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Response of Spring Greengram (*Vigna radiata* L.) Cultivars to Integrated Nutrient Management in Bundelkhand Region of Uttar Pradesh

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A field experiment was conducted to study the effect of integrated nutrient management on growth and yield of *spring* mungbean (*Vigna radiata* (L.) Wilczek) cultivars in Bundelkhand region of Uttar Pradesh during season of 2019 at Banda University of Agriculture and Technology, Banda (Uttar

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Pradesh). The experiment was laid out in asymmetrical factorial randomized block design with 6 treatment combinations of integrated nutrient management practices with 2 varieties. Results revealed that cultivar “Shikha” suits to be the better over “Samrat” in respect of growth, yield attributes, seed yield and economics. Additionally, INM practices had better effect on growth, yield attributes compared to sole application of inorganic fertilizers and vermicompost treatments. 100% RDF + 100% vermicompost had highest seed yield (771kg/ha), closely followed by 75% RDF + 50% vermicompost (741 kg/ha) compared to rest of treatments. Among the INM treatments, application of 50% RDF blended with 50% vermicompost recorded at par values of growth, yield attributes and seed yield over the application of 100% RDF + 100% vermicompost and 75% RDF + 50% vermicompost. On an average, INM treatments noted 69.89, 14.07 and 43.39% higher net returns as well as 68.92, 21.2 and 51.57% more benefit: cost ratio over the control, 100% RDF and 100% vermicompost, respectively. Therefore, application of 50% RDF + 50% vermicompost (1.25 t/ha) was optimum under the existing condition of Bundelkhand.

Keywords: Mungbean; integrated nutrient management; yield and economics.

1. INTRODUCTION

Pulses are the important sources of proteins, with high fiber content and low glycemic index. I.t occupies the predominant position in discussions related to food and nutritional security Didinger et al. [1]. India has appreciably 35% and 26% share in Global area and production, respectively, and the largest producer and consumer of pulses. Realizing the importance of Pulses for human diet, year 2016 was declared as international year of pulses. However, the growth in production and yield of pulses has lagged the growth rate of country’s population and this resulted a decline in per capita availability of pulses from 60.7 g/day during triennium ending 1951 to 55.9 g/day (P) during 2018 [2]. The Bundelkhand is known to be the pulse basket of India which comprises 7 districts from Uttar Pradesh and 6 districts from Madhya Pradesh.

In Uttar Pradesh, Mungbam occupies 89.5 thousand hectares of area with a production of 44.1 thousand metric tonnes and a productivity of 478 kg/ha during the same year. Alone Bundelkhand region of Uttar Pradesh occupies 33.7% in area and 21.0% in total production [3]. Average yield of this crop in the country is very low, which is primarily due to substandard methods of cultivation, poor crop stands, imbalanced nutrition, lack of high yielding varieties, etc.

The production and productivity of this crop is highest but due to lack to technological intervention in this region and high use of land reforms in spring season the yields and its attributing character lacks behind. Thus, an experiment was conducted at BUAT with the hypothesis that Response of spring greengram cultivars to (*Vigna radiata* L.) integrated nutrient management in Bundelkhand region of Uttar Pradesh.

2. MATERIALS AND METHODS

The experimental farm lies between 25º31’36.98" North latitude and 80º21’31.92" East longitude at an elevation of 123 MSL with hot and semi-arid climatic zone. Average rainfall of this region ranges …. however, its distribution pattern is uncertain. Initially pH, organic carbon, available nitrogen, available phosphorous and available potassium of the soil samples (0-15 cm) under the experimental field results 7.2, 0.41%, 211 kg/ha, 8.85 kg/ha and 215 kg/ha respectively.

The experiment was laid out in asymmetrical factorial randomized block design with the 12 treatments and each treatment were replicated thrice to take the mean value. Treatments comprised the combinations of two cultivars viz., Shikha (V_1) and Smart (V_2) and six INM treatments with absolute control viz., Control (N_0), 100% recommended dose of fertilizer-RDF (N_1), 100% Vermicompost-VC @ 2.5 t/ha (N_2), 100% RDF + 100% VC @ 2.5 t/ha (N_3), 75% RDF + 50% VC @ 1.25 t/ha (N_4) and 50% RDF + 50% VC @ 1.25 t/ha (N_5). Organic fertilizer (vermicompost) was applied during the final land preparation. Seeds were initially treated by *rhizobium* PSB @ 3 kg/ ha mixed with 50 kg well decomposed FYM was broadcasted over the entire experimental land during last ploughing. Mung bean was sown on 1 March 2019 @ 20 kg /ha with 30 cm row spacing. Other

recommended practices were adopted till harvesting (15 May, 2019) was adopted. The data in this paper represents the average value of three randomly selected plants from every plot at 30 and 45 DAS for growth analysis and at harvest for yield attributes. The mature pods were picked when they attained their full maturity.

3. RESULTS AND DISCUSSION

The results invoked that the variety 'Shikha' produced numerically higher values of Nodulation/ plant and branches/plant with almost yield attributes viz., number of pods/plant, seeds/pod and 1000-seed weight variety 'Shikha over variety 'Samart' (Table 1). The significant difference among varieties over control plot were attributed might be due to genomic makeup which truly indicated gross photosynthates production [4]. Additionally, seed yield, net return and benefit: cost ratio were recorded comparable values with variety 'Shikha with corresponding figures of 652 kg/ha, Rs. 23346 /ha and 0.97, respectively (Table 1). Among fertilizer treatments (N_3) had maximum number of branches/plant, number of root nodules/plant and its dry weight, followed by 75% RDF + 50% vermicompost and 50% RDF + 50% vermicompost, respectively this is also in conformity with findings of Niranjan et al. [5], Gadi Parvati et al. [6]. The least values of

Table 1. Effect of integrated nutrient management practices on growth, yield attributes and seed yield of mungbean cultivars

Treatment	Branches / Plant	Nodulation/plant at 30 DAS		Pods per Plant	Seeds per pod	Test weight	Seed yield (kg/ha)
		Counts	Dry weight (mg)				
Variety (V)							
V1: Shikha	5.92	45.85	73.18	17.33	5.40	37.36	652
V2: Smart	4.36	37.42	64.88	15.04	4.78	35.98	635
SE(d)±	0.53	4.87	9.23	0.84	0.22	2.41	14
CD (P=0.05)	NS	NS	NS	1.76	0.46	NS	NS
INM treatments (N)							
N0;Control	4.63	25.65	47.29	9.17	4.33	29.11	400
N1;100% RDF	5.28	40.92	64.59	14.18	5.08	37.77	659
N2;100% VC (2.5 t/ha)	4.78	34.32	57.17	13.51	4.65	34.72	563
N3;100%RDF+100%VC	6.28	51.48	86.59	24.91	6.19	40.29	771
N4; 75%RDF +50% VC 5 t/ha	6.01	50.54	80.77	18.75	5.20	39.64	741
N5 50% RDF +50% VC (1.25 t/ha)	5.56	46.92	77.77	16.62	5.11	38.50	729
SE(d)±	0.925	8.44	15.99	1.46	0.38	4.18	25
CD (P=0.05)	NS	17.63	NS	3.05	0.81	NS	35
Interactions	NS	NS	NS	NS	NS	NS	NS

DAS= Days after sowing; RDF= Recommended dose of fertilizer; VC= Vermicompost; NS=Non significant

Table 2. Effect of integrated nutrient management practices on economics of mungbean cultivars

Treatment	Gross return (₹/ha)	Net return (₹/ha)	B:C ratio
Variety (V)			
V1: IPM 2-3	46969	23346	0.97
V2: IPM 205-7	45738	22091	0.92
SE(d)±	1044	1045	0.04
CD (P=0.05)	NS	NS	NS
INM Protocols (N)			
N0; Control	28784	8684	0.43
N1; 100% RDF	47457	24783	1.09
N2; 100% VC (2.5 t/ha)	40525	16327	0.67
N3; 100% RDF + 100% VC (2.5 t/ha)	55529	28757	1.75
N4; 75% RDF + 50% VC (1.25 t/ha)	53346	29049	1.19
N5; 50% RDF + 50% VC (1.25 t/ha)	52482	28713	1.21
SE(d)±	1809	1810	0.076
CD (P=0.05)	3776	3778	0.15
Interactions	NS	NS	NS

Nodulation/plant and branches/plant were recorded with the unfertilized plot. In addition to above, it has also been observed that INM treatments recorded at par compared to control, 100% RDF and 100% vermicompost treatments for almost yield and its attributing characters 46.45, 11.78 and 24.63% respectively (Table 1). It might be due to slow mineralization of organic manure and non-availability of required nutrients resulted in setback of crop growth at early stage of crop growth and thus affected the crop yield. The plot receiving no fertilizer (control) recorded the lowest values of seed yield (400 kg/ha) of mungbean.

Gross return, net return and benefit: cost ratio were higher values recorded with variety 'Shikha being at par to variety 'Smart 'with corresponding figure of ₹ 23346/ha, ₹ 22091/ha and 0.97, respectively (Table 2). Among the different INM treatments, the mean effect of INM irrespective of doses (mean of N3, N4 and N_5) registered significantly higher gross (₹ 53785/ha) and net return (₹ 28839/ha) to the tune of 11.24 and 24.65% gross and 14.07 and 43.39% more net return compared to sole application of 100% RDF and 100% vermicompost, respectively (Table 2). The benefit: cost ratio (1.75) was higher 100% RDF and 100% vermicompost treatments. The superiority in gross and net returns with these treatments was mainly attributed to their higher yield of greengram. However, significantly lower gross and net returns as well as benefit: cost ratio was obtained with the control plot. Among the INM treatments, the maximum gross (₹ 55529/ha) and benefit: cost ratio (1.75) found in treatment 100% RDF + 100% vermicompost (1.25 t/ha), where net return (₹29049/ha) was recorded from the application of 75% RDF + 50% vermicompost (1.25 t/ha), closely followed by two other INM treatments i.e. N_3 and N_5 these results are in agreement with the results obtained by Arsalan et al. [7] and Krishnaprabu [8] in case of mungbean.

4. CONCLUSION

The present research work reveals that the application of 50% RDF + 50% vermicompost (1.25 t/ha) to *spring* mungbean varieties is more beneficial for higher growth, yield and income as compared to other remaining integrated nutrient management practices studied.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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