Indian Journal of Weed Science **48**(4): 453–454, 2016
DOI: 10.5958/0974-8164.2016.00117.9

Short communication

Efficacy of different herbicides for weed control in soybean

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Received: 17 November 2016; Revised: 29 December 2016

Key words: Alachlor, Hand weeding, Imazethapyr, Imazamox, Pendimethalin, Soybean Quizalofop-ethyl

Soybean [*Glycine max* (L.) Merrill] is an important oil seed crop. In India, it is cultivated in 9.60 million ha with the annual production of 12.74 million tonnes. Madhya Pradesh contributes nearly 5.56 mha area with the production of 6.68 mt (Anonymous 2012). The soil and climate of Madhya Pradesh are congenial for soybean production but being a rainy season crop it suffers severely due to weed infestation, resulting reduction in yield to the tune of 20 to 71% depending upon the type and intensity of weeds and their occurrence. Unavailability of labour and high wages during season are the main limitations of manual weeding. Under such situations, farmers may use different pre- and post-emergence herbicides to control annual grass and broad-leaved weeds effectively in soybean. Therefore, the experiment was aimed to find out the efficacy of herbicides on weeds and yield of soybean.

The study was carried out at Research Farm, College of Agriculture, Tikamgarh during *Kharif*, 2014-15. The soil of the experimental site was clayey loam, which was medium in organic carbon (0.62 g/kg), low in available nitrogen (233 kg/ha) and medium in phosphorus (19.7 kg/ha) and potassium content (347 kg/ha) having neutral pH (7.2) and normal electrical conductivity (0.26 dS/m). The experiment was laid out in randomized block design with nine treatments and replicated thrice. The treatments comprised of glyphosate 41% SL 1.0 kg/ha as pre-plant incorporation (PPI), pendimethalin 1.0 kg/ha as pre-emergence (PE) and alachlor 1.0 kg/ha PE and imazethapyr + imazamox (Odyssey) 70 g/ha, quizalofop-ethyl 50 g/ha, chlorimuron-ethyl 9 g/ha and quizalofop-ethyl 50 g/ha at 20 DAS followed by (*fb*) chlorimuron-ethyl 9 g/ha as post-emergence at 20 DAS, two hand weeding at 20 and 40 DAS and weedy check. The soybean variety "*JS-95-60*" was sown on July 14, 2014 at seed rate of 80 kg/ha in rows 30 cm apart with fertilizer dose of 20:60:20 kg N, P_2O_5 and K_2O/ha. Pre-emergence herbicides were applied on next day of sowing. The herbicides were applied in 500 liters of water/ha by knapsack sprayer, using flat fan nozzle.

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Weed flora

There was prevalence of dicot weeds in the experimental field as these weeds constituted the higher relative density of 66.1% as compared to monocot weeds which had only 33.9% relative density. In the dicot weeds, the intensity of *Phyllanthus niruri* was the highest (23.7%) followed by *Digera arvensis* (15.8%) and *Trianthema monogyna* (10.8%) whereas *Echinochloa colona* (15.3%) and *Cyperus rotundus* (11.1%) were seen as dominant monocot weeds in the field.

Weed growth

The lowest mean weed intensity was recorded under two hand weeding at 20 and 40 DAS (2.79/m^2) followed by pendimethalin (5.91/m^2), imazethapyr + imazamox (6.11/m^2) and quizalofop-ethyl *fb* chlorimuron-ethyl (6.40/m^2) being at par with alachlor (6.79/m^2) whereas post-emergence application of quizalofop-ethyl (11.3/m^2) and pre-plant incorporation application of glyphosate (10.1/m^2) was not effective as pre-emergence *fb* pendimethalin and alachlor and post-emergence imazethapyr + imazamox and quizalofop-ethyl *fb* chlorimuron-ethyl. The total weed intensity was recorded maximum under weedy check (13.2/m^2). The lowest total weed dry weight was recorded under two hand weeding at 20 and 40 DAS (1.91 g/m^2) followed by post-emergence application of imazethapyr + imazamox (3.55 g/m^2), quizalofop-ethyl *fb* chlorimuron-ethyl (4.09 g/m^2), chlorimuron-ethyl (5.00 g/m^2) and pre-emergence application of pendimethalin (5.44 g/m^2) and alachlor (5.68 g/m^2) whereas pre-plant incorporation of glyphosate (6.89 g/m^2) registered significantly the highest dry weight among herbicidal treatments. However, among all the treatments, total weed dry weight was recorded maximum under weedy check (8.22 g/m^2).

The weed control efficiency (WCE) among herbicides and its combination varied from 27.5-82.4%. The highest WCE was recorded under hand weeding twice at 20 and 40 DAS (96.3%) followed by post-emergence application of imazethapyr + imazamox (82.4%), whereas it was the lowest under glyphosate (27.5%).

Table 1. Influences of different herbicides on weed intensity, weed dry weight, weed control efficiency, yield attributes, seed yield and economics of soybean

Treatment	Weed intensity (no./m^2)	Weed dry weight (g/m^2)	Weed control efficiency (%)	No. of pods/ plant	No of seeds/ pod	Test weight (g)	100-seed yield (kg/ha)	Net monetary return (x10^3 `/ha)	B:C ratio
Glyphosate 41% SL 1 kg/ha (pre-plant incorporation)	10.10 (102)	6.89 (47.0)	27.51	16.40	2.00	8.06	589	8.42	1.55
Pendimethalin 1.0 kg/ha (pre-emergence)	5.91 (34.7)	5.44 (29.1)	63.86	22.67	2.53	8.60	686	13.79	2.00
Alachlor 1.0 kg/ha (pre-emergence)	6.79 (45.6)	5.68 (31.8)	55.61	20.80	2.33	8.40	665	13.52	2.03
Imazethapyr + imazamox 70 g/ha at 20 DAS	6.11 (36.8)	3.55 (12.1)	82.40	26.40	3.00	9.25	797	18.25	2.33
Quizalofop-p-ethyl 50 g/ha at 20 DAS	11.33 (128)	6.78 (45.6)	31.32	18.40	2.13	8.15	644	12.44	1.93
Chlorimuron-ethyl 9 g /ha at 20 DAS	8.40 (70.1)	5.00 (24.5)	67.88	24.73	2.73	8.99	742	17.13	2.35
Quizalofop-p-ethyl 50 g/ha at 20 DAS *fb* chlorimuron ethyl 9 g/ha at 20 DAS	6.40 (40.5)	4.09 (16.4)	79.18	25.80	2.93	9.08	769	16.74	2.19
Two hand weeding at 20 and 40 DAS	2.79 (7.2)	1.91 (3.1)	96.27	26.80	3.20	9.67	922	17.55	1.91
Weedy check	13.21 (174)	8.22 (67.0)	0.00	14.07	1.80	7.63	436	5.60	1.47
LSD (P=0.05)	0.47	0.41	7.14	3.12	0.45	0.49	78	-	-

* Values in parentheses are original values

Yield attributes and economic yield

The highest number of seeds/pod was recorded under hand weeding twice at 20 and 40 DAS followed by herbicidal application of imazethapyr + imazamox quizalofop-ethyl *fb* chlorimuron-ethyl and chlorimuron-ethyl apparently owing to higher WCE under these treatments. All the herbicidal treatments and hand weeding produced heavier 100-seeds (8.06 to 9.67 g) than weedy check (7.63 g) on account of favorable conditions under the reduced weed stress in these treatments than weedy check.

Yield was significantly higher under all the herbicidal treatments (589-797 kg/ha) compared to weedy check (436 kg/ha). Two hand weeding (20 and 40 DAS) gave significantly the highest seed yield (922 kg/ha) among all the treatments. Among all the herbicides, imazethapyr + imazamox produced significantly higher seed yield followed by quizalofop-ethy *fb* chlorimuron-ethyl and chlorimuron-ethyl. Halvankar *et al.* (2005) also reported that application of imazamox + imazethapyr 75 g/ha effectively controlled the weeds over weedy check and also increased the yield of soybean.

Maximum net monetary return (NMR) was recorded under imazethapyr + imazamox (` 18249/ ha) followed by hand weeding twice (` 17549/ha) and other herbicidal treatments, *viz.* chlorimuron-ethyl (` 17127/ha), quizalofop-ethyl *fb* chlorimuron-ethyl (` 16738/ha), pendimethalin (` 13788/ha), alachlor (` 13516/ha) and quizalofop-ethyl (` 12438/ ha) and lowest NMR was recorded under weedy check (` 5604/ha) followed by glyphosate (` 8416/ ha). Pathak (2007) observed that the maximum net-return (` 14796/ha) was recorded in quizalofop-ethyl 50 g + chlorimuron-ethyl 9 g/ha followed by two hand weeding and imazethapyr 150 g/ha being the minimum (` 2609/ha) under untreated plot.

Benefit cost ratio was higher under chlorimuron-ethyl (2.35). Imazethapyr + imazamox and quizalofop-ethyl *fb* chlorimuron-ethyl gave higher profit with B:C ratio of 2.33 and 2.19, respectively than other herbicidal treatments due to lower cost and higher seed yield over other weed control treatments, whereas the weedy check gave least B:C ratio (1.47). Pathak (2007) revealed that combined application of quizalofop-ethyl 50 g + chlorimuron-ethyl 9 g/ha fetched the highest, B:C ratio (2.26), whereas, it was minimum (1.7) under weedy check plots.

SUMMARY

The seed yield of soybean was significantly higher under two hand weeding at 20 and 40 DAS followed by imazethapyr + imazamox, quizalofop-ethyl *fb* chlorimuron-ethyl and chlorimuron-ethyl than pre-plant incorporation of glyphosate, pre-emergence application of pendimethalin and alachlor and post-emergence application of quizalofop-ethyl and weedy check. Uncontrolled weeds in weedy check resulted yield loss of 52.25% in soybean.

REFERENCES

Anonymous. 2012. *Agricultural Economics and Statistics*. Directorate of Economics and Statistics. Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, New Delhi.

Halvankar GB, Varghese P, Taware SP and Raut VM. 2005. Effect of herbicides on weeds dynamics and yield of soybean. *Journal of Maharashtra Agricultural Universities* **30** (1): 35-37.

Pathak M. 2007. *Efficacy of Different Doses of Imazethapyr for Weed Control in Soybean* [Glycine max (L.) Merrill]. M.Sc. (Ag.) Thesis, Department of Agronomy, JNKVV, Jabalpur (M.P.).