Effect of Herbicides (Lasso and Basalin) on Germination and Plant Height on Soybean (GLYCINE MAX L.)

Madhulika Singh, Ajay Kumar Srivastava[*]

[*]Head, Department of Botany, St. Xavier's College, Ranchi-834001, Jharkhand, INDIA.

[*]Corresponding Address:

ajaysrivas11@gmail.com

Research Article

Abstract: 100 presoaked seeds of varieties Bragg and Birsa-1 of Soybean (*Glycine max* L.) were treated with three concentrations namely 0.25%, 0.50% and 1.00% for Lasso and 0.17%, 0.33% and 0.66% for Basalin for two hours and then sown in experimental field in two replications along with the control after thorough washing. Germination percentage showed significant reduction in all treatment doses of both the varieties except low and medium treatments of Bragg, where the reduction was non-significant. For observation on plant height ten randomly selected competitive plants from each replication were considered. Observations were recorded at the end of 6th, 7th and 8th week. Plant height showed reduction in both herbicide treatments at all concentrations in variety Bragg. In variety Birsa-1 also, the height and growth rate were reduced in both herbicide treatments but no definite correlations were observed. Variety Birsa-1 seemed to be more sensitive to the treatments than variety Bragg.

Keywords: Germination Percentage, Herbicide, Plant height, Soybean.

Introduction

Agricultural chemicals are being used extensively by the farmers for obtaining high crop yields by controlling pests and diseases and eliminating weeds. But the Indian farmers do not realize that their indiscriminate use may have adverse effect on the crop plants as well as other non target organisms.

Materials and Methods

The present investigation deals with the effect of two herbicides, Lasso (Alachlor) and Basalin (Fluchloraline) on percentage of germination and plant height at three stages, on two varieties of Soybean (*Glycine max* L.) namely Bragg and Birsa-1. The normal concentration used in controlling weeds during crop cultivation under field conditions was used as medium dose; half of this and double the normal concentration were designated as low and high doses, respectively. (Table-1).

Table 1: Concentrations of Herbicides used for treatments

Sl. No.	Herbicides	Low Conc.	Medium Conc.	High Conc.
1.	Lasso	0.25%	0.50%	1.00%
2.	Basalin	0.17%	0.33%	0.66%

100 presoaked seeds of both the varieties were treated with each of the three different concentrations of Lasso and Basalin for two hours. Thereafter the seeds were thoroughly washed in tap water and then sown along with the control in two replications, in Randomized Block Design, in the experimental plot of Birsa Agricultural University. For recording the percentage of germination the whole plant population was taken into consideration, but for plant height at 6th, 7th and 8th week after sowing ten randomly selected competitive plants were tagged for observations.

Results

Germination Percentage

Observation on germination under field conditions was recorded after 15 days of sowing. In variety Bragg, the percentage of germination varied from 51.25% in Basalin (high conc.) to 75.00% in Basalin (low conc.). In the control it was 76.25. (Table-2). A linear correlation between dose concentration and reduction in germination was observed. As compared to the control, the germination percentage was significantly lower in Lasso (high conc.) and Basalin (high conc.). Variety Birsa-1 showed a marked reduction in germination percentage from that of control. It ranged from 17.5% in Basalin (high conc.) to 41.25% in Lasso (med. conc.) while the percentage of germination in the control was 58.75% (Table 2). A decreasing trend in the percentage of germination was observed in Basalin with increase in concentration. Although increase in the germination percentage was observed in the medium concentration of Lasso, yet all the three concentrations of both the herbicides were significantly lower as compared to that of the control.

Plant Height

(a) 6th Week After Sowing

In variety Bragg it ranged from 20.59cm in Basalin (high conc.) to 24.66cm. in Lasso (med.conc.) (Table-2). Height reduction was significant in both

Lasso and Basalin treatments as compared to the control showing a linear correlation.

In variety Birsa-1, the plant height ranged from 17.50cm. in Basalin (high conc.) to 27.42cm. in Lasso (high conc.); the control being 27.60cm. (Table-2). No definite pattern was observed with respect to effect of various treatments on plant height in variety Birsa-1. However, significant lowering of plant height as compared to the control were observed in Lasso (med. conc.) and in all the three concentrations of Basalin.

(b) 7th Week After Sowing

In variety Bragg, the plant height varied from 26.15cm. in Basalin (high conc.) to 30.20cm in Lasso (medium and high conc.), control being 32.30cm (Table-2). Significant depression was observed only in Basalin medium and high concentration treatment.

In variety Birsa-1, the plant height ranged from 21.0cm. in Basalin (high conc.) to 31.10cm. in Lasso (high conc.), while the plant height in the control was 32.0cm. (Table-2). The plant heights were significantly lower in Lasso (med. conc.) and Basalin (all three concs.) as compared to that of control.

(c) 8th Week After Sowing :

The plant height in variety Bragg, ranged between 27.1cm. in Basalin (high conc.) and 32.66cm. in Lasso (high conc.). In the control it was 34.44cm. (Table-2). Although, all the three concentrations of Basalin showed significant reduction in plant height as compared to the control, yet no definite correlation could be observed between treatment doses and plant height at this stage.

In variety Birsa-1, the plant height ranged from 21.19cm in Basalin (high conc.) to 30.54cm in Lasso (low conc.), while in the control it was 34.41cm. (Table-2). No definite pattern emerged between treatment doses and plant height. However, plant heights in all the concentrations except Lasso (high conc.) were significantly lower than the control.

In case of variety Bragg, the rate of growth between 6th and 8th week in case of variety Bragg, followed the same pattern in low and medium concentration of both the herbicides, but showed much reduced growth in their high concentration as compared to that of the control (Fig. 1a).

In variety Birsa-1 Lasso (high conc.) exhibited an enhanced rate of growth as compared to the control, whereas the medium concentration showed a lower growth curve. An opposite trend to Lasso was observed in Basalin where the medium concentration exhibited maximum rate of growth and minimum was observed in the high concentration (Fig.-1b).

Discussion

In variety Bragg, the germination percentage in the control was 76.25% while it was only 58.75% in variety Birsa-1, which could perhaps be due to unfavourable storage condition of the seeds of the previous season crop of the latter variety. Gradual reduction in germination percentage with increasing concentration in both the varieties in Basalin treatments and in variety Bragg in Lasso treatments was similar to those observed by Matsasumara and Fuzi (1958) in *Hordeum distichum*; Sinha (1985) in gamma ray treated groundnut; Pal et al (1995) in EMS treated *Albizzia lebbek* ; Ali and Khan (1998) in 2, 4-D treated *Triticum aestivum* ,Singh & Bhattacharya (2003) in *Spodoptera litura* and Amaregouda *et al* (2013) in *Glycine max*. L. In variety Bragg the mean germination percentage of Lasso and Basalin were 85.79% and 84.69% respectively of the control, whereas in Birsa-1 it was 58.86% in Lasso and 41.14% in Basalin. The germination percentage was more adversely affected in Birsa-1 variety as compared to variety Bragg. The differential response to lowering of germination could be due to the different genetic make up of the two varieties. The uniform depressing effect on plant height and their growth in Basalin treatments in both the varieties was quite evident. This could be due to the fact that Basalin is used as presowing soil treatment for weed control. Direct contact with the seed although did not affect the germination percentage in variety Bragg, it was obvious in Birsa-1. This differential response could be again due to genetic difference between the two varieties. Dose dependant linear relationship in plant height reduction in the present investigation are similar to those observed in other cases of effects of agrochemicals as well as chemical and physical mutagens on different plants as reported by Sparrow and Christensen (1953) in gamma irradiated higher plants; Matasumara and Fuzi (1958) in *Hordeum distichum*; Borojevic (1966) through gamma irradiation treated in wheat; Rao and Reddi (1984) in rice; Sahai and Srivastava (1986) in *Cajanus cajan*; Kumar and Singh (1990) in Lens culinaris ; Hussein and Siddqui (1997) in EMS treated *Solanum melongena;* Wang and Zhou (2006) in *Triticum aestivum* and Jitendra Jadav *et al* (2013) in *Soybean max*.L

In case of variety Bragg, growth rate in both the herbicide treatments, was greatly reduced while in Birsa-1 only Basalin treatments exerted similar adverse effect. These agrochemicals are exerting similar adverse effect on germination and height as those of several other chemical and physical mutagens.

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Table 2: Mean values of percentage of germination and plant height under Lasso and Basalin treatments in Soybean

Variety - Bragg

Treatments		Percentage Germination	Plants height (cm)		
			6th week	7th week	8th week
Control		76.25	26.40	32.30	34.44
Lasso	Low	72.50	24.40*	29.90	32.00
	Med	70.00	24.66*	30.20	32.16
	High	53.75*	23.95*	30.20	32.66
Mean		65.42	24.34	30.10	32.27
Basalin	Low	75.00	24.14*	29.15	29.90*
	Med	67.50	23.35*	28.80*	30.14*
	High	51.25*	20.59*	26.15*	27.10*
Mean		64.58	22.69	28.03	29.04

Variety - Birsa-1

Treatments		Percentage Germination	Plants height (cm)		
			6th week	7th week	8th week
Control		58.75	27.60	32.00	34.41
Lasso	Low	37.50*	25.16	29.75	30.54*
	Med	41.25*	23.49*	27.15*	27.20*
	High	25.00*	27.42*	31.10	31.33
Mean		34.58	25.36	29.33	29.69
Basalin	Low	32.50*	18.65*	21.25*	23.12*
	Med	22.50*	22.15*	25.80*	25.96*
	High	17.50*	17.50*	21.00*	21.19*
Mean		24.17	19.43	22.68	23.42

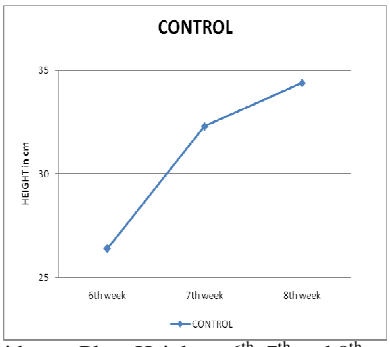

Figure 1a: Effect of Herbicides on Plant Height at 6th, 7th and 8th week after sowing var. bragg.

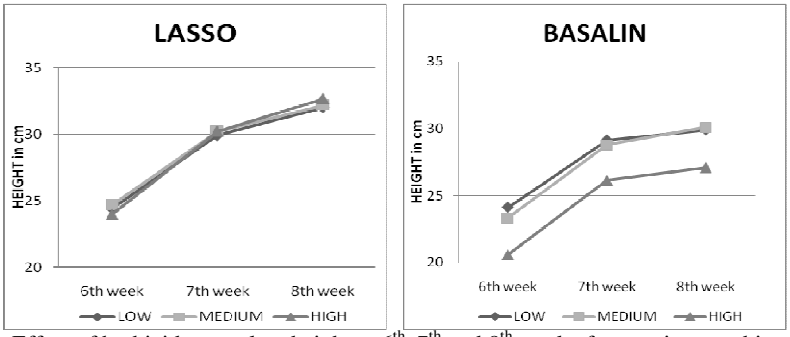

Figure 1b: Effect of herbicides on plant height at 6th, 7th and 8th week after sowing var. birsa