

Bio-efficacy and phytotoxicity evaluation of imazethapyr in soybean

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ABSTRACT

Field studies conducted during *kharif* season 2003 at UAS, Dharwad revealed that post emergence application of imazethapyr 75 g/ha alone and with hand weeding was most effective in minimizing weed growth and enhancing the grain yield of soybean (*Glycine max* (L)). Although recommended soybean herbicides, viz., chlorimuron ethyl and pendimethalin reduced the dry weed bio-mass markedly compared with weedy plot both were found inferior to weed free check. Soybean grain yield due to weed free check was similar to that of imazethapyr 75 g/ha alone and with hand weeding and imazethapyr 100 g/ha fb HW. Crop phytotoxicity symptoms were not observed in soybean due to application of imazethapyr. Imazethapyr 75 g/ha was found also effective provided profitable and comparable with other treatments.

Key words : Imazethapyr, Soybean, Bioefficacy, Phytotoxicity

Soybean (*Glycine max* (L) Merrill) is the most important pulse and oilseed crop of Karnataka, extensively grown during rainy (*kharif*) season. 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 at critical period of crop weed competition during first 30 days of sowing, reduces the yield of soybean from 58 to 85 % depending upon type and weed intensity of infestation (Kolhe *et al.* 1998). The effective control of weeds can help in improving the productivity of soybean. The conventional method of weed control is time consuming, expensive and laborious. Therefore, herbicide use is an alternative to increase the yield of soybean. At present, chlorimuron and pendimethalin as post emergence and pre-emergence, respectively are relatively more effective for weed control in soybean (Jain *et al.* 1998). The new post emergence application of imazethapyr has been developed to control grassy, broadleaf weeds and sedges. Information on the bio-efficacy of imazethapyr against weeds in soybean is not available and thus the present study was undertaken.

Field trial was conducted during *kharif*, 2003 on clay loam soils at University of Agricultural Sciences, Dharwad (Karnataka) to evaluate the bio-efficacy and imazethapyr in soybean. Fifteen treatments consisting with different

doses of imazethapyr as post emergence application alone and as in combination of hand weeding, other recommended herbicides including weed free and weedy check were tested in randomized block design with three replications. Soybean variety JS 335 was sown on July 2, 2003 in rows, 30 cm apart at 75 kg seed/ha treated with rhizobium culture, 5.0 g/kg seed. A uniform dose of 40:80:25 kg NPK/ha was given as basal application. Herbicides were sprayed after sowing using operating Knapsack sprayer with spray solution of 750 l/ha. Crop was harvested on October 14th, 2003. Observations on various weed parameters and growth characters, yield attributes and yield of crop were recorded. The economics of the treatments was also determined by considering prevailing market price of grain.

The experimental site was infested with *Dinebra retroflexa*, *Digitaria marginata*, *Echinochloa colonum* and *Panicum isachne* among grasses and *Achyranthes aspera*, *Ageratum conyzoides*, *Alternanthera sessilis*, *Amaranthus viridis*, *Cassia* spp., *Commelina benghalensis*, *Parthenium hysterophorous*, *Leucas aspera*, *Convolvulus arvensis*, *Digera arvensis*, *Oldenlandia rugosus*, *Phyllanthus niruri*, *Tridax procumbens* and *Vicia indica* among the broad leaf weeds and *Cyperus esculentus* and *Cyperus rotundus* among sedges.

Table 1. Total weed count and weed dry weight different crop stages in soybean as influenced by weed control treatments

Treatments	Weed dry weight (gm ⁻²) (at harvest)				Weed count (M ²) (at harvest)			
	Monocot	Dicot	Sedges	Total	Monocot	Dicot	Sedges	Total
Imazethapyr 50 g/ha	5.01	3.61	2.05	9.93	4.32 (17.67)	5.29 (27.02)	2.08 (3.33)	11.69 (135.7)
Imazethapyr 75 g/ha	4.13	2.23	0.61	6.97	3.64 (12.33)	4.26 (17.12)	1.15 (0.33)	6.30 (38.77)
Imazethapyr 100 g/ha	4.31	2.32	0.69	7.69	4.00 (15.00)	4.93 (23.33)	1.20 (0.44)	6.95 (48.71)
Imazethapyr 125 g/ha	4.57	2.41	0.74	6.51	3.20 (9.3)	4.97 (23.7)	1.24 (0.54)	10.81 (115.8)
Imazethapyr 50 g/ha + HW	3.96	1.84	0.43	6.23	3.34 (10.33)	3.73 (12.92)	1.15 (0.33)	8.13 (65.03)
Imazethapyr 75 g/ha + HW	3.03	0.48	0.00	3.51	2.70 (6.33)	3.21 (92.95)	1.00 (0.00)	5.32 (29.03)
Imazethapyr 100 g/ha + HW	3.42	0.50	0.12	4.04	2.98 (8.00)	3.67 (12.49)	1.10 (1.33)	5.86 (33.3)
Imazethapyr 125 g/ha + HW	3.48	0.59	0.14	4.21	3.40 (10.7)	3.90 (14.2)	1.13 (0.27)	6.28 (38.4)
Chlorimuron 9.37 g/ha	4.48	3.28	1.90	10.03	4.16 (16.33)	4.56 (19.77)	1.55 (1.40)	10.26 (104.3)
Chlorimuron 9.37 g/ha + HW	3.93	2.02	1.24	7.19	3.15 (11.33)	3.69 (12.62)	1.00 (0.00)	8.20 (66.2)
Pendimethalin g/ha	5.07	3.45	2.03	10.56	4.31 (17.67)	4.63 (20.41)	2.08 (3.33)	11.02 (120.4)
Pendimethalin g/ha + HW	4.07	2.45	1.15	7.68	3.55 (11.67)	4.42 (18.52)	1.15 (0.33)	9.13 (82.32)
Farmers Free (2 IC + HW)	3.87	2.32	0.65	6.84	3.92 (14.33)	4.79 (21.94)	1.41 (1.00)	10.12 (101.4)
Weed Free	3.67	0.36	0.00	4.15	2.69 (6.33)	2.94 (7.65)	1.00 (0.00)	5.04 (25.48)
Weedy check	9.51	10.27	5.71	25.55	7.89 (61.33)	8.61 (73.08)	3.97 (14.80)	20.44 (416.9)
LSD CD (P=0.05)	0.93	0.20	0.17	1.02	0.53	0.72	0.13	1.12

Table 2. Seed yield, biological yield and economic in soybean as influenced by weed control treatments

Treatments	Seed yield (Kg/ha)	Bio. yield	Total weed dry weight	WCE (%)	WI(%)	Gross returns (Rs./ha)	Net returns (Rs./ha)	B:C ratio
Imazethapyr 50 g/ha	2015	2709	100.7	60.67	19.35	18478	9469	1.05
Imazethapyr 75 g/ha	2351	2931	69.7	72.34	6.12	25864	16743	1.81
Imazethapyr 100 g/ha	2189	2745	70.9	70.05	1.77	24075	14570	1.53
Imazethapyr 125 g/ha	2151	2638	85.9	73.25	14.23	23664	13909	1.59
Imazethapyr 50 g/ha + HW	2325	2953	62.3	75.27	7.08	25575	15691	1.63
Imazethapyr 75 g/h a + HW	2424	3074	31.4	87.58	3.20	26664	16534	1.53
Imazethapyr 100 g/ha + HW	2391	3015	40.0	84.35	4.59	26297	15917	1.43
Imazethapyr 125 g/ha + HW	2260	2864	42.8	83.91	13.80	23760	13130	1.24
Chlorimuron 9.37 g/ha	2142	2722	100.3	60.15	14.59	23562	14182	1.51
Chlorimuron 9.37 g/ha + HW	2347	2967	71.9	71.48	6.28	25820	15565	1.52
Pendimethalin g/ha	1927	2466	105.6	58.13	23.2	21193	11713	1.24
Pendimethalin g/ha + HW	2254	2895	76.8	69.56	10.04	24794	14439	1.39
Farmers free (2 IC + HW)	2235	2888	68.4	72.70	10.78	24581	14076	1.34
Weed free	2508	3253	31.5	87.73	0.00	27584	15929	1.37
Weedy check	1329	1870	252.5	0.00	46.94	14622	6447	0.72
LSD (P =0.05)	211	219	10.2	3.21	6.36	2328	213.7	0.25

Total weed density was significantly reduced by all herbicide treatments compared to weedy check (Table 1). The maximum total weed count (11 m²) was observed in weedy plot, where as minimum (3.96/m) was recorded under weed free check. Weed population was suppressed by all the treatments of imazethapyr. The entire weed control treatments resulted in significant reduction in total weed dry matter accumulation over weedy check. The highest dry matter of weeds was recorded on weedy check plots at harvest (25.55 g/m) and it was lowest in weed free plot (4.15 g/m), Amongst the herbicides, imazethapyr at 75 g/ha alone and with hand weeding resulted in maximum reduction in weed dry matter (4.04 g/m) which was at par with weed free (4.15 g/ha). Consequently, weed control efficiency was maximum (87.58%) in weed free check plot closely followed by imazethapyr 75 g/ha *fb* HW and imazethapyr (87.35%). Similar result was reported by Angiras and Rana (1995) and Raskar and Bhoi (2002).

All the treatments resulted in significant increase in grain yield and biological yield of soybean over weedy check, which may be accounted by a significant reduction in weed density and dry matter of weeds (Table 2). Highest soybean grain yield (2508 kg/ha) was obtained in weed free check and it was similar to that of imazethapyr 75 and 100 g alone and with hand weeding (2351, 2189, 2424 and 2391 kg/ha, respectively). Good grain yield in imazethapyr with hand weeding may probably be due to better weed management resulting in improvement in all

growth and sink parameters which contributed higher grain yield owing to favourable condition in absorbing soil moisture content, nutrients and sufficient sun light penetration during the crop period (Table 2) Billore *et al.* (1998) and Angiras and Rana (1995). The spraying of imazethapyr at 75 to 125 g/ha did not show any crop toxicity

A maximum gross return of Rs 27,584/ha was calculated under weed free check over rest of the treatments, where as minimum was in weedy plot (Rs. 4,622/ha). Among herbicidal treatments, maximum gross returns (Rs. 25,864 and 26,664/ha ,respectively) were found in imazethapyr at 75 g/ha alone and with hand weeding. Similar trend was also observed in getting net returns as found in gross returns.

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