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Evaluation of Prometryn and Metribuzin against Weeds in Wheat (*Triticum aestivum* L.)

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ABSTRACT

Key weed species in the experimental field were *Phalaris minor, Avena ludoviciana, Chenopodium album, Melilotus indica, Coronopus didymus* and *Convolvulus arvensis*. On an average, prometryn at 2.0 kg ha^{-1} provided 73-82% control of grassy as well as broad leaf weeds. Efficacy of prometryn against grassy weeds was higher than isoproturon but lower than clodinafop and sulfosulfuron. Inspite of good efficacy of prometryn against weeds, wheat grain yield and number of spikes were significantly less than clodinafop and sulfosulfuron due to toxicity to crop.

INTRODUCTION

Wheat is the important cereal crop of Haryana. In areas other than rice-wheat cropping system, wild oat (*Avena ludoviciana* L.) has been reported to be a most prominent and persistent grassy weed alongwith mixed infestation of little seed canary grass (*Phalaris minor* Retz.) and other broad leaf weeds. Isoproturon was introduced as a very effective and economical herbicide for the control of little seed canary grass in wheat but its spectrum is narrow and weed control efficacy is low with respect to wild oat and non-grassy weeds.

P. minor in some parts of Haryana and Punjab has developed resistance to isoproturon. To tackle the resistance problem, fenoxaprop-p-ethyl, sulfosulfuron and clodinafop-propargyl have been recommended and are being used by the farmers on large scale. Fenoxaprop and clodinafop are very specific to *P. minor* and *A. ludoviciana* control but are ineffective against broad leaf weeds of wheat. Continuous use of these herbicides for 2-3 seasons has resulted in tremendous increase in density of broad leaf weeds especially *Rumex retroflexus, C. album, M. indica* and *Fumaria parviflora* at farmers' fields. These two herbicides show antagonism when used as tank mixtures with 2, 4-D and metsulfuron for the control of complex weed flora, leading to poor efficacy on grassy weeds (Yadav *et al.*, 2002). Similarly, 2, 4-D is not effective on non-grassy weeds like *Medicago denticulata, Melilotus indica* and *Lathyrus aphaca*. Hence, there is an urgent need to evaluate new herbicides with different modes of action not only to tackle the ever increasing problem of complex weed flora but also to delay or avert the complex problem of herbicide resistance (Wruble and Gressel,1994). Keeping it in view, present investigation was planned to study the effect of metribuzin 70 WP and prometryn 50 WP manufactured by Rallis India Ltd. on weeds and grain yield of wheat.

MATERIALS AND METHODS

To evaluate the performance of metribuzin and prometryn on weeds, crop selectivity and grain yield of wheat, field experiment consisting of 11 treatments (Table 1) replicated thrice in randomized block design was conducted at Agronomy Research Area of CCSHAU, Hisar during two consecutive seasons of **rabi** 2002-03 and 2003-04. Soil of experimental field was sandy loam in texture, low in available N (120 kg ha^{-1}, medium in P_2O_5 (17.8 kg ha^{-1}), high in available K_2O (376 kg ha^{-1}) and slightly alkaline in reaction (pH 8.2). Wheat variety PBW-343 was drilled on November 12, 2002 and November 6, 2003 on raised beds in furrow irrigated raised bed system (FIRBS) at 87.5 kg seed ha^{-1}. Three rows of wheat

Table 1. Effect of treatments on density and dry matter of weeds in wheat

Treatment	Dose (kg a. i. ha^{-1})	Density of weeds (No. m^{-2})					Dry weight of weeds (g m^{-2})	
		2002-03		2003-04				
		A. ludoviciana	Broad leaf weeds	*A. ludoviciana*	*P. minor*	Broad leaf weeds	2002-03	2003-04
Isoproturon	1.0	4.10 (16)	2.73 (4)	3.8 (14)	2.6 (6)	4.4 (19)	23.5	26.7
Sulfosulfuron	0.025	2.70 (6)	1.82 (3)	3.1 (9)	2.3 (4)	3.5 (11)	20.3	20.0
Metribuzin	0.20	4.27 (17)	2.34 (5)	4.4 (18)	3.1 (9)	3.2 (9)	31.9	39.8
Metribuzin	0.25	3.99 (15)	2.69 (7)	3.9 (14)	2.5 (6)	3.0 (8)	22.4	29.9
Metribuzin	0.30	3.65 (12)	2.51 (5)	2.9 (8)	2 (3)	2.8 (7)	23.2	25.8
Prometryn	1.50	3.25 (10)	2.09 (4)	3.5 (11)	2.9 (8)	3.2 (9)	24.8	36.6
Prometryn	1.75	3.10 (9)	1.96 (3)	3.3 (10)	2.7 (7)	2.7 (7)	23.7	27.8
Prometryn	2.00	2.69 (6)	1.96 (3)	2.7 (6)	2.2 (4)	2.8 (7)	17.8	24.3
Clodinafop (EC)	0.05	1.73 (2)	5.1 (25)	1.8 (2)	1 (0)	6.1 (36)	0.3	8.2
Weed-free		1 (0)	1 (0)	1 (0)	1 (0)	1 (0)	0	0
Weedy check		6.84 (42)	5.42 (29.3)	6.2 (37)	4.2 (16.4)	6.4 (40)	77.63	96.8
LSD (P=0.05)		1.16	1.20	0.7	0.27	0.36	8.96	2.3

Original values are given in parentheses. Data were subjected to X+1 transformation for analysis.

per bed were grown and the plot size was 6.5 x 2.1 m (3 beds per plot) and 7.0 x 2.1 m during 2002 and 2003, respectively. Herbicides were applied at 40 DAS with the help of knapsack sprayer fitted with flat fan nozzle using a spray volume of 375 l ha^{-1}. The data on density and dry weight of weeds were recorded at 70 DAS. The dry weight of weeds was recorded by keeping the weeds in oven at 70°C. Per cent control of weeds was recorded at 120 DAS, on 0-100 scale, where '0' means no control and '100' means complete control.

RESULTS AND DISCUSSION

Effect on Weeds

During first year, *A.ludoviciana* was the only grassy weed representing 61.7% of the total weed flora while during second year both *P. minor* and *A. ludoviciana* were present constituting 17 and 40% of total weed population. Among broad leaf weeds, *C. album, M. indica, Coronopus didymus* and *Convolvulus arvensis* were present during both the years. All the herbicide treatments proved effective in minimizing the density and dry weight of weeds significantly over weedy check except in case of clodinafop (EC) which gave 90-95% control of grassy weeds but remained ineffective on broad leaf weeds. Per cent control of grassy weeds increased with increase in the dose of metribuzin and prometryn but higher dose of metribuzin (0.30 kg ha^{-1}) caused toxicity to wheat crop resulting in significantly less number of spikes/m^2 over the lowest dose. Magnitude of decrease was more during first year as compared to second year. Poor tillering and phytotoxic effect of metribuzin on wheat crop have been reported earlier by Balyan (1999) and Sharma *et al.* (2002). Sulfosulfuron at 25 g ha^{-1} and clodinafop EC at 50 g ha^{-1} were more effective against *A. ludoviciana* and *P. minor* as compared to metribuzin, prometryn and isoproturon (Table 1).

Effect on Crop

Grain yields in these treatments were significantly low as compared to clodinafop and sulfosulfuron and isoproturon treatments due to significantly less number of spikes m^{-2} (Table 2). Highest grain yield (5266 and 5246 kg ha^{-1}) was found in weed-free check which was at par with clodinafop (EC) and significantly higher than rest of the treatments. On an average, presence of weeds throughout growing season caused 28% reduction in wheat yield.

Table 2. Weed control efficiency, visual control, number of effective earheads/m^2 and grain yield of wheat as affected by different weed control treatments

Treatment	Visual weed control (%)		No. of effective earheads/m^2		Grain yield (kg ha^{-1})	
	2002-03	2003-04	2002-03	2003-04	2002-03	2003-04
Isoproturon 1.0 kg ha^{-1}	70	65	369	366	4790	4790
Sulfosulfuron 25 g ha^{-1}	85	78	388	389	5030	5020
Metribuzin 70 WP 0.20 kg ha^{-1}	65	55	385	356	4930	4640
Metribuzin 70 WP 0.25 kg ha^{-1}	70	67	340	368	4527	4760
Metribuzin 70 WP 0.30 kg ha^{-1}	75	70	322	362	4410	4700
Prometryn 1.50 kg ha^{-1}	75	60	332	361	4520	4680
Prometryn 1.75 kg ha^{-1}	77	70	345	378	4644	4860
Prometryn 2.00 kg ha^{-1}	82	73	361	380	4813	4884
Clodinafop (EC) 50 g ha^{-1}	95	90	406	402	5246	5180
Weed-free	100	100	411	405	5266	5246
Weedy check	0	0	290	304	3816	3725
C. D. at 5%	4	3	44	9	209	83

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