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EFFICACY OF DIFFERENT NEW HERBICIDES AGAINST WEED FLORA IN SOYBEAN (*GLYCINE MAX* L.)

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Abstract

Study was conducted at College Farm, Department of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra), India; during *Kharif* season of 2013-14. The results indicated that all the chemical treatments were significantly superior over weed check with all parameter. The tank mix application of Imazethapyr @ 0.100 kg a.i./ha + Quizalofop ethyl @ 0.075 kg a.i./ha recorded significantly lower weed dry weight, maximum weed control efficiency and lowest weed index and significantly improved the growth characters, yield and yield contributing characters. Herbicides Imazethapyr @ 0.100 kg a.i./ha and Quizalofop ethyl @ 0.075 kg a.i./ha applied separately were less effective in controlling weeds. The recommended practices 1H *fb* 1HW though show at par result, but was not cost effective.

Key words : Soybean, herbicides, growth parameter, yield, randomized block design.

Introduction

Soybean is an important pulse as well as oilseed crop of the world and is known for its quality protein and oil. Soybean has emerged as a potential crop for changing the economical position of the farmers in India particularly Maharashtra. Although, ecological condition of the state are congenial for soybean production, but the yield is substantially low, despite of best management practices. The poor weed management practices deprive the crop of its major requirement of nutrients, soil moisture, sunlight and space, which results poor crop growth and yield.

Soybean crop grows slowly during the initial period, which results into vigorous growth and proliferation of weeds. In *kharif* season, the weed competition is one of the most important causes of low yield, which estimated to be of 31-84% (Kachroo *et al*., 2003). Thus, intense weed competition is one of the main constraints for increasing soybean productivity. The weed, if not controlled during critical period of weed crop competition, there may be reduction in the yield of soybean from 58-85% depending upon type and weed intensity (Singh and Singh, 1987; Kolhe *et al*., 1998). Hand weeding is traditional and effective method of weed control, but untimely and continuous rains as well as unavailability of labour during peak period of demand are the main limitations of manual weeding. Therefore, need was felt to explore the possibility of pre and post emergences herbicides for effective control of weed.

Recently, some of the post-emergence herbicides have been found effective in controlling weeds in soybean (Khope *et al*., 2011). Hence, present investigation has been carried out to find out performance of pre and post emergence herbicides for weed control in soybean.

Materials and Methods

The present investigation was carried out at College Farm, Department of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra), India; during *Kharif* season of 2013. The experiment was laid out in randomized block design with twelve treatments replicated thrice. The treatments comprised of weedy check ($\mathbf{T_1}$), while among the mechanical methods the treatment comprised of Recommended Practices- 1H *fb* 1HW ($\mathbf{T_2}$), chemical weed management practices *i.e*. herbicide Pendimethalin, Imazethapyr, Quizalofop ethyl, Chlorimuron ethyl, Fluazifop-p-butyl and Propaquizafop were used alone and in combination were used alone *i.e*. Pendimethalin 1.0 kg a.i./ha PE ($\mathbf{T_3}$), Quizalofop ethyl @ 0.075 kg a.i./ha PoE 15 DAS ($\mathbf{T_4}$), Imazethapyr @ 0.100 kg a.i./ha PoE 15 DAS ($\mathbf{T_5}$) and in combination with different concentrations *i.e*. Imazethapyr @ 0.100 kg a.i./ha *fb* Quizalofop ethyl @

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Table 1 : Effect of different weed control treatments on weed population, weed dry biomass, weed control efficiency and weed index in soybean.

Treatments	Weed count m^{-2} at 60 DAS			Weed dry biomass 60 DAS (g)	Weed control efficiency (%)	Weed index (%)
	Monocot	Dicot	Total			
T_1 - Weedy check	43.00	28.00	71.00	31.24	-	58.01
T_2 - Recommended Practice-1HW+ 1H	11.00	9.00	20.00	8.40	73.11	10.03
T_3 - Pendimethalin 1.0 kg a.i/ha PE	19.33	12.33	31.66	13.93	55.40	15.82
T_4 - Quizalofop ethyl @ 0.075 kg a.i./ha PoE 15 DAS	17.00	23.33	40.33	17.75	43.19	26.50
T_5 - Imazethapyr @ 0.100 kg a.i./ha PoE 15 DAS	12.00	11.00	23.00	10.12	67.61	16.08
T_6 - Imazethapyr @ 0.100 kg a.i./ha *fb* Quizalofop ethyl @ 0.075 kg a.i/ha PoE 15 DAS	9.67	8.33	18.00	7.56	75.80	5.99
T_7 - Imazethapyr @ 0.100 kg a.i./ha + Quizalofop ethyl @ 0.075 kg a.i/ha PoE 15 DAS (Tank mix)	10.00	7.67	17.67	7.42	76.25	-
T_8 - Imazethapyr + Imazamox (premix)@ 0.070 kg a.i./ha PoE 15 DAS	15.67	10.33	26.00	11.20	64.15	16.15
T_9 - Chlorimuron ethyl @ 0.010 kg a.i./ha	22.00	15.00	37.00	14.70	52.94	23.57
T_{10}- Fluazifop-p-butyl @ 0.125 kg a.i./ha	17.00	16.67	33.67	14.14	54.74	10.87
T_{11}- Fluazifop-p-butyl @ 0.0125 kg a.i./ha *fb* Chlorimuron ethyl @ 0.010 kg a.i./ha	15.33	12.00	27.33	11.48	63.25	11.78
T_{12}- Propaquizafop @ 0.100 kg a.i./ha	18.00	16.00	34.00	14.28	54.29	10.74
S.E(m)±	1.84	1.49	2.02	0.88	-	-
C.D. at 5%	5.40	4.36	5.90	2.57	-	-

DAS- Days after sowing, PE- Pre-emergence, PoE- Post-emergence.

0.075 kg a.i./ha PoE 15 DAS (T_6), Imazethapyr @ 0.100 kg a.i./ha + Quizalofop ethyl @ 0.075 Kg a.i./ha (Tank mix) PoE 15 DAS (T_7), Imazethapyr + Imazamox (Premix) @ 0.070 kg a.i./ha PoE 15 DAS (T_8), Chlorimuron ethyl @ 0.010 kg a.i.ha^{-1} PoE 15 DAS (T_9), Fluazifop-p-butyl @ 0.125 kg a.i.ha^{-1} PoE 15 DAS (T_{10}), Fluazifop-p-butyl @ 0.125 kg a.i.ha^{-1} *fb* Chlorimuron ethyl @ 0.010 kg a.i.ha^{-1} PoE 15 DAS (T_{11}), Propaquizafop @ 0.100 kg a.i.ha^{-1} PoE 15 DAS (T_{12}). The crop was sown by drilling at 45 × 5 cm spacing on 17nd June, 2013. The gross and net plot sizes were 4.5 m × 5.0 m and 3.6 m × 4.5 m, respectively. The observation recorded from 1 m^2 area from each plot at 20, 40, 60, 80 DAS and at harvest. The five plants selected from each net plot. The same five plants were harvested separately for the post harvest studies. The mean of five observational plants was taken for calculation. All the data were subjected to statistically analysis.

Results and Discussion

Weed flora

Predominant weed species observed in the experimental field were *Xanthium strumarium*, *Parthenium hysterophorus*, *Euphorbia geniculata*, *Lagasca mollis*, *Euphorbia hirta*, *Tridex procumbense*, *Corchorus acutangulus*, *Abelmoscherus moschatus*, *Alternanathera sessils*, *Digera arvensis* and *Celosia argentea* among the dicot weeds and *Cynodon dactylon*, *Cyperus rotundus*, *Commelina benghalensis*, *Dinebra arabica*, *Poa annua*, *Echinochloa crusgalli* and *Eragrostis* major among the monocot. High intensity of specific weed like *Cynodon dactylon*, *Cyperus rotundus*, *Commelina benghalensis*, *Xanthium strumarium*, *Parthenium hysterophorus*, *Euphorbia hirta*, *Tridex procumbense*.

Table 2 : Growth characters, yield parameters, yield and economics as influenced by different weed control treatments.

Treatment	Growth characters		Yield parameters				Yield (q ha^{-1})		Gross monetary returns (Rs ha-^{1})	Net M:R (Rs ha^{-1})	B:C ratio
	Plant height (cm)	Dry matter accumulation plant^{-1}	No. of pods plant^{-1}	No. of seeds pod^{-1}	Seed wt. (g) plant^{-1}	100 seed wt. (g)	Seed yield	Straw yield			
T_1- Weedy check	45.46	21.17	15.00	2.73	4.81	11.77	9.56	15.91	33124	8599	1.35
T_2- Recommended Practice-1HW + 1H	50.29	35.90	32.00	3.02	12.62	13.09	20.47	24.09	69973	42048	2.51
T_3- Pendimethalin 1.0 kg a.i/ha PE	49.68	34.03	30.13	2.87	11.21	13.05	19.16	23.01	65514	39096	2.48
T_4- Quizalofop ethyl @ 0.075 kg a.i./ha PoE 15 DAS	49.68	27.47	29.03	2.93	11.10	13.02	16.73	21.90	57385	30288	2.12
T_5- Imazethapyr @ 0.100 kg a.i./ha PoE 15 DAS	52.11	27.63	31.67	3.00	12.13	12.77	19.10	23.96	65413	38928	2.47
T_6- Imazethapyr @ 0.100 kg a.i./ha *fb* Quizalofop ethyl @ 0.075 kg a.i/ha PoE 15 DAS	51.62	36.19	33.80	3.24	14.23	13.12	21.39	25.56	73151	44094	2.52
T_7- Imazethapyr @ 0.100 kg a.i./ha + Quizalofop ethyl @ 0.075 kg a.i/ha PoE 15 DAS (Tank mix)	52.57	37.88	36.33	3.29	15.82	13.47	22.76	25.54	77647	48950	2.71
T_8- Imazethapyr + Imazamox (premix)@ 0.070 kg a.i./ha PoE 15 DAS	49.65	33.70	30.33	2.91	11.54	12.98	19.08	23.90	65359	38624	2.44
T_9- Chlorimuron ethyl @ 0.010 kg a.i./ha	50.69	33.67	29.53	3.06	11.65	12.88	17.39	23.10	59705	34370	2.36
T_{10}- Fluazifop-p-butyl @ 0.125 kg a.i./ha	50.13	29.13	28.33	3.03	11.10	12.97	20.28	22.87	69216	43308	2.67
T_{11}- Fluazifop-p-butyl @ 0.0125 kg a.i./ha *fb* Chlorimuron ethyl @ 0.010 kg a.i./ha	45.52	25.63	28.33	2.84	9.82	12.17	20.07	24.33	68677	41959	2.57
T_{12}- Propaquizafop @ 0.100 kg a.i./ha	49.92	27.33	25.87	2.87	9.55	12.90	20.31	23.51	69378	42793	2.61
S.E(m) ±	1.44	2.15	2.35	0.15	0.92	0.32	1.21	1.35	4024	4024	-
C.D. at 5%	4.22	6.29	6.89	NS	2.69	0.94	3.53	3.94	11779	11779	-

Weed parameters

The data revealed that post emergence application of Imazethapyr @ 0.100 kg a.i./ha + Quizalofop ethyl @ 0.075 kg a.i./ha significantly reduced total weed population (17.67 m^{-2}) and was at par with Imazethapyr @ 0.100 kg a.i./ha *fb* Quizalofop ethyl @ 0.075 kg a.i./ ha and Recommended Practices-1H *fb* 1HW (20 m^{-2}). Whereas, lower weed dry biomass was observed with treatment Imazethapyr @ 0.100 kg a.i./ha + Quizalofop ethyl @ 0.075 kg a.i./ha (7.42 g) was at par with Imazethapyr @ 0.100 kg a.i./ha *fb* Quizalofop ethyl @ 0.075 kg a.i./ha (7.56 g) and Recommended Practices- 1H fb 1HW (8.40 g) as compared to all other treatments, these might be due to combination of both herbicides that have longer effect on controlling weed population and brought significant reduction in weed dry matter as compared to weedy check. Similar results were reported by Halvankar *et al*. (2005) and Bhattacharya *et al*. (2004).

Weed control efficiency of all the treatments was higher, whereas weed index was noted lower as compared to weedy check. The highest weed control efficiency (76.25%) and lowest weed index was recorded under herbicidal treatment Imazethapyr @ 0.100 kg a.i./ha + Quizalofop ethyl @ 0.075Kg a.i/ha. Similar findings were also reported by Upadhayay *et al*. (2013), Sangeetha *et al*. (2011) and Tiwari *et al*. (2006).

Growth parameters

Plant height and dry matter accumulation were improved due to the different weed control treatments over control. Application of Imazethapyr @ 0.100 kg a.i./ha + Quizalofop ethyl @ 0.075 kg a.i./ha was found effective in improving most of the growth parameters. The increase in plant height (52.57 cm) and

dry matter of soybean (37.88 g) might be due to the least weed population observed in the treatments Imazethapyr @ 0.100 kg a.i./ha + Quizalofop ethyl @ 0.075 Kg a.i/ha, which reduced the crop weed competition and provided favourable condition for crop growth. These results are in accordance with the results reported by Raskar and Bhoi (2002).

Yield parameters

Application of Imazethapyr @ 0.100 kg a.i./ha + Quizalofop ethyl @ 0.075 Kg a.i/ha was superior over rest of the weed control treatments as regards all yield attributing traits namely number of pods plant^{-1} (36.33), number of seed pod^{-1} (3.29), weight of seeds plant^{-1} (15.82 g), and 100 seed weight (13.47g) revealing the beneficial effect of weed free environment resulting in no competition between weed and crop plant.

Yield

The results of the study indicated that maximum seed yield (22.76 q ha^{-1}) and straw yield (25.56 q ha^{-1}) were obtained with application of Imazethapyr @ 0.100 kg a.i./ha + Quizalofop ethyl @ 0.075 Kg a.i/ha as compared to other. Seed yield was increased in treatment Imazethapyr @ 0.100 kg a.i./ha + Quizalofop ethyl @ 0.075 Kg a.i/ha by 138.07 % over the treatment Weedy check. This might be due to the better weed control associated with decrease in weed population and improvement in yield contributing characters in these treatments. Similar results were reported by Sharma (2000), Raskar and Bhoi (2002).

Economics

Treatment Imazethapyr @ 0.100 kg a.i./ha + Quizalofop ethyl @ 0.075 Kg a.i./ha recorded significantly highest gross monetary returns Rs. 77647 ha^{-1}, net monetary returns Rs. 48950 ha^{-1} and benefit cost ratio 2.71 and was at par with recommended practices 1H *fb* 1HW. The lowest gross monetary returns, net monetary returns and benefit cost ratio were observed with weedy check. Similar results were reported by Dhane *et al*. (2009).

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