

Effect of weed-control method on soybean (*Glycine max*)

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ABSTRACT

A field experiment was conducted during the rainy season of 1990 and 1991 on silty clay-loam soil to study the effect of different herbicides on 'PK 327' soybean [*Glycine max* (L.) Merr.]. Weed population, weed-dry matter and weed-control efficiency were the lowest with 2 hand-weedings at 30 and 45 days after sowing. The pods/plant, seeds/pod and 1,000-seed/weight were the highest with the application of dimethazone @ 1.0 kg/ha in 1990. But in 1991, the pods/plant and seeds/pod were the highest with 2 hand-weedings and 1,000 seed/weight was the highest with the post-emergence application of haloxyfop-methyl @ 0.5 kg/ha. In 1990, the highest seed yield was recorded with 2 hand-seedlings which was at par with the post-emergence application of haloxyfop-methyl @ 0.5 kg/ha and remained significantly greater than rest of the treatments. During 1991, the highest seed yield was recorded when soybean was planted at 22.5 cm + pre-emergence spray of alachlor @ 1.0 kg/ha, which remained at par with dimethazone @ 1.0 kg/ha and significantly more than rest of the treatments.

Presence of weeds lowers the yields of crops by competing with them for space, moisture, light, nutrients etc. Chandel (1989) observed 59–85% reduction in the grain yield of soybean [*Glycine max* (L.) Merr.]. An experiment was therefore conducted to study the effect of weed control on yield and yield attributes of soybean.

MATERIALS AND METHODS

The field experiment was conducted during the rainy season (*kharif*) of 1990 and 1991 at Pantnagar, with 'PK 327' soybean. Soil was silty clay loam in texture, having pH 7.1 and 7.2, organic carbon 1.15 and 1.22%, available phosphorus 95 and 39.6 kg/ha and available K 250 and 235.2 kg/ha

in 1990 and 1991 respectively. The experiment was conducted in randomized block design with 3 replications taking 10 treatments (Table 1).

Weed-control efficiency (WCE) was calculated on the basis of weed-dry matter as:

$$WCE = \frac{\text{Weed-dry matter in weedy check} - \text{Weed-dry matter in treated plot}}{\text{Weed-dry matter in weedy check}} \times 100$$

RESULTS AND DISCUSSION

Dominant weeds

The most dominant weed species infesting soybean crop were: *Cyperus rotundus* L.

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Table 1. Effect of weed-control treatments on weed population (number of weeds/m²), weed-dry weight and weed-control efficiency at 45 days after sowing (mean data of 2 years)

Treatment	No. of weeds/m ²	Weed-dry weight (g/m ²)	Weed-control efficiency (%)
Fluchloralin @ 1.0 kg ai/ha, PPI	76.3	187.6	42.2
Metolachlor @ 1.0 kg ai/ha, PE	66.0	177.0	45.4
Alachlor @ 2.0 kg ai/ha, PE	57.3	180.0	44.5
Haloxypop-methyl @ 0.5 kg/ha, PoE	94.3	205.0	36.8
Dimethazone @ 1.0 kg ai/ha, PE	42.6	102.3	68.4
Soybean planted at 22.5 cm + alachlor 1.0 kg ai/ha	71.3	184.0	43.3
Sethoxydim @ 1.5 kg ai/ha, PoE	98.0	214.6	33.8
1 operation by <i>dora</i> or hand-hoe as per requirement	30.3	50.0	84.5
2 hand-weedings at 30 and 45 days after sowing	22.0	44.6	86.2
Weed (check)	120.3	324.6	
CD (P = 0.05)	6.3	11.6	

PPI, Pre-plant soil incorporation; PE, pre-emergence spray; PoE, post-emergence spray

(27.6%), *Echinochloa colonum* Link (25.3%), *Sorghum halepense* (L.) Pers. (13.6%) and *Celosia argenticola* L. (5.9%). The sequence of pre-dominance of these weed species remained almost same up to 60 days after sowing of soybean. At 30 days *Trianthema portulacastrum* L. was also one of the dominant weeds, covering 23.8% of the weed population.

Weed intensity

At 45 days the highest number of weeds was recorded in weedy check, which was significantly more than all other treatments, whereas the lowest number of weeds was recorded in 2 hand-weedings, followed by 1 hoeing (Table 1). Out of 6 herbicides tested, dimethazone @ 1.0 kg/ha was more effec-

tive in reducing weed population (by 64.5%), followed by alachlor @ 2.0 kg/ha (52.3%) as pre-emergence spray. The performance of haloxypop-methyl @ 0.5 kg/ha and sethoxydim @ 1.5 litre/ha as post-emergence sprays was similar in decreasing weed population. Their efficacy was lower than all pre-emergence herbicides tested. The differential response of weeds to various herbicides may be due to complex species and chemical interaction.

Dry matter of weeds

In general, the dry-matter weight of weeds increased with weed population with slight variation due to species differentiation. The highest dry matter of weeds was recorded under weedy check at 45 days after

Table 2. Effect of weed-control treatments on yield attributes and seed yield of soybean

Treatment	Pods/ plant		Grains/ pod		1,000-seed weight (g)		Grain yield (kg/ha)	
	1990	1991	1990	1991	1990	1991	1990	1991
Fluchloralin @ 1.0 kg ai/ha, PPI	63.3	96.6	2.4	2.3	115.3	126.0	2,160	950
Metolachlor @ 1.0 kg ai/ha, PE	63.8	104.6	2.4	2.5	105.3	129.0	2,443	1,400
Alachlor @ 2.0 kg ai/ha, PE	75.2	106.0	2.4	2.5	104.3	129.6	2,366	1,500
Haloxfop-methyl @ 0.5 kg ai/ha, PoE	84.5	86.0	2.3	2.2	116.0	125.6	2,893	705
Dimethazone @ 1.0 kg ai/ha, PE	89.8	114.3	2.3	2.6	100.0	129.6	2,365	1,548
Soybean planted at 22.5 cm + alachlor @ 1.0 kg ai/ha	81.3	91.6	1.9	2.2	103.6	125.0	2,460	1,600
Sethoxydim @ 1.5 kg ai/ha, PoE		83.6		2.2		124.0		650
1 operation by <i>dora</i> or hand-hoe as per regional requirement	74.2	91.6	2.0	2.3	107.0	126.3	2,365	1,350
2 hand-weedings at 30 and 45 days after sowing	90.5	101.3	2.4	2.4	100.0	127.3	3,216	1,350
Weedy (check)	51.8	71.3	1.8	2.1		122.0	2,110	543
CD (P = 0.05)	40.0	4.9	NS	0.08	NS	3.7	590	82

PPI, Pre-plant soil incorporation; PE, pre-emergence spray; PoE, post-emergence spray

sowing (Table 1). At 45 days, the lowest weed-dry matter was found with 2 hand-weedings followed by 1 hoeing, because of weed removal. Out of herbicides, dimethazone @ 1.0 kg/ha resulted in the maximum (68.4%) reduction in weed-dry matter, followed by metolachlor @ 1.0 kg/ha (45.4%). Reduction in weed-dry matter due to application of post-emergence herbicides like haloxyfop-methyl @ 0.5 kg/ha and sethoxydim @ 1.5 litre/ha was less (33.8–36.8%) than that due to pre-emergence herbicides. Their efficiency in decreasing weed-dry matter was 36.8 and 33.8% respectively.

Weed-control efficiency

The highest weed-control efficiency was found in 2 hand-weedings, followed by 1 hoeing and dimethazone @ 1.0 kg/ha as pre-emergence. The lowest weed-control efficiency was recorded with sethoxydim @ 1.5 litre/ha and haloxyfop-methyl @ 0.5 kg/ha.

Yield attributes

During 1990 the effect of weed-control treatments was significant on the number of pods/plant (Table 2). The highest number of pods/plant was recorded with 2 hand-weedings, which was significantly more than that of weedy check and remained on a par with rest of the treatments. Neither number of seeds/pod nor 1,000-seed weight varied significantly due to different treatments of weed control.

In 1991, all the yield attributes, viz number of pods/plant, number of seeds/pod and 1,000-seed weight, were significantly affected by different weed-control treatments (Table 2). Increase in number of pods/plant over the weedy check due to application of dimethazone @ 1.0 kg/ha was maximum (60.2%) and was significantly higher than

all the other treatments. The lowest number of pods/plant was found in weedy check (Table 2). The highest number of seeds/pod was also recorded with dimethazone @ 1.0 kg/ha which was at par with alachlor @ 2.0 kg/ha and was significantly more than rest of the treatments. The lowest number of seeds/pod was found in weedy check. The seed weight in treatments of alachlor @ 2.0 kg/ha as well as in dimethazone @ 1.0 kg/ha was significantly higher than haloxyfop-methyl @ 0.5 kg/ha, soybean planted at 22.5 cm + alachlor @ 1.0 kg/ha, sethoxydim @ 1.5 litre/ha and weedy check and was at par with rest of the treatments. The lowest 1,000-seed weight was found in weedy check.

Grain yield of soybean

During both the years, weed-control treatments resulted in significantly higher grain yield over the weedy check. During 1990, 2 hand-weedings resulted in the highest seed yield which was at par with that of haloxyfop-methyl @ 0.5 kg/ha as post-emergence and remained significantly more than rest of the treatments (Table 2). The lowest seed yield was recorded in the weedy check.

During 1991, yield levels were low due to heavy incidence of *Rhizoctonia* leaf-blight. The highest seed yield was recorded in the treatments of soybean planted at 22.5 cm + alachlor @ 1.0 kg/ha as pre-emergence, which was at par with dimethazone 1.0 kg/ha and was significantly more than rest of the treatments. The lowest seed yield was found in weedy check.

REFERENCE

- Chandel, A. S. 1989. Soybean productivity constraints in North-West Plains—An Agronomist's view. *World Soybean Research Conference, IV*, pp. 672–676.