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Effect of integrated weed management practices on growth and yield of soybean (*Glycine max* L.) under agro-climatic situation Chhattisgarh

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ABSTRACT

An experiment was conducted during *Kharif* season 2004 at Instructional Farm of Indira Gandhi Krishi Vishwavidyalya, Raipur (C.G) to study the effect of weed management on weed dynamics and performance of soybean. The experiment was laid out in Randomized Block Design having the combination of fourteen treatments with three replications. The soybean variety JS-335 was grown as test crop. The growth performance of soybean *i.e.* plant height, branches plant^{-1}, dry matter accumulation plant^{-1}, nodule plant^{-1} and dry weight of nodule plant^{-1} was higher under metribuzin 300 gha^{-1} fb quizalofop 50 g ha^{-1} as compared to other weed management practices. Where as the minimum growth of soybean was recorded under unweeded. Maximum seed yield and stalk yield was under metribuzin 300 gha^{-1} fb quizalofop 50 gha^{-1}.

Key words : Integrated weed management practices, Growth and yield of soybean

INTRODUCTION

Soybean is mainly grown during *Kharif* season in sandy loam to clay loam soils in Chhattisgarh, which have low water holding capacity, do not turn up in working condition, hindering the timely weeding and intercultural operation. Weed flush come at the same time in almost all the *Kharif* crops, which also restrict the availability of manpower for weeding operation in this crop. The ultimely poor weed management adversely affects proper growth and yield of soybean. It is estimated that the loss in yield of soybean in the tune of 30 to 77 per cent due to poor weed control (Tiwari and Khurchania, 1990). These losses can be alleviated by effective integrated weed management practices. Integrated weed management is an integration of effective and workable weed management practices that can be used ecologically and economically by the farmers. Now-a-days a few herbicides like metribuzin, chlorimuron, imazethapyr, quizalofop, fenoxaprop (most of the selective herbicides) are available, which can be used safely in soybean.

MATERIALS AND METHODS

The field experiment was conducted during *Kharif* season of 2004 at the Instructional cum Research Farm, Indira Gandhi Krishi Vishwavidyalya, Raipur (C.G.). The soil of experimental field was clayey in texture (Vertisol). The chemical composition of field soil was pH 7.14, electrical conductivity 0.17 dsm^{-1}, available N 217.35 kg ha^{-1}, available P_2O_5 14.10 kg ha^{-1}and available K_2O 365.27 kg ha^{-1}. The design selected of these treatments was randomized block design of with three replications. The experiment comprised for fourteen treatments *viz.,* the treatments metribuzin @ 300 g ha^{-1} as (PE), imazethapyr @ 80 g ha^{-1} (PE), metribuzin @ 300 g ha^{-1} (PE) fb quizalofop @ 50 g ha^{-1} (POE), metribuzin @ 300 g ha^{-1} (PE) fb fenoxaprop @ 80 g ha^{-1} (POE), imazethapyr @ 80 g ha^{-1} (PE) fb fenoxaprop @ 80 g ha^{-1} (POE), imazethapyr @ 80 g ha^{-1} (PE) fb quizalofop @ 50 g ha^{-1} (POE), chlorimuron @ 4 g ha^{-1} (POE), chlorimuron @ 4 g ha^{-1} + fenoxaprop @ 80 g ha^{-1} (POE), chlorimuron @ 4 g ha^{-1} + quizalofop @ 50 g ha^{-1} (POE), fenoxaprop @ 80 g ha^{-1} (POE), quizalofop @ 50 g ha^{-1} (POE), hand weeding at 40 DAS, hoeing at 40 DAS and unweeded control. The soybean variety 'JS-335' was taken as test crop. The crop was sown during first week of July. The fertilizers N, P_2O_5 and K_2O were applied @ 20, 50 and 20 kg ha^{-1}, respectively.

RESULTS AND DISCUSSION

The results obtained from the present study as well as relevant discussion have been presented under following heads:

Effect on growth:

The higher plant height was recorded under metribuzin @ 300 g ha^{-1} fb quizalofop @ 50 g ha^{-1} as compared to other weed management practices of soybean. Significantly lower plant height was observed under unweeded (Table 1). Higher plant height under these treatments was due to the fact that there was lower weed competition of weeds, which allowed soybean to absorb required amount of nutrient and water for its growth. This favoured the higher plant height of soybean. The maximum number of branches plant^{-1} was registered in metribuzin 300 g ha^{-1} fb quizalofop 50 g ha^{-1}.

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Table 1 : Effect of different weed management practices on plant growth and nodulation of soybean

Treatments	Plant height at harvest (cm.)	Branches plant^{-1} at harvest (No.)	Dry matter accumulation at harvest (g plant^{-1})	Nodules plant^{-1} at 60 DAS (No.)	Nodule Dry weight at 60 DAS (g plant^{-1})
T_1 - Metribuzin 300 g ha^{-1}	57.89	10.98	21.60	57.43	0.77
T_2 - Imazethapyr 80 g ha^{-1}	57.85	10.89	21.48	56.06	0.76
T_3 - Metribuzin 300 g ha^{-1} fb quizalofop 50 g ha^{-1}	59.69	11.88	23.56	65.20	0.88
T_4 - Metribuzin 300 g ha^{-1} fb fenoxaprop 80 g ha^{-1}	59.40	11.44	22.17	64.50	0.86
T_5 - Imazethapyr 80 g ha^{-1} fb fenoxaprop 80 g ha^{-1}	58.77	11.33	22.06	59.60	0.80
T_6 - Imazethapyr 80 g ha^{-1} fb quizalofop 50 g ha^{-1}	58.27	11.00	21.76	57.43	0.78
T_7 - Chlorimuron 4 g ha^{-1}	55.44	9.86	19.73	46.73	0.70
T_8 - Chlorimuron 4 g ha^{-1} + fenoxaprop 80 g ha^{-1}	55.36	9.66	19.71	46.33	0.69
T_9 - Chlorimuron 4 g ha^{-1} + quizalofop 50 g ha^{-1}	54.20	9.66	19.39	43.20	0.67
T_{10} - Fenoxaprop 80 g ha^{-1}	54.03	9.10	19.26	42.40	0.64
T_{11} - Quizalofop 50 g ha^{-1}	53.64	8.99	19.13	41.96	0.63
T_{12} - Hand weeding	57.13	10.32	19.94	52.40	0.75
T_{13} - Hoeing	56.69	10.03	19.89	47.30	0.75
T_{14} - Unweeded control	44.73	7.88	15.87	40.93	0.55
S.E.±	1.83	0.62	0.79	3.59	0.05
C.D. (P=0.05)	5.33	1.81	2.30	10.44	0.14

Significantly higher dry matter accumulation plant^{-1} was under metribuzin @ 300 g ha^{-1} fb quizalofop @ 50 g ha^{-1}, Followed by metribuzin @ 300 g ha^{-1} fb fenoxaprop @ 80 g ha^{-1}, imazethapyr @ 80 g fb fenoxaprop @ 80 g ha^{-1} and imazethapyr @ 80 g ha^{-1} fb quizalofop @ 50 g ha^{-1} which were found at par with each other over to other weed management practices. Significantly lower dry matter production of soybean was observed under unweeded. Higher dry matter production under these treatment was due to lower weed competition, which allowed soybean to absorb required amount of nutrient and water for its growth. Higher dry matter accumulation also associated with the higher LAI and nodulation which supported the growth. The increased leaf area might have enhanced the photosynthesis due to which plant dry matter accumulation was higher under these treatments. Similar result were also reported by Marenco and Lopes (1998). The minimum number of nodules was recorded under unweeded control. On the other hand, the maximum number of nodules was recorded under metribuzin @ 300 g ha^{-1} fb quizalofop @ 50 g ha^{-1} and found significantly superior to rest of the treatment except metribuzin @ 300 g ha^{-1} fb fenoxaprop @ 80 g ha^{-1} and imazethapyr @ 80 g ha^{-1} fb fenoxaprop @ 80 g ha^{-1}. The higher nodulation fixed the atmospheric N which ultimately supported in higher crop growth of soybean. Maximum nodule dry weight was observed under metribuzin @ 300 g ha^{-1} fb quizalofop @ 50 g ha^{-1} which was significantly higher than chlorimuron 4 g ha^{-1}, chlorimuron 4 g ha^{-1} + fenoxaprop 80 g ha^{-1}, chlorimuron 4 g ha^{-1} + quizalofop 50 g ha^{-1}, fenoxaprop 80 g ha^{-1}, quizalofop 50 g ha^{-1} and unweeded control. Minimum nodules dry weight was observed under unweeded control.

Effect on yield components:

The metribuzin @ 300 g ha^{-1} fb quizalofop @ 50 g ha^{-1} proved to be the best for enhancing pods plant^{-1} and it was significantly superior to rest of the treatments except metribuzin @ 300 g ha^{-1}, imazethapyr @ 80 g ha^{-1}, metribuzin @ 300 g ha^{-1} fb fenoxaprop @ 80 g ha^{-1}, imazethapyr @ 80 g ha^{-1} fb fenoxaprop @ 80 g ha^{-1} and imazethapyr @ 80 g ha^{-1} fb quizalofop @ 50 g ha^{-1}. Maximum seeds pod^{-1} was observed under metribuzin @ 300 g ha^{-1} fb quizalofop 50 g ha^{-1} and minimum unweeded control (Table 2). These facts are also supported by Singh and Singh (1984). Metribuzin @ 300 g ha^{-1} fb quizalofop @ 50 g ha^{-1} produced maximum test weight and it was significantly superior to other weed

Table 2 : Effect of different weed management practices on yield attributes, yield and weed index of soybean

Treatments	Pods plant^{-1} (No.)	Seeds pods^{-1} (No.)	Test weight (g)	Seed yield (q ha^{-1})	Straw yield (q ha^{-1})	Weed index (%)
T_1 - Metribuzin 300 g ha^{-1}	37.38	2.31	13.50	21.76	48.98	7.40
T_2 - Imazethapyr 80 g ha^{-1}	36.88	2.27	12.64	19.62	48.06	16.57
T_3 - Metribuzin 300 g ha^{-1} fb quizalofop 50 g ha^{-1}	43.54	2.55	14.00	23.50	55.81	-
T_4 - Metribuzin 300 g ha^{-1} fb fenoxaprop 80 g ha^{-1}	42.71	2.40	13.96	23.13	55.19	1.57
T_5 - Imazethapyr 80 g ha^{-1} fb fenoxaprop 80 g ha^{-1}	40.77	2.33	13.75	22.76	53.95	3.14
T_6 - Imazethapyr 80 g ha^{-1} fb quizalofop 50 g ha^{-1}	37.48	2.33	13.53	22.45	51.78	4.46
T_7 - Chlorimuron 4 g ha^{-1}	30.33	2.22	11.21	13.95	37.21	40.63
T_8 - Chlorimuron 4 g ha^{-1} + fenoxaprop 80 g ha^{-1}	29.50	2.20	11.10	13.70	36.15	41.70
T_9 - Chlorimuron 4 g ha^{-1} + quizalofop 50 g ha^{-1}	25.65	2.17	10.47	13.08	34.10	44.34
T_{10} - Fenoxaprop 80 g ha^{-1}	24.42	2.17	10.45	9.67	31.93	58.85
T_{11} - Quizalofop 50 g ha^{-1}	23.69	2.14	10.44	8.99	28.52	61.74
T_{12} - Hand weeding	33.66	2.25	12.64	15.25	39.69	35.10
T_{13} - Hoeing	31.60	2.25	12.21	14.69	39.07	37.48
T_{14} - Unweeded control	18.79	2.14	9.97	7.44	25.11	66.34
S.E.±	2.35	0.14	0.60	1.52	3.35	
C.D. (P=0.05)	6.84	NS	1.73	4.43	9.73	

management practices whereas lowest test was recorded under unweeded control. This was due to better suppression of weeds, more availability of nutrients, production of higher crop growth and favorable influence on sink capacity and its effective translocation towards the maximum seed and pod plant^{-1} under metribuzin @ 300 g ha^{-1} fb quizalofop @ 50 g ha^{-1}. These findings corroborate the report of Dubey (1995).

Effect on yield:

The maximum seed yield was procived under metribuzin @ 300 g ha^{-1} fb quizalofop @ 50 g ha^{-1} (23.50 q ha^{-1}) as compared to other weed management practices (Table 1). Minimum seed yield was observed under unweeded control (7.44 q ha^{-1}), which was significantly lower than rest of the treatments. It may be due to high growth and yield attributes as well as low crop-weed competition under these treatments. The capacity of plants to produce seed yield depends not only on the size of photosynthetic system, it's efficiency and length of the time for which it is active but also on translocation of dry matter in to the economic sink. The final build up of yield is the cumulative function of yield components. The results are conformity with the finding by Billore *et al.* (1999). Amongst weed management practice, metribuzin @ 300 g ha^{-1} fb quizalofop @ 50 g ha^{-1} produced the maximum straw yield of (55.81 q ha^{-1}). All the herbicides alone or in combination were significantly superior to unweeded control. This was due to better suppression of weeds, more availability of nutrients, production of higher crop growth and favorable influence on sink capacity and its effective translocation towards the maximum seed and pod plant^{-1} under metribuzin @ 300 g ha^{-1} fb quizalofop @ 50 g ha^{-1}. The similar finding was also reported by Dubey (1995).

Weed index:

Weed index indicates that the reduction in yield was due to weed competition as compared to the maximum attained seed yield. Weed index had remarkably influenced by weed management practices. Maximum weed index was noticed under unweeded control (66.34%) where as minimum weed index was registered under metribuzin 300 g ha^{-1} fb quizalofop 80 g ha^{-1} (Table 2). It was observed that the weed index was substantially lowered when either metribuzin or imazethapyr was supplemented with post-emergence application of either quizalofop or fenoxaprop-p-ethyl. One hand weeding as well as one hoeing showed weed index in the range of 35.10 to 37.48 per cent. It might be due to the fact that there was minimum yield under unweeded control.

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