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Effect of Weed Management and Sulphur Nutrition on Productivity of Soybean [*Glycine max* (L.) Merrill]

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Soybean [*Glycine max* (L.) Merrill] is a crop of multiple qualities as it is both a pulse and oilseed crop. It is third largest oilseed crop of India after rapeseed-mustard and groundnut. Inspite of its high yield potential (4.5 t/ha) soybean productivity is much less in India (0.95 t/ha) than the world average of 2.3 t/ha (FAI, 2006). Being a **kharif** season crop, it suffers from severe infestation of weeds which rob it of essential nutrients, space and moisture, causing substantial loss in yield (33-55%) depending on the weed flora and density (Kewat *et al.,* 2000). The effective and economical weed control may not be possible through mechanical means due to heavy and continuous rainfall in **kharif**. Hence, use of herbicides offers an alternate method to manage weeds in such a situation. The herbicides presently available are either pre-emergence or pre-plant incorporated and have a narrow spectrum of weed control. Further, if farmer skip application of these herbicides due to any reason necessitates alternative post-emergence herbicides for managing weeds. In addition to reduction in soybean yield due to infestation of weeds, sulphur deficiency in the soils is also one of the factors responsible for lower productivity of soybean. Continuous use of sulphur free fertilizers, intensification of agriculture with high yielding varieties and a scarce amount of organic fertilizers resulted in sulphur deficiency in the soil, which ultimately reflected in poor yield of crop. Under such situation use of post emergence herbicides in conjuction with sulphur nutrition needs to be explored as an effective and economical method for obtaining better yield of soybean.

A field experiment was conducted during **kharif** 2009 at Instructional Farm, Rajasthan College of Agriculture, Udaipur. The soil of the experimental field was clay loam in texture having pH of 8.2, organic carbon 0.75%, available N, P, K and S were 277.0, 20.10, 286.0 kg/ha and 8.7 ppm, respectively. The experiment was laid out in a factorial randomised block design comprising six weed control treatments and three sulphur levels thereby making 18 treatment combinations. Six weed management treatments include weedy check, two hand weedings 20 and 40 DAS, chlorimuron 9 g and imazethapyr 100 g 15 DAS alone and in combination with one hoeing and weeding 40 DAS, while sulphur nutrition includes 0, 20 and 40 kg sulphur application per hectare. The treatments were replicated thrice. Soybean variety "JS-335" was sown at 30 x 10 cm spacing on July 3, 2009. The crop was fertilised with a uniform dose of 40 kg/ha each of N and P_2O_5. The phosphorus was applied through DAP, remaining nitrogen was applied through urea at the time of sowing and sulphur as per treatment was applied through mineral gypsum at the time of sowing. Herbicides were applied in 750 litres of water/ha with the help of knapsack sprayer fitted with flat fan nozzle. Observation on weed count at 50 DAS was recorded by using a quadrat measuring 50 x 50 cm at two randomly selected spots in each plot and converted into one square metre area and these data were subjected to square root transformation $\sqrt{x+0.5}$ before analysis. The weeds taken for weed density at 50 DAS were dried in an oven to obtain weed dry matter, while at harvest all the weeds of the net plot were harvested and categoried before drying and weighing.

Weed flora of the experimental field comprised *Echinochloa colona, Cynodon dactylon, Cyperus rotundus* among monocot weeds and *Trianathema portulacastrum, Commelina benghalensis*, *Amaranthus spinosus, Digera arvensis* and *Parthaniun hysterophorus* among dicot weeds. Overall the experiment was dominated by monocot weeds. All the weed management treatments except weedy and chlorimuron 9 g alone, significantly reduced the density of monocot, dicot and total weeds at 50 DAS (Table 1). Similarly, all the weed management treatments significantly reduced the dry matter of monocot, dicot and total weeds 50 DAS and at harvest compared to weedy check.

Hand weeding twice at 20 and 40 DAS found significantly superior in reducing the density and weed dry matter at all the stages of observations; however, this treatment was closely and non-significantly followed by imazethapyr+one hand weeding 40 DAS in this regard. Density of monocot, dicot and total weeds under two hand weedings was 46, 33 and 78/m^2 as against

Table 1. Effect of weed management and sulphur nutrition on weed density*, weed dry matter and weed control efficiency in soybean

Treatments	Weed density/m^2 at 50 DAS			Weed dry matter (kg/ha) at harvest			Weed control efficiency (%) at harvest		
	Monocots	Dicots	Total	Monocots	Dicots	Total	Monocots	Dicots	Total
Weed management									
Weedy check	15.83 (257)	13.20 (177)	20.74 (434)	2661.56	1585.70	4247.26	-	-	-
Hand weedings (Two)	6.59 (46)	5.54 (33)	8.66 (78)	522.11	306.67	828.78	80.19	80.57	80.39
Chlorimuron 9 g/ha	15.51 (250)	8.91 (82)	18.00 (331)	1658.99	740.72	2399.71	37.16	53.66	43.18
Chlorimuron 9 g/ha HW	7.38 (55)	6.10 (40)	9.68 (96)	652.02	419.43	1071.45	75.16	73.42	74.56
Imazethapyr 100 g/ha	9.63 (99)	7.35 (55)	12.33 (154)	803.65	462.78	1266.43	69.54	70.68	69.99
Imazethapyr 100 g/ha HW	6.97 (49)	5.74 (35)	9.13 (84)	601.48	369.20	970.68	77.14	76.70	77.04
S. Em±	0.72	0.56	0.66	44.04	21.50	56.44	-	-	-
LSD (P=0.05)	2.07	1.61	1.88	126.57	61.78	162.22	-	-	-
Sulphur nutrition (kg/ha)									
0	9.73 (110)	7.19 (62)	12.18 (171)	1086.93	619.62	1706.55	54.75	59.34	56.58
20	10.50 (129)	7.91 (72)	13.35 (200)	1168.04	647.63	1815.68	57.56	58.97	57.91
40	10.72 (139)	8.31 (78)	13.73 (217.00)	1194.93	674.99	1869.93	57.28	58.90	58.91
S. Em±	0.51	0.39	0.46	31.14	15.20	39.91	-	-	-
LSD (P=0.05)	NS	NS	NS	89.50	43.68	114.71	-	-	-

Figures in parentheses are original values. *Transformed values (√x+0.5). NS–Not Significant.

257, 177 and 434/m^2, respectively, recorded under weedy check. The highest total weed control efficiency (80.39%) was also recorded under two hand weedings followed by imazethapyr 100 g+one hand weeding 40 DAS (77.04%), while it was recorded minimum (43.18%) under chlorimuron 9 g/ha when applied alone.

Among different treatments of weed management two hand weedings 20 and 40 DAS as well as imazethapyr 100 g/ha+one hand weeding 40 DAS being at par significantly increased pods/plant, pod length, 1000-seed weight, seed, haulm and biological yield compared to weedy check (Table 2). The highest yield and yield attributes under these treatments were attributed to the lower weed density, weed dry weight and higher weed control efficiency. The maximum seed yield (1475 kg/ha) was obtained under hand weeding twice which was at par with imazethapyr 100 g/ha+one hand weeding 40 DAS (1395 kg/ha). Harvest index was also significantly increased due to all the weed control treatments except chlorimuron 9 g/ha compared to weedy check and all these weed control treatments were found at par in this regard. Significant increase in harvest index under the influence of weed control treatment might be due to the fact that reduced weed density and weed dry matter resulted in diversion of more photosynthates from source to sink. Increase in yield under the influence of two hand weedings and imazethapyr 100 g/ha+one hand weeding corroborates with the findings of Vyas and Kushwah (2008) and Shete *et al*. (2008).

Economic evaluation of different weed management treatments (Table 2) indicated that maximum net returns of Rs. 15601 were obtained with imazethapyr 100 g/ha+one hand weeding 40 DAS followed by net returns of Rs. 15566 under two hand weedings 20 and 40 DAS. B : C ratio of 1.93 was also recorded maximum under this treatment followed by two hand weedings (1.84).

Application of different levels of sulphur significantly increased weed dry matter 50 DAS and at harvest compared to no sulphur application. The highest

Table 2. Effect of weed management and sulphur nutrition on yield attributes, yield and economics in soybean

Treatments	Pods/plant	Pod length (cm)	Test weight (g)	Seed yield (kg/ha)	Haulm yield (kg/ha)	Biological yield (kg/ha)	Harvest index (%)	Net returns (Rs./ha)	B : C ratio
Weed management									
Weedy check	15.44	2.54	84.61	471.77	754.83	754.83	38.46	161	1.01
Hand weedings (Two)	45.44	3.57	132.25	1475.00	1991.25	3466.25	42.55	15566	1.84
Chlorimuron 9 g/ha	35.67	3.38	105.94	815.74	1223.62	2039.36	40.16	7412	1.63
Chlorimuron 9 g/ha HW	41.67	3.41	130.11	1148.53	1607.95	2756.48	41.76	11196	1.72
Imazethapyr 100 g/ha	40.33	3.39	106.14	970.61	1329.77	2300.34	42.19	9550	1.73
Imazethapyr 100 g/ha HW	44.35	3.48	130.80	1395.00	1897.43	3292.43	42.36	15601	1.93
S. Em±	0.94	0.08	2.13	40.72	54.90	71.04	0.92	-	-
LSD (P=0.05)	2.71	0.23	6.12	117.02	157.77	204.18	2.66	-	-
Sulphur nutrition (kg/ha)									
0	33.89	3.17	110.58	948.82	1290.60	2239.42	41.88	7828	1.51
20	37.56	3.28	114.74	1039.50	1457.56	2497.06	41.21	9759	1.63
40	40.01	3.44	119.61	1150.0	1654.26	2804.26	40.77	12156	1.79
S. Em±	0.67	0.06	1.51	28.79	38.82	50.24	0.65	-	-
LSD (P=0.05)	1.92	0.16	4.33	82.84	111.56	144.38	NS	-	-

NS–Not Significant.

total weed dry matter at 50 DAS and at harvest was recorded due to 40 kg S/ha which was found at par with 20 kg sulphur application. Data in Table 2 further reflect that different levels of sulphur could not provide much variation in the weed control efficiency. Application of 40 kg sulphur/ha significantly increased pods/plant, pod length, 1000-seed weight as well as seed, haulm and biological yield compared to no sulphur application. This may be possibly due to the fact that sulphur fertilization plays an important role to alter physico-chemical properties of soil, conducive for growth and development of the crop, thus better availability of nutrients to the crop thus more translocation towards reproductive structure and also higher photosynthesis activity might have resulted in significant increase in yield and yield attributes. The results are in the agreement with those of Maity and Giri (2003), Singh *et al.* (2006) and Singh (2006).

REFERENCES

FAI. 2006. *Fertilizer Statistics, 2005-06*. The Fertilizer Association of India, New Delhi.

Kewat, M. L., J. Pandey, N. T. Yaduraju, and G. Kulshresthra. 2000. Economic and ecofriendly weed management in soybean. *Ind. J. Weed Sci.* **32** : 135-139.

Maity, S. K. and Gajendra Giri. 2003. Influence of phosphorus and sulphur fertilization on productivity and oil yield of groundnut (*Arachis hypogaea*) and sunflower (*Helianthus annuus*) in intercropping with simultaneous and staggered planting. *Ind. J. Agron.* **48** : 267-270.

Shete, B. T., H. M. Patil and S. S. Ilhe. 2008. Effect of cultural practices and post-emergence herbicides against weed control in soybean. *J. Mahar. agric. Univ.* **33** : 118-119.

Singh, P., V. Nepalia and S. S. Tomer. 2006. Effect of weed control and nutrient management on soybean (*Glycine max*) productivity. *Ind. J. Agron.* **51** : 314-317.

Singh, S. D. 2006. Effect of fertility levels and sulphur sources on yield and seed quality of mungbean (*Vigna radiata*) and fertility of alluvial soil. *Legume Res.* **29** : 221-224.

Vyas, M. D. and S. S. Kushwah. 2008. Effect of cultural and chemical methods on growth and yield of soybean in Vindhynagar plateau of Madhya Pradesh. *Ind. J. Weed Sci.* **40** : 92-94.