Indian J. Weed Sci. **38** (1 & 2) : 1-4 (2006)

Studies on Herbicide Mixtures in Wheat

S. S. Punia, Samunder Singh, R. K. Malik and Dharambir Yadav
Department of Agronomy
CCS Haryana Agricultural University, Hisar-125 004 (Haryana), India

ABSTRACT

2, 4-D when used as tank mixture or one week before application of fenoxaprop and clodinafop-propargyl reduced efficacy of these herbicides against *A. ludoviciana* and *Phalaris minor*, whereas efficacy of sulfosulfuron used as tank mixture or one week after 2, 4-D application was not affected. Efficacy of 2, 4-D against broadleaf weeds *Chenopodium album* L., *Melilotus indica* and *Rumex retroflexus* L. was same either used as tank mixture or in sequential application before or after these grassy herbicides. Sequential application of 2, 4-D one week after spray of fenoxaprop and clodinafop-propargyl did not reduce efficacy of these herbicides and gave grain yield of wheat at par with weed-free check.

INTRODUCTION

Fenoxaprop-ethyl, sulfosulfuron and clodinafop-propargyl provide excellent control of grassy weeds like *Phalaris minor* and *Avena ludoviciana* (Malik and Yadav, 1997). 2, 4-D provides effective control of *Chenopodium album* L. and other broadleaf weeds in wheat. To avoid cross-resistance to newly recommended herbicides for grassy weeds and to broaden weed control spectrum, use of herbicide mixtures is desirable. 2, 4-D in combination with diclofop-methyl was found to reduce control of diclofop-methyl against grassy weeds (Gillespie and Nalewaja, 1989). So, there is a possibility of antagonistic interaction between 2, 4-D and fenoxaprop, sulfosulfuron and clodinafop. The present experiment was conducted to determine whether 2, 4-D tank mixed with fenoxaprop, sulfosulfuron and clodinafop reduce control of selected grassy weeds and if sequential application of these herbicides would overcome antagonism.

MATERIALS AND METHODS

To evaluate the efficacy of fenoxaprop-p-ethyl, clodinafop-propargyl and sulfosulfuron as tank mixed with 2, 4-D (34.2% ester), against complex weed flora in wheat, field experiment was conducted during **rabi** (winter) season of 2002-03 and 2003-04 at the Agronomy Research Farm of CCS Haryana Agricultural University, Hisar. The experimental soil was sandy loam (Typic Ustochrepts) with 61% sand, 22.1% silt and 19.1% clay, medium in fertility with 0.29% organic carbon and a pH of 8.2. Wheat variety PBW 343 was planted on beds using a seed rate of 87.5 kg ha^{-1} on October 28, 2002 and November 14, 2003 in a plot size of 6.0 m x 2.1 m. Recommended dose of fertilizers and irrigations were applied uniformly. Thirteen herbicide treatments (Tables 1 and 2) were compared with untreated and weed-free checks. Thus, 15 treatments were replicated thrice in a randomized block design. Herbicides were applied with knapsack sprayer at 35 DAS delivering 500 litres of water ha^{-1}. Weed count and dry weight were recorded at 70 DAS during both the growing seasons. The data on per cent visual control (phytotoxicity) of weeds were recorded at six weeks after herbicide application on 0-100 scale, where, 0 is no control and 100 is complete control. Growth reduction and foliar necrosis were considered while making visual estimates.

RESULTS AND DISCUSSION

Weed Flora

Experimental field was infested with *Avena ludoviciana, Phalaris minor, Rumex retroflexus,*

Table 1. Effect of different treatments on weeds, visual mortality and grain yield of wheat (2002-03)

Treatment	Dose (g ha^{-1})	Weed density (No. m^{-2}) 70 DAS		Dry weight of weeds (g m^{-2}) 70 DAS		Visual mortality (%)		Spikes (No. m^{-2})	Grain yield (kg ha^{-1})
		A. ludoviciana	*C. album*	BLW	Grassy	BLW	Grassy		
Fanoxaprop	120	2.1 (4)	4.8 (22)	13.1	3.5	0	96	424	4884
Clodinafop	60	1.0 (0)	4.9 (25)	19.5	0	0	100	432	4920
Sulfosulfuron	25	5.3 (39)	3.4 (13)	6.7	15..6	43	70	396	4252
Fenoxaprop+2, 4-D	120+500	2.5 (5)	1.4 (1)	0.6	9.2	98	70	392	4297
Clodinafop+2, 4-D	60+500	1.0 (0)	1.4 (1)	2.1	2.4	98	80	404	4468
Sulfosulfuron+2, 4-D	25+500	5.5 (33)	1.0 (0)	2.9	21	95	48	368	4255
2,4-D fb fenoxaprop	500 & 120	6.0 (33)	1.0 (0)	0	79.6	90	13	328	3254
2,4-D fb clodinafop	500 & 60	4.4 (21)	1.0 (0)	1.1	35.9	95	23	340	3614
2,4-D fb sulfosulfuron	500 & 25	5.2 (28)	1.0 (0)	0.46	55.6	91	70	344	3602
Fenoxaprop fb 2, 4-D	120 & 500	1.2 (1)	3.9 (16)	17.3	0.93	93	93	456	5180
Clodinafop fb 2, 4-D	60 & 500	1 (0)	5.6 (31)	35.1	0	90	95	460	5220
Sulfosulfuron fb 2, 4-D	25 & 500	5.4 (40)	5.3 (34)	12.0	14.4	96	70	396	4321
2,4-D (Ester)	500	8.7 (79)	1.0 (0)	0	82	100	0	324	3051
Weedy		10.1 (102)	5.1 (25)	4.0	120.8	0	0	316	2890
Weed-free		1.0 (0)	1.0 (0)	0	0	100	100	460	5220
LSD (P=0.05)		3.0	2.1	7.14	11.4			NS	145

BLW–Broadleaf weeds. NS–Not Significant.

Table 2. Effect of different treatments on weeds, visual mortality and grain yield of wheat (2003-04)

Treatment	Dose (g ha^{-1})	Weed density (No. m^{-2}) 70 DAS		Dry weight of weeds (g m^{-2}) 70 DAS		Visual mortality (%)		Spikes (No. m^{-2})	Grain yield (kg ha^{-1})
		C. album	*P. minor*	BLW	Grassy	BLW	Grassy		
Fanoxaprop	120	4.8 (22)	1.7 (2)	21.7	3.3	0	95	415	5140
Clodinafop	60	4.1 (16)	1 (0)	20.2	3.0	0	98	417	5182
Sulfosulfuron	25	2.6 (6)	4.2 (17)	8.6	19.8	50	75	402	4824
Fenoxaprop+2, 4-D	120+500	1 (0)	4.5 (19)	1.3	22.3	75	65	396	4800
Clodinafop+2, 4-D	60+500	1 (0)	3.7 (13)	2.0	18.6	85	75	406	4910
Sulfosulfuron+2, 4-D	25+500	1 (0)	4.7 (20)	2.2	20.7	85	75	389	4728
2,4-D fb fenoxaprop	500&120	1.7 (2)	4.2 (17)	0.6	16.5	90	70	408	4920
2,4-D fb clodinafop	500&60	1.4 (1)	2.8 (7)	1.3	14.7	90	78	412	4948
2,4-D fb sulfosulfuron	500&25	1 (0)	4.4 (18)	0.9	16.3	95	75	398	4820
Fenoxaprop fb 2, 4-D	120&500	1.7 (2)	2 (3)	1.3	3.4	90	95	432	5226
Clodinafop fb 2, 4-D	60&500	1 (0)	1.7 (2)	1.2	2.6	90	98	432	5238
Sulfosulfuron fb 2, 4-D	25&500	1 (0)	4.1 (16)	2.0	18.9	90	75	409	4952
2,4-D (Ester)	500	1 (0)	7.8 (60)	1.5	106.8	90	0	344	3500
Weedy		4.6 (20)	7.5 (56)	20.2	108.4	0	0	328	3380
Weed-free		1 (0)	1 (0)	0	0	100	100	435	5280
LSD (P=0.05)		0.9	0.4	2.6	202	-	-	12	62

BLW–Broadleaf weeds.

Chenopodium album, *Melilotus indica* and *Coronopus didymus*. *A. ludoviciana* (42%) was the most dominant weed during first year, while *P. minor* (47%) was the dominant one during second year.

Clodinafop and fenoxaprop being at par with each other provided efficient control (95-100%) of grassy weeds. Sulfosulfuron at 25 g ha^{-1} could provide only 70-75% control of grassy and 43-50% control of broadleaf weeds. Efficacy of fenoxaprop and clodinafop against *A. ludoviciana* and *P. minor* was reduced when these herbicides were used as tank mixture with 2, 4-D. (Tables 1 and 2). Yadav *et al.* (2002) also reported poor efficacy of fenoxaprop when used as tank mixture with 2, 4-D because of antagonism between 2, 4-D and fenoxaprop. Sequential application of 2, 4-D, one week after application of fenoxaprop and clodinafop provided acceptable control of both grassy as well as broadleaf weeds but use of fenoxaprop and clodinafop one week before 2, 4-D application showed poor control of *A. ludoviciana* and *P. minor*. Efficacy of sulfosulfuron against grassy weeds used as tank mixture or one week after 2, 4-D application was not antagonized but was at par with use of sulfosulfuron used alone.

Maximum grain yield of 5220 and 5260 kg ha^{-1} was recorded in weed-free treatment which was similar to fenoxaprop fb 2, 4-D and clodinafop at 60 g ha^{-1} fb 2, 4-D at 500 g ha^{-1}. Presence of weeds throughout growing season caused 44.6% reduction in grain yield as compared to weed-free check.

REFERENCES

Gillespie, G. R. and J. D. Nalewaja, 1989. Influence of 2, 4-D and MCPA formulations and oil on diclofop phytotoxicity. *Weed Sci.* **37** : 380-384.

Malik, R. K. and A. K. Yadav, 1997. Potency of alternate herbicides against isoproturon-resistant little seed canary grass. Proc. 16th Asian Pacific Weed Sci. Soc. Conf. Session 4A. pp. 208-210.

Yadav, A., R. K. Malik, B. S. Chauhan and G. Gill, 2002. Present status of herbicide resistance in Haryana. Proc. International Workshop on Herbicide Resistance Management and Zero Tillage in Rice-Wheat Cropping System, CCSHAU, Hisar, March 4-6. pp. 15-20.