



Efficacy of early post-emergence herbicides against associated weeds in soybean

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Soybean has emerged as a potential crop for changing the economical position of the farmers in India particularly in Madhya Pradesh. Although ecological conditions of the state are congenial for soybean production but the yield is substantially low, despite of best management practices. The poor weed management practices deprive the crop of its major requirement of nutrients, soil moisture, sunlight and space which results poor crop growth and yield. Being a rainy season crop, it has high yielding capacity but weed infestation is one of the major constraints in soybean cultivation (Bhan *et al.* 1974). The weed, if not controlled during critical period of weed crop competition, there may be reduction in the yield of soybean from 58-85% depending upon type and weed intensity (Singh and Singh 1987, Kolhe *et al.* 1998). Looking to the present need of post-emergence herbicides for higher soybean yield, this study was undertaken.

A field experiment was conducted during *Kharif* of 2009-10 at Research Farm, Jawaharlal Nehru Krishi Vishwa Vidhyalaya, Jabalpur. The soil of the experimental field was sandy loam in texture, neutral in reaction (pH 7.35) with normal electrical conductivity (0.48 ds/m). The organic content of the soil was 0.68% and low in available nitrogen (215 kg/ha), phosphorus (9.2 kg/ha) and medium in available potassium (318 kg/ha). Eleven treatments, viz. T₁- Odyssey 75 g/ha (mixture of imazethapyr + imazamox), T₂- Odyssey 87.5 g/ha, T₃- Odyssey 100 g/ha, T₄- Odyssey + adjuvant (75 g + 1000 ml/ha), T₅- Odyssey + adjuvant (87.5 g + 1000 ml/ha), T₆- Odyssey + adjuvant (100 g + 1000 ml/ha), T₇- Imazethapyr + adjuvant (1000 ml + 1000 ml/ha), T₈- Imazamox + adjuvant (350 ml + 1000 ml/ha), T₉- chlorimuron-ethyl 37.5 g/ha, T₁₀- Fenoxoprop-ethyl 750 ml/ha and T₁₁- Weedy check. These eleven treatments were tested under randomized block design with three replication.

Pre-treated seeds (70 kg/ha) of soybean cv. 'JS 97-52' was sown on July 8, 2009 in furrow opened manually at 30 cm apart rows and fertilized with 20:60:20 kg N,

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P₂O₅ and in K₂O/ha with urea, single super phosphate and muriate of potash, respectively. Odyssey (mixture of imazethapyr + imazamox) is a herbicides used as post-emergence in soybean. The total rainfall received during the field experimentation was 1339.3 mm and was received in well distributed pattern in 35 rainy days. The quadrat of 0.25 square meter was used to count the weeds in each plot species wise. The data thus obtained, were transformed and expressed in per square meter. The percentage of weed flora was estimated from weedy check plot. Weed control efficiency (WCE) was estimated by the formula given by Mani *et al.* (1973).

The major weed flora in the experimental field comprised of monocot weeds, viz. *Echinochloa colona*, *Dinebra retroflexa* and *Cyperus iria*; and dicot weeds, viz. *Eclipta alba* and *Alternanthera philoxeroides*.

All the weed control treatments significantly reduced the dry weight of weeds when compared with weedy check (Table 1 and 2). Among the herbicides, application of Odyssey + adjuvant (87.5 g + 1000 ml/ha) significantly reduced the weed dry weight than the weedy check and other herbicides at 40 DAS and harvest. The weed control efficiency was highest at 40 DAS and harvest (69.82 and 81.82%) with the application of Odyssey + adjuvant (87.5 g + 1000 ml/ha). The lower and the higher doses of Odyssey without adjuvant was not effective for controlling the weeds but found superior over other tested herbicides for controlling the weeds (Shete *et al.* 2008).

All the yield attributing traits (Table 3) namely branches/plant, leaf area index (LAI), dry matter production and pods/plant were significantly superior under application of Odyssey + adjuvant (87.5 g + 1000 ml/ha) than other treatments. Application of Odyssey 75, 87.5 g/ha, fenoxoprop-p-ethyl (750 ml/ha) and imazamox (350 ml/ha) as early post-emergence produced better yield attributing characters compared to weedy check an account of maximum reduction in weed growth coupled with no inhibitory effects on soybean plants (Kothawade *et al.* 2007). The lowest seed yield (0.080 t/ha) was observed

Table 1. Weed density of the experiment field in weedy plot at 40 DAS and harvest

Treatment	Density (no./m ²)		Relative density (%)	
	40 DAS	At harvest	40 DAS	At harvest
<i>Moncot weeds</i>				
<i>Echinochloa colona</i>	8.00	10.67	4.41	8.60
<i>Dinebra retroflexa</i>	96.00	50.67	52.94	40.86
<i>Cyperus iria</i>	45.33	22.67	25.00	18.28
<i>Dicot weeds</i>				
<i>Eclipta alba</i>	14.67	9.33	8.09	07.53
<i>Alternanthera philoxeroides</i>	17.33	30.67	9.56	24.73
Total	181.33	124.01	100.00	100.00

Table 2. Influence of herbicides the dry weight and weed control efficiency at 40 DAS and harvest in soybean

Treatment	Dose (g/ha)	Weed biomass (g/m ²)		Weed control efficiency (%)	
		40 DAS	At harvest	40 DAS	At harvest
T ₁ - Odyssey 75 g/ha	52.50	8.44	15.51	53.9	58.0
T ₂ - Odyssey 87.5 g/ha	61.25	6.78	8.14	62.9	78.0
T ₃ - Odyssey 100 g/ha	70.00	11.25	22.81	38.5	37.4
T ₄ - Odyssey 75 g/ha + adjuvant	52.50+1000	7.72	13.89	57.8	62.4
T ₅ - Odyssey 87.5 g/ha + adjuvant	61.25+1000	5.52	6.71	69.8	81.8
T ₆ - Odyssey 100 g/ha + adjuvant	70.00+1000	10.03	19.31	45.2	48.2
T ₇ - Imazethapyr 1000 g/ha + adjuvant	100.00+1000	12.57	23.95	31.3	35.1
T ₈ - Imazethapyr 350 g/ha + adjuvant	42.00+1000	10.77	21.39	41.1	50.2
T ₉ - Chlorimuron-ethyl 37.5 g/ha	9.37	13.72	25.86	25.0	29.0
T ₁₀ - Fenoxoprop-ethyl 750 g/ha	67.50	8.77	16.25	52.1	56.0
T ₁₁ - Weedy check	-	18.29	36.92	-	-
LSD (P=0.05)		4.60	NS		

Table 3. Influence of herbicides on growth and seed yield of soybean

Treatment	Dose (g/ha)	Branches/ plant (90 DAS)	Dry matter production (g/m ²)	LAI (60 DAS)	Pods/ plant	Seed yield (t/ha)	Harvest index
T ₁ - Odyssey 75 g/ha	52.5	4.60	941.3	7.51	89.5	2.44	37.5
T ₂ - Odyssey 87.5 g/ha	61.25	5.20	974.3	7.58	93.7	2.53	36.3
T ₃ - Odyssey 100 g/ha	70.00	4.40	899.1	7.45	85.3	2.11	36.5
T ₄ - Odyssey 75 g/ha + adjuvant	52.50+1000	4.73	943.6	7.55	90.5	2.49	37.1
T ₅ - Odyssey 87.5 g/ha + adjuvant	61.25+1000	5.40	1020.9	7.78	95.8	2.86	38.9
T ₆ - Odyssey 100 g/ha + adjuvant	70.00+1000	4.73	911.8	7.48	88.0	2.19	35.7
T ₇ - Imazethapyr 1000 g/ha + adjuvant	100.00+1000	4.37	878.9	7.43	83.5	1.94	35.6
T ₈ - Imazethapyr 350 g/ha + adjuvant	42.00+1000	4.47	904.0	7.47	87.8	2.18	36.2
T ₉ - Chlorimuron-ethyl 37.5 g/ha	9.37	4.33	860.4	7.38	72.6	1.40	36.9
T ₁₀ - Fenoxoprop-ethyl 750 g/ha	67.50	4.53	916.2	7.49	89.1	2.43	38.1
T ₁₁ - Weedy check	-	3.67	804.0	7.30	59.7	0.78	35.4
LSD (P=0.05)	0.87	75.0	0.30	13.7	286.3		

in weedy check treatment and it was due to severe competition stress right from crop establishment upto the end of critical period of crop growth, leading to poor

growth, yield attributing traits and finally the yield. The grain yield of soybean was significantly higher (2.9 t/ha) under Odyssey + adjuvant (87.5 + 1000 ml/ha) and found

Table 4. Economics of soybean as influenced by different herbicides

Treatment	Dose (g/ha)	Cost of cultivation (x10 ³ ₹/ha)	Gross monetary returns (x10 ³ ₹/ha)	Net monetary returns (x10 ³ ₹/ha)	B:C ratio
T ₁ - Odyssey 75 g/ha	52.5	15.65	50.85	35.20	3.25
T ₂ - Odyssey 87.5 g/ha	61.25	15.83	52.78	36.94	3.33
T ₃ - Odyssey 100 g/ha	70.00	16.01	43.94	27.93	2.74
T ₄ - Odyssey 75 g/ha + adjuvant	52.50+1000	16.05	51.87	35.81	3.23
T ₅ - Odyssey 87.5 g/ha + adjuvant	61.25+1000	16.23	59.46	43.23	3.67
T ₆ - Odyssey 100 g/ha + adjuvant	70.00+1000	16.41	45.72	29.31	2.79
T ₇ - Imazethapyr 1000 g/ha + adjuvant	100.00+1000	16.21	40.64	24.42	2.50
T ₈ - Imazethapyr x 350 g/ha + adjuvant	42.00+1000	16.13	45.48	29.35	2.81
T ₉ - Chlorimuron-ethyl 37.5 g/ha	9.37	15.11	29.13	14.01	1.92
T ₁₀ - Fenoxoprop-ethyl 750 g/ha	67.50	16.06	50.63	34.57	3.15
T ₁₁ - Weedy check	-	14.56	16.22	16.56	1.11

superior over other treatment, because of relatively low competitiveness and better yield attributes. These results were in conformity to the findings of Vyas and Jain (2003), Kothawade *et al.* (2007) and Shete *et al.* (2008).

Benefit: cost ratio as influenced by various treatments (Table 4) revealed that highest net returns and B:C ratio was observed in plots treated with Odyssey + adjuvant (87.5 g + 1000 ml/ha) followed by Odyssey + adjuvant (75 g + 1000 ml/ha). The minimum net returns and B:C ratio were recorded under weedy check treatments.

SUMMARY

A field experiment was conducted during *Kharif* season of 2009-10 at Research Farm, Adhartal, JNKVV, Jabalpur to study the effect of early post-emergence herbicides against weeds in soybean (*Glycine max* L.). The density and dry weight of weeds were higher under weedy check treatment. However, identical reduction in density and dry weight of weeds were observed when weeds were controlled chemically. Significantly higher weed control efficiency (81.82%) and seed yield (2.9 t/ha) was observed under Odyssey (mixture of imazethapyr + imazamox) + adjuvant (87.5 g + 1000 ml/ha). The maximum net profit (₹ 43233/ha) and B: C ratio (3.67) were also recorded under the same treatment.

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