

Yield and quality of soybean (*Glycine max* (L.) Merrill) as influenced by integrated weed management

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ABSTRACT

The seed and straw yields and protein and oil content of soybean crop was found to be significantly affected by different weed control treatments and was significantly superior in case of weed free check (37.51, and 48.18/ ha, respectively), while it was observed to be significantly lowest in unweeded control(19.56 and 30.84q/ha, respectively). Among the integrated weed control treatments, Imazethapyr (EPOE) @ 0.075 kg a.i./ha + one Hoeing at 30 DAS was found to be significantly superior in case of seed and straw yields (32.04 and 44.84q/ha, respectively) over the other integrated weed control treatments under study. Among the chemical weed control treatments, application of Quizalofop ethyl@ 0.05 kg a.i./ha recorded the lowest seed and straw yield (24.37 and 35.73 q/ha, respectively).

Key words : Integrated weed management, Yield, Quality and Soybean

INTRODUCTION

Soybean [*Glycine max* (L.) Merrill] is one of the important pulse and oilseed crops of India. It is of paramount importance in human and animal nutrition, as it is a major source of edible vegetable oil and high quality protein food. It contains about 40 per cent quality protein, 23 per cent carbohydrates and 20 per cent cholesterol free oil. Soybean is mainly grown in rainy (*Kharif*) season due to which weed growth remains a serious problem. Among the various factors responsible for low productivity of soybean, weed infestation during early stages of crop growth is one of the major factors which results in a loss to the extent of 79 per cent (Reddy *et al.*, 1990).

Herbicides in isolation, however, are unable to obtain complete weed control because of their selective kill. Their use can be made more effective if supplemented with hand weeding or hoeing. Recent investigations have revealed that Imidazolinones group of herbicides is very effective in controlling the weeds in soybean (e.g. Imazethapyr). A judicious combination of chemicals 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. A judicious combination of chemical and cultural weed control would certainly prove to be effective for controlling weeds in soybean.

MATERIALS AND METHODS

A field experiment to study "Effect of integrated weed management on yield and quality of Soybean [*Glycine max* L. Merrill] " was conducted during *Kharif*,

2008 at Agronomy farm, College of Agriculture, Pune-5. The experiment was laid out in Randomized Block Design with ten treatments replicated thrice. The different treatments comprised of Weedy check (T_1), while among the mechanical methods the treatments comprised of two hand weedings at 30 and 45 DAS (T_2), two hoeings at 30 and 45 DAS (T_3), one HW at 30 DAS + one hoeing at 45 DAS (T_4). The chemical methods of weed control comprised of the treatments fluchloralin (PPI) @ 1 kg a.i./ha (T_5), pendimethalin (PE) @ 1 kg a.i./ha (T_7) and pursuit (EPOE) @ 100 g a.i./ha (T_9). The integrated methods of weed control comprised of the treatments fluchloralin (PPI) @ 1 kg a.i./ha + one HW at 30 DAS (T_6), pendimethalin (PE) @ 1 kg a.i./ha + one HW at 30 DAS (T_8) and pursuit (EPOE) @ 100 g a.i./ha + one HW at 45 DAS (T_{10}). The gross and net plot sizes were 4.8 x 4.2 m² and 4.2 x 3.6 m², respectively. The soil of the experimental field was clay in texture, with medium in available nitrogen, medium in available phosphorus and rich in available potassium. The soil was slightly alkaline in reaction with pH of 7.6. The experimental crop was sown by dibbling at 30 x 10 cm² spacing on 28th June, 2008.

RESULTS AND DISCUSSION

The results obtained from the present investigation have been discussed in the following sub heads:

Seed yield :

The results of the study indicate that the maximum seed yield (37.51q/ha) was obtained with weed free check and was significantly superior over rest of the weed control treatments. Among the IWM treatments for weed

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control, treatment T₇ *i.e.* Imazethapyr (EPOE) @ 0.075 kg a.i./ha + one hoeing at 30 DAS recorded the highest seed yield. All the weed control treatments recorded significantly higher seed yield *vis-a-vis* the treatment weedy check thereby revealing the beneficial effect of lower weed crop competition in enhancing the seed yield in soybean. Quizalofop ethyl @ 0.05 kg a.i./ha (24.37 q/ha) recorded the lowest seed yield among the chemical weed control treatments which was followed by treatment Chlorimuron ethyl @ 0.009 kg a.i./ha (26.22q/ha). This result corroborates the results of Porwal *et al.* (1991) and Dubey *et al.* (1996).

Unweeded control recorded the lowest seed yield due to heavy infestation of weeds, hindering the uptake of nutrients and reducing photosynthesis by shading of the main crop. Elimination of weeds during early stages of crop growth would thereby enable the plant to grow better and consequently yield better. These results corroborate the findings of Muniyappa *et al.* (1986) and Singh and Kolar (1994).

The increase in seed yield with integrated methods can be attributed to the fact that the crop was kept free of competition at the early critical stage of growth resulting in the crop using the land and climatic resources more efficiently. These results are in confirmation with the earlier findings of Prakash *et al.* (1991), Chandrakar and Urkurkar (1993), Rao *et al.* (1995) and Velu and Sankaran (1996).

Stover yield :

The straw yield in soybean crop was found to be significantly influenced by different weed control

treatments. The data revealed that weed free check significantly recorded the maximum straw yield (48.18 q/ha) *vis-a-vis* all the other weed control methods which can be attributed to the fact that the treatment resulted in least crop weed competition for nutrients, water, light and space, thereby resulting in highest straw yield. Conversely, the weedy check significantly recorded least straw yield (30.84 q/ha). Similar results were obtained by Satao and Chandurkar (1994).

Among the IWM treatments, T₇ *i.e.* Imazethapyr (EPOE) @ 0.075 kg a.i./ha + one hoeing at 30 DAS was reported the maximum straw yield (44.84 q/ha). Quizalofop ethyl @ 0.05 kg a.i./ha revealed the minimum straw yield (35.73 q/ha) due to higher competition offered by the weeds to the crop resulting from lower weed control efficiency of the herbicides in isolation. This result is similar to that obtained by Natarajan *et al.* (1997).

Quality studies:

Protein and oil content :

The data regarding the per cent protein and oil content in soybean seed as influenced by different treatments are presented in Table 1. The data indicated that the mean per cent protein and per cent oil content in the soybean was 39.56 % and 20.32 %, respectively. The data from the Table 1 revealed that weed free check produced significantly the highest protein (42.31 %) and oil content (21.82 %) in soybean as compared to the other methods of weed control. Similar results were reported by Porwal *et al.* (1991).

The lowest per cent protein (37.66 %) and per cent oil content (18.18 %), however, were reported under

Table 1 : Seed and stover yields (q/ha) and mean protein and oil content in soybean seed (per cent) as influenced by different treatments

Symbol	Treatments	Yield (q/ha)		Protein content (%)	Oil content (%)
		Seed	Stover		
T ₁	Unweeded control	19.56	30.84	37.66	18.18
T ₂	Weed free check	37.51	48.18	42.31	21.82
T ₃	Two hand weedings (15 and 30 DAS)	35.18	45.18	41.13	21.62
T ₄	Hand weeding at 15 DAS followed by one hoeing at 30 DAS	32.19	40.18	39.71	21.38
T ₅	Two hoeings (15 and 30 DAS)	30.84	38.56	34.32	19.80
T ₆	Imazethapyr @ 0.075 kg a. i. ha ⁻¹ at 15 DAS	27.67	39.67	40.13	20.04
T ₇	Imazethapyr @ 0.075 kg a. i. ha ⁻¹ at 15 DAS + one hoeing at 30 DAS	32.04	44.84	40.72	20.72
T ₈	Chlorimuron ethyl @ 0.009 kg a. i. ha ⁻¹ at 15 DAS	26.22	38.03	39.45	20.04
T ₉	Chlorimuron ethyl @ 0.009 kg a. i. ha ⁻¹ at 15 DAS + one hoeing at 30 DAS	30.22	40.83	40.15	20.64
T ₁₀	Quizalofop-p-ethyl @ 0.05 kg a. i. ha ⁻¹ at 15 DAS	24.37	35.73	38.10	19.32
T ₁₁	Quizalofop ethyl @ 0.05 kg a. i. ha ⁻¹ at 15 DAS + one hoeing at 30 DAS	28.73	39.47	39.56	20.32
S.E. ±		0.13	0.10	0.12	0.08
C.D. (P=0.05)		0.40	0.30	0.35	0.25
General mean		29.50	39.99	39.84	20.35

unweeded control revealing the adverse effect of weed-crop competition for nutrients, space, moisture and sunlight adversely affecting the protein and oil content in soybean.

Among the herbicide treatments, treatment T₇ i.e. Imazethapyr (EPOE) @ 0.075 kg a.i./ha + one Hoeing at 30 DAS recorded the highest protein (40.72 %) and oil (20.72 %) content in soybean. The herbicides in isolation i.e. Quizalofop ethyl @ 0.05 kg a.i./ha recorded the lowest protein (38.10 %) content among the herbicides treatments which may be due to phytotoxic effect of herbicides on crop plants. These results, however, contradictory with the results obtained by Chhokar *et al.* (1995).

Conclusion:

As regards the seed and straw yields and qualitative studies in case of soybean crop, weed free check was found to be superior which was at par with two hand weeding at 15 and 30 DAS and in IWM treatments. Application of Imazethapyr (EPOE) @ 0.075 kg a.i./ha + one hoeing at 30 DAS was superior than other treatments. Unweeded control, however, was observed to be inferior in respect of seed and straw yields and qualitative studies among the treatments under study. The treatment weedy check, however, was found to indicate the lowest values of the yield components because of severe competition for the natural resources for growth between the crop and weed.

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