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Effect of Varieties, Crop Geometries and Weed Management Practices on Weed Growth and Grain Yield of Soybean

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ABSTRACT

Field experiments were conducted during **kharif** seasons of 2001 and 2002 at Instructional Farm, Rajasthan College of Agriculture, MPUAT, Udaipur. Results indicated that variety JS-335 produced significantly higher grain yield (16.09 q ha^{-1}) than JS 71-05 and NRC-37, though there existed no significant variation among varieties, when judged in terms of weed density and dry matter. Crop geometries (30 cm x 10 cm and 20 cm x 15 cm) did not show any significant effect on weeds as well as on crop. Pre-emergence application of clomazone at 1.0 kg ha^{-1} reduced the population of *Echinochloa colona, Cynodon dactylon, Cyperus rotundus, Trianthema portulacastrum, Parthenium hysterophorus* and *Commelina benghalensis,* while post-emergence herbicide fenoxaprop-p-ethyl at 75 g ha^{-1} (at 20 DAS) was effective against *E. colona* and *C. dactylon* only. Both the herbicides failed to control *Amaranthus spinosus* and *Digera arvensis.* Two hand weedings (at 20 and 40 DAS) and clomazone at 1.0 kg ha^{-1} pre-emergence+HW (at 40 DAS) were found most appropriate treatments, when judged in terms of reducing total weed density and dry matter, and increasing soybean grain yield.

INTRODUCTION

Soybean, being a rainy season crop, suffers severely due to competitional stress of weeds which results in reduction of yield from 20-77% depending on nature and density of weed species (Tiwari and Kurchania, 1990). Hand weeding and mechanical weeding are difficult due to continuous rainfall and scare availability of labourers at the critical stage of crop-weed competition. The only alternative, therefore, seems to be application of suitable herbicide, which can control the weeds during critical phase of crop growth. These herbicides might just not be able to provide substantial period of weed control, therefore, their integration with interculture can prove more successful. Different varieties may differ in their canopy structure and growth characteristics, which may play a pivotal role in smothering the weeds. Alteration in crop geometry without changing plant density, particularly in high plant density crops like soybean may also play an important role in smothering weeds and deciding crop productivity. The present investigation was, therefore, undertaken to generate the informations on the suppressing ability of different soybean varieties crop geometries and weed management practices on weed growth and yield of soybean.

MATERIALS AND METHODS

The field experiment was conducted at Instructional Farm, Rajasthan College of Agriculture, Udaipur (Rajasthan) during the **kharif** seasons of 2001 and 2002. The experimental soil was clay loam, medium in available nitrogen, phosphorus and potassium content. The treatments consisted of three soybean varieties (NRC-37, JS 335 and JS 71-05) and two crop geometries (30 cm x 10 cm and 20 cm x 15 cm) in main plots and six weed management practices (weedy, two hand weedings at 20 and 40 days after sowing, clomazone at 1.0 kg ha^{-1}, clomazone at 1.0 kg ha^{-1} + HW at 40 DAS, fenoxaprop-p-ethyl at 75 g ha^{-1} at 20 DAS and fenoxaprop-p-ethyl at 75 g ha^{-1} + HW at 40 DAS in sub-plots. The experiment was laid out in split plot

Table 1. Effect of treatments on density of prominent weed flora at 60 DAS (Pooled of two crop seasons)

Treatment	Weed density (No. m^{-2})							
	E. colona	*C. dactylon*	*C. rotundus*	*T. portul acastrum*	*C. benghalensis*	*A. spinosus*	*D. arvensis*	*P. hysterophorus*
Weedy	8.28*	5.29	3.53	8.55	5.79	3.74	3.43	5.88
	(68)	(28)	(12)	(73)	(33)	(14)	(11)	(34)
Two HW at 20 & 40 DAS	2.28	2.34	2.28	2.00	2.14	2.15	1.96	2.48
	(5)	(5)	(5)	(4)	(4)	(4)	(3)	(6)
Clomazone	2.47	2.47	2.40	2.23	2.26	3.55	3.27	2.56
	(6)	(6)	(5)	(5)	(5)	(12)	(10)	(6)
Clomazone+HW at 40 DAS	2.31	2.37	2.29	2.03	2.23	2.23	1.90	2.46
	(5)	(5)	(5)	(4)	(5)	(5)	(3)	(6)
Fenoxaprop-p-ethyl	2.89	4.35	3.40	8.34	5.63	3.68	3.33	5.73
	(8)	(19)	(11)	(69)	(31)	(13)	(11)	(33)
Fenoxaprop-p-ethyl+HW at 40 DAS	2.40	2.40	2.29	2.16	2.35	2.27	2.02	2.53
	(5)	(5)	(5)	(4)	(5)	(5)	(4)	(6)
LSD (P=0.05)	0.19	0.20	0.17	0.25	0.22	0.19	0.18	0.22

*Values are ($\sqrt{x+0.5}$) transformed and actual values are given in parentheses.

design with three replications. A uniform dose of 20 kg N and 40 kg P_2O_5 ha^{-1} was given through urea and DAP as a basal dose in crop rows at about 5 cm below the seeding depth. Total rainfall in the respective seasons during the crop period was 362.7 and 253.2 mm. Life saving irrigations were also applied as and when needed. As per treatment, clomazone was applied next day of sowing as pre-emergence, while fenoxaprop-p-ethyl at 20 DAS as post-emergence. In the plots involving hand weeding treatment, weeds were removed manually at 20 and 40 DAS as per treatment. The data on weed density (species-wise) and total weed density and dry matter were recorded at 60 DAS.

RESULTS AND DISCUSSION

Effect on Weeds

The major weed species which infested the experimental field comprised *Trianthema portulacastrum* (26.5%), *Commelina benghalensis* (12.0%), *Parthenium hysterophorus* (12.4%), *Amaranthus spinosus* (5.1%), *Digera arvensis* (4.0%), *Echinochloa colona* (24.7%), *Cynodon dactylon* (14.2%) and *Cyperus rotundus* (4.4%). Density of *T. portulacastrum* was not observed at the harvesting stage due to its maturity much earlier than the crop maturity. Varieties and crop geometries had no significant effect on weed density and total weed dry matter (Table 1).

Density of *E. colona* and *C. dactylon* was reduced significantly due to all the weed control methods compared to weedy check (Table 1). *A. spinosus* and *D. arvensis* were controlled due to two hand weedings only and not by herbicides. *C. rotundus, T. portulacastrum, C. benghalensis* and *P. hysterophorus* were reduced significantly due to hand weeding and clomazone at 1.0 kg ha^{-1} compared to weedy. However, fenoxaprop-p-ethyl had no effect on these weeds.

Fenoxaprop-p-ethyl at 75 g ha^{-1} was found at par with hand weeding in controlling *E. colona*. Integration of one hand weeding was found useful upto harvest of crop, when done with clomazone, however, with fenoxaprop-p-ethyl; it was not found equivalent to two hand weedings. Effect of treatments was similar to that of weed density.

Table 2. Effect of treatments on total density and dry matter of weeds and grain yield of soybean (Pooled for two crop seasons)

Treatment	Total weed density (No. m^{-2})	Total weed dry weight ($g\ m^{-2}$)	Soybean grain yield ($kg\ ha^{-1}$)
Weedy	16.58*	281.1	848
	(275)		
Two HW at 20 & 40 DAS	6.02	19.8	1718
	(36)		
Clomazone	7.46	40.7	1520
	(55)		
Clomazone+HW at 40 DAS	6.10	19.2	1690
	(37)		
Fenoxaprop-p-ethyl	14.00	217.4	1091
	(196)		
Fenoxaprop-p-ethyl+HW at 40 DAS	6.30	19.7	1393
	(39)		
LSD (P=0.05)	0.35	4.9	66

*Values are ($\sqrt{x+0.5}$) transformed and actual values are given in parentheses.

Effect on Crop

Soybean variety JS-335 exhibited significant superiority over NRC-37 and JS 71-05 when judged in terms of grain yield (Table 2). Variety JS 71-05 was also significantly superior over NRC-37. The difference in grain yield of varieties may be ascribed to variation in genetic potential and adaptability to soil and climatic conditions. Crop geometries failed to record significant influence on grain yield. All the weed management treatments significantly increased grain yield of soybean as compared to weedy check. Among different weed control practices, two hand weedings and clomazone+HW produced significantly higher grain yield as compared to rest of the treatments though variation between these two was found statistically non-significant. The increase in yield under clomazone +HW and two hand weedings may be attributed to significant reduction in weed density and dry matter, thereby reduction in crop-weed competition.

REFERENCE

Tiwari, J. P. and S. P. Kurchania, 1990. Survey and management of soybean *(Glycine max)* ecosystem in Madhya Pradesh. *Indian J. agric. Sci.* **60** : 672-676.