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Effect of Fenoxaprop-p-ethyl (Puma Super 10 EC) with and without Surfactant (Power Activator) on Weeds and Wheat Yield

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ABSTRACT

Addition of power activator increased the efficacy of fenoxaprop-p-ethyl at 80 and 100 g ha^{-1} on grassy weeds in wheat. The efficacy of this herbicide at 120 g ha^{-1} was not affected due to addition of surfactant. Fenoxaprop at 100 g ha^{-1} with or without surfactant produced wheat grain yields at par with weed-free treatment and clodinafop-propargyl at 400 g ha^{-1}.

INTRODUCTION

The rice-wheat system is one of the most important cropping systems in the irrigated agro-ecosystems of India occupying about 10 m ha and contributing about 40% total food grain requirements of the country. In these systems, wheat fields have been found to be infested with wide range of weeds including grasses and non-grasses. *Phalaris minor* and *Avena ludoviciana* have been the major problems. Isoproturon was introduced as a very effective and economical herbicide for *P. minor* control in wheat. *P. minor* in some parts of Haryana and Punjab has developed resistance to isoproturon (Malik and Singh, 1993; Walia *et al.*, 1997). The performance of some alternate herbicides, namely, diclofop-methyl, tralkoxydim, fenoxaprop-p-ethyl, clodinafop-propargyl and sulfosulfuron were evaluated and found to be very effective against resistant *P. minor*. Adjuvant contributes materially to the weed control obtained with herbicides. Experience shows that successful weed control often depends on the appropriate use of adjuvants in herbicide spray to ensure uniform application and target coverage, to facilitate foliar penetration and some times to enhance selectivity (National Academy of Science, 1968). Surfactant interactions with herbicides were reported in the earliest day of experimentation with 2, 4-D (Zimmerman and Hitchcock, 1942). Later several investigators found significant increases in the activity of herbicides and growth regulators from the addition of surfactants (Hull, 1956). Activator adjuvants increase herbicide activity. This group includes compound ranging from unmixed surfactants or blends of surfactants to phytoblend oil mixed with enough surfactant to permit emulsification in water (WSSA, 1982). Surfactants facilitate wetting, spreading, dispersing, solubilizing and emulsifying besides other surface modifying properties to bring about enhanced herbicide action. Therefore, the present investigation was undertaken to find out the efficacy of fenoxaprop-p-ethyl with or without surfactant (Puma Activator) on weeds and wheat yield.

MATERIALS AND METHODS

Field experiment was conducted during winter seasons of 2001-02 and 2002-03 at the Crop Research Centre of G. B. Pant University of Agriculture & Technology, Pantnagar (Udhain Singh Nagar) to study the effects of fenoxaprop-p-ethyl (Puma Super 10 EC) applied alone at various doses and also in combination with a surfactant (Power Activator) on the control of *P. minor* and *A. ludoviciana* in wheat and their effects on grain yield of the crop. The soil of experimental field was clay loam, medium in organic carbon (0.7%), available phosphorus (18 kg ha^{-1}) and potassium (266 kg ha^{-1}). The treatments consisted of three doses of fenoxaprop (80, 100 and 120 g ha^{-1}) alone and its tank mixture with Power Activator, clodinafop-propargyl at 400 g ha^{-1}, weed-

Table 1. Effect of fenoxaprop-p-ethyl (Puma Super 10 EC) with and without surfactant (Power Activator) on weeds in wheat (2001-02)

Treatment	Dose (g ha^{-1})	Weed density (No. m^{-2})											
		P. minor						*A. ludoviciana*					
		30 DAS		60 DAS		90 DAS		30 DAS		60 DAS		90 DAS	
		2001-02	2002-03	2001-02	2002-03	2001-02	2002-03	2001-02	2002-03	2001-02	2002-03	2001-02	2002-03
Fenoxaprop	80	253	307	185	201	61	73	52	41	11	7	0	0
Fenoxaprop	100	240	322	41	37	0	0	55	47	0	0	0	0
Fenoxaprop	120	237	317	0	0	0	0	61	51	0	0	0	0
Fenoxaprop+ Power Activator	80+ 500 ml	248	315	24	31	17	11	49	43	0	0	0	0
Fenoxaprop+ Power Activator	100+ 500 ml	250	319	0	0	0	0	47	41	0	0	0	0
Fenoxaprop+ Power Activator	120+ 500 ml	268	325	0	0	0	0	51	45	0	0	0	0
Clodinafop	400	247	329	5	7	0	0	49	49	0	0	0	0
Weed-free	-	0	0	0	0	0	0	0	0	0	0	0	0
Weedy	-	241	318	232	305	227	298	57	42	51	37	47	31

free and weedy (Table 1). Power Activator was applied at 500 ml product per hectare. Herbicides were applied as spray using flat fan nozzle fitted with knapsack sprayer at spray volume of 400 l ha^{-1} at 40 days after wheat sowing. Experiment with nine treatments and four replications was laid out in randomized block design. Wheat cv. PBW 343 at 100 kg seed ha^{-1} was sown on November 12, 2001 and November 15, 2002. Recommended package of practices was adopted to raise the experimental crop.

RESULTS AND DISCUSSION

Effect on Weeds

The major weeds of the experimental field were *P. minor* (82.0%) and *A. ludoviciana* (14.5%). Other weeds (3.5%) like *Chenopodium album*, *Melilotus* spp. and *Lathyrus aphaca* were at a very low density. Fenoxaprop was very effective in reducing density of *P. minor* and *A. ludoviciana* and their total dry matter production (Tables 1 and 2). At 60 and 90 days after sowing, fenoxaprop at 80 g a. i. ha^{-1} had more density of these weeds as compared to application at 100 and 120 g a. i. ha^{-1}. Fenoxaprop at 100 g a. i. ha^{-1} when applied with Power Activator had less density of *P. minor* than its application without surfactant at 60 days stage of observation. But at 90 days stage, there was complete kill of *P. minor* at 100 and 120 g a. i. ha^{-1} of this herbicide applied alone or with Power Activator. These observations indicated that addition of Power Activator with fenoxaprop (Puma Super) caused quick killing of *P. minor*. The efficacy of fenoxaprop at lower dose (80 g a. i. ha^{-1}) was increased due to addition of Power Activator. Similar effects were also observed on *A. ludoviciana* and it was fully controlled due to fenoxaprop applied alone or with Power Activator as recorded at 90 days stage. The non-grassy weeds present in the experimental field were not controlled by fenoxaprop whether applied alone or as tank mixture with Power Activator.

Effect on Crop

On an average, wheat grain yield loss of 65.2% was recorded due to uncontrolled weeds (Table 2). All the treatments yielded higher than weedy check. Fenoxaprop at 80 g a. i. ha^{-1} applied with Power Activator produced significantly less grain yield than at 80 g a. i. ha^{-1} applied with Power Activator. At 100 and 120 g a. i. ha^{-1} of fenoxaprop grain yield did not differ significantly whether applied with Power Activator or without Power Activator. Fenoxaprop at 100 g a. i. ha^{-1} with or without Power Activator produced wheat grain yield at par with weed-free treatment and clodinafop-propargyl at 400 g a. i. ha^{-1}. Grain yields in plots treated with

Table 2. Effect of fenoxaprop-p-ethyl (Puma Super 10 EC) with and without surfactant (Power Activator) on weed dry matter and wheat yield

Treatment	Dose (g ha^{-1})	Total weed dry weight (g m^{-2}) 90 DAS		Wheat grain yield (kg ha^{-1})	
		2001-02	2002-03	2001-02	2002-03
Fenoxaprop	80	71.2	86.2	3105	3210
Fenoxaprop	100	5.0	3.8	4500	4600
Fenoxaprop	120	4.2	5.1	4550	4680
Fenoxaprop+ Power Activator	80+ 500 ml	15.8	11.2	4300	4450
Fenoxaprop+ Power Activator	100+ 500 ml	4.1	5.8	4572	4650
Fenoxaprop+ Power Activator	120+ 500 ml	3.9	4.7	4650	4705
Clodinafop	400	4.7	5.2	4558	4625
Weed-free	-	0.0	0.0	4785	4800
Weedy	-	361.2	307.8	1742	1850
LSD (P=0.05)		-	-	468	510

fenoxaprop at 80 g a. i. ha^{-1} with Power Activator were slightly lower than at its higher dose but the differences were non-significant.

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