

Original Research Article

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Effect of Herbicidal Weed Control on Growth and Yield of Soybean

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ABSTRACT

A field experiment was conducted during *kharif*, 2019 at Agricultural Research Station, Ummédganj, Kota. Dominating weed flora of the experimental field consisted of *Cynodon dactylon* L., *Eleusine indica* L., *Echinochloa crusgalli* and *Echinochloa colona* among grassy weeds, *Boerhaavia diffusa* L., *Convolvulus arvensis* L., *Commelina benghalensis* L., *Digera arvensis* Forsk., *Celosia argentea* L. among broad leaved weeds and *Cyperus rotundus* L. in the sedge category of weeds. The results showed that all weed control treatments recorded significantly higher values of growth parameters plant height, branches plant⁻¹, dry matter accumulation and yield attributes *viz.* pods plant⁻¹, seeds pod⁻¹, seed yield plant⁻¹ and seed index as compared to weedy check. Two hand weeding at 20 and 40 DAS recorded significantly lower weed density, weed dry weight, maximum weed control efficiency and significantly improved the growth characters, yield and yield attributing characters followed by post emergence application of sodium acifluorfen 16.5% + clodinafop propargyl 8% (premix) @ 165 + 80 g a.i. ha⁻¹ at 20 DAS.

Keywords

Soybean, Weed,
Weed control
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Introduction

Soybean (*Glycine max* L. Merrill) is an important oilseed and food grain legume crop. Being a rainy season crop soybean faces severe weed competition during early stages of crop growth, resulting in a loss of potential yield, depending on the weed intensity, nature, environmental condition and duration

of weed competition. The competitiveness of weeds on crop for nutrients, water, light and space are responsible for poor yield of soybean. Weeds can cause significant seed yield losses in soybean (Jha *et al.* 2014). If weeds are not controlled during critical periods of crop-weed competition, there is identical reduction in the yields of soybean up-to 58-85%, depending upon the types and

intensity of weeds. Thus, it is important to keep the crop free from weeds as far as possible so as to get higher yield from soybean (Kewat *et al.*, 2000). Manual weeding is the best option for weed control, but it is costly, time consuming and difficult due to intermittent rains. Timely unavailability of adequate labourers also possesses serious problem. Therefore, it is necessary, to find out the alternative methods for reducing the weed load during early growth period of soybean to get economical yields. Thus, herbicidal weed control remains only the choice under such situation to minimize the weed menace economically. Therefore, keeping the above facts in view, the present experiment has been carried out to find out effective weed control method.

Materials and Methods

The experiment was conducted during *kharif* season of 2019 at Agricultural Research Station, Umedganj, Kota, which is situated at 25°21' N latitude and 75°87' E longitude at an altitude of 271 m above mean sea level. It falls under agroclimatic zone V (Humid South Eastern Plain) of Rajasthan and agroclimatic zone VIII (Central Plateau and Hills) of India. The experiment was laid out in RBD with eight treatments, replicated three times. The experiment comprises eight treatments *viz.* pendimethalin 30% EC @ 1.0 kg *a.i.* ha⁻¹ as PE, pendimethalin 30% EC + imazethapyr 2% SL (premix) @ 960 g *a.i.* ha⁻¹ as PE, sodium acifluorfen 16.5% + clodinafop propargyl 8% EC (premix) @ 165 + 80 g *a.i.* ha⁻¹ at 20 DAS, quizalofop-ethyl 5% EC @ 50 g *a.i.* ha⁻¹ at 20 DAS, imazethapyr 10% SL @ 100 g *a.i.* ha⁻¹ at 20 DAS, imazethapyr 3.75% + propaquizafop 2.5% ME (premix) @ 50 + 75 g *a.i.* ha⁻¹ at 20 DAS, two hand weeding at 20 & 40 DAS and weedy check.

The soil of the experimental field was clay loam in texture and the soil having medium

fertility status. Soybean variety RKS-113 (Kota Soya-1) was used as experimental material developed at ARS, Kota (Rajasthan).

Results and Discussion

Dominating weed flora of the experimental field consisted of *Cynodon dactylon* (L.), *Digitaria arvensis* Forsk, *Eleusine indica* L. and *Echinochloa colonum* among grassy weeds, *Boerhavia diffusa* L., *Convolvulus arvensis* L., *Commelina bengalensis* L., *Celosia argentea* L. among broad leaved weeds and *Cyperus rotundus* L. in the sedge category of weeds. Category wise weed data recorded in weedy check plots indicated that there was pre-dominance of grassy weeds (48.60 %) as compared to broad leaved weeds (39.49 %) and sedges weeds (11.91 %) in the experimental field. Almost similar results were observed by Meena *et al.* (2011).

The effect of various weed control treatments and total weeds population was found significantly reduced at all stages. Lowest weed density and dry weight was recorded under two hand weeding, which was superior as compared to all the herbicidal treatments in the agreement results reported by Meena *et al.*, (2009). Among herbicidal weed control treatments post emergence application of sodium acifluorfen 16.5% + clodinafop propargyl 8% EC (premix) @ 165+80 g *a.i.* ha⁻¹ at 20 DAS found most effective in reducing significantly weed density and weed dry weight, which was superior as compared to over rest of herbicidal treatments. Similar results were observed by Verma and Kushwaha, 2019. The highest weed control efficiency at 60 DAS was recorded in treatment hand weeding twice at 20 and 40 DAS (77.79 %), followed by application of sodium acifluorfen 16.5% + clodinafop propargyl 8% EC (premix) @ 165+80 g *a.i.* ha⁻¹ at 20 DAS (66.67 %) (Table 1 and 2).

Table.1 Effect of herbicidal weed control on yield attributing characters and yield of soybean

Treatments	Pods plant ⁻¹ (No.)	Seeds pod ⁻¹ (No.)	Seed yield plant ⁻¹ (g)	Seed index (g)	Seed yield (kg ha ⁻¹)	Straw yield (kg ha ⁻¹)
Pendimethalin 30% EC @1.0 kg <i>a.i.</i> ha ⁻¹ as PE	33.9	2.00	4.29	11.00	1225	1792
Pendimethalin 30% EC + imazethapyr 2% SL (premix)@960 g <i>a.i.</i> ha ⁻¹ as PE	37.2	2.13	4.85	11.20	1475	2128
Sodium acifluorfen 16.5% + clodinafop propargyl 8% EC (premix) @165+80 g <i>a.i.</i> ha ⁻¹ at 20 DAS	41.2	2.20	5.32	11.33	1550	2233
Quizalofop ethyl 5% EC @50 g <i>a.i.</i> ha ⁻¹ at 20 DAS	34.9	2.13	4.56	10.97	1325	1930
Imazethapyr 10% SL 100 g <i>a.i.</i> ha ⁻¹ at 20 DAS	35.9	2.13	4.65	11.07	1425	2091
Imazethapyr 3.75% + propaquizafop 2.5% ME (premix) 50+75 g <i>a.i.</i> ha ⁻¹ at 20 DAS	39.5	2.13	5.21	11.10	1520	2190
Hand weeding at 20 & 40 DAS	46.7	2.27	6.10	11.43	1800	2592
Weedy check	24.1	1.93	2.82	10.93	700	1028
SEm±	1.27	0.09	0.17	0.20	40.53	63.72
CD at 5%	3.86	NS	0.51	NS	122.93	193.28
CV	6.01	7.43	6.12	3.08	5.10	5.52

Table.2 Effect of herbicide weed control on density m⁻² of weeds and weed control efficiency at 60 DAS

Treatments	Grassy weeds (dry weight g m ⁻²)	Broad leaved weeds (dry weight g m ⁻²)	Sedges (dry weight g m ⁻²)	Total weeds (dry weight g m ⁻²)	Weed Control Efficiency (%)
	60 DAS	60 DAS	60 DAS	60 DAS	60 DAS
Pendimethalin 30% EC @1.0 kg a.i. ha⁻¹ as PE	5.05 (24.50)	4.59 (20.17)	2.38 (4.68)	7.09 (49.34)	44.39
Pendimethalin 30% EC + imazethapyr 2% SL (premix)@960 g a.i. ha⁻¹ as PE	4.09 (15.77)	3.76 (13.13)	2.18 (3.74)	5.80 (32.63)	63.28
Sodium acifluorfen 16.5% + clodinafop propargyl 8% EC (premix) @165+80 g a.i. ha⁻¹ at 20 DAS	4.01 (15.07)	3.52 (11.38)	2.04 (3.17)	5.53 (29.62)	66.67
Quizalofop ethyl 5% EC @50 g a.i. ha⁻¹ at 20 DAS	3.76 (13.17)	4.81 (22.12)	2.24 (4.03)	6.35 (39.32)	55.71
Imazethapyr 10% SL 100 g a.i. ha⁻¹ at 20 DAS	4.48 (19.08)	3.97 (14.80)	2.21 (3.87)	6.22 (37.75)	57.52
Imazethapyr 3.75% + propaquizafop 2.5% ME (premix) 50+75 g a.i. ha⁻¹ at 20 DAS	4.04 (15.33)	3.67 (12.51)	2.18 (3.77)	5.71 (31.61)	64.39
Hand weeding at 20 & 40 DAS	3.33 (10.23)	2.87 (7.23)	1.81 (2.28)	4.55 (19.74)	77.79
Weedy check	6.87 (46.33)	6.25 (38.27)	2.74 (6.56)	9.48 (88.83)	0.00
SEm ±	0.17	0.16	0.07	0.10	1.33
CD at 5%	0.51	0.49	0.22	0.29	4.03
CV	6.59	6.75	5.54	2.61	4.28

Note: Data in parenthesis are original values of weed density and dry weight. Square root transformed value ($\sqrt{x+1}$) of weed density used for statistical analysis

All the weed control treatments gave significantly more plant height and higher branches plant⁻¹ than weedy check. Hand weeding twice at 20 and 40 DAS was recorded taller plants and maximum branches plant⁻¹ followed by application of sodium acifluorfen 16.5% + clodinafop propargyl 8% EC (premix) @165+80 g a.i. ha⁻¹ at 20 DAS. The increased dry matter accumulation by crop in plots receiving hand weeding twice at 20 and 40 DAS followed by application of sodium acifluorfen 16.5% + clodinafop propargyl 8% EC (premix) @165+80 g a.i. ha⁻¹ at 20 DAS, which was at par with application of imazethapyr 3.75% + propaquizafop 2.5% ME (premix) 50+75 g a.i. ha⁻¹ at 20 DAS. Hand weeding twice at 20 and 40 DAS recorded higher values of yield attributing characters like pods plant⁻¹, seeds pod⁻¹, seed index and seed yield plant⁻¹ than other treatments except application of sodium acifluorfen 16.5% + clodinafop propargyl 8% EC (premix) @165+80 g a.i. ha⁻¹ at 20 DAS, which was closely followed to hand weeding. The seed and straw yield was recorded significantly higher under two hand weeding (1800 & 2592 kg ha⁻¹, respectively) followed by post emergence application of sodium acifluorfen 16.5% + clodinafop propargyl 8% (premix) @ 165 + 80 g a.i. ha⁻¹ at 20 DAS (1550 & 2233 kg ha⁻¹, respectively). Manjunath and Hosmath (2016) and Kamble *et al.*, (2017) also reported that hand weeding as an effective method of weed control for achieving the maximum yield of soybean. Harithavardhini *et al.*, 2016 and Verma and Kushwaha, 2019 was reported that sodium acifluorfen 16.5% + clodinafop propargyl 8% EC (premix) @187.5 g a.i. ha⁻¹ gave higher yield among herbicidal weed control treatments.

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