



Yield and nutrient uptake in soybean as influenced by weed management

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Soybean (*Glycine max* (L.) Merrill.) often designated as miracle crop of twenty first century, contains about 20% of oil, 40% high quality proteins, 23% carbohydrates and reasonable amount of minerals, vitamins and dietary fibres. The initial slow growth of soybean with lateral spread, offers severe infestation of a large number of weeds which reduces the yield to an extent of 31 to 84% (Kachroo *et al.* 2003). The present investigation was undertaken to study the extent of nutrients depletion by the crop and weed under different weed management practices.

A field experiment was carried out at Rajasthan College of Agriculture, MPUAT, Udaipur during *Kharif* 2014 to evaluate the effect of weed management practices on nutrient uptake by soybean crop, weeds and their combine uptake. The soil of the experiment plot was clay loam, alkaline in reaction, medium in nitrogen and phosphorus and high in potassium content. The experiment was laid out in randomized block design comprising of 14 treatments. Soybean variety 'JS-9560' was sown on 16th July, 2014 by drilling 80 kg seed/ha at 30 cm row spacing. Observations on weed count at 50 DAS was recorded by using a quadrat measuring 50 × 50 cm at two randomly selected spots in each plot and their average was taken as weed dry matter and converted into kg/ha. Weed samples were collected at 75 DAS, while crop samples collected at harvest from each experimental unit and oven dried at 70 °C till a constant weight was recorded and grinded in laboratory mill. These samples were analyzed for N and P content following standard procedure. The uptake of nutrient was estimated by following formula.

Weed biomass

The experimental field was heavily infested with mixed flora of broad-leaved, sedge and grassy weeds, viz. *Trianthema portulacastrum*, *Commelina benghalensis*, *Parthenium hysterophorus*, *Amaranthus viridis*, *Digera arvensis*, *Cynodon dactylon*, *Echinochloa colona* and *Cyperus rotundus*.

Data (Table 1.0) revealed that all the weed management treatments significantly reduced dry weight of monocots, dicots and total weeds as compared to weedy check. The minimum total weed

dry matter (146.0 kg/ha) at 75 DAS was observed under weed free treatment which was closely followed by pre-emergence application of pendimethalin 750 g/ha + hand weeding at 30 DAS (431.7 kg/ha) and two hand weeding treatment at 15 and 30 DAS (475.6 kg/ha) as compared to weedy check (1.88 t/ha). The superiority of pre-emergence application of pendimethalin 750 g/ha + hand weeding at 30 DAS was because of the fact that the emergence of early growth of weeds was inhibited by pre-emergence application of soil applied herbicide and later emerging weeds were effectively controlled by hand weeding performed at 30 DAS. Thus, this treatment provided long weed free period compared to their application alone. While in case of two hand weeding, weed growth of early flush of weeds was checked by hand weeding performed at 15 DAS and second or late emerging weeds were effectively controlled by second hand weeding which was done at 30 DAS. The per cent reduction in total biomass of weeds due to weed free, pre-emergence application of pendimethalin 750 g/ha + one hand weeding at 30 DAS, two hand weeding at 15 and 30 DAS and pre-emergence application of pendimethalin 750 g/ha followed by post-emergence application of imazethapyr 100 g/ha was 92.25, 77.09, 74.76, 71.68, respectively as compared to weedy check.

Effect on crop

Weed free treatment recorded the highest dry matter production, pods/plant, seeds/pod, seed and haulm yield, which was statistically at par with pre-emergence application of pendimethalin 750 g/ha + one hand weeding at 30 DAS and two hand weeding at 15 and 30 DAS.

The highest grain and haulm yield was recorded in weed free treatment as 1.42 t/ha and 3.10 t/ha, respectively which was statistically followed by pendimethalin 750 g/ha + hand weeding at 30 DAS with the corresponding grain and haulm yield of 1.38 t/ha and 3.04 t/ha, respectively. The per cent increase in seed yield due to weed free, pre-emergence application of pendimethalin 750 g/ha + hand weeding at 30 DAS, two hand weeding, and pre-emergence application of pendimethalin 750 g/ha *fb* post-emergence application of imazethapyr 100 g/ha was 172.74, 164.11, 153.55 and 136.47, respectively over

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Table 1. Effect of weed management on yield, nutrient uptake and economics in soybean crop

Treatment	Total biomass (t/ha)	Seed yield (t/ha)	Haulm yield (t/ha)	Total N uptake by weeds (kg/ha)	Total P uptake by weeds (kg/ha)	Total N uptake by crop (kg/ha)	Total P uptake by crop (kg/ha)	Net return (x10 ³ ₹/ha)	B:C ratio
Pendimethalin 750 g/ha PE	0.80	0.91	2.08	15.39	2.20	88.23	9.66	15.11	1.80
Metribuzin 350 g/ha PE	0.78	0.83	1.90	15.08	2.14	80.70	8.83	12.52	1.68
Fenoxaprop-p-ethyl 75 g/ha POE	0.76	1.00	2.29	14.61	2.08	97.43	10.62	18.08	1.94
Imazethapyr 100 g/ha POE	0.72	1.04	2.38	13.79	1.96	101.75	11.05	19.26	1.98
Pendimethalin 750 g/ha PE + HW at 30 DAS	0.43	1.38	3.04	8.17	1.18	137.93	15.03	29.51	2.38
Metribuzin 350 g/ha PE + HW at 30 DAS	0.54	1.13	2.57	10.34	1.47	113.88	12.47	21.02	2.00
Pendimethalin 750 g/ha PE + fenoxaprop-p-ethyl POE	0.57	1.18	2.69	10.84	1.55	117.70	12.72	23.27	2.12
Pendimethalin 750 g/ha PE + imazethapyr 100 g/ha POE	0.53	1.23	2.79	10.14	1.44	123.33	13.44	24.70	2.17
Metribuzin 350 g/ha PE + fenoxaprop-p-ethyl 75 g/ha POE	0.56	1.13	2.57	10.84	1.53	112.92	12.20	21.64	2.06
Metribuzin 350 g/ha PE + imazethapyr 100 g/ha POE	0.56	1.18	2.71	10.83	1.53	118.52	12.82	23.43	2.13
One hand weeding at 20 DAS	0.63	1.12	2.54	12.12	1.71	108.52	11.97	21.51	2.08
Two hand weeding at 15 and 30 DAS	0.48	1.32	2.90	9.04	1.28	131.91	14.49	27.24	2.26
Weed free up to 50 days	0.15	1.42	3.10	2.78	0.40	143.78	15.63	26.75	2.04
Weedy check	1.88	0.52	1.36	33.91	4.88	52.32	5.64	2.34	1.13
LSD (P=0.05)	0.11	0.21	0.40	2.18	0.31	18.31	2.12	-	-

PE= Pre-emergence; POE= Post-emergence

weedy check. The result corroborate with the finding of Singh *et al.* (2015).

Nutrient uptake by weeds

All the weed management treatments significantly reduced the uptake of N and P by the weeds compared to weedy check. The minimum removal of total nitrogen (2.78 kg/ha) and phosphorus (0.40 kg/ha) by weeds were observed under weed free treatment which was closely followed by pendimethalin 750 g/ha + hand weeding at 30 DAS and two hand weeding treatment at 15 and 30 DAS (Table 1), while the maximum total removal of nutrient (33.91 kg/ha N and 4.88 kg/ha P) was recorded under weedy check. The uptake of N and P by weeds was estimated as 39.3 and 46.4%, respectively of the total removal (weeds + crop) in weedy check and only 5.59 and 7.28% N and P, respectively under pendimethalin 0.75 kg/ha + hand weeding at 30 DAS treatment and thus, treatment saved 33.7% nitrogen and 39.1% phosphorus over weedy check. The uptake of nitrogen and phosphorus by the crop and weeds could be mainly attributed to the extent of their dry matter production. It is apparent (Table 1) that whenever the removal of nutrients by weeds was more, corresponding uptake by the crops was less or vice-versa. Reduced nutrient uptake by weeds under the influence of different weed control measures have also been reported by Kalhapure *et al.* (2015).

Nutrient uptake by crops

The highest total N and P uptake by the crop (143.8 kg/ha and 15.6 kg/ha, respectively) was recorded under weed free treatment, which was closely followed by pendimethalin 750 g/ha + hand weeding at 30 DAS and two hand weeding treatment

at 15 and 30 DAS, which might be ascribed to higher yield with these treatments. Weed free, pre-emergence application of pendimethalin 750 g/ha + hand weeding at 30 DAS, two hand weeding treatment increased N and P uptake by the crop to the tune of 174.8, 163.6, 152.1 and 177.1, 166.5, 156.9%, respectively over weedy check. These results were in close conformity with the finding of Habimana *et al.* (2013). The highest net returns (₹ 29508/ha) and BC ratio (2.38) were obtained under pre-emergence application of pendimethalin + hand weeding at 30 DAS followed by two hand weeding at 15 and 30 DAS with net return of ₹ 27244/ha and BC ratio of 2.26.

SUMMARY

On the basis of one-year field experiment at Udaipur during Kharif 2014 it was emerged that pre-emergence application of pendimethalin 750 g/ha + hand weeding at 30 DAS recorded the maximum seed yield (1.38 t/ha) along with the highest economic returns in terms of net returns and B: C ratio of ₹ 27244/ha and 2.32, respectively.

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