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Efficacy of early post emergence herbicide on weeds, yield and benefit cost ratio of soybean (*Glycine max* L.)

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ABSTRACT : The field experiment was conducted on sandy loam soil during the *Kharif* season 2009-2010 at the Adhartal Farm, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur. The field was infested with grassy weeds (51.6%), broad leaf weeds (34.1%) and sedges (13.2%). Density and relative density of monocot weeds were higher than the dicot weeds both at 40 and at harvest also weed menace was the minimum under weed free treatment. Lowest weed biomass was recorded under weed free treatment closely followed by T_5 (Imazethapyr + adj. + ammonium sulphate @ 100g + 750 ml + 1 kg/ha). Weed free treatment significantly provided higher pods per plant, straw yield and seed yield closely followed by T_5 (Imazethapyr + adj. + ammonium sulphate @ 100g + 750 ml + 1 kg/ha) was found significantly superior over all the rates of imazethapyr (75 and 100g/ha) with or without adjuvant as early post-emergence. Application of imazethapyr + adj. + AS @ 100g + 750 ml + 1 kg/ha (T_5) recorded significantly higher net return (39109.18 Rs/ha) and B : C ratio (3.20) followed by hand weeding (T_8) and imazethapyr + adj. @ 100g + 750 ml/ha (T_4) as early post-emergence to soybean.

Key Words : Soybean, Post emergence herbicide, Weed, Yield, Imazethapyr

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Soybean (*Glycine max*) is an important rainy season crop and an important oilseed crop in Madhya Pradesh. It has emerged as a potential crop for changing the economical position of the farmers in India particularly in Madhya Pradesh because of comparatively good economic return/unit area obtained by the farmers from cultivation. On an average soybean contains 37-41 per cent protein, 17-21 per cent oil, 25-30 per cent carbohydrate, 4-5 per cent ash 4-5 per cent crude fibre and 2 per cent phospholipids. Hence, it called as "meat of the field''. Being a rainy season crop, the environment is more conductive for excessive weed infestation in soybean. Sever weed competition is one of the major constraints for low productivity of soybean. The competitional stress of weeds on crop for nutrient, water, light and space are responsible for poor yield of soybean. Weeds in general cause competition stress on soybean growth, especially during the first 40 days after sowing (Tiwari *et al.,* 1997). The weeds if not controlled during critical period of weed-crop competition there is reduction in the yield of soybean 35 to 55 per cent depending upon type and weed intensity (Chandel and Saxena, 1998 and Singh, 2007). Weed management through manual weeding or hoeing although effective in reducing the weed competition but it is not free from several limitations such as non-availability of sufficient manpower during peak periods, high labour cost, time consuming and not feasible under heavy soils and high rainfall areas. To overcome these difficulties, weed control by chemical is resorted to, which is effective, easier, cheaper and many times faster than the conventional methods. Recently, some of the post-emergence herbicides have been develop which selectively control either grassy or broad leaved weeds in a single application. The objective of the study was to effect of post emergence herbicide against weeds in soybean.

Research Procedure

A field experiment was conducted during rainy season

of 2009-10 at Research Farm, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (Madhya Pradesh). The soil of the experimental field was sandy clay loam in texture, neutral in reaction having 0.68 per cent organic carbon. The soil was low in available N (215 kg/ha), P (9.20 kg/ ha) and medium in K (318.0 kg/ha). Nine treatments, *viz.*, imazethapyr (75 g/ ha), imazethapyr (100 g/ha) imazethapyr + adjuvant (75 g + 1 l/ha) imazethapyr + adjuvant + ammonium sulphate (100 g + 750 ml + 1 kg/ha), chlorimuron-ethyl (9.7 g/ha), fenoxoprop-ethyl (67.5 g/ha), weed free (HW at 30 DAS) and weedy check were tested in Randomized Block Design with three replications. Healthy seeds (70 kg/ha) of soybean cv. 'JS 97.52' were treated before sowing with thiram at the rate of 3 g/kg and sown in furrows opened manually at 30 cm apart rows. The soybean crop fertilized with 20 kg N (urea) : 60 kg P_2O_5 (single super phosphate) and 20 kg K_2O (muriate of potash) at the time of sowing. The total rainfall received during the period of experimentation was 1339.3 mm. Dominant weed flora, species wise weed population and their dry weight was recorded under all the treatments at 40 DAS and harvest stages using 50 cm quadrat randomly at three place in a plot. The data were transformed and expressed in per square meter. The percentage of weed flora was estimated from weedy check. Weed control efficiency (WCE) was estimated by the formula given by Mani *et al.* (1973). The economic viability of treatment was computed with minimum support price or prevailing market rate of products.

RESEARCH ANALYSIS AND REASONING

The experimental findings obtained from the present study have been discussed in following heads:

Effect on weeds:

The weed flora of the experimental field consisted of both grassy weeds *viz.*, *Cyperus rotundus*, *Digitaria sanguinallis* and *Eleusine indica* and broad-leaved weeds, *viz.*, *Portulaca oleracea* and *Eclipta alba.*

Density and relative density of monocot weeds were higher than the dicot weeds both at 40 and harvest growth stages (Table 1). In weedy check, total weed population was significantly higher than all the herbicidal treatments including weed free treatments. Among herbicidal treatments, imazethapyr + adjuvant + ammonium sulphate (100 g + 750 ml + 1 kg/ha) was most effective in reducing most of the weeds and was almost similar to hand weeding. But, if imazethapyr was applied without adjuvant and ammonium sulphate, its effect on weeds was not appreciable. Weedy check had the highest weed biomass and it had reduced significantly when weeds were controlled either by the use of herbicides or hand weeding. The lowest weed biomass was recorded under weed free treatment (Table 2), closely followed by imazethapyr + adjuvant + ammonium sulphate (100 g + 750 ml + 1 kg/ha). Application of imazethapyr at 75 and 100 g/ha with adjuvant found significant to reduce the weed biomass than the application of imazethapyr alone and other herbicides (Kushwah and Vyas, 2009). Weed-free treatment registered maximum weed control efficiency than all other treatments because of least dry matter production of the weeds over weedy checks (Table 3). The next best treatment was imazethapyr + adjuvant + ammonium sulphate (100 g + 750 ml + 1 kg/ ha). These findings are in agreement with Shete *et al.* (2007).

Effect on yield attributes and yields of soybean:

All yield attributing characters, *viz.*, branches/plant, leaf area index (LAI), dry matter productions were significantly different due to different treatments. Significantly maximum number of branches/plant (3.67), LAI (9.25), dry matter production (1.2 kg/m^2) was recorded under weed free condition followed by imazethapyr +

Table 1: Weed flora in control at 40 DAS and harvest

Weed species	Density (no./m^2)		Relative density (%)	
	40 DAS	Harvest	40 DAS	Harvest
Monocot weeds				
Grasess				
Digitaria sangunallis	8.2	8.8	18.6	18.2
Eleusine indica	10.2	11.2	24.6	24.8
Sedges				
Cyperus rotundus	11.1	10.9	25.2	24.1
Dicot weeds				
Partulaca oleracea	3.5	4.0	8.1	7.8
Eclipta alba	5.3	4.0	8.1	7.8
Other weeds	5.1	5.5		
Total	44.2	45.2		

Table 2: Species wise dry weight of weeds at 40 DAS and harvest as influenced by different weed control treatments (g/m^2)

Tr. No.	Treatments (Dose a.i. ha^{-1})	*Digitariasanguinallis*		*Eleusine indica*		*Cyperus rotundus*		*Partulaca oleracea*		*Eclipta alba*		Others	
		40 DAS	Harvest	40 DAS	Harvest	40 DAS	Harvest	40 DAS	Harvest	40 DAS	Harvest	40 DAS	Harvest
1.	Imazethapyr	4.75	3.72	4.17	3.73	2.79	2.00	3.32	2.57	2.51	1.64	2.02	1.39
	(75g)	(22.05)	(13.32)	(16.86)	(13.41)	(7.27)	(3.52)	(10.53)	(6.13)	(5.80)	(2.20)	(3.60)	(1.43)
2.	Imazethapyr	4.34	3.35	3.73	3.27	2.76	1.89	3.02	2.44	2.39	1.62	1.99	1.31
	(100g)	(18.33)	(10.73)	(13.40)	(10.20)	(7.13)	(3.07)	(8.60)	(5.47)	(5.20)	(2.13)	(3.47)	(1.23)
3.	Imazethapyr+ adj.	4.18	2.98	3.47	2.63	2.63	1.68	2.75	2.17	2.27	1.46	1.65	1.18
	(75g + 1lit.)	(16.97)	(8.40)	(11.53)	(6.40)	(6.40)	(2.33)	(7.07)	(4.20)	(4.67)	(1.64)	(2.22)	(0.90)
4.	Imazethapyr+adj.	3.11	2.52	2.91	2.15	2.53	1.60	2.42	2.03	2.22	1.37	1.56	1.18
	(100g + 1lit.)	(9.16)	(5.87)	(7.97)	(4.13)	(5.93)	(2.07)	(5.36)	(3.64)	(4.43)	(1.37)	(1.94)	(0.90)
5.	Imazethapyr+adj. +A.S.	2.60	2.11	2.61	1.99	2.49	1.50	2.32	1.95	2.08	1.30	1.52	1.11
	(100 g + 750 ml + 1 kg.)	(6.27)	(3.94)	(6.33)	(3.47)	(5.70)	(1.77)	(4.87)	(3.29)	(3.82)	(1.20)	(1.82)	(0.73)
6.	Chlorimuron ethyl	5.42	4.36	4.89	4.42	3.23	2.17	3.69	2.68	2.43	1.68	2.04	1.70
	(9.7g)	(28.85)	(18.50)	(23.43)	(19.07)	(9.97)	(4.2)	(13.15)	(6.70)	(5.42)	(2.33)	(3.67)	(2.40)
7.	Fenoxoprop ethyl	4.87	3.85	4.41	3.41	2.93	1.93	4.00	2.92	2.53	1.75	1.95	1.53
	(67.5g)	(23.24)	(14.34)	(18.98)	(11.13)	(8.10)	(3.22)	(15.49)	(8.03)	(5.93)	(2.58)	(3.29)	(1.83)
8.	Hand weeding	2.01	1.38	1.66	1.66	1.47	1.21	0.71	0.71	1.31	1.28	1.30	0.98
	Once at 30 DAS	(3.53)	(1.40)	(2.27)	(2.26)	(1.67)	(0.97)	(0.00)	(0.00)	(1.21)	(1.13)	(1.20)	(0.47)
9.	Weedy check	5.86	6.12	9.24	9.84	4.12	4.39	5.19	5.97	3.13	3.77	4.08	8.42
		(33.80)	(37.00)	(84.86)	(96.33)	(16.50)	(18.80)	(26.4)	(35.20)	(9.33)	(13.75)	(16.15)	(70.49)
	S.E.±	0.18	0.13	0.20	0.16	0.15	0.10	0.16	0.29	0.13	0.18	0.08	0.13
	C.D. at 5%	0.55	0.38	0.60	0.49	0.45	0.30	0.47	0.87	0.39	0.55	0.25	0.40

* Values in parenthesis are square root transformed and real values (above value)

adjuvant + ammonium sulpate (100 g +750 ml + 1 kg/ha). This may be because of effective control of weeds which promoted the better growth and development of plants and ultimately produced higher yield attributing traits than the weedy check and other herbicidal treatments. These results are in confirmation with findings of Mishra *et al.* (2001) and Dhane *et al.* (2009).

Pods/plant, seed yield and straw yield were significantly higher under weed free treatment closely followed by imazethapyr + adjuvant + ammonium sulphate (100 g +750 ml + 1 kg/ ha). Excellent growth and development of soybean plants under weed free conditions and imazethapyr applied along with adjuvant and ammonium sulphate were noted. Because, both these treatments provided congenial environment at critical period of crop- weed competition than the weedy check, resulted in most inferior seed yield (1.25 t/ ha). These results are in close conformity with the findings of Pandya *et al.* (2005).

Effect on economic returns:

The minimum gross monetary returns (Rs. 25,577/ha), net monetary returns (Rs. 11,937/ha) and B:C ratio (1:1) was recorded under weedy check treatments than the other treatments. The maximum gross returns (Rs. 58,533/ha) and net monetary returns (Rs. 39,893/ha) was observed under weed free conditions closely followed by imazethapyr (Rs. 56,419 and 38,809/ha) + adjuvant + ammonium sulphate (100 g +750 ml + 1 kg/ha). The benefit : cost ratio represents the profitability of the treatments with each rupee investment. It is remarkable (Table 4) to note that the application of imazethapyr + adjuvant + ammonium sulphate (100 g + 750 ml + 1 kg/ha) was more remunerable (3.20) than rest of the treatments including weed free treatment (3.14). While weedy check was not advantageous as there was loss of almost 100 paise per rupee investment. Similar findings have also been reported by Bhan and Kewat (2003).

Conclusion:

Early post-emergence applications of imazethapyr with adjuvant and ammonium sulphate (100 g + 750 ml + 1 kg/ha) was most effective in paralyzing the weed growth and producing significantly higher yield attributing characters and seed yield (2.6 t/ha). The same treatment recorded the maximum net monetary returns (39,109/ha) and B:C ratio (3.20). The minimum seed yield (1.25 t/ha) was recorded under weedy check.

Table 3: Weed control efficiency and weed index of different weed control treatments over weedy check treatment

Tr. No.	Treatments (Dose a.i. ha^{-1})	WCE 40 DAS (%)	WCE Harvest (%)	Weed index (%)
1.	Imazethapyr (75g/ha)	64.67	85.27	30.32
2.	Imazethapyr (100g/ha)	70.00	87.91	22.91
3.	Imazethapyr+ adj. (75g+1lit./ha)	73.89	91.21	17.80
4.	Imazethapyr+adj. (100g+1lit./ha)	81.41	93.38	5.96
5.	Imazethapyr + adj. + A.S. (100g+750ml.+1kg/ha)	84.60	94.70	3.05
6.	Chlorimuron-ethyl (9.7g/ha)	54.84	80.41	35.16
7.	Fenoxoprop ethyl (67.5 g/ha)	59.90	84.85	32.06
8.	Hand weeding once at 30 DAS	94.72	97.71	0.00
9.	Weedy check	0.00	0.00	52.90

Table 4: Effect of herbicides on yield and economics of soybean

Tr. No.	Treatments (Dose a.i. ha^{-1})	Pods/ plant	Seed yield (t/ha)	Straw yield (t/ha)	Gross monetary returns (x 10^3 Rs/ha)	Total cost of cultivation (x 10^3 Rs/ha)	Net monetary returns (x 10^3 Rs/ha)	B:C Ratio
1.	Imazethapyr (75g/ha)	69.88	1.96	4.78	41.1	16.9	24.5	2.43
2.	Imazethapyr (100g/ha)	76.64	2.19	5.29	48.1	17.2	31.2	2.79
3.	Imazethapyr+ adj. (75g+1lit./ha)	79.46	2.24	5.64	49.2	17.3	32.2	2.85
4.	Imazethapyr+adj. (100g+1lit./ha)	83.72	2.52	6.45	54.6	17.6	37.3	3.10
5.	Imazethapyr + adj. + A.S. (100g+750ml.+1kg/ha)	87.77	2.56	6.65	56.4	17.6	39.1	3.20
6.	Chlorimuron-ethyl (9.7g/ha)	65.93	1.64	4.45	36.3	16.1	20.6	2.27
7.	Fenoxoprop ethyl (67.5 g/ha)	68.80	1.81	4.65	39.5	17.1	22.9	2.33
8.	Hand weeding once at 30 DAS	91.14	2.65	6.86	58.5	18.7	39.9	3.14
9.	Weedy check	50.42	1.25	3.23	27.6	15.6	11.9	-

LITERATURE CITED

Bhan, M. and Kewat, M.L. (2003). Activity and persistence of pendimethalin applied as per-emergence to soybean in rertisol. *Ann. Agric. Res.*, **24** (4): 970-982.

Chandel, A.S. and Saxena, S.C. (1998). Technology for raising soybean productivity in Uttar Pradesh. *Indian J. Fmg*., **38**: 10-12.

Dhane, J.B., Jawale, S.M., Shaikh, A.A., Dalvi, N.D. and Dalvi, P.N. (2009). Effect of integrated weed management on yield and economics of soybean. *J. Maharashtra Agric. Univ.*, **34** (2): 141-143.

Kushwah, S.S. and Vyas, M.D. (2005). Herbicidal weed control in soybean. *Indian J. Agron.*, **50** (3): 225-227.

Mani, V.S., Malla, M.C., Gautam, K.C. and Bhagwandas (1973). Weed killing chemicals in potato cultivars. *Indian Fmg.*, **22**(8): 17–18.

Mishra, O.R., Gautam, V.S., Dinesh, E., Rajput, A.M. and Patidar, G.L. (2001). Integrated weed management and its economics in soybean. *Crop Sci*., **21** (1): 115-119.

Pandya, N., Chauhan, G.S. and Nepalia, V. (2005). Influence of integrated weed management on yield and economic viability of soybean [*Glycine max* (L.) Merrill] grown at different crop geometries. *Indian J. Agric. Sci.,***75** (8): 510-512.

Shete, B.T., Patil, H.M. and Kolekar, P.T. (2007). Effects of cultural practices and post-emergence herbicides against weed control in soybean. *Internat. J. agric. Sci*., **3** (2): 273-275.

Singh, Guriqbal (2007). Integrated weed management in soybean (*Glycine max*). *Indian J. Agric. Sci.,* **77** (10): 675-676.

Tiwari, J.P., Kurchania, S.P., Paradkar, N.R. and Bhalla, C.S. (1997). Varietal susceptibility and weed control efficiency of fluazifop-p-butyl in soybean (*Glycine max*). *Indian J. Agric. Sci*., **67** (4): 147-149.