	60.2 (75.35)	16.4
T_2- Isoproturon 1000 g/ha at 30 DAS	3.8 (14.6)	6.4	53.1 (64.03)	18.6
T_3- Isoproturon 750 g + 2,4-D 563 g/ha at 30 DAS	3.9 (15.0)	6.8	52.6 (63.04)	18.4
T_4- Sulfosulfuron 22 g/ha at 30 DAS	3.3 (10.6)	4.7	59.3 (73.89)	12.3
T_5- Sulfosulfuron 16.5 g/ha + 2,4-D 563 g/ha at 30 DAS	2.8 (7.6)	3.1	64.4 (81.27)	7.8
T_6- Metsulfuron-methyl 6 g/ha at 30 DAS	3.4 (11.0)	5.1	58.6 (72.88)	14.3
T_7- Metsulfuron-methyl 4.5 g + 2,4-D 563 g/ha at 30 DAS	3.2 (9.6)	3.5	60.9 (76.34)	11.9
T_8- 2,4-D 750 g/ha at 30 DAS	4.3 (18.3)	6.4	47.8 (54.92)	20.0
T_9- Unweeded control	6.4 (40.6)	18.4	0	34.9
T_{10}- Weed free check	0.7 (0.0)	0.0	90.0 (100)	0.0
LSD (P=0.05)	0.1	0.4	1.36	5.57

*Transformed values ($\sqrt{x+0.5}$); **Original values

Table 2. Mean length of spike, number of spikelets/spike, number of grains/spike, grain weight/plant and thousand grain weight, grain and straw yield as influenced by different treatments

Treatment	Length of spike (cm)	No. of spikelets /spike	No. of grains /spike	Grain weight /plant (g)	1000 - seed weight (g)	Grain yield (t/ha)	Straw yield (t/ha)
T_1- One hand weeding at 20 DAS and one hoeing at 40 DAS	8.4	15.7	40.2	7.2	39.1	4.0	5.6
T_2- Isoproturon 1000 g/ha at 30 DAS	7.8	14.7	38.9	6.3	37.8	3.9	5.0
T_3- Isoproturon 750 g + 2,4-D 563 g/ha at 30 DAS	8.1	15.2	39.9	7.1	38.5	3.9	5.1
T_4- Sulfosulfuron 22 g/ha at 30 DAS	8.4	15.5	42.0	7.5	38.7	4.2	5.7
T_5- Sulfosulfuron 16.5 g/ha + 2,4-D 563 g/ha at 30 DAS	8.6	16.4	44.9	7.7	39.8	4.4	5.9
T_6- Metsulfuron-methyl 6 g/ha at 30 DAS	8.1	15.5	41.6	6.5	38.7	4.1	5.7
T_7- Metsulfuron-methyl 4.5 g + 2,4-D 563 g/ha at 30 DAS	8.4	15.8	42.1	7.5	39.3	4.3	5.8
T_8- 2,4-D 750 g/ha at 30 DAS	7.3	14.8	37.9	6.5	37.1	3.8	5.2
T_9- Unweeded control	6.3	13.5	34.3	5.2	35.5	3.1	4.5
T_{10}- Weed free check	9.2	17.5	46.8	8.3	41.5	4.8	6.5
LSD (P=0.05)	0.4	1.1	2.4	0.5	1.5	0.28	0.46

ha) was reduced significant weed count compared with hand weeding and mixture of 2,4-D + isoproturon (0.4 + 0.6 kg/ha) and also recorded highest weed control efficiency, which may be due to broad spectrum control of both narrow and broad leaved weeds.

The yield attributes presented in Table 2 were differed significantly by various weed control treatments. The statistically higher yield attributes, *viz*. length of spike, number of spikelets/spike, number of grains/spike, grain weight/plant and thousand seed weight were recorded in weed free check than rest of the weed control treatments except treatment T_7, where, it was found at par for number of grains/spike. The application of sulfosulfuron 16.5 g/ha + 2,4-D 563 g/ha statistically outyielded the length of spike and grain weight/plant than T_3, T_2 and T_8 however, it was at par with treatments T_1, T_4 and T_7. The same treatment (T_5) also registered statistically higher number of spikelets/spike (16.4) than T_3, T_8, T_2 and T_9, however, it was at par with treatments T_7, T_1, T_4 and T_6. The number of grains/spike was statistically higher with T_{10} and it showed significant superiority over all other treatments except T_7 where it was at par. The application of sulfosulfuron 16.5 g/ha + 2,4-D 563 g/ha (T_5) showed its significant superiority over rest of the treatments and it was found at par with treatments T_1, T_7, T_6, T_4, and T_3 for thousand seed weight. The statistically minimum values of yield attributes were obtained in unweeded control (T_9). It could be seen from the data

in Table 2 that weeds free check (T_{10}) produced maximum grain yield (4.8 t/ha) and straw yield (6.5 t/ha), which were significantly superior over rest of the treatments. Among the weed control treatments, the best treatment was T_5 *i.e.* spraying of sulfosulfuron 16.5 g/ha + 2,4-D 563 g/ha, which recorded maximum grain and straw yield. Whereas, unweeded control (T_9) observed significantly the lowest grain and straw yield than rest of the treatments.

The increase in yield attributes might be because of less weed competition, significant reduction in weed population and weed biomass which may be enhanced N, P and K uptake by crop besides efficient use of moisture, space and light thereby resulting in significant increase in yield attributes over unweeded control plots. It has been observed that sulfosulfuron is a broad spectrum herbicide, which controlled both grassy and broadleaved weeds, while, 2,4-D also controlled dicot weeds effectively. Bharat and Kachroo (2010) studied the bioefficacy of herbicides in wheat and revealed that application of sulfosulfuron + 2,4-D produced significantly higher effective tillers/m^2 (66.25), grains/ear (61.67), grain yield (4.78 t/ha) and straw yield (8.45 t/ha) than application of metsulfuron methyl (4 g/ha) and 2,4-D alone (750 g/ha) and unweeded control. The results are conformity with the findings of Bisen *et al.* (2006), Kumar *et al.* 2001, Saini and Angiras (2005), Singh *et al.* 2002, Singh *et al.* (2010) and Yadav *et al.* (2008).

SUMMARY

A field experiment was conducted during *Rabi* season of 2010-11 at College of Agriculture, Pune to study the effect post-emergence herbicides on weeds and productivity of wheat. Among the weed control treatments, application of sulfosulfuron 16.5 g/ha + 2,4-D 563 g/ha registered significantly lower weed population (7.6/m^2), dry matter of weeds (3.1 g/m^2) and significantly more weed control efficiency of 81.27% than rest of the treatments. The same treatment recorded lowest value of weed index. The values of yield attributes were higher in magnitude in weed free check treatment. Among the herbicide treatments, post-emergence application of sulfosulfuron 16.5 g/ha + 2,4-D 563 g/ha recorded higher values of yield attributes, *viz*. length of spike, number of spikelets/spike, number of grains/spike, grain weight/plant and thousand seed weight. Amongst the weed control treatments, application of sulfosulfuron 16.5 g/ha + 2,4-D 563 g/ha recorded maximum grain and straw yield of 4.4 and 5.9 t/ha, respectively as compared to other treatments.

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