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Weed control in soybean (*Glycine max*)

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ABSTRACT

An on-farm trial conducted during the rainy seasons of 1999 and 2000 on farmer's field of village Bhagwanpura under the operational area of Krishi Vigyan Kendra, showed that farmer's practice of following *dora* (a small *bakhar*- shape implement, drawn by a pair of bullocks between the rows of a crop) 3 times + 2 hand-weedings at 15 and 30 days after sowing recorded the least weed population and weed dry weight and highest grain and straw yields compared to other treatments. Pre-emergence application of Alachlor granules @ 20 kg/ha proved as effective as farmer's practice for grain and straw yields of soybean and gave the highest net profit (Rs 22,727/ha.) and benefit : cost ratio (1:55).

Key words : Weed-control efficiency, *Dora*, Harvest index

Intensive weed competition is one of the main constraints of soybean productivity, and reduction in the yield due to weeds varies from 35 to 50% depending on type of weeds, their intensity and time of crop–weed competition (Chandel and Saxena, 1988). The nature of yield response to weed management and economic analysis determines the feasibility of adoption of the technology by the growers. The use of selective herbicide in soybean can be effective and economical (Yadav and Shrivastava, 1999). In the present study, an attempt was made to evaluate cultural practices and use of selective herbicide for the control of weeds and to find out the effect of weed-control methods on the yield of soybean.

MATERIALS AND METHODS

An on-farm trial was conducted during the rainy *(kharif)* seasons of 1999 and 2000 on farmer's field of Bhagwanpura village under operational area of Krishi Vigyan Kendra, Khandwa, Madhya Pradesh. The soil was clay loam with pH 6.4 to 7.2, electrical conductivity 0.19 to 0.89 mmhos/cm, organic carbon 0.29 to 0.34%, available P_2O_5 12.7 to 22.1 kg/ha and available K_2O 255 to 397 kg/ha. The average rainfall was 880 mm spread over 72 rainy days. The treatments comprised different weed-control methods, viz. T_1, farmer's practice *dora* 3 times + 2 hand-weedings at 15 days after sowing and 30 DAS; T_2, *dora* once + 1 weeding by wheel hoe: T_3, *dora* once + 2 hand-weedings at 15 and 30 DAS; T_4, *dora*

2 times + 2 hand-weedings at 15 and 30 DAS; T_5, chemical control by 20 kg/ha Alachlor granules applied as pre-emergence; T_6, weedy check]. The treatments were laid down in randomized block design at 5 locations. The data were analysed considering each location as replication. 'JS 335' soybean was sown at 30 cm row distance at seed rate of 100 kg/ha. A uniform dose of 20, 60 and 20 kg N, P_2O_5 and K_2O/ha was given at the time of sowing. Weed counts (No./m^2) and their dry weight were recorded at the harvesting time. The weed-control efficiency (WCE) was calculated as per the formula suggested by Mani *et al.* (1973) :

$$WCE = \frac{DMC\text{-}DMT}{DMC} \times 100$$

where DMC, dry-matter production by weeds in control plots and DMT, dry-matter production of weeds in treated plots.

RESULTS AND DISCUSSION

The major weeds in the experimental plots were cock's comb (*Celosia argentea* L.), floss flower (*Ageratum conyzoides* L.), spurge (*Euphorbia hirta* L.), *Echinochloa* spp., day flower (*Commelina benghalensis* L.), *Eclipta alba* L, bermudagrass [*Cynodon dactylon* (L.) and *Panicum* spp. etc. Density of dicotyledonous weeds was more than that of grasses during both the years.

Weed dry matter

In general all the weed-control treatments caused significant reduction in dry weight of weeds (Table 1). Maximum and significant decrease (89%) in weed dry weight was recorded from T_1 (*dora* 3 times + 2 hand-weedings) compared with weedy check and was on a par with T_3 (*dora* once + 2 hand-weedings) and T_4 (dora twice + 2 hand-weedings). Application of Alachlor granules @ 20 kg/ha as pre-emergence was also significantly effective in reducing the weed dry matter (78.7%) over the control. These findings are in close agreement with those of Singh and Chandel (1995).

Weed population

The highest number of weeds was recorded in weedy ckeck which was significantly more than all other treatments, while the lowest number of weeds was recorded in T_1 (*dora* 3 times + 2 hand-weedings). Herbicidal treatment, i.e. Alachlor granules as pre-emergence was quite effective in reducing weed population (73.5%) over the control and it was at par with T_4.

Yield attributes

The yield-attributing characters, viz. plant height, branches/plant, filled pods/plant, total pods/plant, pod yield/plant and total seeds/plant were maximum and significantly more under T_1 (*dora* 3 times + 2 hand-weedings) compared to weedy check and it was at par with pre-emergence application of Alachlor granules @ 20 kg/ha (Table 2)

Grain yield

There was 69% and 61% reduction in soybean seed and straw yields, respectively, in unweeded check over the best treatment T_1. The highest mean seed and straw yields of 20.4 and 22.6 q/ha, respectively, were

recorded under treatment T_1, which was at par with T_3,T_4 and T_5 and proved significantly superior to the rest of the treatments. Chandel *et al.* (1995) also indicated that Alachlor is as efficient as cultural method. The higher yield under treatment T_1 may be attributed to better weed-control efficiency (89%) apart from creating soil mulch due to

Table 1. Effect of weed control on yield and economics of soybean (mean of 2 years)

Treatment	Weed count/ m^2	Weed dry weight (m^2)	Weed-control efficiency (%)	Yield (q/ha)		Harvest index	Net returns (Rs/ha)	Benefit : cost ratio
				Grain	Straw			
T_1, *Dora* *3 times + 2 hand-weedings at 15 and 30 DAS (farmer's practice)	23.2	36.9	89.0	20.4	22.4	47.86	11,044	1.12
T_2, *Dora* once + 1 hand-weeding by wheel hoe	106.5	154.8	55.9	13.4	15.4	46.85	6,570	0.89
T_3, *Dora* once + 2 hand-weedings at 15 and 30 DAS	41.1	43.5	86.8	18.3	20.6	47.80	10,035	1.08
T_4, *Dora* 2 times + 2 hand-weedings at 15 and 30 DAS	31.8	55.3	83.5	19.7	21.8	48.06	10,658	1.11
T_5, Alachlor granules @ 20 kg/ha as pre-emergence	39.7	71.5	78.7	19.1	21.4	47.26	11,727	1.55
T_6, Weedy check	150.3	335.9		6.3	8.7	21.40	915	0.04
CD (P=0.05)	8.10	21.6	6.72	2.12	2.24	2.73	575	0.33

DAS, Days after sowing

*A small *bakhar*-shape implement drawn by a pair of bullocks between the rows of a crop.

Cost : Alachlor granules @ 10.50/kg bullock pair @ Rs 150/day, labour @ Rs 50 day; Soybean grain @ Rs 8.50/kg; soybean straw Rs 20/q

Table 2. Yield-attributing characters of soybean as influenced by weed control (mean data 2 years)

Treatment	Plant height (cm)	Branches/ plant	Filled pods/ plant	Total pods/ plant	Pod yield/ plant (g)	Total seeds/ plant
T_1 *Dora* 3 times + 2 H.W. at 15 and 30 DAS (farmer's practice)	45.3	3.05	22.0	22.41	7.91	48.1
T_2 *Dora* once + 1 hand-weeding by wheel hoe	38.4	2.25	16.3	18.60	5.32	39.2
T_3, *Dora* once + 2 hand-weedings at 15 and 30 DAS	41.2	2.75	18.1	18.40	6.61	44.5
T_4, *Dora* 2 times + 2 hand-weedings at 15 and 30 DAS	43.2	2.85	19.0	19.30	6.89	46.2
T_5, Alachlor granules @ 20 kg/ha, as pre-emergence	44.6	2.98	20.1	20.3	7.52	47.6
T_6, Weedy check	18.6	2.01	14.6	12.4	4.26	30.6
CD (P=0.05)	4.3	0.30	2.3	2.2	0.45	2.10

repeated *dora* operation. All the weed-control treatments gave significantly higher harvest index than weedy check.

Economics

Economics of different weed-control treatments showed that significantly highest net profit (Rs 11,727/ha) and benefit : cost ratio (1.55) were obtained under treatment T_5, i.e. pre-emergence application of Alachlor granules @ 20 kg/ha compared with rest of the treatments.

Based on the grain yield and net returns owing to weed-control methods and also considering the scarcity of labour at many places, it was found that pre-emergence application of Alachlor granules @ 20 kg/ha is most effective in controlling weeds in soybean in Nimar tract of Madhya Pradesh.

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