

Effect of cultural and chemical weed control methods on growth and yield of soybean in Vindhyanagar plateau of Madhya Pradesh

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ABSTRACT

A field experiment was conducted at Sehore (Madhya Pradesh) to evaluate the effect of various cultural and herbicidal weed control methods on the extent of weed control, growth and yield of soybean [*Glycine max* (L.) Merrill]. Two hand weeding (HW) at 30 and 45 days after sowing (DAS), *in situ* mulching with weeds at 30 DAS, pendimethalin or clomazone applied as pre emergence both at 1.0 kg/ha supplemented with 1 HW reduced the weed density and weed bio mass significantly at 50 DAS. These treatments also improved yield attributes and seed yield of soybean.

Key words : Chemical control, Cultural control, Soybean, Yield.

Soybean [*Glycine max* (L.) Merr.] is the most important rainy season oil seed crop of Madhya Pradesh, which has brought about a perceptible change in the economy of the farmers of the state. Being rainy season crop, it suffers from severe infestation of weeds which reduces its seed yield by 25-77% (Kurchania *et al.* 2001). Hand weeding is commonly practiced by the farmers as an effective method of weed control but incessant rain, vertisol soil type and timely unavailability and high wages of labourers at weeding peaks are some constraints. Therefore, application of pre-emergence herbicides coupled with cultural practices and use of post emergence herbicides needs to be explored as a cheap and quick method of weed management. Hence, present study was undertaken.

MATERIALS AND METHODS

A field experiment was conducted during rainy season in 2003-04 and 2004-05 at research farm, R.A.K. College of Agriculture, Sehore (M.P.). The soil of the field was clayey loam in texture with organic content (0.48%) and 224.2, 18.20 and 296 kg/ha available N,P and K, respectively. The soil was neutral in reaction (pH 7.50). Treatments consisted of two hand weeding(HW) at 30 and 45 days after sowing (DAS), two hoeing at 20 and 40 DAS, *in situ* mulching with weeds at 30 DAS, alachlor 2.0 kg/ha as pre emergence (PE), clomazone 1.0 kg/ha as PE, pendimethalin 1.0 kg/ha as PE, clomazone 1.0kg/ha PE+ 1 HW at 30 DAS, pendimethalin 1.0 kg/ha PE+ 1 HW at 30 DAS, quizalofop ethyl 50 g/ha as post emergence (PoE) and weedy check. Soybean variety JS 335 was sown in rows of 45 cm apart in all the treatments on June 30, 2003 and July 10, 2004.

A uniform dose of 20 kg N, 60 kg P₂O₅ and 20 kg K₂O/ha was applied at the time of sowing. The pre emergence application of herbicides was done on next day of sowing while post emergence application of herbicide was done at 15-20 DAS. The crop was raised with recommended package of practices. Observations on weed counts and weed biomass were recorded by using quadrat of 0.25x 0.25 m² at 20 and 50 DAS, respectively. The observations on growth parameters and yield attributes including yield were recorded at 50 DAS and maturity, respectively.

RESULTS AND DISCUSSION

Effect on weeds

The experimental field was severely infested with about 23 weed species, consisting of both monocots and dicot in weedy check plots. Among monocot weeds, *Cyperus rotundus*, *Digitaria sanguinalis*, *Echinochloa colonum*, *Commelina benghalensis*, *Cynotis axillaries* and *Dinebra arabica* were dominant whereas *Caesulia axillaries*, *Acalypha indica*, *Anotis mothulani*, *Digera arvensis*, *Xanthium strumarium*, *Phyllanthus maderaspteris*, *Corchorus* sp. and *Euphorbia* sp. were among dicot weeds.

Weed control through various means significantly reduced the weed density over weedy check at 20 and 50 DAS (Table 1). Treatments differed significantly with each other in controlling both monocot and dicot weeds. The hand weeding at 30 and 45 days resulted in minimum weed population at 50 DAS (24 weed/m²) and weed biomass

Table 1. Effect of weed control treatments on weed intensity, weed biomass and weed control efficiency (%) in soybean (pooled data of two years)

Treatment	Weed intensity(number/m ²)						Weed biomass at 50DAS (q/ha)	Weed control efficiency (%)
	20 DAS			50DAS				
	Monocot	Dicot	Total	Monocot	Dicot	Total		
2 HW at 20 & 45 DAS	155.3	31.3	186.7	19.3	4.7	24.0	0.4	96.8
2 HH at 20 & 40 DAS	160.7	31.3	188.7	60.7	15.3	80.0	3.7	67.5
<i>In situ</i> mulching of weeds at 30 DAS	164.7	34.0	195.3	17.3	8.0	24.7	0.8	92.4
Alachlor 2.0 kg/ha (PE)	56.0	26.0	82.0	56.7	24.0	80.7	4.9	62.0
Clomazone 1.0 kg/ha(PE)	143.3	37.3	182.7	58.0	34.7	92.7	7.2	40.9
Pendimethalin 1.0 kg/ha(PE)	87.3	20.0	107.3	55.3	26.7	82.0	5.2	56.0
Clomazone 1.0 kg/ha (PE) + 1 HW 30 DAS	140.7	17.3	156.0	26.7	7.3	34.0	0.0	92.6
Pendimethalin 1.0 kg/ha (PE) + 1 HW 30 DAS	82.0	20.7	101.3	26.0	9.3	35.3	1.4	89.1
Quizalofop ethyl 0.05 kg/ha(PoE)	161.3	32.7	194.0	26.7	38.0	64.7	2.7	53.3
Weedy check	206.7	48.7	255.3	134.0	55.3	189.3	11.4	-
LSD (P=0.05)	22.7	7.0	24.6	7.9	5.0	14.8	0.6	

PE, Pre- emergence, PoE: Post emergence, HW- Hand weeding, HH- Hand hoeing

Table 2. Effect of differens weed control treatments on growth, yield attributes and yield of soybean (pooled data for 2 years 2003-04 and 2004-05)

Treatment	Plant height (cm)	Branches/plant (No.)	Dry weight/Plant (g)	Pods/plant (No.)	Seed yield/plant (g)	Seed index (g)	Seed yield(q/ha)		
							2003	2004	Pooled
2 HW at 20 & 45 DAS	74.3	3.0	17.6	40.8	9.6	9.9	23.3	7.4	15.1
2 HH at 20 & 40 DAS	74.2	2.6	14.6	31.3	7.8	9.8	19.9	4.8	12.5
<i>In situ</i> mulching of weeds at 30 DAS	73.4	2.7	19.7	389	9.7	9.8	22.2	6.5	14.4
Alachlor 2.0 kg/ha (PE)	71.6	2.5	14.6	31.5	7.2	9.5	18.9	5.4	11.7
Clomazone 1.0 kg/ha(PE)	74.4	2.4	14.9	27.5	6.4	9.2	15.6	5.3	10.8
Pendimethalin 1.0 kg/ha(PE)	72.9	2.6	12.8	30.0	7.6	9.5	18.7	5.9	11.9
Clomazone 1.0 kg/ha (PE) + 1 HW 30 DAS	69.8	2.8	18.5	34.8	8.8	10.7	19.0	6.9	12.8
Pendimethalin 1.0 kg/ha (PE) + 1 HW 30 DAS	74.1	2.8	19.9	36.8	8.7	9.7	20.7	6.5	13.8
Quizalofop ethyl 0.05 kg/ha(PoE)	73.8	2.4	15.6	33.5	7.7	9.6	9.6	20.0	14.8
Weedy check	66.7	1.6	12.3	20.2	5.9	7.8	7.8	13.0	10.4
LSD (P=0.05)	6.5	0.8	2.9	5.8	1.5	0.7	4.8	0.8	2.0

(0.42 q/ha) with highest weed control efficiency (WCE) of 96.78% amongst all the treatments but it was at par with *in situ* mulching of weeds at 30 DAS and with pre emergence herbicides *viz.*, pendimethalin 1.0 kg/ha or clomazone 1.0 kg/ha supplemented with 1 hand weeding at 30 DAS for all these weed parameters. Post emergence application of quizalofop ethyl 0.050 kg/ha gave significantly lower weed density and weed biomass at 50 DAS over treatments comprised of pre-emergence herbicides alone. On the whole all the herbicides were found effective in minimizing the losses caused by weeds in soybean crop confirming the view of Behera *et al.* (2005).

Effect of crop

All the weed control treatments significantly produced tall plants with more branches/plant and dry weight/plant than weedy check and consequently they also favoured in

producing yield attributing characters and seeds over weedy check. The maximum values of yield attributes *viz.*, branches/plant, pods/plant, yield/plant and seed index (100 seed weight) were recorded with 2 hand weeding at 20 and 45 DAS closely followed by *in situ* mulching with weeds at 30 DAS (Vyas *et al.* 2000). Seed yields were quite less in all the treatments during 2004-05 than the previous year because of low rainfall coupled with long dry spells. Among herbicides, pendimethalin 1.0 kg/ha (PE) supplemented with 1 HW at 30 DAS gave the highest values for most of the yield attributes and seed yield during both the years being at par to clomazone (PE) 1.0 kg/ha +1 HW at 30 DAS. Similar results were reported by Rajput and Kushwah (2004) with pre emergence use of pendimethalin with 1 HW at 30 DAS. The post emergence application of quizalofop ethyl 0.050 kg/ha resulted in significantly higher values for yield attributes and yield

over weedy check but it was at par with other pre emergence herbicides (Vidrin *et al.* 1999).

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