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Effect of Sequential Application of Pre and Post-emergence Herbicides on Growth, Yield attributes and Yield of Soybean (*Glycine max*)

J. Vijay[1*], M. Mallareddy[2], K. Chandra Shekar[3] and B. Padmaja[4]

[1]Department of Agronomy, [2]Professor and Head, Department of Agronomy;

[3]Assistant Professor, Soil Science; [4]Associate Professor, Agronomy

Professor Jayashankar Telangana State Agricultural University, Agricultural College,

Polasa, Jagtial – 505 529, Telangana State, India

*Corresponding Author E-mail: vijayjakkula86@gmail.com

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ABSTRACT

A field experiment was conducted during kharif season of 2015 at College Farm, Agricultural College, Polasa, Jagtial to study the effect of sequential application of pre and post-emergence herbicides on growth, yield attributes and yield of soybean (Glycine max (L.) Merril). Among these sequential treatments, Growth parameters, yield attributes and yield of soybean was higher with the Pre emergence of (PE) application of pendimethalin @ 2.5 l/ha followed by imazethapyr @ 75 g/ha at 20 DAS (T_{12}) followed by PE application of pendimethalin @ 2.5 l/ha followed by imazethapyr + imazamox @ 100 g/ha at 20 DAS (T_8). This treatment also recorded highest seed yield of soybean with taller plants, more number of pods/plant and seeds/pod. The test weight was not influenced by the herbicides. Similarly, Pre emergence of (PE) application of pendimethalin @ 2.5 l/ha followed by imazethapyr @ 75 g/ha at 20 DAS (T_{12}) was found to be economical with high B:C ratio.

Key words: *Herbicides, Pre-emergence, Post-emergence, Yield attributes, Soybean, Yield.*

INTRODUCTION

The soybean (*Glycine max* (L.) Merril), is an important oil-yielding rainy-season (*kharif*) crop having multiple uses. Weeds are the major biotic factor responsible for poor yield in soybean. Simultaneous emergence and rapid growth of large number of weed species causes severe crop-weed competitions and reduction in crop yields (30-80%) depending upon the type of weed flora and weed density[3]. The incessant rains do not permit timely inter cultivation and manual control of weeds is also difficult on large scale on account of high cost and labour shortage during weeding peaks. Therefore, there is a need for alternative methods of reducing weed load during early crop growth period of soybean *i.e.*, first 30-45 DAS[1]. The herbicides presently available are either pre-emergence (PE) or pre-plant incorporated (PPI) have a narrow spectrum weed control. The biology of some weeds that occur in soybean makes it difficult to achieve effective weed control with single application of herbicides; PPI or Pre or Post emergence[4].

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Only few farmers are applying weedicides as post emergence spray at 25-30 DAS without pre-emergence application of herbicides in Northern Telangana Zone. Sequential application of herbicides i.e., pre followed by post will provide more consistent weed control than single application[6]. Therefore, the present investigation is planned to find out the effect of sequential application of pre and post emergence herbicides on growth, yield attributes and yield of soybean.

MATERIAL AND METHODS

A field experiment was conducted during the rainy (*kharif*) season at 2015 at College Farm, Agricultural College, Polasa, Jagtial, on a sandy loamy soil, slightly alkaline in reaction, normal in EC (0.19), low in available N (183 kg/ha) and P_2O_5 (18 kg/ha) and medium in available K_2O (243 kg/ha) deficient in S (18 kg/ha) and Zn (0.5 ppm). The experiment was laid out in randomized block design with 3 replications. Soybean variety 'Asb-22' was sown in June at the seed rate of 62.5 kg seed/ha and harvested October 2015.

The experiment comprised 12 treatments, viz. weedy check (T_1), weed free (T_2), pre-emergence (PE) application of pendimethalin @ 2.5 l/ha (T_3) , PE application of metribuzin @ 0.5 kg/ha (T_4), PE application of chlorimuron-p-ethyl @ 35 g/ha (T_5), PE application of oxyfluorfen @ 0.1 kg/ha (T_6) , post-emergence (POE) application of imazethapyr + imazamox @ 100 g/ha at 20 DAS (T_7), PE application of pendimethalin @ 2.5 l/ha followed by (fb) imazethapyr + imazamox @ 100 g/ha at 20 DAS (T_8), PE application of metribuzin @ 0.5 kg/ha fb imazethapyr + imazamox @ 100 g/ha at 20 DAS (T_9), PE application of chlorimuron-p-ethyl @ 35 g/ha fb imazethapyr + imazamox @ 100 g/ha at 20 DAS (T_{10}), PE application of oxyfluorfen @ 0.1 kg/ha fb imazethapyr + imazamox @ 100 g/ha at 20 DAS (T_{11}), PE application of pendimethalin @ 2.5 l/ha fb imazethapyr @ 75 g/ha at 20 DAS (T_{12}). Recommended dose of 60 kg N, 60 kg P, 40 kg K, 20 kg S and 5 kg Zn was applied basal at the time of sowing. Seed was treated with Thiram @ 3 g/kg of seeds.

RESULTS AND DISCUSSION

The influence of weed control treatments on growth parameters viz. plant height and dry matter production at harvest indicated that, significantly taller plants and higher dry matter production (Table 1) were recorded in the treatments with sequential application of herbicides especially in pre emergence application of pendimethalin @ 2.5 l/ha fb imazethapyr @ 75 g/ha at 20 DAS (T_{12}) and it was followed by pre emergence application of pendimethalin @ 2.5 l/ha followed by (fb) imazethapyr + imazamox @ 100 g/ha at 20 DAS (T_8).

The yield attributing characters viz. pods/plant and seed/pod were significantly influenced by different weed control treatments (Table 1). The highest values of these parameters over control (weedy check) were under weed free treatment. Among herbicidal applications, significantly higher seed yield was obtained with PE application of pendimethalin @ 2.5 l/ha fb imazethapyr @ 75 g/ha at 20 DAS (T_{12}). The lowest seed yield was recorded under weedy check. Tiwari and Kuruchania[5]. also reported that weed infestation in soybean field may reduce yield up to 77% depending on the intensity, nature and duration of weed competition. Pods/plant, seeds/pod and 100 seed weight were higher with PE application of pendimethalin @ 2.5 l/ha followed by imazethapyr @ 75 g/ha at 20 DAS (T_{12}), which contributed towards the higher seed yield (Jha and Mounika Soni, 2013). The increase in yield attributes under pendimethalin @ 2.5 l/ha followed by imazethapyr @ 75 g/ha at 20 DAS was due to its effectiveness in controlling weeds and improvement in growth and development of crop and higher yield attributes of soybean crop. The increase in yield attributes and yield under these treatments may be attributed to concomitant reduction in weed dry matter, which accounted for reduction in crop weed competition, and provided congenial environment to the crop for better reproductive potential.

Significantly higher gross and net returns were realized with PE application of pendimethalin @ 2.5 l/ha fb imazethapyr @ 75

g/ha at 20 DAS (T_{12}) followed by PE application of pendimethalin @ 2.5 l/ha followed by (fb) imazethapyr + imazamox @ 100 g/ha at 20 DAS (T_8) along with higher B:C ratio (Table 2) and these two treatments were at par with weed free condition as well.

Table 1: Effect of sequential application of pre and post-emergence herbicides on growth, yield attributes and yield of soybean

Treatment	Plant height (cm) at harvest	Dry matter production (kg/ha) at harvest	Pods/plant	Seeds/pod	100 seed weight (g)	Seed yield (kg/ha)	Haulm yield (kg/ha)
T_1-Weedy check	38.70	2543.0	39.27	2.6	9.87	809	1171
T_2-Weed free	54.20	4932.7	65.47	3.0	11.33	1755	1972
T_3-PE application of Pendimethalin @ 2.5 l ha^{-1}	43.60	3237.7	48.53	2.8	10.67	1250	1472
T_4-PE application of Metribuzin @ 0.5 kg ha^{-1}	42.87	3189.7	46.40	2.6	10.73	1198	1504
T_5-PE application of Chlorimuron -p-ethyl @ 35 g ha^{-1}	41.13	3142.3	40.73	2.7	10.33	1217	1450
T_6-PE application of Oxyfluorfen @ 0.1 kg ha^{-1}	43.20	3266.7	36.93	2.8	10.67	1244	1443
T_7-Post-emergence application of Imazethapyr + Imazamox @ 100 g ha^{-1} at 20 DAS	45.87	4121.3	51.87	2.9	10.93	1455	1680
T_8-PE appli. of Pendi. @ 2.5 l ha^{-1} fb Imazethapyr + Imazamox @ 100 g ha^{-1} at 20 DAS	50.10	4428.7	61.33	3.0	11.00	1591	1800
T_9-PE application of Metribuzin @ 0.5 kg ha^{-1} fb Imazethapyr + Imazamox @ 100 g ha^{-1} at 20 DAS	47.23	4259.0	53.27	2.9	10.67	1470	1790
T_{10}-PE application of Chlor.-p- ethyl @ 35 g ha^{-1} fb Imazethapyr + Imazamox @ 100 g ha^{-1} at 20 DAS	46.10	4191.3	56.07	2.9	10.67	1465	1751
T_{11}-PE appli. of Oxy. @ 0.1 kg ha^{-1} fb Imazethapyr + Imazamox @ 100 g ha^{-1} at 20 DAS	48.23	4350.3	54.27	2.9	10.83	1509	1808
T_{12}-PE application of Pendi. @ 2.5 l ha^{-1} fb Imazethapyr @ 75 g ha^{-1} at 20 DAS (Farmer's practice)	52.13	4590.3	63.13	3.0	11.23	1641	1853
SEm±	2.16	163.9	3.18	0.06	0.43	64.10	81.64
CD (P=0.05)	6.35	480.9	9.35	0.18	NS	188.01	239.45

DAS, Days after sowing; PE, Pre-emergence

Table 2: Effect of sequential application of pre and post-emergence herbicides on economics of soybean

Treatment	Cost of cultivation (×10^3 ₹/ ha)	Gross returns (×10^3 ₹/ ha)	Net returns (×10^3 ₹/ ha)	B:C ratio
T_1-Weedy check	25.3	59.6	34.3	1.35
T_2-Weed free	20.8	27.5	6.6	0.32
T_3-PE application of Pendimethalin @ 2.5 l ha^{-1}	22.5	42.5	19.9	0.89
T_4-PE application of Metribuzin @ 0.5 kg ha^{-1}	21.6	40.7	19.1	0.88
T_5-PE application of Chlorimuron -p-ethyl @ 35 g ha^{-1}	21.9	41.3	19.4	0.89
T_6-PE application of Oxyfluorfen @ 0.1 kg ha^{-1}	22.0	42.2	20.2	0.92
T_7-Post-emergence application of Imazethapyr + Imazamox @ 100 g ha^{-1} at 20 DAS	23.3	49.4	26.1	1.12
T_8-PE appli. of Pendi. @ 2.5 l ha^{-1} fb Imazethapyr + Imazamox @ 100 g ha^{-1} at 20 DAS	24.9	54.3	29.3	1.17
T_9-PE application of Metribuzin @ 0.5 kg ha^{-1} fb Imazethapyr + Imazamox @ 100 g ha^{-1} at 20 DAS	24.1	49.9	25.8	1.07
T_{10}-PE application of Chlor.-p- ethyl @ 35 g ha^{-1} fb Imazethapyr + Imazamox @ 100 g ha^{-1} at 20 DAS	24.3	49.8	25.4	1.04
T_{11}-PE appli. of Oxy. @ 0.1 kg ha^{-1} fb Imazethapyr + Imazamox @ 100 g ha^{-1} at 20 DAS	24.5	51.3	26.7	1.09
T_{12}-PE application of Pendi. @ 2.5 l ha^{-1} fb Imazethapyr @ 75 g ha^{-1} at 20 DAS (Farmer's practice)	23.5	55.7	32.2	1.37

CONCLUSION

- Based on the study, it is concluded that the growth parameters, yield attributes and yield of soybean was higher with the application of pendimethalin @ 2.5 l/ha followed by either imazethapyr @ 75 g/ha or imazethapyr + imazamox @ 100 g/ha at 20 DAS.
- Higher gross, net returns and B:C ratio were realized with PE application of pendimethalin @ 2.5 l/ha followed by either imazethapyr @ 75 g/ha or imazethapyr + imazamox @ 100 g/ha at 20 DAS.

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