

## Performance of Tank Mixture of Metribuzin with Clodinafop and Fenoxaprop for the Control of Mixed Weed Flora in Wheat

Samar Singh, Samunder Singh, S. D. Sharma, S. S. Punia and Harpal Singh

Department of Agronomy

CCSHAU Regional Research Station, Karnal-132 001 (Haryana), India

### ABSTRACT

Fenoxaprop at 120 g ha<sup>-1</sup>, clodinafop at 60 g ha<sup>-1</sup> and sulfosulfuron at 25 g ha<sup>-1</sup> significantly reduced the density of *Phalaris minor* and increased number of spikes and grain yield of wheat over their lower doses. Density of broad leaf weeds decreased significantly with sulfosulfuron or metribuzin or tank mixture of metribuzin with fenoxaprop or clodinafop compared to weedy check. Tank mixture of clodinafop+metribuzin at 45+140 g ha<sup>-1</sup> recorded lowest weed biomass followed by fenoxaprop+metribuzin at 90+140 g ha<sup>-1</sup> and clodinafop+metribuzin at 30+140 g ha<sup>-1</sup>. Increasing the dose of metribuzin in the mixture from 100 to 140 g ha<sup>-1</sup> reduced wheat yield; the effect was more pronounced with fenoxaprop than with clodinafop.

### INTRODUCTION

With isoproturon being found ineffective for controlling *Phalaris minor* in parts of Indo-Gangetic plains due to resistant population, the new recommended herbicides in wheat provided a good option for the control of resistant *P. minor*. These molecules are costly and so increase the cost of production of wheat crop. Combination of these new herbicides with metribuzin may provide effective weed control at cheaper prices besides providing control of mixed weed flora (Katyal *et al.*, 1997). Metribuzin applied alone causes reduced tillering in wheat, therefore, its combination may be tried for better efficacy and crop safety.

### MATERIALS AND METHODS

Three years 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, 2000, December 6, 2001 and November 29, 2002 and was harvested on April 20, 2001, April 28, 2002 and April 25, 2003. The soil of experimental field was sandy clay loam in texture having pH 8.1 and organic carbon 0.35%. Clodinafop (45 and 60 g ha<sup>-1</sup>), fenoxaprop (90 and 120 g ha<sup>-1</sup>), sulfosulfuron (20 and 25 g ha<sup>-1</sup>), metribuzin (140 and

210 g ha<sup>-1</sup>) alone and the tank mixture of clodinafop+metribuzin (30+140, 45+100, 45+140 g ha<sup>-1</sup>) and fenoxaprop+metribuzin (60+140, 90+100, 90+140 g ha<sup>-1</sup>) were compared with weedy and weed-free treatments. All the herbicides were applied 35 DAS by flat fan nozzle delivering 300 l ha<sup>-1</sup> spray volume. Crop was raised according to the package and practices of the region.

### 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 clodinafop at 60 g ha<sup>-1</sup> and fenoxaprop at 120 g ha<sup>-1</sup> provided more than 95% control of *P. minor*, but did not affect the density of broad leaf weeds. Alone application of sulfosulfuron at 25 g ha<sup>-1</sup> or metribuzin at 210 g ha<sup>-1</sup> provided similar reduction in density of broad leaf weeds, but in case of *P. minor* sulfosulfuron proved superior to metribuzin. Tank mixture of metribuzin or clodinafop provided effective control of *P. minor* and broad leaf weeds (Table 1). The tank mixture of metribuzin with clodinafop and fenoxaprop helped in reducing the number and dry weight of weeds as compared

Table 1. Effect of tank mixture of metribuzin with clodinafop and fenoxaprop on weeds in wheat

Treatment	Dose (g ha <sup>-1</sup> )	Weed density (No. m <sup>-2</sup> )						Total weed density (No. m <sup>-2</sup> )			Total weed dry weight (g m <sup>-2</sup> )		
		<i>Phalaris minor</i>			Broad leaf weeds			2000-01	2001-02	2002-03	2000-01	2001-02	2002-03
		2000-01	2001-02	2000-01	2001-02	2000-01	2001-02						
Clodinafop	45	3.30 (10)	3.44 (11)	2.98 (8)	3.30 (10)	4.4 (18)	4.6 (21)	4.4 (18)	4.4 (18)	4.4 (18)	38.8	36.4	32.5
Clodinafop	60	1.41 (1)	1.40 (1)	2.83 (7)	2.85 (7)	2.9 (8)	3.0 (8)	2.9 (8)	2.9 (8)	2.9 (8)	13.5	11.8	11.0
Fenoxaprop	90	3.14 (9)	3.34 (10)	3.16 (9)	3.18 (9)	4.3 (18)	4.4 (19)	4.2 (17)	4.2 (17)	4.2 (17)	33.1	35.0	32.4
Fenoxaprop	120	1.74 (2)	2.01 (3)	3.01 (8)	2.86 (7)	3.3 (10)	3.3 (10)	3.3 (10)	3.3 (10)	3.3 (10)	17.0	14.6	12.8
Sulfosulfuron	20	4.35 (18)	4.56 (20)	2.24 (4)	2.21 (4)	4.7 (22)	5.0 (24)	4.8 (22)	4.8 (22)	4.8 (22)	43.6	38.2	36.6
Sulfosulfuron	25	2.23 (4)	2.47 (5)	1.75 (2)	1.74 (2)	2.6 (6)	2.7 (7)	2.6 (6)	2.6 (6)	2.6 (6)	20.0	10.4	9.5
Metribuzin	140	4.40 (28)	5.58 (30)	2.02 (3)	2.46 (5)	5.6 (31)	6.0 (35)	5.7 (31)	5.7 (31)	5.7 (31)	50.5	60.6	58.8
Metribuzin	210	5.15(16)	4.25 (17)	1.71 (2)	2.00 (3)	4.3 (18)	4.6 (20)	4.4 (18)	4.4 (18)	4.4 (18)	28.8	34.8	30.2
Clodinafop+Metribuzin	30+140	2.26 (4)	1.74 (2)	1.42 (1)	2.20 (4)	2.4 (5)	2.6 (6)	2.5 (5)	2.5 (5)	2.5 (5)	8.2	10.7	8.8
Clodinafop+Metribuzin	45+100	2.01 (3)	1.43 (1)	1.70 (2)	2.23 (4)	2.3 (5)	2.4 (5)	2.4 (5)	2.4 (5)	2.4 (5)	15.8	10.5	7.9
Clodinafop+Metribuzin	45+140	1.71 (2)	1.71 (2)	1.40 (1)	1.42 (1)	1.9 (3)	2.0 (3)	2.0 (3)	2.0 (3)	2.0 (3)	5.7	8.0	6.8
Fenoxaprop+Metribuzin	60+140	4.02 (15)	3.97 (15)	1.73 (2)	2.26 (4)	4.2 (17)	4.4 (19)	4.1 (16)	4.1 (16)	4.1 (16)	26.4	36.2	35.7
Fenoxaprop+Metribuzin	90+100	3.28 (10)	3.31 (10)	2.25 (4)	2.44 (5)	3.8 (14)	3.9 (15)	3.7 (13)	3.7 (13)	3.7 (13)	20.7	26.7	24.9
Fenoxaprop+Metribuzin	90+140	1.73 (2)	1.41 (1)	1.00 (0)	1.40 (1)	1.6 (2)	1.8 (2)	1.7 (0)	1.7 (0)	1.7 (0)	6.5	7.4	6.4
Weedy		1.89 (140)	2.14 (145)	3.32 (10)	3.48 (11)	12.2 (150)	12.5 (156)	12.4 (152)	12.4 (152)	12.4 (152)	179.9	192.6	187.7
Weed-free		1.0 (0)	1.0 (0)	1.0 (0)	1.0 (0)	1.0 (0)	1.0 (0)	1.0 (0)	1.0 (0)	1.0 (0)	0.5	0.5	0.5
LSD (P=0.05)		0.87	0.92	0.65	0.78	1.8	1.7	1.4	1.4	1.4	5.4	7.2	6.9

Table 2. Effect of different treatments on yield and yield attributing characters of wheat

Treatment	Dose (g ha <sup>-1</sup> )	Spikes (No. m <sup>-2</sup> )						Spike length (cm)						Grain yield (kg ha <sup>-1</sup> )					
		2000-01		2001-02		2002-03		2000-01		2001-02		2002-03		2000-01		2001-02		2002-03	
Clodinafop	45	425	415	416	416	416	9.8	10.1	9.3	9.3	9.3	5147	4860	4824					
Clodinafop	60	465	462	460	460	460	10.2	9.2	9.3	9.3	5648	5352	5184						
Fenoxaprop	90	428	418	408	408	408	10.6	10.7	9.3	9.3	5294	4998	4886						
Fenoxaprop	120	457	452	442	442	442	9.8	9.6	9.3	9.3	5531	5220	5075						
Sulfosulfuron	20	400	395	385	385	385	9.9	9.9	9.6	9.6	5049	4760	4615						
Sulfosulfuron	25	465	450	444	444	444	9.8	9.9	9.9	9.9	5425	5298	5078						
Metribuzin	140	396	380	366	366	366	9.2	9.0	9.1	9.1	4806	4500	4412						
Metribuzin	210	423	410	405	405	405	9.1	8.8	9.4	9.4	5128	4830	4707						
Clodinafop+Metribuzin	30+140	420	416	415	415	415	9.9	9.6	10.0	10.0	5153	4842	4664						
Clodinafop+Metribuzin	45+140	436	424	412	412	412	9.6	9.5	10.1	10.1	5333	5050	4987						
Clodinafop+Metribuzin	45+140	426	413	407	407	407	9.9	9.5	9.5	9.5	5194	4896	4658						
Fenoxaprop+Metribuzin	60+140	408	405	406	406	406	9.6	9.4	9.4	9.4	5067	4772	4608						
Fenoxaprop+Metribuzin	90+100	416	412	394	394	394	9.6	9.5	9.9	9.9	5355	4856	4707						
Fenoxaprop+Metribuzin	90+140	405	400	384	384	384	9.5	9.4	9.7	9.7	5098	4818	4689						
Weedy	-	366	362	356	356	356	10.4	10.2	9.0	9.0	4100	3990	3895						
Weed-free	-	481	472	462	462	462	10.2	10.1	9.3	9.3	5696	5400	5387						
LSD (P=0.05)		28	23	32	32	32	NS	NS	NS	NS	170	182	168						

NS-Not Significant.

to their alone application. Clodinafop+metribuzin at 45+140 g ha<sup>-1</sup> applied 35 DAS and fenoxaprop+metribuzin at 90+140 g ha<sup>-1</sup> provided minimum number and total dry weight of weeds, thus providing greatest control of weeds. Clodinafop+metribuzin at 45+140 g ha<sup>-1</sup> and fenoxaprop+metribuzin at 90+140 g ha<sup>-1</sup> provided 96.8, 95.8 and 96.3% and 95.8, 96.1 and 96.6% weed control efficiency (WCE) during 2000-01, 2001-02 and 2002-03, respectively, as compared to sulfosulfuron at 25 g ha<sup>-1</sup>, which provided 88.8, 94.6 and 94.9% WCE during these years.

#### Effect on Crop

Tank mixture of clodinafop+metribuzin and fenoxaprop+metribuzin did not provide more number of spikes and/or yield in comparison to alone application of these herbicides during all the three years (Table 2). Tank mixture of clodinafop+metribuzin at 45+100 g ha<sup>-1</sup> produced significantly higher grain yield of wheat compared to the mixture of clodinafop+metribuzin at 30+140 g ha<sup>-1</sup>. The plots treated with clodinafop at 60 g ha<sup>-1</sup>, fenoxaprop at

120 g ha<sup>-1</sup> and sulfosulfuron at 25 g ha<sup>-1</sup> provided more significantly more number of spikes and higher grain yield compared to their lower doses and found at par with plots kept weed-free for the whole season. It may be inferred that tank mixture of herbicides although provided effective control of weed flora but provided some phytotoxic effect on effective tillers and grain yield of wheat crop. Similar results were reported by Balyan (1999) and Sharma *et al.* (2002).

#### REFERENCES

- Balyan, R. S. 1999. Metribuzin and chlorsulfuron effect on grains of treated winter wheat (*Triticum aestivum*). *Weed Sci.* **34** : 734-737.
- Katyal, Gaurav, R. S. Panwar, R. K. Malik and S. S. Pahuja, 1997. Efficacy of diclofopmethyl alone or in combination with other herbicides on weeds in wheat. *Indian J. Weed Sci.* **29** : 106-109.
- Sharma, Rajbir, S. S. Pahuja, R. S. Balyan and R. K. Malik, 2002. Effect of sulfonylurea herbicides applied alone and tank mixture with metribuzin on weeds in wheat and their residual effect on succeeding crop of sorghum. *Indian J. Weed Sci.* **34** : 178-183.