Indian J. Weed Sci. **36** (1 & 2) : 21-24 (2004)

Bio-efficacy of Clodinafop, Fenoxaprop, Sulfosulfuron, Tralkoxydim, Dithiopyr and Chlorsulfuron Alone and in Combination against Complex Flora of Weeds in Wheat

Ashok Yadav, R. K. Malik, R. S. Banga, Dharam Bir, R. S. Malik and V. Kumar
Department of Agronomy
CCS Haryana Agricultural University, Hisar-125 004 (Haryana), India

ABSTRACT

Chlorsulfuron, clodinafop, fenoxaprop, sulfosulfuron, tralkoxydim and dithiopyr alone and in combination were evaluated against complex flora of weeds in wheat. All the herbicidal treatments significantly reduced the dry weight of complex weeds. Chlorsulfuron was effective against broadleaf weeds and ineffective against grassy weeds. Fenoxaprop, clodinafop and tralkoxydim controlled grassy weeds but not the broadleaf weeds. Sulfosulfuron was very effective against grassy weeds and also to some extent against non-grassy weeds. Dithiopyr alone or in tank mixture was ineffective. Tank mixture of fenoxaprop+ chlorsulfuron at 100+20 g, clodinafop+chlorsulfuron at 50+20 g, tralkoxydim+ chlorsulfuron at 250+20 g and sulfosulfuron+chlorsulfuron at 15+10 g ha^{-1} provided 73-84% control of complex weed flora and being at par with each other produced grain yield of wheat similar to weed-free. Isoproturon+2, 4-D sodium salt at 750+500 g ha^{-1} resulted in 72-75% control of both types of weeds and produced grain yield equivalent to weed-free in one season.

INTRODUCTION

High yielding dwarf wheat varieties coupled with improved facilities of irrigation and fertilizers have led to the problem of grassy weeds particularly littleseed canary grass (*Phalaris minor* Retz.) in rice-wheat cropping areas (Malik and Singh, 1995) and wild oat (*Avena ludoviciana* Dur.). *P. minor* has also evolved resistance against isoproturon due to its continuous use and mono-cropping sequence of rice-wheat (Malik and Singh, 1995). Losses due to *A. ludoviciana* in wheat have been to the extent of 16 to 65% depending upon intensity of its infestation. The acute problem of both of grassy weeds alongwith some broadleaf weeds is also not uncommon in many parts of the country, which often results in huge yield losses and makes the weed management issue more complex (Singh and Singh, 2002). Tank mixture of isoproturon with 2, 4-D (Malik *et al.*, 1992) and isoproturon with metsulfuron (Singh and Singh, 2002) was successful against complex weed flora and has been recommended to growers. In resistance-affected areas, any isoproturon based tank mixture would be useless besides further complicating the problem of herbicide resistance and hence, there is a need to find out some suitable herbicidal mixture (S) to tackle the problem of mixed weed flora. Clodinafop-propargyl, fenoxaprop-p-ethyl, sulfosulfuron and tralkoxydim at 60, 120, 25 and 350 g ha^{-1}, respectively, were recommended against isoproturon-resistant *P. minor* in 1997. Tank mix application of metsulfuron or 2, 4-D with aforesaid alternate herbicides has been reported to cause antagonistic effects on *P. minor* (Yadav *et al.*, 2002). Therefore, it was realized to evaluate these herbicides in tank mix applications with chlorsulfuron to exploit the possibilities of their success against complex flora of weeds in wheat.

MATERIALS AND METHODS

Chlorsulfuron, clodinafop, fenoxaprop, sulfosulfuron, tralkoxydim and dithiopyr alone and in combination were evaluated against complex flora of weeds in wheat during 1998-99 and 1999-2000 at Research Farm of CCS Haryana Agricultural University, Hisar, India. The soil of the experimental field was sandy loam in texture, low in available N (122.3 kg ha^{-1}), medium in P_2O_5 (16.6 kg ha^{-1}) and high in K_2O (516.1 kg ha^{-1}) with slightly alkaline in reaction (pH 8.2). Wheat variety WH 542 was sown on 8 December in 1998 and WH 283 on 5 November in 1999 on raised beds in furrow irrigated raised bet system (FIRBS) using a seed rate of 87.5 kg ha^{-1}. Three rows of wheat per bed were grown. The experiment consisting 15 treatments (Table 1) was laid out in randomized block design replicated thrice. All the herbicidal treatments were employed at 35 days after sowing (DAS) with the help of knapsack sprayer fitted with flat fan nozzle using a spray volume of 625 l ha^{-1}. The data on the density and dry matter of weeds at 90 days after treatment (DAT) were recorded. Weed control efficiency was also computed on the basis of combined dry weight of weeds at 90 DAT.

RESULTS AND DISCUSSION

Effect on Weeds

The experimental field was infested with *A. ludoviciana* (30%), *P. minor* (13%), *Rumex retroflex* (20%), *Melilotus indica* (18%), *Coronopus didymus* (10%) and *Chenopodium album* (9%).

All the herbicidal treatments significantly reduced the dry weight of weeds during both the years (Table 1). Chlorsulfuron at 30 g ha^{-1} being

Table 1. Effect of herbicides alone and in tank mixture on the density and dry weight of weeds in wheat

Herbicide	Dose (g ha^{-1})	Density (No. m^{-2}) of broadleaf weeds		Density (No. m^{-2}) of grassy weeds		Dry weight (g m^{-2}) of total weeds	
		1998-99	1999-2000	1998-99	1999-2000	1998-99	1999-2000
Chlorsulfuron	20	4.3 (18)	5.2 (27)	3.2 (10)	2.8 (8)	66.8	42.2
Chlorsulfuron	30	4.2 (17)	4.8 (23)	2.1 (4)	1.8 (3)	54.2	32.5
Fenoxaprop+ Chlorsulfuron	100+20	2.4 (5)	2.9 (8)	2.4 (5)	1.9 (3)	40.2	24.1
Clodinafop+ Chlorsulfuron	50+20	2.3 (5)	2.8 (8)	2.6 (6)	2.0 (4)	35.2	26.2
Tralkoxydim+ Chlorsulfuron	250+20	2.2 (4)	2.9 (8)	2.1 (4)	1.8 (3)	37.0	24.5
Sulfosulfuron+ Chlorsulfuron	15+10	1.9 (3)	2.4 (5)	1.8 (3)	1.8 (3)	24.5	18.2
Dithiopyr+ Chlorsulfuron	100+20	4.4 (19)	5.1 (25)	3.2 (9)	2.1 (4)	70.2	43.5
Fenoxaprop	120	1.7 (2)	2.3 (5)	10.6 (113)	9.8 (95)	48.2	29.8
Clodinafop	60	1.6 (2)	2.3 (5)	10.7 (116)	10.0 (100)	46.6	31.5
Sulfosulfuron	25	1.6 (2)	2.4 (5)	6.6 (44)	4.8 (22)	44.4	28.9
Tralkoxydim	350	1.8 (3)	2.6 (7)	10.5 (111)	9.9 (99)	50.1	36.2
Dithiopyr	150	4.1 (16)	5.1 (25)	8.7 (76)	6.3 (40)	95.2	68.5
Isoproturon+ 2, 4-D Na	750+500	2.8 (7)	3.2 (10)	2.6 (6)	1.8 (3)	42.0	26.7
Weedy	-	4.6 (205)	5.6 (30)	10.1 (102)	9.0 (80)	150.1	107.5
Weed-free	-	0.7 (0)	0.7 (0)	0.0 (0)	0.7 (0)	0.0	0.0
LSD (P=0.05)		0.7	0.9	0	0.9	11.2	8.6

Original data on density of weeds given in parentheses were subjected to square root transformation $\sqrt{x+0.5}$ before analysis.

superior to its lower dose (20 g ha^{-1}) in terms of reducing the density of broadleaf weeds was ineffective against grassy weeds during both the years. Balyan and Malik (2000) have also reported chlorsulfuron to be very effective against most of broadleaf weeds including *R. retroflex*. Fenoxaprop at 120 g, clodinafop at 60 g and tralkoxydim at 350 g ha^{-1} also reduced the population of grassy weeds significantly but these were ineffective against broadleaf weeds. Sulfosulfuron at 25 g ha^{-1} was very effective against both the grass weeds (Tables 1 and 2). But dithiopyr failed to provide satisfactory control weeds.

Tank mixture of fenoxaprop+chlorsulfuron at 100+20 g, clodinafop+chlorsulfuron at 50+20 g, tralkoxydim+chlorsulfuron at 250+20 g and sulfosulfuron+chlorsulfuron at 15+10 g ha^{-1} provided 73-84% control of weeds (Tables 1 and 2). Tank mixture of dithiopyr with chlorsulfuron at 100+20 g ha^{-1} resulted in poor weed control but isoproturon+2, 4-D sodium salt at 750+500 g ha^{-1} provided 72-75% control of both types of weeds.

Effect on Crop

All the herbicidal treatments, except dithiopyr resulted in significant increase in the number of spikes and grain yield of wheat during both the years. Its performance as tank mixture with chlorsulfuron was also not satisfactory. Tank mixture of fenoxaprop+chlorsulfuron at 100+20 g, clodinafop+chlorsulfuron at 50+20 g, tralkoxydim+chlorsulfuron at 250+20 g and sulfosulfuron+chlorsulfuron at 15+10 g ha^{-1} being at par with each other could produce number of spikes and grain yield of wheat statistically similar to weed-free (Table 2). This was due to wide spectrum weed control. Under present field study, *A. ludoviciana* was dominating against which aforesaid four grass herbicides have been observed to be very effective. Isoproturon+2, 4-D sodium salt at 750+500 g ha^{-1} though resulted in 72-75%

Table 2. WCE of herbicides alone and in tank mixture at 90 DAT and their effect on spikes and grain yield of wheat

Herbicide	Dose (g ha^{-1})	WCE (%)		Spikes (No. m^{-2})		Grain yield (kg ha^{-1})	
		1998-99	1999-2000	1998-99	1999-2000	1998-99	1999-2000
Chlorsulfuron	20	56	61	469	477	4220	4850
Chlorsulfuron	30	64	67	477	485	4410	5000
Fenoxaprop+ Chlorsulfuron	100+20	73	78	524	541	4780	5410
Clodinafop+ Chlorsulfuron	50+20	77	76	529	536	4690	5515
Tralkoxydim+ Chlorsulfuron	250+20	75	77	515	534	4570	5450
Sulfosulfuron+ Chlorsulfuron	15+10	84	83	514	544	4800	5565
Dithiopyr+ Chlorsulfuron	100+20	52	60	466	474	4195	4790
Fenoxaprop	120	68	72	482	502	4240	4900
Clodinafop	60	69	71	487	493	4280	4895
Sulfosulfuron	25	70	73	497	507	4500	5200
Tralkoxydim	350	67	66	479	487	4100	4760
Dithiopyr	150	37	36	430	444	3720	4332
Isoproturon+ 2, 4-D Na	750+500	72	75	512	519	4760	5256
Weedy	-	0	0	408	438	3623	4262
Weed-free	-	100	100	536	554	4925	5675
LSD (P=0.05)		-	-	27	29	360	405

WCE, yet it could produce grain yield equivalent to the weed-free check only in 1998-99 but not in 1999-2000 (Table 2). This might be becuase of presence of wheat variety WH 283 in second year, which has already been identified as highly sensitive to 2, 4-D and hence, such results might be obvious.

REFERENCES

Balyan, R. S. and R. K. Malik, 2000. New herbicides for jangli palak (*Rumex retroflex* L.). *Indian J. Weed Sci.* **32** : 86-88.

Malik, R. K., R. S. Panwar and R. S. Malik, 1992. Chemical control of broadleaf and grassy weeds in wheat (*Triticum aestivum*). *Indian J. Agron.* **37** : 324-326.

Malik, R. K. and S. Singh, 1995. Littleseed canary grass (*Phalaris minor* Retz.) resistant to isoproturon in India. *Weed Technol.* **9** : 419-425.

Singh, G. and M. Singh, 2002. Bio-efficacy of metsulfuron-methyl in combination with isoproturon for control of grassy and non-grassy weeds in wheat. *Indian J. Weed Sci.* **34** : 9-12.

Yadav, A., R. K. Malik, B. S. Chauhan and G. Gill, 2002. Present status of herbicide resistance in Haryana. In : Proc. International Workshop on Herbicide Resistance Management and Zero Tillage in Rice-Wheat Cropping System, March 4-6, 2002, held at CCS Haryana Agricultural University, Hisar, India. pp. 15-22.