

## Bio-efficacy of Chlorimuron-ethyl in Soybean

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### ABSTRACT

Chlorimuron-ethyl at various doses (6, 9 and 18 g ha<sup>-1</sup>) was effective on non-grassy weeds in soybean without any phytotoxicity. Chlorimuron-ethyl at 9 g ha<sup>-1</sup> was better than at 6 g ha<sup>-1</sup>. Application at 3 or 7 DAS was more effective than at 15 DAS. Grain yields due to chlorimuron-ethyl at 9 g ha<sup>-1</sup> applied 3 or 7 DAS were at par with weed-free treatment.

### INTRODUCTION

Weed competition is one of the most important causes of yield loss in soybean and is estimated to be 20-77% (Kurchania *et al.*, 2001). The degree of loss depends upon the intensity and growth rate of the infesting weed spp., duration of competition, adequacy of the available resources and growth rate and density of crop. Manual weeding during critical growth stages is sometimes not possible due to uncertain weather and soil conditions. Several herbicides like pendimethalin, fluchloralin and alachlor have been used for weed control in soybean. These herbicides provide effective control of grassy weeds but are ineffective on non-grassy weeds and sedges. There are observations that continuous use of these herbicides is resulting in development of non-grassy weeds and sedges in soybean. In general, growth rate of non-grassy weeds in soybean is very high and they suppress soybean crop very effectively in its early growth stage. Such changes beyond a certain level may become unmanageable. The application window of presently used herbicides in soybean is narrow. They have to be applied as pre-plant incorporation or pre-emergence. Therefore, there is necessity to develop herbicides, which may be applied as post-emergence of varying nature with respect to their weed control spectrum to avoid weed shift and also

possible development of herbicide resistance. In view of above facts, the present investigation was carried out to evaluate bio-efficacy of chlorimuron-ethyl in soybean.

### MATERIALS AND METHODS

Field experiment was conducted to study the bio-efficacy of chlorimuron-ethyl in soybean during rainy seasons of 2000 and 2001 at Crop Research Centre of G. B. Pant University of Agriculture & Technology, Pantnagar. The soil of experimental field was loam in texture (38.4% sand, 45.2% silt and 16.4% clay), medium in organic carbon (0.58%), very high in available phosphorus 109 kg ha<sup>-1</sup> and medium in available potassium (201 kg ha<sup>-1</sup>) content with pH 7.7. Treatments consisted of various doses of chlorimuron-ethyl (6, 9 and 18 g ha<sup>-1</sup>) with and without surfactant (Triton 0.2%) applied at 3, 7 and 15 days after sowing (Table 1). Pendimethalin and alachlor were included in the experiment for comparative assessment. Experiment with 15 treatments and three replications was laid out in randomized block design. Herbicides were applied as spray using 500 litres of water per hectare. Soybean variety PK 1162 at a row spacing of 60 cm was sown on July 10, 2000 and June 30, 2001. The recommended package of practices other than weed control was adopted to grow experimental crop.

## RESULTS AND DISCUSSION

### Effect on Weeds

The weeds observed in the experimental field were : *Echinochloa colona* (13.1%), *Celosia argentea* (21.6%), *Trianthema monogyna* (24.9%), *Cyperus* spp. (26.8%) and others (13.6%)—*Commelina benghalensis*, *Parthenium hysterophorus* and *Phyllanthus niruri*. Application of chlorimuron-ethyl at 6, 9 and 18 g ha<sup>-1</sup> 3 DAS was more effective than application at 7 and 15 DAS in reducing the density of weeds (Table 1).

Pendimethalin at 1.0 kg ha<sup>-1</sup> and alachlor at 2.5 kg ha<sup>-1</sup> as pre-emergence (3 DAS) were more effective in reducing population of *E. colona* than application of chlorimuron-ethyl at various doses at 7 and 15 DAS. Weed control efficacy of chlorimuron-ethyl at various doses (Table 1) applied at 3 DAS or even 7 DAS was much higher than pendimethalin and alachlor on *c. argentea*, *T. monogyna* and sedges (*Cyperus iria* and *C. rotundus*). Chlorimuron-ethyl at 9 g ha<sup>-1</sup> applied 3 and 7 DAS was more effective than at 6 g ha<sup>-1</sup>. Dixit *et al.* (2003) also reported higher weed control efficacy of chlorimuron-ethyl at 9 g ha<sup>-1</sup>. Addition of surfactant further increased

Table 1. Effect of chlorimuron-ethyl on weeds in soybean (Mean of two crop seasons)

Treatment	Dose (g ha <sup>-1</sup> )	Stage of application (DAS)	Weed density (No. m <sup>-2</sup> ) 45 DAS				
			<i>E. colona</i>	<i>C. argentea</i>	<i>T. monogyna</i>	<i>C. spp.</i>	Others
Chlorimuron-ethyl	6	7	12	19	20	22	13
Chlorimuron-ethyl+S	6	3	7	15	13	12	11
Chlorimuron-ethyl+S	6	7	11	10	6	18	9
Chlorimuron-ethyl+S	6	15	14	22	26	25	16
Chlorimuron-ethyl	9	7	9	11	8	3	9
Chlorimuron-ethyl+S	9	3	2	2	1	0	2
Chlorimuron-ethyl+S	9	7	7	6	3	1	3
Chlorimuron-ethyl+S	9	15	15	24	24	6	11
Chlorimuron-ethyl+S	18	3	1	0	0	1	3
Chlorimuron-ethyl+S	18	7	3	7	2	5	7
Chlorimuron-ethyl+S	18	15	15	25	25	4	10
Pendimethalin	1000	3	2	20	24	24	9
Alachlor	2500	3	2	26	23	24	9
Weed-free	-	0	0	0	0	0	0
Weedy	-	-	14	23	27	29	15

S—Surfactant at 0.2%.

the weed control efficacy of chlorimuron-ethyl at 6 and 9 g ha<sup>-1</sup> when application was done 7 DAS. Application at 15 DAS was not effective whether applied with surfactant or without surfactant. Total weed dry matter production was significantly reduced due to chlorimuron-ethyl applied at various doses and stages (Table 2). Application 15 DAS, irrespective of doses, produced more weed dry matter than application at 3 or 7 DAS. Pendimethalin and alachlor produced more dry matter of weeds from all the treatments involving chlorimuron-ethyl.

This was mainly due to ineffective control of non-grasses and sedges by these herbicides.

### Effect on Crop

Non of the treatments had any phytotoxic effect on soybean crop. The total number of crop plants was almost similar in all the treatments (Table 2). Crop dry matter production was significantly higher in plots treated with chlorimuron-ethyl at various doses and stages of application than that

Table 2. Effect of chlorimuron-ethyl on weed dry weight, crop growth and yield of soybean

Treatment	Dose (g ha <sup>-1</sup> )	Stage of application (DAS)	Total weed dry weight (g m <sup>-2</sup> )		Crop shoots (No. m <sup>-2</sup> )		Crop dry weight (g m <sup>-2</sup> )		Soybean grain yield (kg ha <sup>-1</sup> )				
			45 DAS		45 DAS		45 DAS		2000	2001	2000	2001	Mean
			2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	Mean
Chlorimuron-ethyl	6	7	27.2	24.3	27	28	82.3	79.5	2012	1815	1914		
Chlorimuron-ethyl+S	6	3	22.8	20.7	27	25	88.7	81.7	2327	2205	2266		
Chlorimuron-ethyl+S	6	7	26.1	24.8	30	30	79.8	74.5	2128	1927	2028		
Chlorimuron-ethyl+S	6	15	172.5	161.2	25	27	61.7	59.2	1412	1305	1359		
Chlorimuron-ethyl	9	7	15.1	13.8	27	31	98.2	95.3	2715	2565	2640		
Chlorimuron-ethyl+S	9	3	1.7	2.1	25	26	111.7	105.7	3118	2815	2967		
Chlorimuron-ethyl+S	9	7	4.2	3.7	33	29	102.9	99.8	2905	2708	2807		
Chlorimuron-ethyl+S	9	15	181.3	172.5	27	30	65.2	63.2	1876	1535	1706		
Chlorimuron-ethyl+S	18	3	1.2	0.9	30	27	97.9	92.5	2970	2715	2843		
Chlorimuron-ethyl+S	18	7	6.8	5.9	27	25	95.7	93.6	2875	2650	2763		
Chlorimuron-ethyl+S	18	15	179.5	168.8	27	29	66.4	62.7	1950	1702	1826		
Pendimethalin	1000	3	201.3	199.7	27	31	65.8	63.8	1811	1605	1708		
Alachlor	2500	3	211.2	213.8	28	27	67.7	64.5	1805	1612	1709		
Weed-free	-	0	0.0	0.0	32	30	108.7	102.7	2972	2756	2684		
Weedy	-	-	234.5	237.6	30	31	56.2	54.7	1152	1097	1125		
LSD (P=0.05)	-	-	18.7	15.3	NS	NS	9.6	8.7	562	482	-		

NS-Not Significant.

of weedy check. Application of chlorimuron-ethyl at 3 and 7 DAS produced more crop dry matter than application at 15 DAS irrespective of doses. Crop dry matter production at 6 g ha<sup>-1</sup> was less than at 9 g ha<sup>-1</sup>.

There was more than 60.7% reduction in the grain yield of soybean in weedy treatment in comparison to weed-free treatment. All the herbicide treatments produced significantly higher grain yields than weedy treatment. Chlorimuron-ethyl at 9 and 18 g ha<sup>-1</sup> applied 3 and 7 DAS produced significantly more grain yields than pendimethalin and alachlor. Chlorimuron-ethyl at 9 g ha<sup>-1</sup> applied

3 or 7 DAS yielded significantly more than at 6 g ha<sup>-1</sup>. Chlorimuron-ethyl at 18 g ha<sup>-1</sup> applied 3 or 7 DAS produced grain yields at par with 9 g ha<sup>-1</sup> applied 3 or 7 DAS and weed-free treatment.

#### REFERENCES

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