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Evaluation of Dithiopyr Alone and in Combination with Trifluralin for the Control of Weeds in Wheat

Samar Singh, Samunder Singh, Sandeep Narwal, Harpal Singh and R. K. Malik
Department of Agronomy
CCSHAU Regional Research Station, Karnal-132 001 (Haryana), India

ABSTRACT

Dithiopyr at 360 g ha^{-1} proved superior in reducing the density of *Phalaris minor* than the lower doses and was at par with trifluralin at 1250 g ha^{-1} and isoproturon at 1000 g ha^{-1}. Density of broad leaf weeds was significantly lower in the plots treated with dithiopyr at 240 g ha^{-1} compared to trifluralin at 1250 g ha^{-1}. Tank mixture of dithiopyr+isoproturon at 120+1000 g ha^{-1} reduced the total dry weight of weeds by more than 90% over weedy check and provided similar yield to that of isoproturon and weed-free treatment. It was observed that at higher dose (480 g ha^{-1}) of dithiopyr crop lodged due to thin stem and increased length of internodes.

INTRODUCTION

Mixing of different types of herbicides may provide some synergistic effect in controlling the weed flora in wheat crop. The efficacy of herbicide mixtures may vary due to several factors including the compatibility of the mixing partners. To manage the dynamic weed flora, we need to evaluate a range of herbicides alone and as tank mixture to have a broad spectrum weed control. In the present experiment, dithiopyr was evaluated alone and as tank mixture with trifluralin against wheat weeds.

MATERIALS AND METHODS

Two-year field experiment was conducted at CCS Haryana Agricultural University Regional Research Station, Karnal using wheat cv. PBW 343 in a randomized block design replicated thrice. Crop was sown on November 11, 1999 and November 22, 2000 and was harvested on April 20, 2000 and April 22, 2001. The soil of experimental field was sandy clay loam in texture having pH 8.1 and organic carbon 0.35%. Treatments of dithiopyr (180-240 g ha^{-1}), trifluralin (1000-2000 g ha^{-1}), tank mix application of dithiopyr+trifluralin (120+480, 150+600, 90+1000 and 120+1000 g ha^{-1}), isoproturon (1000 g ha^{-1}) and isoproturon+trifluralin (1000+1000 g ha^{-1}) were compared with weedy and weed-free treatments. All the herbicides were applied pre-emergence except isoproturon alone and in mixture with trifluralin (20 DAS) by flat fan nozzle delivering 300 l ha^{-1} volume. Crop was raised according to the package of practices of the region.

RESULTS AND DISCUSSION

Effect on Weeds

The field was dominated with *Phalaris minor* and other broad leaf weeds such as *Rumex dentatis, Anagallis arvensis, Melilotus indica* and *Medicago denticulata* were also present at small scale. Alone application of dithiopyr at 360 g ha^{-1} and trifluralin at 1250 g ha^{-1} being at par with isoproturon at 1200 g ha^{-1} significantly decreased the density of *P. minor* and total density and dry weight of weeds over their lower doses. Dithiopyr at 240 g ha^{-1} significantly reduced the density of broad leaf weeds compared to trifluralin at 1250 g ha^{-1}. Dithiopyr at 360 g ha^{-1} reduced weed dry weight by 84 - 90% over untreated check (Table 1). Tank mixture of dithiopyr+trifluralin at 120+1000 g ha^{-1}, alone application of dithiopyr at 480 g ha^{-1} and trifluralin at 1500 g ha^{-1} proved effective in controlling all types of weeds. Similar results were reported by Singh *et al.* (2003a,b).

Effect on Crop

Dithiopyr alone at all the doses proved inferior

Table 1. Effect of tank mixture of chlorsulfuron and dinitroaniline herbicide on weeds

Treatment	Dose (g ha^{-1})	Weed density (No. m^{-2})				Total weed density (No. m^{-2})		Total weed dry weight (g m^{-2})	
		Phalaris minor		Broad leaf weeds					
		1999-2000	2000-01	1999-2000	2000-01	1999-2000	2000-01	1999-2000	2000-01
Dithiopyr	180	6.07 (36)	7.40 (54)	3.15 (9)	2.99 (8)	6.78 (45)	7.94 (62)	50.8	55.9
Dithiopyr	240	5.71 (32)	6.05 (36)	2.63 (6)	2.13 (4)	6.24 (38)	6.40 (40)	40.8	35.2
Dithiopyr	360	4.15 (16)	4.35 (18)	2.23 (4)	2.07 (3)	4.58 (20)	4.69 (21)	18.4	26.4
Dithiopyr	480	3.57 (12)	2.87 (7)	1.62 (4)	1.82 (1)	3.87 (14)	3.00 (8)	12.5	8.9
Trifluralin	1000	5.34 (28)	4.54 (20)	3.621 (2)	3.87 (14)	6.40 (40)	5.92 (34)	43.4	37.9
Trifluralin	1250	3.61 (12)	3.04 (8)	3.19 (9)	3.54 (12)	4.69 (21)	4.58 (20)	28.2	26.5
Trifluralin	1500	3.30 (10)	2.51 (5)	2.97 (8)	2.87 (7)	4.36 (10)	3.60 (12)	17.4	14.0
Trifluralin	2000	2.2 (14)	1.82 (2)	2.63 (6)	2.75 (7)	3.32 (10)	3.16 (9)	8.9	10.6
Dithiopyr+Trifluralin	120+480	4.75 (22)	5.36 (28)	2.98 (8)	3.27 (10)	5.57 (30)	6.24 (38)	32.7	38.2
Dithiopyr+Trifluralin	150+600	3.36 (10)	3.95 (15)	2.51 (5)	2.30 (4)	4.00 (15)	4.47 (19)	14.3	22.9
Dithiopyr+Trifluralin	90+1000	3.27 (10)	2.51 (5)	3.36 (10)	2.72 (7)	4.58 (20)	4.80 (12)	28.1	23.9
Dithiopyr+Trifluralin	120+1000	3.04 (8)	2.22 (4)	2.23 (4)	2.57 (9)	3.61 (12)	3.32 (10)	10.4	13.4
Isoproturon	1000	3.85 (14)	2.81 (7)	2.64 (6)	2.16 (4)	4.58 (20)	3.46 (11)	18.2	14.4
Trifluralin+Isoproturon	1000+1000	1.82 (2)	1.52 (1)	2.45 (5)	1.82 (1)	3.00 (8)	1.41 (1)	6.8	1.4
Weedy	--	14.23 (202)	12.23 (149)	5.55 (5)	4.97 (24)	15.26 (232)	13.15 (172)	192.2	164.0
Weed-free	--	1.00 (0)	1.00 (0)	1.00 (0)	1.00 (0)	1.0 (0)	1.0 (0)	1.5	0.5
LSD (P=0.05)		0.87	0.68	0.53	0.61	1.5	1.31	11.2	5.7

Figures in parentheses are original values and are transformed to $\sqrt{X+1}$.

Table 2. Effect of dithiopyr alone and in combination with trifluralin on yield and yield attributing characters of wheat

Treatment	Dose	Spikes (No. m^{-2})		1000-grain weight (g)		Grain yield (kg ha^{-1})	
	(g ha^{-1})	1999-2000	2000-01	1999-2000	2000-01	1999-2000	2000-01
Dithiopyr	180	416	404	42.4	41.3	5204	4893
Dithiopyr	240	424	419	44.6	42.7	5382	5234
Dithiopyr	360	430	431	45.8	43.0	5484	5387
Dithiopyr	480	411	404	41.2	41.9	5068	5068
Trifluralin	1000	421	415	44.3	42.1	5325	5201
Trifluralin	1250	423	420	45.3	43.0	5472	5294
Trifluralin	1500	438	437	47.8	44.8	5590	5432
Trifluralin	2000	431	425	46.2	43.2	5462	5375
Dithiopyr+Trifluralin	120+480	424	415	46.5	42.3	5481	5161
Dithiopyr+Trifluralin	150+600	456	443	49.0	45.0	5714	5481
Dithiopyr+Trifluralin	90+1000	445	445	46.7	44.4	5502	5475
Dithiopyr+Trifluralin	120+1000	456	446	49.3	45.6	5728	5573
Isoproturon	1000	451	448	48.2	47.8	5690	5622
Trifluralin+Isoproturon	1000+1000	42	434	45.1	44.2	5415	5410
Weedy	-	390	379	40.2	39.8	4334	4147
Weed-free	-	462	452	49.5	48.1	5766	5663
LSD (P=0.05)		26	19	3.8	3.6	180	122

in producing the number of spikes per square metre, 1000-grain weight and grain yield of wheat than weed-free check. Plots treated with trifluralin at 1500 g ha^{-1} provided similar spikes number and 1000-grain weight compared to the plots kept weed-free for the whole season during both the years. Tank mixture of dithiopyr+trifluralin (120+1000 g ha^{-1}) produced significantly higher yield over weedy check plot and was at par with weed-free treatment (Table 2). Dithiopyr application alone though reduced the weed dry weight, but there was no significant improvement in yield of wheat compared with weed-free treatment or its tank mixture with trifluralin at higher doses. Similar results have been reported by Singh *et al.* (2003a) and Aggarwal *et al.* (2002). It was observed that at higher (480 g ha^{-1}) dose of dithiopyr crop lodged due to thin stem and increased length of intenodes. 1000-grain weight and number of spikes followed the same trend as of grain yield of crop.

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