The Pharma Innovation Journal 2021; 10(11): 1403-1405

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; 10(11): 1403-1405

www.thepharmajournal.com
Received: 02-08-2021
Accepted: 08-10-2021

DP Pacharne
Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

RD Lokhande
Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

SD Bhingade
Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

SR More
Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

SS Chitodkar
Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

Corresponding Author:
RD Lokhande
Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

Response of different nutrient management treatments on high yielding varieties of soybean

DP Pacharne, RD Lokhande, SD Bhingade, SR More and SS Chitodkar

Abstract
A field experiment was conducted during *kharif* season of 2015-16 on silty clay loam soil at MPKV, Rahuri (MS), to study the effect of different varieties and varying nutrient management levels on productivity and economics of soybean. The experiment was laid out in factorial randomized block design with 15 combinations of three varieties (KDS-344, JS-9305 and KS-103) and five nutrient management levels (GRDF, 75% GRDF + 0.5% foliar spray of grade IInd at 30 and 45 DAS, 100% GRDF + 0.5% foliar spray of grade IInd at 30 and 45 DAS, N_4: 125% GRDF + 0.5% foliar spray of grade IInd at 30 and 45 DAS and 50:75:30 N, P_2O_5, K_2O kg ha^{-1} + 5 tons FYM ha^{-1}. The variety KDS-344 and application of nutrient management dose 125% GRDF + 0.5 Grade IInd foliar spray at 30 and 45 DAS recorded significantly the highest growth and yield attributes *viz*., plant height (cm), number of branches, number root of nodules, number of pod plant^{-1} and weight of seeds plant^{-1} (g). The variety KDS-344 recorded highest grain and stover (3.66 and 4.64 t /ha) yield and highest economic indices like cost of cultivation (40,623), net monetary returns (87,355) and net returns per rupee invested (3.17). The grain yield (4.34 t/ha) and stover yield (4.53 t/ha) of soybean was significantly higher by application of fertilizer dose of 125% GRDF + 0.5% Grade IInd foliar spray at 30 and 45 DAS than rest of treatments, but it was also at par with 75% GRDF + 0.5 Grade IInd foliar spray at 30 and 45 DAS and 100% GRDF + 0.5% Grade IInd foliar spray at 30 and 45 DAS. Similarly, variety KDS-344 and application of nutrient levels of 75% GRDF + 0.5% Grade IInd foliar spray at 30 and 45 DAS recorded the highest net returns (82,756) and net returns per rupee invested (3.24) in soybean due to reduce in cost of cultivation (36,931) and nutrient losses.

Keywords: Varieties, nutrient management, grain yield and economics

Introduction
Soybean is the premier oilseed crop of India, occupies an area of 113.99 lakh ha and contributes 135.05 lakh tonnes towards oilseed production with 1185 kg ha^{-1} productivity (Anonymous, 2019) [1]. Selection of newly released genotype plays a vital role in crop production and helps to increase the crop productivity by 20-25%. Balanced and timely nutrient management practices were applied for soybean to contributes the sustainable growth, yield and quality of produce. It also influences plant health and reduces environmental risks. Nutrient management practices involves the use of appropriate combination of organic (FYM) and Inorganic (chemical) fertilizers and foliar spray of IInd grade micronutrient at 30 and 45 days after sowing to achieve sustained crop production and for maintaining better soil health. This is best approach for better utilization of resources and to produce crops with less expenditure in soybean (Shinde *et al.*, 2015) [6]. Foliar nutrition is recognized as an important method of fertilization, since foliar nutrients usually penetrate the leaf cuticle or stomata and enter the cells facilitating easy and rapid utilization of nutrients by the crop and also reduction in nutrient losses (Latha and Nadanassababady, 2003) [4]. It is an important to identify the appropriate genotype and appropriate combination nutrient management like organic, inorganic and foliar spray of micronutrients which increases growth, yield and economics of soybean. In the present study, an attempt was made to assess the combined effects of different promising newly released soybean varieties and different nutrient management levels to increase yield potential and economics of *kharif* soybean, for this purpose experiment was conducted on "Performance of different varieties and varying nutrient management levels on growth, yield and economics of soybean".

Materials and Methods
A field experiment was conducted at Instructional Farm of Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri, (19° 48' N latitude and 74° 32' E longitude and 495 meter

above mean sea level), in factorial randomized block design with three replications during *kharif* season of 2015. Climatologically, this area falls in the semi-arid tract characterized by scarcity zone and frequently occurring dry spell in *kharif* season. The daily minimum and maximum temperature ranged from 14.5 to 23.7 ºC and 30.1 to 36.0 ºC, respectively and the total rainfall of 285.4 mm was received during crop growth period. The soil of the experimental field was silty clay loam, having pH 7.72, medium in organic C (0.47%), low in available N (144.57 kg ha^{-1}) and medium in available P (17.24 kg ha^{-1}) and available K (388.20 kg ha^{-1}) and Moderate in organic carbon, pH and EC were 0.47%, 7.72 and 0.25 dS/ m of soil, respectively. The experiment consisted of 15 treatments with 3 varieties *viz.*,V_1: KDS-344,V_2: JS-9305 and V_3: KS-103 and 5 nutrient management levels *viz.*, N_1: GRDF (50:75:00 N, P_2O_5, K_2O kg/ha + 5tons FYM/ ha), N_2: 75% GRDF (37.5:56.25:00 N, P_2O_5, K_2O kg/ ha + 3.75 tons FYM/ha) + 0.5% foliar spray of grade II^{nd} at 30 and 45 DAS, N_3: 100% GRDF (50:75:00 N, P_2O_5, K_2O kg/ ha+ 5tons FYM/ ha) + 0.5% foliar spray of grade II^{nd} at 30 and 45 DAS, N_4: 125% GRDF (62.5:93.75:00 N, P_2O_5, K_2O kg/ ha+ 6.25 tons FYM/ ha) + 0.5% foliar spray of grade II^{nd} at 30 and 45 DAS and N_5: 50:75:30 N, P_2O_5, K_2O kg/ ha + 5 tons FYM/ ha. The crop soybean was dibbled at 30 cm x 10 cm in I^{st} week of July and harvested at I^{st} to II^{nd} week of October as per treatments. The whole dose of fertilizer (N, P_2O_5 and K_2O kg ha^{-1}) were applied at the time of sowing through urea, single super phosphate and muriate of potash. Common treatments of *Rhizobium* and *PSB* were given at the time of sowing and 0.5% foliar spray of grade II^{nd} micronutrient (Fe - 2.5%, Zn-3.0%, Mn-1.0%, Cu-1.0%, Mo-0.1% and Bo-0.5%) was done at 30 DAS and 45 DAS of soybean. The intercultural operations, protective irrigation as per critical growth stages and plant protection measures were carried out as per the recommendations of respective crops. The plant stand and crop conditions were good during the experimental period. From randomly 5 plants were selected in a net plot and recorded observation of growth and yield attributing characters as per treatment wise. 100 seed weight was measured as per representative sample from net plot. Soybean grain and stover yield was weighed after threshing and winnowing of net plot.The harvest index was worked out from the grain yield divided by grain+stover yield per hectare and multiplying by 100. Net returns were calculated by difference between the gross returns and cost of cultivation as per treatment wise and analysis was done. The net retuns per rupees invested (B:C)was calculated by gross returns divided by cost of cultivation.

Results and Discussion

The growth and yield attrbutes of soybean were influenced significantly due to different varieties and nutrient management levels at harvest (Table1). The growth and yield attrbutes *viz.*, plant height (75.10 cm), number of branches (4.46), number of nodules $plant^{-1}$ (23.11), number of pod/plant (58.88),weight of seeds/plant (11.92) and 100 seed weight (12.39 g) were recorded significantly higher by soybean variety KDS-344 than variety KS-103 and JS-9305. The variety KDS-344 exhibited superior for grain and stover yield. The higher growth and yield attributes were responsible for achieving higher grain yield (3.66 t/ha) and stover yield (4.64 t /ha) of soybean variety KDS-344 and it was 14.29 and 7.45%, respectively higher than the variety JS-9305 and KS-103. Similarly, It also recorded lowest harvest index (44.09%) due to higher yield of stover (4.64 t/ha) than variety JS-9305 (3.82 t/ha) and KS-103 (4.07 t/ha). The variety KDS-344 was recorded highest economic indices like cost of cultivation (40,623), net returns (87,355) and B:C ratio (3.17) than variety KS-103 and JS-9305. The variety JS-9305 was recorded the lowest economic indices like cost of cultivation (39,357), net returns (71,679) and B:C ratio (2.82) than rest of all varieties. Similarly, the variety KDS-344 has ability to produce higher photosynthates and dry matter partitioning between roots and shoots. The rate of growth and duration are interrelated into yield, total biomass accumulation and economic returns of crop. These results are in conformity with those reported by Andrade *et al*. (2005) [2] and Lomte *et al*. (2006) [5]

The application of fertilizer dose of 125% GRDF + 0.5% Grade II^{nd} foliar sprays at 30 and 45 DAS on soybean crop recorded maximum growth and yield attributes like plant height (72.46 cm), number of branches (4.74), number of root nodules/plant (23.62), number of pod/plant (54.30), weight of seeds/ plant (11.31 g) and 100 seed weight (12.35g) as compared to rest of the treatments. Similarly, these growth and yield attributes were directly reflected on grain yield of soybean and recorded significantly higher grain yield and stover yield (and t/ha) on application of fertilizer dose @ 125% GRDF + 0.5% Grade II^{nd} foliar spray at 30 and 45 DAS than GRDF and 50:75:30 N, P_2O_5, K_2O kg/ha + 5tons FYM/ ha, however it is found at par with 75% GRDF and 100% GRDF + 0.5% Grade II^{nd} foliar spray at 30 and 45 DAS (Table1). Similarly, application of fertilizer dose @ 75% GRDF + 0.5% Grade II^{nd} foliar spray at 30 and 45 DAS were recorded highest economic indices like net returns (82,786/ha) and B:C ratio (3.24) due to lower cost of cultivation (36,931/ha) than rest of treatments. The results revealed that foliar spraying of micronutrient at critical stages of the crop growth also enhances photosynthetic activity in effective leaves and in turn supplied developing pods with current photosynthates and resulted to sustain the productivity of soybean. Similar kind of results was observed by Kathmale *et al*. (2013) [3] and Latha and Nadanassababady (2003) [4].

Interaction effect between varieties and different nutrient management practices was found to be significant in respect of grain yield of soybean (Table 2). The interaction effect between variety KDS-344 with application of 125% GRDF+ 0.5% II^{nd} Grade foliar spray at 30 and 45 DAS recorded significantly highest grain yield (39.97 q/ ha) than rest of treatments but however it was at par with variety KDS-344 with application of 75% GRDF+ 0.5% II^{nd} Grade foliar spray at 30 and 45 DAS (38.51 q/ ha) and KDS-344 with application of 100% GRDF+ 0.5% II^{nd} Grade foliar spray at 30 and 45 DAS recorded significantly highest grain yield (37.29 q/ ha).

The results showed that, the sobean variety KDS-344 with application @ 125% GRDF (62.5:93.75:00 N:P_2O_5: K_2O kg ha^{-1} + 6.25 tons FYM ha^{-1}) + 0.5% Grade II^{nd} foliar spray at 30 and 45 DAS recorded significantly maximum yield of soybean but at par with 75% GRDF (37.5:56.25:00 N, P_2O_5, K_2O kg ha^{-1} + 3.75 tons FYM ha^{-1}) + 0.5 Grade II^{nd} foliar spray of micronutrient at 30 and 45 DAS. It means that application of 75% GRDF + 0.5 Grade II^{nd} foliar spray of micronutrient at 30 and 45 DAS was also more beneficial due to reducing cost of cultivation of farmers and nutrient losses as compred to 125% GRDF + 0.5% Grade II^{nd} foliar spray at 30 and 45 DAS.

It was concluded that, to get maximum productivity and

profitability of soybean can be achieved from variety KDS-344 fertilized with 75% GRDF (37.5:56.25:00 N, P_2O_5, K_2O kg ha^{-1} + 3.75 tons FYM ha^{-1}) + 0.5% Grade II^{nd} foliar spray of micronutrient at 30 and 45 DAS.

Table 1: Effect of different varieties and varying nutrient management practices on growth, yield attributes, yield and economics of soybean

Treatment	Plant height (cm)	Number of branches /plant	Number. of pods/ plant	Weight of seeds plant/ (g)	100 seed weight (g)	Grain yield (t/ ha)	Stover yield (t/ ha)	Harvest index (%)	Cultivation cost (₹/ha)	Net returns (₹/ha)	Benefit: cost ratio
A. Varieties											
V_1	75.10	4.46	58.88	11.92	12.74	3.66	4.64	44.09	40,623	87,355	3.17
V_2	63.35	4.16	46.49	10.23	11.35	3.20	3.82	45.58	39,357	71,679	2.82
V_3	73.94	4.12	52.85	10.98	12.39	3.41	4.07	45.59	39,990	78,102	2.94
S.Em ±	0.54	0.07	0.55	0.12	0.10	0.04	0.05	0.26	--	1,730	--
CD at 5%	1.56	0.20	1.59	0.35	0.29	0.14	0.16	0.76	--	5,013	--
B. Nutrient management											
N_1	70.34	4.3	53.02	10.86	12.22	3.35	4.14	44.72	39,207	77,079	2.96
N_2	71.11	4.08	51.17	10.85	11.87	3.45	4.21	45.04	36,931	82,786	3.24
N_3	70.99	4.15	53.26	11.12	12.02	3.48	4.19	45.37	40,393	80,380	2.98
N_4	72.46	4.74	54.30	11.31	12.35	3.58	4.34	45.20	43,477	80,597	2.85
N_5	69.24	3.94	51.96	11.06	12.34	3.25	4.01	44.76	39,943	74,386	2.86
S.Em ±	0.65	0.09	0.71	0.04	0.13	0.06	0.07	0.34	--	2,234	--
CD at 5%	1.89	0.26	2.05	0.15	0.37	0.18	0.21	N.S.	--	N.S.	--
C. Interaction (A x B)											
S.Em ±	3.28	0.15	1.23	0.27	0.36	0.11	0.25	0.59		5,869	--
CD at 5%	N.S.	N.S.	N.S.	N.S.	N.S.	0.31	N.S.	N.S.		N.S.	--

Table 2: Interaction effect between grain yield of soybean by different treatments

Treatments	**Grain Yield (q ha^{-1})**		
Varieties / **Nutrient management**	**V_1: KDS-344**	**V_2: JS-9305**	**V_3: KS-103**
N_1: GRDF (50:75:00 N, P_2O_5, K_2O kg ha^{-1} + 5tons FYM ha^{-1})	36.75	31.35	32.45
N_2: 75% GRDF (37.5:56.25:00 N, P_2O_5, K_2O kg ha^{-1} + 3.75 tons FYM ha^{-1}) + 0.5% foliar spray of grade II^{nd} at 30 and 45 DAS	38.51	33.09	32.99
N_3: 100% GRDF (50:75:00 N, P_2O_5, K_2O kg ha^{-1}+ 5tons FYM ha^{-1}) + 0.5% foliar spray of grade II^{nd} at 30 and 45 DAS	37.29	31.55	35.70
N_4: 125% GRDF (62.5:93.75:00 N, P_2O_5, K_2O kg ha^{-1}+ 6.25 tons FYM ha^{-1}) + 0.5% foliar spray of grade II^{nd} at 30 and 45 DAS	39.97	31.91	35.28
N_5: 50:75:30 N, P_2O_5, K_2O kg ha^{-1} + 5tons FYM ha^{-1}	30.36	31.97	35.22
Source (A x B)	S.Em + 1.10		C.D. at 5% 3.18

References

1. Anonymous. Soybean Processors Association of India. Indore (M.P.), SOPA Publication, 2019, 1-4.
2. Andrade FH, Sudras VO, Vega CRC, Echarte L. Physiological determinants of crop growth and yield in maize, sunflower and soybean. Their application to crop management, modeling and breeding. Journal of Crop Improvement 2005;14:51-101.
3. Kathmale DK, Andhale AV, Deshmukh MP. Growth and yield of soybean genotypes as influenced by sowing time at different location under climate change situation in Maharastra, India. International Journal of Bio research and stress Manageent 2013;4(4):492-495.
4. Latha MR, Nadanassababady T. Foliar nutrition in crops-A Review. Agricultural Reviews 2003;24(3):229-234.
5. Lomte DM, Umate MG, Kausale SP, Kote GM. Effect of different land configuration on yield of soybean *(Glycine max* (L) Merrill.) genotypes under rainfed conditions. Legume Research 2006;29(4):295-297.
6. Shinde RN, Karanjikar PN, Gokhale DN. Effect of different levels fertilizer and micronutrients on growth, yield and quality of soybean. Journal of Crop and Weed 2015;11(1):213-215.