Indian Journal of Agronomy **60** (1): 160–162 (March 2015)

Research Communication

Effect of herbicides and cultural practices for effective weed management in soybean (*Glycine max*)

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Received : November 2013; Revised accepted : February 2015

ABSTRACT

A field experiment was conducted during rainy season (*kharif*) of 2007 at Research Farm of Indira Gandhi Krishi Vishwavidyalaya, Raipur to find out the effective measure of weed control with combination of herbicides and cultural practices in soybean [*Glycine max* (L.) Merril]. Application of fluchloralin @ 1,000 g/ha PPI + hand weeding at 40 DAS resulted in the lowest weed dry-matter and maximum weed control efficiency followed by hand-weeding twice at 20 and 40 days after sowing. This treatment also recorded the highest seed yield of soybean.

Key words : Herbicides, Pre-emergence, Post-emergence, Soybean, Weed dynamics, Weed management

The use of selective herbicides in soybean [*Glycine Max* (L.)Merril] seems to be effective and economical weed-management strategy. However, effectiveness depends on the weed flora and their time of emergence. The traditional methods of weed control, viz, manual and mechanical methods, are cumbersome and time-consuming and hence prove costly. Non-availability of labourers at critical period leads to ineffective control of weeds and severe crop-weed competition. The crop-weed competition starts from the beginning, since the crop and weed emerge simultaneously, hence, warrants the suitable weed-management practices to get effective, timely and economical control of weeds in soybean. Now-a-days a few herbicides like alachlor, fluchloralin, fenoxyprop-e-ethyl are available, which can be used safely in soybean. It has been reported that most of the selective herbicides do not practices because different weeds present in the crop. Therefore integrated approach of chemical and cultural control may be more feasible and practable. Hence a study was carried out to find out the effective measure of weed control, with combination of herbicides and cultural practices.

Based on part of M.Sc. Thesis of the first author submitted to IGKVV, Raipur

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A field experiment was conducted during the rainy (*kharif*) season of 2007 at Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh), on clayey soil with medium in available N (217 kg/ha) and P_2O_5 (12 kg/ha) and high in available K_2O (366 kg/ha). The experiment was laid in split-plot design with 3 replications. Soybean variety 'JS 335' was sown in July at the seed rate of 75 kg seed/ha and harvested October 2007.

The experiment comprised 6 treatments, viz. W_1, weedy check W_2, 2-hand weedings at 20 and 40 days after sowing (DAS); W_3, alachlor 1.50 kg ai/ha pre-emergence (PE); W_4, alachlor 2.0 kg ai/ha pre-emergence; W_5, fenoxaprop-p-ethyl 75 g/ha (PoE); W_6, fluchloralin 1.0 kg ai/ha pre-emergence + hand-weeding at 40 DAS. Recommended dose of 20 kg N, 80 kg P_2O_5, 5 kg Zn was applied basal at the time of sowing. Seed treated with thiram @ 2 g + bavistin 1.0 g/kg seed, followed by inoculation with *bradyrhizobium japonicum* culture (7 g/kg of seed). Thinning was done to maintain optimum plant population (i.e. 0.4 million plants/ha) at 15–20 DAS.

Application of fluchloralin @ 1,000 g/ha (PE) + hand-weeding at 40 days proved better in minimizing the total weed population and found significantly superior in alleviating total weed population than the other weed-management practices, followed by hand-weeding twice at 20 and 40 DAS. Dry-matter accumulation of weeds increased with the increasing weed density as well as variation of weed species and their growth. The highest weed dry-matter was obtained under weedy check at 60 DAS (Table

1) and the lowest in weed-free plot. Among the all the time intervals of observations, use of fluchloralin @ 1,000 g/ha (PE) + hand-weeding at 40 days resulted in the lowest weed dry matter production except at 30 days (Table 1). It was significantly superior to rest of the treatments. At 60 days, fluchloralin @ 1,000 g/ha (PE) + hand-weeding at 40 DAS recorded lowest weed dry-matter production followed by hand-weeding twice at 20 and 40 days. Similar trend was observed at harvest stage.

The maximum weed-control efficiency was recorded under hand-weeding twice at 20 and 40 days. However, during later stage, i.e. 60 DAS and 90 DAS (at harvest) the highest weed control efficiency, was witnessed under fluchloralin @ 1,000 g/ha (PE) + hand-weeding at 40 days respectively. This might be due to less dry-matter production and population of weeds, which resulted successful checking of weed growth in the above treatments. The minimum weed-control efficiency was found under fenoxyprop-p-ethyl @ 75 g/ha (PoE). Maximum weed-control efficiency was observed under fluchloralin @ 1,000 g/ha (PE) + hand-weeding at 40 days followed by hand-weeding twice at 20 and 40 days. This may be due to less dry-matter production and population of weed in this treatment (Singh *et al.,* 1989). The maximum weed index was found under weedy check (68.81%) and it was minimized to 1.61% under hand-weeding twice at 20 and 40 days.

The yield and yield-attributing characters, *viz.* branches and pods/plant were significantly influenced by different weed-control treatments (Table 2). The highest values of these parameters over control (weedy check) were under weed-free treatment. Among herbicidal applications, significantly higher seed yield obtained with fluchoralin@ 1,000 g/ha (PE) + hand-weeding at 40 DAS; however, it was found comparable with the yield obtained under hand-weeding twice at 20 and 40 DAS. The lowest seed yield was recorded under weedy check Tiwari and Kurchania (1990) also reported that weed infestation in soybean field may reduce yield up to 77% depending on the intensity, nature and the duration of weed competition. The lowest seed yield was recorded with weedy plot. Pods/plant, seeds/pod and 100-seed weight were higher with fluchoralin @ 1,000 g/ha (PE) + hand-weeding at 40 DAS, which contributed towards the higher seed yield (Suri and Choudhary, 2013a). The increase in yield attributes under fluchoralin @ 1,000 g/ha (PE) + hand-

Table 1. Effect of weed-control treatment on total weed dry-weight, weed-control efficiency and weed density

Treatment	Dose (g/ha)	Time of application	Total weed dry weight (g/m^2)			Weed control efficiency (%)			Weed index
			30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS	
Weedy check	-	-	26.8	-	37.7	-	-	-	68.81
Hand-weeding twice	-	20 and 40 DAS	8.2	71	16.3	87.0	82.6	71	1.61
Alachlor	1500	PE (2 DAS)	13.6	53.0	24.4	84.8	70.8	53.0	11.21
Alachlor	2000	PoE (10DAS)	12.3	53	24.4	85.6	72.6	53.1	9.17
Fenoxaprop-p-ethyl	75	PoE (10DAS)	16.4	53.8	24.3	53.0	63.0	53.8	16.39
Fluchloralin + hand-weeding	1000	PE (2DAS)	10.2	72.4	13.9	87.1	85.1	72.4	-
SEm±			0.22	0.66	0.6	0.2	0.27	0.6	-
CD (P=0.05)			0.59	1.78	1.78	0.59	0.73	1.78	-

DAS, Days after sowing; PE, Pre-emergence; PoE, Post-emergence; H, hand-weeding

Table 2. Yield attributes and yields of soybean as affected by seed-management practices

Treatment	Plant height (cm) at harvest	Dry matter production (g/plant)	Pods/ plant	Seed/ pod	100 seed weight (g)	Seed yield (t/ha)	Stover yield (t/ha)
Weedy check	48	21.0	18.8	2.2	9.4	0.73	2.56
Hand-weeding twice	57	25.1	31.7	2.6	12.4	2.32	5.37
Alachlor	49	24.0	30.7	2.3	11.3	2.09	4.66
Alachlor	50	24.3	30.7	2.4	11.3	2.14	4.72
Fenoxaprop-p-ethyl	48	24.2	24.6	2.2	11.5	1.97	4.62
Fluchloralin + hand-weeding	59	25.1	31.9	2.6	12.5	2.35	5.45
SEm±	2.12	1.46	0.42	0.05	0.05	0.061	0.178
CD (P=0.05)	5.74	4.04	1.14	0.14	0.15	0.167	0.482

DAS, Days after sowing; PE, Pre-emergence; PoE, Post-emergence; H, hand-weeding

weeding at 40 DAS was due to weed managed from early crop growth and higher dry-matter production, which resulted in greater translocation of food materials to the reproductive parts and reflected in superiority of yield attributing characters and ultimately to higher yield. The lower weed population and higher weed-control efficiency also resulted in higher seed yield. The poor growth of plant as well as yield attributes in weedy check might be due to less moisture and nutrient available at the time of flowering and pod development, which adversely influenced the seed yield (Suri and Choudhary, 2013). The lower seed yield with weedy check might be also due to higher weed interference.

Based on the study, it is concluded that for effective weed control in soybean, integrated hand weeding at 40 DAS with fluchoralin @ 1,000 g ai/ha pre-emergence application within 2-3 days after sowing.

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