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Effect of Affinity on Wheat and Associated Weeds

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ABSTRACT

Weed control efficacy of Affinity at 1.75 and 2.00 kg ha^{-1} was higher than at 1.5 kg ha^{-1} on *Chenopodium*. Affinity at all the doses was equally effective. Affinity at 2.0 kg ha^{-1} was comparable with isoproturon at 1.33 kg, clodinafop at 60 g and sulfosulfuron at 20 g ha^{-1} with respect to control of *P. minor*. Affinity at higher doses being at par with isoproturon at 1.33 kg ha^{-1}, sulfosulfuron at 25 g ha^{-1} and weed-free treatments yielded significantly more than all other treatments.

INTRODUCTION

Wheat fields in north India have been found to be infested with wide range of weeds including grasses and non-grasses. In rice-wheat system, *Phalaris minor* is maintaining its dominance in wheat crop. Isoproturon was introduced as a very effective and economical herbicide for *P. minor* control in wheat. However, continuous use of isoproturon has resulted in development of resistance in *P. minor* in Haryana and Punjab (Malik and Singh, 1993; Walia *et al.*, 1997). To tackle the problems of resistance to isoproturon, diclofop methyl, tralkoxydim, fenoxaprop-p-ethyl, clodinafop-propargyl and sulfosulfuron were evaluated for their phytotoxicity, weed control spectrum and efficacy in wheat and ultimately fenoxaprop-p-ethyl, clodinafop-propargyl and sulfosulfuron are presently being used for *P. minor* control specially in *P. minor* resistant areas. Continuous use of isoproturon even in those areas where at present we do not have resistant population may result in developing such population. Therefore, there is necessity to make rotational use of alternate herbicides in place of isoproturon. Isoproturon is still being used as effective and economical herbicide for the control of *P. minor* in those areas where isoproturon resistant biotypes do not exist. *Chenopodium album,* one of the major broad leaf weeds in wheat, is controlled by timely application of isoproturon in *P. minor* infested fields. But other weeds like *Melilotus* spp., *Medicago denticulata* and *Lathyrus aphaca* are not controlled by isoproturon alone or tank mixed with 2, 4-D. In such treated wheat areas, the population of these non-grassy weeds is increasing. Therefore, there is necessity of alternative to 2, 4-D which may be effective against non-grassy and compatible with isoproturon. Affinity, a ready mix formulation of isoproturon and carfentrazone-ethyl, was considered as one such possibility. Therefore, there is urgent need to have alternative herbicides which may provide wide range of weed control and at the same time may be rotated with presently available herbicides to avoid further build up of resistant weed population in wheat fields. Keeping these points in view, the present investigation was undertaken to find out weed control spectrum, efficacy and effect on wheat of Affinity at various doses and to compare the new herbicides for *P. minor* control.

Table 1. Effect of treatments on weed density (No. m^{-2}) in wheat at 60 days after sowing (Average of two crop seasons)

Treatment	Dose (Product kg/l ha^{-1})	*P. minor*	*C. album*	*Melilotus* spp.	*M. denticulata*	Others
Affinity	1.50	40	0	14	20	10
Affinity	1.75	7	0	4	6	4
Affinity	2.00	4	0	1	4	4
Isoproturon	1.33	6	2	12	15	4
Isoproturon+ 2, 4-D Na	1.00+ 0.625	33	0	6	10	6
Fenoxaprop	1.00	11	29	20	15	9
Clodinafop	0.400	2	32	24	15	13
Sulfosulfuron	0.032	6	4	8	4	4
Weed-free	-	0	0	0	0	0
Weedy	-	298	24	30	16	12

MATERIALS AND METHODS

A field trial was conducted during winter seasons of 2000-01 and 2001-02 at Crop Research Centre of G. B. Pant University of Agriculture & Technology, Pantnagar, U. S. Nagar (Uttaranchal). The soil of the experimental field was clay loam, medium in organic carbon (0.8%), available phosphorus (18 kg P ha^{-1}) and potassium (266 kg K ha^{-1}). Affinity at various doses i. e. 1.5 kg (isoproturon 750 g a. i.+carfentrazone-ethyl 11.25 g a. i. ha^{-1}), 1.75 kg (isoproturon 875 g a. i. +carfentrazone-ethyl 13.175 g a. i. ha^{-1}), 2.0 kg (isoproturon 1000 g a. i.+carfentrazone-ethyl 115.0 g a. i. ha^{-1}), was evaluated on grassy and non-grassy weeds in wheat and was compared with isoproturon, fenoxaprop-p-ethyl, clodinafop-propargyl and sulfosulfuron at their recommended doses. Experiment with 10 treatments (Table 1) and three replications was laid out in randomized block design. Herbicides were applied as spray using knapsack sprayer fitted with flat fan nozzle at spray volume of 400 l ha^{-1} at 35 days stage. Wheat variety UP 2425 at 100 kg seed ha^{-1} was sown on December 1, 2000 and November 26, 2001. The experimental crop was raised adopting all other recommended package of practices.

Table 2. Effect of treatments on total dry matter production and grain yield of wheat

Treatment	Dose (Product kg/l ha^{-1})	Weed dry weight (g m^{-2}) 60 DAS			Wheat grain yield (kg ha^{-1})		
		2001	2002	Mean	2001	2002	Mean
Affinity	1.50	102.7	98.2	100.4	3675	3712	3694
Affinity	1.75	18.5	15.8	17.2	4875	5000	4938
Affinity	2.00	4.3	3.6	4.0	5025	4995	5010
Isoproturon	1.33	8.7	7.2	8.0	4985	4852	4919
Isoproturon+ 2, 4-D Na	1.00+ 0.625	69.5	71.6	70.6	4415	4285	4350
Fenoxaprop	1.00	52.3	48.7	50.5	4405	4228	4317
Clodinafop	0.400	56.7	53.5	55.1	4420	4300	4360
Sulfosulfuron	0.032	3.6	4.8	4.2	5100	4975	5038
Weed-free	-	0.0	0.0	0.0	5005	5025	5015
Weedy	-	296.2	281.6	288.9	1502	1625	1564
LSD (P=0.05)		12.3	11.2		416	385	-

RESULTS AND DISCUSSION

Effect on Weeds

Experimental field was infested with *P. minor* (78.6%), *C. album* (6.3), *Melilotus* spp. (7.9%), *M. denticulata* (4.1%) and others (3.1%).

There was reduction in the density of all the weeds at various doses of Affinity over weedy check (Table 1). Its efficacy at 1.75 and 2.0 kg ha^{-1} on *P. minor* was higher than at 1.5 kg ha^{-1}. Affinity provided almost complete control of *C. album* at all the doses. On other weeds also efficacy was more at higher doses than at 1.5 kg ha^{-1}. Its efficacy on *P. minor* at 1.75 and 2.0 kg ha^{-1} was comparable with that of isoproturon at 1.0 kg ha^{-1}, clodinafop at 60 g ha^{-1}, fenoxaprop at 100 g ha^{-1} and sulfosulfuron at 25 g ha^{-1} but it had very good control on non-grassy weeds in comparison to clodinafop and fenoxaprop. Effect of Affinity and other treatments on total weed dry matter production was similar to that of weed density (Table 2).

Effect on Crop

Weed competition in weedy plots caused more than 68.8% reduction in the grain yield of wheat (Table 2). There was significantly more grain yield in all the treatments in comparison to weedy check. Affinity at 1.75 and 2.00 kg ha^{-1}, being at par, yielded significantly higher than at 1.50 kg ha^{-1}. There were non-significant variations in the grain yields obtained due to higher dose of Affinity, isoproturon at 1.33 kg ha^{-1}, sulfosulfuron at 25 g ha^{-1} and weed-free treatment. Fenoxaprop and clodinafop yielded less than these treatments due to their poor efficacy on non-grassy weeds. Affinity caused scorched spots on the top leaf of wheat four days after spraying. This symptom was not observed on the other leaves. The intensity of scorching was very low.

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