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Integrated weed management in soybean

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ABSTRACT

A field experiment was conducted during 2010 to 2012 for three years at Agricultural Research Station, Karad Maharashtra to find out the suitable integrated weed management method in soybean. Post-emergence application of quizalofop-ethyl at 0.05 kg/ha + chlorimuron-ethyl at 0.009 kg/ha at 15 days after seeding (DAS) + hand weeding at 30 DAS, recorded lowest weed biomass (38.1 g/m^2) with higher weed control efficiency (62%) and lower weed index (8.0). The some treatment also recorded the highest seed yield and net returns with lower weed index (8.0) in soybean.

Soybean (*Glycine max.*) is an important rainy season crop having national productivity of 1.006 t/ha (Anonymous 2010). The sowing window for soybean in rainy season is very short and farmers give first priority to sow the crop. The weeds emerges simultaneously with the crop plants and compete with soybean causing loss in yield (35-55%) depending upon the weed flora and density (Chandel and Saxena 1998, Kewat *et al.* 2000, Singh 2007). Due to intermittent rainfall during rainy season and scanty labour, manual weeding at right stage is difficult and time consuming and expensive, so farmers rarely adopt this practices for weed control (Nainwal *et al.* 2010). Under such a situation herbicidal use with suitable dose remains the pertinent choice for controlling weeds. Herbicides in isolation, however are unable to provide complete weed control because of their selective kill (Anonymous 2010). Their use can be made more effective if supplemented with hand weeding or hoeing (Nainwal *et al.* 2010). A judicious combination of chemical and cultural methods of weed control would not only reduce the expenditure on herbicides but would benefit the crop timely by providing proper aeration and conservation of moisture (Velu and Shankaran 1996, Prakash *et al.* 1991). Thus the present experiment was conducted with an objective to identify a judicious combination of chemical and cultural weed control methods for effectively managing weeds in soybean.

A field experiment was conducted during *Kharif* season of 2010, 2011 and 2012 at Agricultural Research Station, Karad Maharashtra to identify the suitable integrated weed management method for managing weeds in soybean. The experiment was laid out in a randomized block design with ten treatments replicated thrice. Experimental treatments comprised of weedy check, weed free check, hoeing at 15 days after seeding (DAS) and 30 DAS, hoeing at 15 DAS and hand weeding at 30 DAS, imazethapyr (pursuit) 0.075 kg/ha as post- emergence (PoE) at 15 DAS, imazethapyr 0.075 kg/ha as PoE at 15 DAS and hand weeding at 30 DAS, pendimethalin 1.0 kg/ha as pre-emergence, pendimethalin 1.0 kg/ha as pre-emergence and hand weeding at 30 DAS, quizalofop-ethyl (turga super) 0.05 kg/ha + chlorimuron-ethyl (cloben) 0.009 kg/ha as PoE at 15 DAS, and quizalofop-ethyl 0.05 kg/ha + chlorimuron-ethyl 0.009 kg/ha as PoE at 15 DAS + hand weeding at 30 DAS. The experimental plot size was 6.00 x 4.20 m^2. The soybean was sown by dibbling at 30 x 10 cm spacing during *Kharif* 2010-2012. The soil of the experimental field was medium deep, with low in available nitrogen (260 kg/ha) medium in available phosphorus (45.2 kg/ha) and rich in available potash (350 kg/ha). The soil was normal in reaction with pH 6.7. Weed biomass was recorded by weighing the weeds collected from the treatment plots after drying collected weeds for about one week. Weed control efficiency was estimated on the basis of reduction in weed biomass in comparison with unweeded control and expressed as an index taking weed free as 100% efficiency. Weed index refers to reduction in soybean yield due to presences of weeds in comparison to the weed free treatment plot soybean yield. The economics of treatment was computed with prevailing market prices of products.

Table 1. Mean pooled soybean plant height, pods per plant, associated weed biomassgrain and straw yield, weed control efficiency, weed index and economics as influenced by different treatments

Treatment	Plant height (cm)	No. of pods/ plant	Weed biomass (g/m^2)	Soybean yield (t/ha)		Weed control efficiency (%)	Weed index (%)	Gross monetary returns (x10^3 `/ha)	Net returns (x10^3 `/ha)	B:C ratio
				Grain	Straw					
Hoeing at 15 DAS and 30 DAS	64	24	66.6	2.54	1.92	36	32	46.43	27.12	2.40
Hoeing at 15 DAS and HW at 30 DAS	69	24	44.8	2.89	2.16	55	23	52.94	31.90	2.52
Imazethapyr 0.075 kg/ha as PoE at 15 DAS	59	19	72.6	2.35	1.70	31	37	42.98	22.87	2.14
Imazethapyr 0.075 kg/ha as PoE at 15 DAS and HW at 30 DAS	70	22	45.7	3.07	2.22	54	18	56.25	34.28	2.56
Pendimethalin 1.0 kg/ha as PE	60	22	72.7	2.34	1.74	30	37	42.85	23.29	2.19
Pendimethalin 1.0 kg/ha as PE and HW at 30 DAS	52	25	61.3	2.70	2.07	47	28	49.36	27.94	2.30
Quizalofop-ethyl 0.05 kg/ha + chlorimuron-ethyl 0.009 kg/ha as PoE at 15 DAS	65	26	65.5	2.45	1.73	38	34	44.91	25.21	2.28
Quizalofop-ethyl 0.05 kg/ha + chlorimuron-ethyl 0.009 kg/ha as PoE at 15 DAS + HW at 30 DAS	71	28	38.1	3.42	2.44	62	8	62.62	41.06	2.90
Weedy check	63	18	104.7	1.90	1.61	0	49	34.74	18.34	2.12
Weed free check	75	29	0	3.73	2.59	100	0	68.26	45.85	3.05
LSD (p=0.05)	8	5	13.4	0.32	0.18	5	8	5.81	5.81	-

Effect on weeds

The dominant weeds occurred in the experimental field during the three years were *Cynodon dactylon, Cyprus rotundus, Celosia argentea, Portulaca oleracea, Eclipta alba, Echinochlola colona, Alternenthra* spp.*, Eupherbia* spp.*etc*.

Significantly the lowest weed biomass, higher weed control efficiency and lower weed index were recorded with weed free treatment (**Table 1**). The second best treatment was quizalofop-ethyl 0.05 kg/ ha + chlorimuron-ethyl 0.009 kg/ha PoE at 15 DAS + hand weeding at 30 DAS, which recorded the lowest weed biomass (38.1 g/m^2) with higher weed control efficiency (62%) and lower weed index (8.0). The highest weed biomass was recorded with weedy check treatment. These result are corroborates with those of Dubey *et al.* (1996).

Effect on crop

Significantly the highest plant height (75 cm), number of pods per plant (29), grain yield (3.73 t/ha) and straw yield (2.59 t/ha) were obtained in weed free treatment (**Table 1**). It was at par with quizalofop-ethyl 0.05 kg/ha + chlorimuron-ethyl 0.009 kg/ha PoE at 15 DAS + HW at 30 DAS with the next highest grain yield (3.42 t/ha) and straw yield (2.44 t/ha). The increase in soybean seed yield with integrated methods can be attributed to the fact that the crop was kept free of competition at the early critical stages of growth resulting in the crop using the land and climatic resources more efficiently (Natrajan *et al.* 1997).

Economics

Weed free treatment recorded significantly the highest gross monetary returns (` 68,269/ha) and net returns (` 45,857/ha) (**Table 1**), which was at par with quizalofop-ethyl 0.05 kg/ha + chlorimuron-ethyl 0.009 kg/ha PoE at 15 DAS + HW at 30 DAS. The benefit:cost ratio also followed similar trend. These results are in close conformity with the findings of Chandel *et al.* (1995). On the basis of study it was concluded that quizalofop-ethyl 0.05 kg/ha + chlorimuron-ethyl 0.009 kg/ha as PoE at 15 DAS + HW at 30 DAS was the best effective and economic integrated weed management treatment for soybean.

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