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Performance of Tank Mixtutre of Chlorsulfuron and Dinitroaniline Herbicides for the Control of Weeds in Wheat

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ABSTRACT

Alone application of chlorsulfuron at lower doses (20 and 30 g ha^{-1}) was not effective against *Phalaris minor* but it was at par with sulfosulfuron in reducing the broad leaf weeds at lowest (20 g ha^{-1}) dose. Tank mixture of chlorsulfuron either with pendimethalin or trifluralin at 1430+70 g ha^{-1} provided effective control of both *P. minor* and broad leaf weeds. The number of spikes and wheat yield increased with the increase in dose of chlorsulfuron from 20-40 g ha^{-1}. Tank mixture of pendimethalin or trifluralin with chlorsulfuron did not increase grain yield of wheat over their alone application at corresponding doses.

INTRODUCTION

Due to continuous use of one herbicide, there are possibilities of acquiring of resistance by some weeds (Malik and Malik, 1994). To increase the spectrum of weed control and for avoidance of evolution of resistance in weeds, mixtures of herbicides with different target sites are recommended (Bayer *et al.*, 1987). Use of some herbicides also enhances shift of weed flora towards difficult to control weed species. Experiment with herbicide mixture of chlorsulfuron and dinitroanilines was conducted in the light of above facts for the management of *Phalaris minor* and other weeds of wheat.

MATERIALS AND METHODS

A 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 harvested on April 20 in both the years. Various doses of chlorsulfuron alone and as tank mixture with pendimethalin and trifluralin were compared with sulfosulfuron, weedy and weed-free checks (Table 1). Sulfosulfuron was applied 35 DAS, whereas all other herbicides were applied pre-emergence. All the herbicides were sprayed by knapsack sprayer using flat fan nozzle at spray volume of 300 l ha^{-1}. Recommended doses of fertilizers and irrigations were uniformly applied.

RESULTS AND DISCUSSION

Effect on Weeds

The field was dominated with *P. minor* and other broad leaf weeds such as *Rumex dentatis, Anagallis arvensis, Melilotus indica* and *Medicago denticulata* were also present at small scale. Application of chlorsulfuron at 40 g ha^{-1} significantly decreased the density of *P. minor* compared to its lower dose (30 g ha^{-1}) but proved inferior to sulfosulfuron. However, chlorsulfuron at 30 g ha^{-1} was at par with sulfosulfuron in reducing the density of broad leaf weeds.

Tank mixture of chlorsulfuron either with pendimethalin or trifluralin provided similar control of weeds. Lowest weed dry weight was recorded with trifluralin+chlorsulfuron (1950+50 g ha^{-1}). Chlorsulfuron at 50 g ha^{-1}, pendimethalin or trifluralin at 2000 g ha^{-1}, pendimethalin/trifluralin+chlorsulfuron at 1960+40 g ha^{-1} and trifluralin+ chlorsulfuron at 1470+3 0 g ha^{-1} provided significant reduction in dry weight of weeds and were at par with sulfosulfuron at 25 g ha^{-1}. Reduction in dry weight

Table 1. Effect of tank mixture of chlorsulfuron and dinitroaniline herbicides 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
Chlorsulfuron	20	6.60 (43)	6.87 (47)	1.97 (3)	2.30 (4)	6.88 (46)	7.22 (51)	80.4	89.9
Chlorsulfuron	30	5.58 (30)	5.97 (35)	1.79 (2)	1.97 (3)	6.03 (35)	6.28 (39)	51.5	64.8
Chlorsulfuron	40	4.45 (19)	5.26 (27)	1.52 (1)	1.82 (2)	4.59 (20)	5.44 (29)	24.6	56.6
Chlorsulfuron	50	3.72 (13)	4.22 (17)	1.52 (1)	1.52 (1)	3.89 (14)	4.33 (18)	17.3	27.4
Pendimethalin	1500	3.57 (12)	3.73 (13)	2.87 (7)	2.81 (7)	4.41 (19)	4.59 (20)	26.8	34.5
Pendimethalin	2000	3.32 (10)	3.39 (11)	3.00 (8)	2.63 (6)	4.34 (18)	4.32 (18)	21.4	26.1
Pendimethalin+Chlorsulfuron	980+20	4.10 (16)	3.97 (15)	1.82 (2)	2.49 (5)	4.33 (18)	4.50 (19)	32.7	43.4
Pendimethalin+Chlorsulfuron	1470+30	3.15 (9)	3.59 (12)	1.82 (0)	1.82 (3)	3.27 (10)	3.89 (14)	18.6	32.5
Pendimethalin+Chlorsulfuron	1960+40	2.73 (5)	2.43 (5)	1.52 (1)	1.52 (1)	2.56 (6)	2.64 (6)	10.8	19.5
Trifluralin	1500	2.80 (7)	2.82 (7)	2.81 (7)	2.98 (8)	3.80 (14)	4.02 (15)	28.1	38.0
Trifluralin	2000	2.67 (6)	2.63 (6)	2.81 (7)	3.15 (9)	3.86 (13)	3.94 (15)	14.6	23.0
Trifluralin+Chlorsulfuron	980+20	5.28 (27)	4.91 (24)	2.06 (3)	2.30 (4)	5.57 (30)	5.29 (27)	42.3	40.6
Trifluralin+Chlorsulfuron	1470+30	3.05 (8)	4.09 (16)	1.52 (1)	1.62 (2)	3.14 (9)	4.38 (18)	18.4	31.9
Trifluralin+Chlorsulfuron	1960+40	1.99 (3)	4.59 (7)	1.52 (1)	1.52 (1)	2.26 (4)	3.06 (8)	7.1	17.3
Trifluralin+Chlorsulfuron	975+25	3.71 (13)	4.21 (17)	1.73 (2)	1.52 (1)	4.04 (15)	4.30 (18)	31.9	35.8
Trifluralin+Chlorsulfuron	1463+37	2.21 (34)	4.46 (19)	1.52 (2)	1.52 (1)	2.49 (5)	3.24 (10)	10.5	24.2
Trifluralin+Chlorsulfuron	1950+50	1.93 (3)	2.82 (7)	1.52 (1)	1.52 (1)	1.54 (1)	2.93 (8)	2.3	13.7
Sulfosulfuron	25	2.43 (5)	2.36 (5)	1.82 (3)	1.99 (3)	2.79 (7)	3.01 (8)	15.9	20.5
Weedy	-	9.47 (89)	10.61 (112)	3.59 (12)	3.73 (13)	10.07 (100)	11.25 (126)	180.8	241.1
Weed-free	-	1.00 (0)	1.00 (0)	1.00 (0)	1.00 (0)	1.0 (0)	1.0 (0)	0.5	0.5
LSD (P=0.05)		0.57	0.69	0.35	0.29	1.4	1.3	17.6	11.0

Table 2. Effect of tank mixture of chlorsulfuron and dinitroaniline herbicides on spikes and yield of wheat

Treatment	Dose	Spikes (No. m^{-2})		Grain yield (kg ha^{-1})	
	(g ha^{-1})	1999-2000	2000-01	1999-2000	2000-01
Chlorsulfuron	20	412	407	5014	4834
Chlorsulfuron	30	425	423	5384	5167
Chlorsulfuron	40	456	452	5762	5346
Chlorsulfuron	50	453	444	5710	5253
Pendimethalin	1500	458	455	5772	5393
Pendimethalin	2000	455	450	5738	5441
Pendimethalin+Chlorsulfuron	980+20	440	434	5632	5267
Pendimethalin+Chlorsulfuron	1470+30	454	440	5784	5487
Pendimethalin+Chlorsulfuron	1960+40	446	440	5624	5235
Trifluralin	1500	457	439	5706	5261
Trifluralin	2000	450	444	5682	5213
Trifluralin+Chlorsulfuron	980+20	434	434	5504	5240
Trifluralin+Chlorsulfuron	1470+30	454	452	5772	5334
Trifluralin+Chlorsulfuron	1960+40	444	436	5612	5176
Trifluralin+Chlorsulfuron	975+25	447	432	5640	5301
Trifluralin+Chlorsulfuron	1463+37	461	452	5764	5431
Trifluralin+Chlorsulfuron	1950+50	441	429	5510	5094
Sulfosulfuron	25	464	454	5792	5540
Weedy	-	388	382	4421	3967
Weed-free	-	461	452	5814	5576
LSD (P=0.05)		36	30	224	96

was higher with the increase in proportion of chlorsulfuron in tank mixture of trifluralin+ chlorsulfuron at all the doses.

Effect on Yield

Highest grain yield of wheat was recorded with weed-free treatment followed by sulfosulfuron at 25 g ha^{-1}, tank mixture of pendimethalin+chlorsulfuron (1470+30 g ha^{-1}), pendimethalin alone at 2000 g ha^{-1} and trifluralin+chlorsulfuron at 1470+30 g ha^{-1}, which was significantly higher than other treatments (Table 2). The number of spikes also showed similar trends as the yield of wheat. Sulfosulfuron produced highest number of spikes. No differences in the yield were observed in the mixture of pendimethalin or trifluralin with chlorsulfuron when averaged over treatments. Weedy check plots resulted in lowest crop yield (3967 kg ha^{-1}), which was 29% lower than weed-free plots. Similarly, number of spikes was also found lowest in weedy plots.

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