Evaluation of integrated weed management package for soybean

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Abstract

A field experiment was conducted to evaluate a suitable integrated weed management package for irrigated soybean. The treatments included different combinations of pre-emergence and post-emergence herbicides with or without physical control methods. Among the herbicides, pre-emergence application of two formulations of pendimethalin (Dhanutop and Tata Panida) along with one hand weeding at 30 days after sowing recorded lower number of weeds (15/m2) which was significantly lower than pre-emergence application of alachlor (27 /m2). However, post emergence application of quizalofop ethyl recorded highest number of weeds 151 /m2. Among the physical methods, two hoeings at 20 and 40 DAS recorded the lowest weed density of 14/m2 followed by insitu mulching (27 /m2) and two hand weedings (29 /m2). Higher grain yields and net returns were recorded in pre-emergence application of pendimethalin at 1.0 kg ai/ha with or without hand weeding and were comparable with two hoeings at 20 and 40 DAS .

Key words

Soybean, weed management, herbicides, physical methods

Introduction

Soybean is considered as a miracle golden bean of 20th century which possesses the potential of revolutionizing the Indian economy by correcting the health of human beings (with its wide spectrum of chemical composition) and soil (increasing the C:N ratio). However the growth of soybean is greatly affected by inadequate weed control especially during the early period of the crop under irrigated conditions. The yield loss due to weed infestation in soybean was to the tune of 20-77 per cent (Kurchania *et al.,* 2001) Presence of weeds was found to reduce the number of branches, pods and seeds per plant in soybean. Significantly higher N, P and K uptake (151, 32 and 79 kg/ha) by weeds was observed in a weedy check in soybean. Critical period of weed control was found to be 3045 days after sowing (DAS) in soybean (Chokar and Balyan, 1999). Usually two hand weedings at 4 and 6 weeks after sowing are considered adequate, but involves labour and cost. Hence herbicidal weed control may improve net return in this crop. Several post-emergence herbicides are available for effective control of weeds in soybean. So this study was undertaken to obtain a suitable chemical weed control system and also to compare the relative efficacy of different herbicides with physical methods.

Methods

A field experiment was conducted during 2003 – 2005 at Tamil Nadu Agricultural University, Coimbatore, India. The experiment comprised of alachlor at 2 kg ai/ha at pre- emergence, two hand weedings at 30 and 45 DAS, quizalofop ethyl 50 g ai/ha at post-emergence, pendimethalin at 1 kg ai/ha at pre-emergence (Dhanutop 30% EC), pendimethalin @ 1 kg ai/ha at pre-emergence (Tata panida 30% EC), pendimethalin at 1 kg ai/ha at pre-emergence (Dhanutop 30% EC) + 1 hand weeding (HW) on 30 DAS, pendimethalin at 1 kg ai/ha as pre-emergence (Tata panida 30% EC) + 1 hand weeding at 30 DAS, two hoeings at 20 and 40 DAS, *Insitu* mulching with weeds at 30 DAS and weedy check. Herbicides were applied with the help of knap-sack sprayer fitted with flat fan nozzle using a spray volume of 500 litres water /ha under moist field conditions. *Insitu* mulching was done by spreading harvested stalks of the previous crop of maize in between the crop rows at the rate of 5 tons/ha. The experiment was laid out in randomized block design with three replications. The test variety of soybean was CO 1, sown at a spacing of 30 x 10 cm applying 20 : 80 : 40 kg NPK/ha. The soil type was sandy loam with nutrient status of 235, 14.7 and 795 kg/ha of N, P and K respectively with previous crop of maize.

The weed density was recorded by the least-count quadrat (0.25 x 0.25m) method at 60 DAS and weed dry weight was estimated. Economic analysis was done on the basis of prevailing market price of inputs used and the output obtained under each treatment.

Results and discussion

Weed incidence

The observation on the common weeds of the experimental field in the unweeded check revealed that the major grassy weeds were *Eleusine indica, Chloris barbata , Panicum repens, Echinochloa sp.* and *Digitaria sanguinalis. Cyperus rotundus* was the only sedge species found. Broad leaved weeds included *Trianthema portulacastrum, Amaranthus viridis, Digeria arvensis, Portulaca quadrifida, Phyllanthus niruri, Acalypha indica, Boerhaavia diffusa* and *Parthenium sp.* Generally the broad leaved weeds (BLW) dominated the grasses and sedges of which *Trianthema portulacastrum* occupied 90 % of the total weed population.

Among the treatments with herbicides, pre-emergence application of both the formulations of pendimethalin (Dhanutop and Tata Panida) with one hand weeding on 30 DAS recorded lower number of weeds (15 /m^2) and were significantly superior to spraying of alachlor (27 /m^2). However post-emergence application of quizalofop ethyl recorded highest number of weeds (151 /m^2), since this herbicide was not effective on the broadleaf species. Among the physical methods, two hoeings at 20 and 40 DAS recorded the lowest weed density of 14/m^2 followed by *insitu* mulching and two hand weedings. The weed density recorded in weedy check was 220 /m^2 with dry matter production of 103.9 g/ m^2 (Table 1). The weed dry weight also followed a similar trend as that of weed density.

Table 1. Effect of treatments on weed incidence at 60 days after sowing on soybean yield and net returns:

Treatments	Weed density (No./m^2)				Weed dry weight (g/ m^2)	No. of pods per plant	100 seed weight (g)	Grain yield (t/ha)	Net returns (A$/ha)
	BLW	Grass	Sedge	Total					
Alachlor	21	4	2	27	14.8	68.1	10.62	1.315	267.3
Two hand weedings	24	3	2	29	14.7	70.8	10.70	1.268	145.0
Quizalofop ethyl	143	4	4	151	88.1	24.7	8.68	0.407	-182.2
Pendimethalin (Dhanutop)	12	5	2	19	12.7	75.6	10.73	1.429	295.5
Pendimethalin (Tata Panida)	17	5	2	24	12.1	75.4	10.53	1.378	323.8

Dhanutop + 1 HW on 30 DAS	11	2	2	15	11.0	76.0	10.89	1.445	282.2
TataPanida + 1 HW on 30DAS	10	3	2	15	10.9	74.9	10.65	1.507	312.9
Two hoeings @ 20 & 40 DAS	9	3	2	14	11.7	69.5	10.74	1.361	191.1
Insitu mulching on 30 DAS	21	5	1	27	14.1	66.7	10.77	1.292	218.8
Weedy check	197	19	4	220	103.9	22.2	7.93	0.328	-208.9
Critical Difference (P=0.05)				4.45	7.76	6.45	0.416	0.186	

Yield parameters, yield and economics

The weed density was reflected on the yield parameters and grain yield. The highest number of pods per plant and 100 seed weight (g) were recorded in plots applied with pre emergence spray of two formulations of pendimethalin and were comparable with hand weeding and hoeing. Highest grain yield was registered in plots applied with pre-emergence application of pendimethalin as Tata Panida at 1.0 kg ai/ha (1.507 t/ha). The plots applied with pre-emergence spray of pendimethalin @ 1.0 kg/ha either as Tata Panida or Dhanutop both with hand weeding and without hand weeding registered comparable grain yields. These treatments were at par with the treatment receiving two hand hoeings at 20 and 40 DAS. Similar results were reported by Gracy and Sreenivasan (1998). These treatments recorded higher net returns due to saving in labour cost for weeding.

Among the physical methods higher grain yield was recorded by two hand hoeings (1.361 t/ha), which was higher than *insitu* mulching (1.292 t/ha) and hand weedings (1.268 t/ha). Though the physical methods were effective in controlling weeds the net returns were much lower due to higher cost of labour involved in manual weeding. Lowest grain yield of 328 kg/ha was recorded in the weedy check and post-emergence application of quizalofop ethyl recorded 0.407 t/ha. These findings are in agreement with that of Vyas and Jain (2003).

Conclusion

Both formulations of pendimethalin (Dhanutop and Tata Panida) @ 1 kg ai/ha not only effectively controlled weeds and increased soybean grain yield but also increased net returns.

References

Chokar RS and Balyan RS (1999). Competition and control of weeds in soybean. Soybean Abstracts. 22(3): 171.

Gracy Mathew and Sreenivasan E (1998). Effect of weed control methods on yield and economics of rainfed cowpea. Madras Agricultural Journal. 85(1): 50-52.

Kurchania SP, Pathi GS, Bhaua CS and Mathew R (2001). Bio efficiency of Post emergence herbicides for weed control in soybean (*Glycine max*). Indian Journal of Weed Science, 33: 34-37

Vyas MD and Jain AK (2003). Effect of pre and post emergence herbicides on weed control and productivity of soybean. Indian Journal of Agronomy 48(4): 309-311.