

Effect of post emergence herbicides on yield and economics of *kharif* soybean

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ABSTRACT

A field experiment was carried out at Agronomy Farm, B.A. College of Agriculture, Anand Agricultural University, Anand (Gujarat) during *kharif* season of the year 2008. The experiment was laid out in randomized block design (RBD) with four replications and twelve weed control treatments *viz.*, imazethapyr 75 g/ha (T₁), imazethapyr 75 g/ha *fb* chlorimuron ethyl 8 g/ha (T₂), imazethapyr 75 g/ha *fb* hand weeding 30 DAS (T₃), fenoxaprop-p-ethyl 75 g/ha (T₄), fenoxaprop-p-ethyl 75 g/ha *fb* chlorimuron ethyl 8 g/ha (T₅), fenoxaprop-p-ethyl 75 g/ha *fb* hand weeding at 30 DAS (T₆), quizalofop ethyl 75 g/ha (T₇), quizalofop ethyl 75 g/ha *fb* chlorimuron ethyl 8 g/ha (T₈), quizalofop ethyl 75 g/ha *fb* hand weeding at 30 DAS (T₉), hand weeding at 20 and 40 DAS (T₁₀), interculturing *fb* hand weeding at 20 and 40 DAS (T₁₁) and weedy check (T₁₂), with the objectives to compare different weed management practices and effect on growth and yield of soybean. Application of post emergence herbicide in conjunction with hand weeding was found effective for control of monocot, dicot and sedges at harvest in *kharif* soybean. Treatment T₁₁, registered higher seed (2251 kg/ha), straw yield (3756 kg/ha) and harvest index (34.72%) followed by treatments T₁₀, T₉ (quizalofop ethyl 75 g/ha as PoE *fb* hand weeding at 30 DAS) and T₆ (fenoxaprop-p-ethyl 75 g/ha as PoE *fb* hand weeding at 30 DAS), respectively. Moreover, cost benefit ratio was also recorded higher (1:3.67) under the treatment T₁₁, followed by treatment T₁₀, T₉, and T₆.

Key words : Soybean, Weeds, Imazethapyr, Chlorimuron ethyl, Fenoxaprop-p-ethyl, Quizalofop ethyl

Soybean, the miracle crop has witnessed phenomenal growth in production, processing and trade in last few years in India. It has revolutionized the rural economy and has improved socio-economic status of the farmers. Soybean produces 2-3 times more high quality protein yield per hectare than other pulses and cholesterol free oil (Kumari *et al.* 2002). It is preferred especially by vegetarians on account of its richness in protein, fat, carbohydrates, mineral, salts and vitamins. In Gujarat, soybean is cultivated in Sabarkantha, Bharuch, Vadodara, Dahod and Amreli districts. Among the various factors responsible for the low yield of soybean, weeds have been considered to be of prime importance. The losses caused by weeds exceed the losses from any other category of biotic factors like insects, nematodes, diseases, rodents, mites, *etc.* Soybean is mostly grown in *kharif* season and suffers from severe weed crop competition due to continuous rain, which do not permit hand weeding operation timely resulted in yield loss to the tune of 30–80% (Yaduraju 2002). In general, judicious use of herbicides in crop land generally increase crop yield, improve crop quality and reduce production costs (Balyan and Malik 2003). Therefore, an experiment was planned to test the bio-efficacy of selective post emergence herbicides on yield and economics of *kharif* soybean under middle Gujarat agro-climatic conditions.

A field experiment was carried out at Agronomy Farm, Anand Agricultural University, Anand during *kharif* season of the year 2008. The soil of the region is loamy sand in texture and locally known as “Goradu” having soil pH 8.60, low in available nitrogen, medium in available phosphorus and high in potassium. The experiment was laid out in randomized block design (RBD) with four replications. Twelve weed control treatments *viz.*, imazethapyr 75 g/ha (T₁), imazethapyr 75 g/ha *fb* chlorimuron ethyl 8 g/ha (T₂), imazethapyr 75 g/ha *fb* hand weeding at 30 DAS (T₃), fenoxaprop-p-ethyl 75 g/ha (T₄), fenoxaprop-p-ethyl 75 g/ha *fb* chlorimuron ethyl 8 g/ha (T₅), fenoxaprop-p-ethyl 75 g/ha *fb* hand weeding at 30 DAS (T₆), quizalofop ethyl 75 g/ha (T₇), quizalofop ethyl 75 g/ha *fb* chlorimuron ethyl 8 g/ha (T₈), quizalofop ethyl 75 g/ha *fb* hand weeding at 30 DAS (T₉), hand weeding at 20 and 40 DAS (T₁₀), interculturing *fb* hand weeding at 20 and 40 DAS (T₁₁) and weedy check (T₁₂).

All herbicides were sprayed at 14 days after sowing with Knapsack sprayer using 500 liter of water/ha. The total weed population as well as dry weight of weeds were recorded at harvest.

Effect of treatments on weed growth

Among the weed control treatments (Table 1), lower weed population was recorded under interculturing *fb* hand weeding at 20 and 40 days after sowing (DAS), treatment T₃ (imazethapyr 75g/ha *fb* hand weeding at 30 DAS), T₆ (fenoxaprop-p-ethyl 75g/ha *fb* hand weeding at 40 DAS) and T₉ (quizalofop ethyl 75g/ha *fb* hand weeding at 30 DAS). Similarly, significantly lower total weed dry weight as well as more than 90% weed control efficiency was recorded under interculturing *fb* hand weeding at 20 and 40 DAS, T₃ (imazethapyr 75 g/ha *fb* hand weeding at 30 DAS), T₆ (fenoxaprop-p-ethyl 75g/ha *fb* hand weeding at 40 DAS) and T₉ (quizalofop ethyl 75g/ha *fb* hand weeding at 30 DAS). Similar trend was also noticed by Bhall *et al.* (1998). Weedy check treatment registered significantly higher total weed population and dry weight of weeds.

Effect of treatments on economics

Interculturing *fb* hand weeding carried out at 20 and

40 DAS registered highest seed yield (2251 kg/ha), straw yield (3756 kg/ha) and harvest index (34.72 %) followed by T₁₀ (hand weeding done at 20 and 40 DAS), T₃, T₉ and T₆. Weedy check recorded the lowest seed yield (856 kg/ha) and straw yield (1682 kg/ha). Moreover, cost benefit ratio was also recorded higher (1:3.67) under the interculturing *fb* hand weeding carried out at 20 and 40 DAS, followed by treatment T₁₀, T₃ and T₆ as compared to weedy check. Treatments T₁₀, T₃ and T₆ recorded CBR ratio of 1:3.48, 1:3.11 and 1:3.05, respectively (Table 2). Similar results were also found by Yadav *et al.* (1999).

In light of the results obtained from the present investigation, it was concluded that for effective control of weeds and for securing maximum seed yield of soybean as well as economic returns, interculturing *fb* hand weeding at 20 and 40 DAS or post-emergence application of any one of the herbicides (imazethapyr 75 g/ha or fenoxaprop-p-ethyl 75 g/ha or quizalofop ethyl 75 g/ha) integrated with one hand weeding at 30 DAS may be done.

Table 1. Effect of weed management treatments on weed population and dry weight of weeds

Treatments	Dose (g/ha)	Application stage (DAS)	Weed population (no/m ²)		Weed dry weight (g/m ²)		
			30 DAS	60 DAS	30 DAS	60 DAS	At harvest
T ₁ : Imazethapyr	75	14	2.3 (188)	2.3 (240)	30.2	91.7	187.2
T ₂ : Imazethapyr <i>fb</i> Chlorimuron ethyl	75+8	14	2.1 (132)	2.2 (175)	17.8	53.7	113.1
T ₃ : Imazethapyr <i>fb</i> HW	75	14+30	0.0 (0)	1.4 (31)	0.0	23.1	51.0
T ₄ : Fenoxaprop-p-ethyl	75	14	2.4 (291)	2.4 (352)	46.9	107.9	298.4
T ₅ : Fenoxa <i>fb</i> Chlorimuron	75+8	14	2.3 (192)	2.4 (244)	25.6	79.4	165.6
T ₆ : Fenoxa <i>fb</i> HW	75	14+30	0.0 (0)	1.5 (31)	0.0	23.8	50.8
T ₇ : Quizalofop ethyl	75	14	2.2 (167)	2.3 (214)	29.7	99.9	189.3
T ₈ : Quizalo <i>fb</i> Chlorimuron	75+8	14	2.0 (105)	2.2 (147)	14.8	47.1	94.0
T ₉ : Quizalo <i>fb</i> HW	75	14+30	0.0 (0)	1.5 (32)	0.0	24.5	50.8
T ₁₀ : Hand Weeding	-	20&40	1.7 (61)	1.6 (54)	8.3	25.4	52.0
T ₁₁ : I C <i>fb</i> HW	-	20&40	1.6 (52)	1.8 (46)	7.0	22.3	44.3
T ₁₂ : Weedy check	-	-	2.7 (529)	2.5 (615)	87.5	271.2	556.5
LSD (P=0.05)			0.2	0.2	2.1	4.6	11.8

* Figures in parentheses are original values. All figures subjected to log (X+1) transformed values. DAS-Days after sowing, HW-Hand weeding

Table 2. Effect of various weed management treatments on weed control efficiency (WCE), seed yield, straw yield, harvest index, cost : benefit ratio (CBR) and net CBR in soybean

Treatments	Dose (g/ha)	Application stage (DAS)	WCE (%)			Seed yield (kg/ha)	Straw yield (kg/ha)	Harvest index (%)	CBR	Net CBR
			30 DAS	60 DAS	At harvest					
T ₁ :Imazethapyr	75	14	65.5	66.2	66.4	1792	3275	33.81	1:2.71	1:1.71
T ₂ :Imazethapyr <i>fb</i> Chlorimuron ethyl	75+8	14	79.7	80.2	79.7	1965	3392	34.17	1:2.74	1:1.74
T ₃ :Imazethapyr <i>fb</i> HW	75	14+30	100	91.5	90.8	2196	3639	35.07	1:3.11	1:2.11
T ₄ :Fenoxaprop-p-ethyl	75	14	46.4	60.2	46.4	1417	2823	34.67	1:2.13	1:1.13
T ₅ :Fenoxa <i>fb</i> Chlorimuron	75+8	14	70.7	70.7	70.3	1883	3243	33.97	1:2.60	1:1.60
T ₆ :Fenoxa <i>fb</i> HW	75	14+30	100	91.2	90.9	2165	3677	35.56	1:3.05	1:2.05
T ₇ :Quizalofop ethyl	75	14	66.0	63.2	66.0	1603	3099	35.65	1:2.03	1:1.03
T ₈ :Quizalofop <i>fb</i> Chlorimuron	75+8	14	83.1	82.6	83.1	1924	3372	35.68	1:2.27	1:1.27
T ₉ :Quizalofop <i>fb</i> HW	75	14+30	100.	91.0	90.9	2111	3605	37.00	1:2.53	1:1.53
T ₁₀ : Hand Weeding	-	20&40	90.5	90.6	90.7	2236	3651	34.69	1:3.48	1:2.48
T ₁₁ : I C <i>fb</i> HW	-	20&40	92.0	92.0	92.1	2251	3756	34.72	1:3.67	1:2.67
T ₁₂ :Weedy check	-	-	0.0	0.0	0.0	856	1682	35.10	1:1.81	1:0.81
LSD (P=0.05)	-	-	-	-	-	183	312	NS	-	-

* CBR- Cost Benefit Ratio; IC - Inter cultivation; HW - Hand weeding; Fb - Followed by.

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