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Effect of herbicides to control weeds in wheat

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ABSTRACT

Field experiments was conducted to study the effect of weed control methods on wheat (*Triticum aestivum* L.) during *Rabi* seasons of 2014-15 and 15-16 at Agronomy Research Farm of NDUAT, Kumarganj, Ayodhya (U.P.). Pre-emergence application of pendimethalin + metribuzin (1.0 + 0.175 kg/ha) being *at par* with weed free and pendimethalin (1.0 kg/ha) followed by sulfosulfuron (0.025 kg/ha) significantly reduced the density of weeds as compared to other treatments. Pre-emergence application of pendimethalin + metribuzin (1.0 + 0.175 kg/ha) significantly increased all growth and yield contributing characters, *viz.* plant height, dry matter accumulation, spikelength, grains/spike obtained with weed free. Among different herbicidal treatments, maximum grain and straw yields were recorded under pendimethalin + metribuzin (1.0 + 0.175 kg/ha) (4.22 and 5.70 t/ha, respectively). However, the highest benefit: cost ratio was recorded in weed free (1.97) followed by pendimethalin + metribuzin (1.0 + 0.175 kg/ha) (1.91).

Weed infestation is one of the main causes of low wheat yield not only in India but all over the world, as it reduces wheat yield by 37-50% (Waheed *et al.* 2009). Rice-wheat is one of the most important cropping systems in northern part of the country. The *Phalaris minor* is one of the very serious problems in wheat in this cropping system and sometimes almost 65% crop losses have been reported (Chhokar *et al.* 2008). Broad-leaved weeds (BLWs) are also causing a threat, but their management is comparatively easier and effective, whereas, control of *Phalaris minor* has become a serious challenge. Chemical weed control is a preferred practice due to scare and costly labour as well as lesser feasibility of mechanical or manual weeding in wheat.

Some new ready-mix herbicide, *viz*. sulfosulfuron + metsulfuron (pre-mix), mesosulfuron + iodosulfuron (pre-mix), clodinofop + metsulfuron (pre-mix) must be tested to control many of the weeds in wheat crop because some of broad-leaved weeds BLWs or grassy weeds are not control by applying single herbicide molecule in wheat. Considering this fact in view, a field experiment was conducted during *Rabi* season of 2014-15 and 2015-16 at Agronomy Research farm of N.D. University of Agriculture & Technology, Kumarganj, Ayodhya (U.P.) to study the bio-efficiency of combination of herbicides against complex weed flora and their effect on growth and yield of wheat.

The Field Experiment was conducted during *Rabi* season in 2014-15 and 2015-16 at Agronomy Research Farm, N.D. University of Agriculture & Technology, Kumarganj, Ayodhya. The experimental site was situated in main campus of the university, about 42 km. away from Ayodhya on Raibareli road at $26^0 47'$ N latitude, $82^0 12'$ E longitude and an altitude of 113 meters above mean sea level in North Indo-gangatic plain. The soil of the experimental field was silt loam with medium fertility status (Available Nitrogen – 180, phosphorus -18 and potassium- 260 Kg/ha). The crop was fertilizered with 120 kg N, 60 kg P_2O_5 and 30 kg K_2O/ha. The experiment was laid out in a randomized block design (RBD) with three replications, comprising 12 treatments allocated randomly. Pre-emergence pendimethalin 0.75 kg/ha and 1.0 kg/ha were applied on 3rd day of sowing and post-emergence sulfosulfuron 0.025 kg/ha, clodinafop 0.06kg/ha and sulfosulfuron + metsulfuron 0.03 + 0.002 kg/ha were applied at 30days after sowing (DAS) of crop. Variety (*PBW-502*) of wheat was sown on 9 December 2014-15 and 2015-16. Herbicides were sprayed with the help of manually operated knapsack sprayer fitted with fan nozzle using 600 litres water per hectare. Data on weed density was taken with quadrate measuring 0.5×0.5m placed randomly at four spot to each plot at 60 DAS and harvest stage and weed control efficiency was calculated based on total biomass of weed. The weed data were subjected to square root transformation to normalize the distribution. The data on yield and yield attributes of wheat were recorded at the time of crop harvest.

The herbicidal treatments reduced the weed density significantly over un-weeded control (**Table 1**). Next to weed free, pre-emergence application of pendimethalin + metribuzin 1.0 + 0.175 kg/ha was found most effective to control the weeds as compared to other herbicides. Pre-emergence application of pendimethalin followed by *(fb)* sulfosulfuron (1.0*fb* 0.025 kg/ha) was most effective to control the weeds followed by post-emergence application of sulfosulfuron + metsulfuron 0.03 + 0.002 kg/ha and both were significantly superior to weedy check. The results were in accordance with Nayak *et al.* (2003).

The spectrum of weeds has a bearing on the efficiency of the management practices adopted. Pre-emergence application of pendimethalin + metribuzin 1.0 + 0.175 kg/ha provided the highest weed control efficiency (93.3%) followed by pre-emergence application of pendimethalin followed by sulfosulfuron (1.0 *fb* 0.025 kg/ha, 92.23%). This was mainly due to the lowest weed dry weight under the effects of above treatment. Nayak *et al.* (2003) and Chhipa *et al.* (2005) have also reported increase in weed control efficiency with use of herbicides in wheat.

Weed index is the measure of reduction in yield caused by weed infestation and directly related with weed density and weed dry matter. Pre-emergence application of pendimethalin + metribuzin 1.0 + 0.175 kg/ha recorded the lowest weed index of 5.12 followed by pre-emergence application of pendimethalin *fb* sulfosulfuron (1.0 *fb* 0.025 kg/ha) of 6.99 as compared to weed index of 32.50 with weedy check. This was mainly due to lesser crop weed competition in herbicidal treatment as compared to weedy check within term resulted higher yield vis-à-vis reduce weed index. The results are in agreement with Chhipa *et al.* (2005).

Effect on crop

Different weed control treatments increased the plant height and dry matter accumulation significantly at harvest stage. Tallest plants (92.2 cm) were recorded under weed free which was at par with pre-emergence application of pendimethalin + metribuzin (1.0 + 0.175 kg/ha) and pre- emergence of pendimethalin *fb* sulfosulfuron (1.0 *fb* 0.025 kg/ha) over all rest of the treatment with weedy check plot (**Table 1**). The increase in plant height was due to greater availability of nutrient, which resulted profuse growth of plants at various growth factors. Similar results have also been reported by Satao and Padola (1994). Similar trend was also found in plant dry matter accumulation.

Spike length and no. of grains/spike increased significantly with weed control treatments. The largest spikes length of 8.96 cm was recorded with weed free which was at par with pendimethalin + metribuzin (1.0 + 0.175 kg/ha), pendimethalin *fb* sulfosulfuron (1.0 *fb* 0.025 kg/ha) and sulfosulfuron + metsulfuron (0.03 + 0.002 kg/ha). Amongst different herbicidal treatments, clodinafop 0.06 kg/ha recorded the lowest length of spike (6.94 cm).

The number of grains/spike was found significantly more under all the weed control treatments as compareded to weedy check. Weed

Table 1.Effect of herbicides on weed density and growth parameters at different growth stages (pooled data of two years)

Treatment	Weed density (no./ m^2)		W.C.E. (%)	W.I. %	Plant height at harvest (cm)	Dry matter accumulation (g/m^2) at harvest
	60 DAS	At harvest				
Pendimethalin (0.75 kg/ha)	(92.4)9.67	(51.3)7.23	76.70	25.75	80.5	248
Sulfosulfuron (0.025 kg/ha)	(92.4)9.66	(34.0)5.91	79.32	22.38	82.2	253
Metribuzin (0.21 kg/ha)	(111.7)10.66	(40.7)6.46	78.05	25.39	81.4	251
Clodinafop (0.06 kg/ha)	(97.7)9.93	(46.1)6.86	74.27	26.07	80.4	242
Pendimethalin + metribuzin (1.0 + 0.175 kg/ha)	(50.3)7.16	(19.9)4.57	93.33	5.12	92.2	270
Pendimethalin*fb*sulfosulfuron (1.0 + 0.025 kg/ha)	(56.9)7.61	(22.9)4.88	92.23	6.99	91.2	266
Sulfosulfuron + metsulfuron (0.03 + 0.002 kg/ha)	(65.3)8.14	(25.2)5.12	91.30	11.13	89.4	264
Pinoxaden + metsulfuron (0.06 + 0.004 kg/ha)	(76.7)8.82	(29.3)5.50	89.97	14.06	87.8	262
Mesoulfuron + iodosulfuron (0.012 + 0.0024 kg/ha)	(81.7)9.09	(31.5)5.70	88.77	15.07	86.9	259
Clodinafop + metsulfuron(0.06 + 0.004 kg/ha)	(82.3)9.13	(33.4)5.86	88.15	15.56	85.8	258
Weed free	(0)1.00	(0)1.00	100	0	93.2	272
Un-weeded control	(199.4)14.15	(70.2)8.44	0	32.50	77.7	239
LSD (p=0.05)	5.70	4.64	-		2.6	5

*Values in parentheses are original. **Values transformed by ($\sqrt{x+1}$); WCE: weed control efficiency, WI: weed index

Table 2. Effect of weed control treatments on length of spike, grains/spike and test weight (pool data of two years)

Treatment	Spike length (cm)	No. of grains/spike	Grain yield t/ha	Straw yield t/ha	B:C Ratio
Pendimethalin (0.75 kg/ha)	7.11	34.22	3.30	4.73	1.39
Sulfosulfuron (0.025 kg/ha)	7.25	34.66	3.45	4.92	1.53
Metribuzin (0.21 kg/ha)	7.22	34.40	3.32	4.74	1.45
Clodinafop (0.06 kg/ha)	6.94	33.11	3.29	4.70	1.38
Pendimethalin + metribuzin (1.0 + 0.175 kg/ha)	8.91	40.25	4.22	5.70	1.91
Pendimethalinfbsulfosulfuron (1.0 + 0.025 kg/ha*)*	8.83	39.11	4.13	5.64	1.89
Sulfosulfuron + metsulfuron (0.03 + 0.002 kg/ha)	8.63	36.55	3.95	5.50	1.82
Pinoxaden + metsulfuron (0.06 + 0.004 kg/ha)	8.19	36.33	3.82	5.41	1.74
Mesoulfuron + iodosulfuron (0.012 + 0.0024 kg/ha)	7.64	35.55	3.77	5.35	1.68
Clodinafop + metsulfuron(0.06 + 0.004 kg/ha)	7.86	35.11	3.75	5.33	1.66
Weed free	8.96	40.61	4.44	6.00	1.97
Un-weeded control	6.91	30.00	3.00	4.30	1.28
LSD (p=0.05)	2.00	1.92	0.34	0.47	-

free produced the highest number of 40.6 grains/ spike being at par with pendimethalin + metribuzin at 1.0 + 0.175 kg/ha, pendimethalin *fb* sulfosulfuron at 1.0 + 0.025 kg/ha (40.25 and 39.11, respectively) but significantly superior to the rest of treatments. The lowest grains/spike (30.00) was recorded in weedy check.

The weed control treatments resulted significant increase in grain yield as compare to weedy check (3.0 t/ha). The maximum grain yield of 4.4 t/ha was recorded under weed free plots which remained at par with pre-emergence application of pendimethalin + metribuzin at 1.0 + 0.175 kg/ha (4.22 t/ha) and pre-emergence application of pendimethalin *fb* sulfosulfuron at 1.0 *fb* 0.025 kg/ha (4.13t/ha) (**Table 2**). This Exhibed an increase of grain yield (40.6%) over pre-emergence application of pendimethalin + metribuzin at 1.0 + 0.175 kg/ha and un-weeded control.

It was clearly found that in weed free and sulfosulfuron + metsulfuron at 0.03 + 0.002 kg/ha resulted into significant increase in straw yield as compared to weedy check. The maximum straw yield of 6 t/ha was recorded in weed free followed by pendimethalin + metribuzin at 1.0 + 0.175 kg/ha (5.70 t/ha) and pendimethalin *fb* sulfosulfuron at 1.0 *fb* 0.025 kg/ha (5.64 t/ha) exhibiting an increase of (26.3%) over clodinafop + metsulfuron at 0.06 + 0.004 (4.30 t/ha).

Weed free as well as pendimethalin + metribuzin at 1.0 + 0.175 kg/ha, pendimethalin *fb* sulfosulfuron at 1.0 *fb* 0.025 kg/ha and sulfosulfuron + metsulfuron at 0.03 + 0.002 kg/ha treatment also recorded highest benefit cost ratio of 1.91, 1.89 and 1.82 as compared to weedy check of 1.28, due to higher grain and straw yield to greater extent as compared to lesser increase in cost of cultivation with these treatments. The results are in agreement with Kushwaha and Singh (2000).

It was concluded that pre -emergence application of pendimethalin + metribuzin at 1.0 + 0.175 kg/ha was found most effective in controlling weeds. Pre- emergence application of pendimethalin followed by sulfosulfuron (1.0 *fb* 0.025kg/ha) was equally effective.

REFERENCES

Chhokar RS, Sharma RK, Chauhan DS and Mongia AD. 2008. Evaluation of herbicides against *Phalaris minor* in wheat in north-western Indian plains. *Weed Research* **46**(1): 40–49.

Chippa KG, Pareek RG and Jain NK. 2005. Evaluation of metsulfuron –methyl and sulfosulfuron in combination with other herbicides against weed in wheat. *Haryana Journal of Agronomy* **21**(1): 72–73.

KushwahaBL and Singh PK. 2000. Comparative efficacy and economics of mechanical and chemical weed control in wheat. *Annals of Plant Production Science* **8**(1): 71–75.

Nayak S, Rawat AK and Sharma RS. 2003. Effect of metsulfuron methyl and 2,4-D alone and in combination for control of broad leaf weeds in irrigated wheat. *JNKVV Research Journal* **37**(1): 104–106.

Satao RN and Padola SG. 1994. Effect of weed control on growth and yield of late sown wheat. *Indian Journal of Agronomy* **39**(4): 645–647.

Waheed AR, Qureshi GS, Jakhar and Tareen H. 2009. Weed community dynmics in wheat crop of district Rahim Yarkhan, Pakistan. *Pakistan Journal of Botany* **41**(1): 247–254.