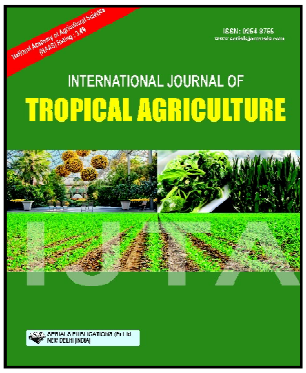

INTERNATIONAL JOURNAL OF TROPICAL AGRICULTURE

ISSN : 0254-8755

available at http: www.serialsjournal.com

Volume 35 • Number 3 • 2017

Enhance the Seed Yield and Nutrient Uptake by Green Gram (*Vigna radiata* L.) through INM

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Abstract: Mungbean is one of leading pulse crop in India. It is a good source of nutrients. The integrated nutrient management comprising of different sources of nutrient and management practices complementary to intercropping systems play a vital role in maintaining of soil fertility with increasing of long term productivity. Keeping above important in view, an experiment was conducted at research farm BRDPG College, Deoria during two continue years 2012-13 and 2013-14. The main objective of experiment to enhance the seed yield and nutrient uptake by green gram (Vigna radiata L.) through INM. Results revealed that the application of RDF (20:40:20, NPK kg ha^{-1})+ 20 kg S ha^{-1} + FYM at 5t ha^{-1} + Rhizobium at 20 g kg^{-1} seed + PSB 20g kg^{-1} seed + 1% $FeSO_4$ + $ZnSO_4$ at 1% foliar spray at 30 and 45 DAS + Trichoderma harzianum at 2.5 kg ha^{-1} at time of sowing gave significantly higher values of seed yield (1191 kg ha^{-1}), plant height(50.18 cm), number of branches $plant^{-1}$ (7.25) and number of pods $plant^{-1}$ (7.25) followed by other treatments. Similar trend was also found in content and uptake of (N, P, K) by seed and straw by green gram.

Key words: Green gram, INM, Nutrient uptake and seed yield.

INTRODUCTION

Mungbean (*Vigna radiate* L.) one of the leading pulse crop in India. It is cultivated in all most all state of India in an area of 3.10 m ha with a production of 0.94 m tons at an average productivity of 304 kg ha^{-1} (D P D, 2012). It is a good source of nutrients. On whole grain basis it contains 10% moisture , 24% protein , 10% fat, 3% mineral, 57% carbohydrates and 4% fibred (Gopalan *et al.*, 2004). Different agricultural practices that get better soil quality and agricultural sustainability have inward much interest from researchers and farmers. The function of

organic fertilizers in plant nutrition is now attracting the thought of agriculturists and scientists throughout the world. Chemical fertilizers, no doubt have boosted the crop growth and yield, but to larger level they have contributed to soil deterioration. Integration of different sources of nutrients has a promising efficient soil health management and sustained productivity. Integrated nutrient management (INM) involves the use of manures, biofertilizers and chemical fertilizers to get sustained crop production and maintain better soil health. INM is best approach for better use of resources and to produce crops with fewer outflows. In recent years, a concept of integrated nutrient supply involving use of organic manures and inorganic fertilizers has been developed to achieve sustained agricultural production. Integration of organic and inorganic sources of nutrients along with biofertilizers is found to give more nutrient uptake, productivity and economic returns in legumes (Bhattacharyya *et al.*, 2008). Keeping in view the importance of integrated nutrient management, the present investigation was undertaken on green gram with the objective to study yield potential of green gram (*Vigna radiate* L.) under integrated nutrient management and its nutrient uptake from soil.

MATERIALS AND METHODS

A field experiment was conducted during *rabi* season of 2012-13 and 2013-14 at Research Farm, Department of Agronomy, BRDPG College Deoria (UP). The soil was sandy loam with low in available nitrogen and potassium but medium in available phosphorus. The experiment was laid out in randomized block design with 9 treatments consist of T_1 - Control, T_2 - RDF (20: 40:20, NPK kg ha^{-1}) T_3 - RDF + 20 kg S ha^{-1}, T_4 - RDF + 20 kg S ha^{-1} + FYM at 5 t ha^{-1}, T_5- RDF + 20 kg S ha^{-1} + FYM at 5 t ha^{-1} + *Rhizobium* at 20 g kg^{-1} seed, T_6 - RDF + 20 kg S ha^{-1} + FYM at 5 t ha^{-1} + *Rhizobium* at 20 g kg^{-1} seed + PSB at 20 g kg^{-1} seed, T_7 - RDF + 20 kg S ha^{-1} + FYM at 5 t ha^{-1} + *Rhizobium* at 20 g kg^{-1} seed + PSB 20 g kg^{-1} seed + 1 % $FeSO_4$ foliar spray at 30 and 45 DAS, T_8 - RDF + 20 kg S ha^{-1} + FYM at 5 t ha^{-1} + *Rhizobium* at 20 g kg^{-1} seed + PSB at 20 g kg^{-1} seed + 1 % $FeSO_4$ + $ZnSO_4$ at 1 % foliar spray at 30 and 45 DAS, T_9 - RDF + 20kg S ha^{-1} + FYM at 5t ha^{-1} + *Rhizobium* at 20 g kg^{-1} seed + PSB 20g kg^{-1} seed + 1% $FeSO_4$ + $ZnSO_4$ at 1% foliar spray at 30 and 45 DAS + *Trichoderma harzianum* at 2.5 kg ha^{-1} at time of sowing with three replication. Seed treatment, organic manure, Biofertilizers, *T. harzianum* and recommended dose of fertilizers were applied as per the treatments before sowing the crop in previously opened furrows. Observations on growth and yield parameters were recorded at harvest from the plants drawn randomly. Plant samples were also taken after the harvest of crop. Plot-wise analysis of plant samples for total nitrogen, phosphorus, potassium were estimated for each of the treatment with the standard procedures. Statistical analysis for all the growth and yield parameters was done as per the standard procedures.

RESULTS AND DISCUSSION

Response on growth, yield attributes and seed yield

The recommended dose of fertilizer (RDF), control and INM systems had significant influence on plant height, number of branches, number of pods $plant^{-1}$ and seed yield of green gram. However, INM recorded numerically higher seed yield of green gram (Table 1) compared to control and RDF due to more nutrient uptake from the soils (Table 2). The results of the experiment indicated that yield attributes *viz.*, plant height at harvest, number of branches $plant^{-1}$ and number of pods $plant^{-1}$ (Table 1). The seed yield (1191kg ha^{-1}) was noted higher under treatment of RDF (20:40:20, NPK kg ha^{-1}) + 20 kg S ha^{-1} + FYM at 5t ha^{-1} + *Rhizobium* at 20 g kg^{-1} seed + PSB 20g kg^{-1} seed + 1% $FeSO_4$ + $ZnSO_4$ at 1% foliar spray at 30 and 45 DAS + *Trichoderma harzianum* at 2.5 kg ha^{-1} at time of sowing (T_9). Percent increase in plant height,

Table 1
Response of different INM treatments on seed yield and yield attributes of green gram (Pooled data of 2012-13 and 2013-14)

	Treatments	*Seed yield (kg ha^{-1})*	*Plant height (cm)*	*Branches plant^{-1}*	*No. of pods plant^{-1}*
T_1	Control	794	36.80	4.99	11.38
T_2	RDF (20:40:20, NPK kg ha^{-1}	996	41.20	6.13	13.90
T_3	RDF + 20 kg S ha^{-1}	1012	43.07	6.17	14.65
T_4	RDF + 20 kg S ha^{-1} + FYM at 5 t ha^{-1}	1089	45.48	6.35	14.96
T_5	RDF + 20 kg S ha^{-1} + FYM at 5 t ha^{-1} + *Rhizobium* at 20 g kg^{-1} seed	1135	46.24	6.66	15.35
T_6	RDF + 20 kg S ha^{-1} + FYM at 5 t ha^{-1} + *Rhizobium* at 20 g kg^{-1} seed + PSB at 20 g kg^{-1} seed	1144	46.65	6.74	15.60
T_7	RDF + 20 kg S ha^{-1} + FYM at 5 t ha^{-1} + *Rhizobium* at 20 g kg^{-1} seed + PSB 20 g kg^{-1} seed + 1 % $FeSO_4$ foliar spray at 30 and 45 DAS	1157	47.27	6.92	15.63
T_8	RDF + 20 kg S ha^{-1} + FYM at 5 t ha^{-1} + *Rhizobium* at 20 g kg^{-1} seed + PSB at 20 g kg^{-1} seed + 1 % $FeSO_4$ + $ZnSO_4$ at 1 % foliar spray at 30 and 45 DAS	1171	49.33	7.08	15.87
T_9	RDF + 20kg S ha^{-1} + FYM at 5t ha^{-1} + *Rhizobium* at 20 g kg^{-1} seed + PSB 20g kg^{-1} seed + 1% $FeSO_4$ + $ZnSO_4$ at 1% foliar spray at 30 and 45 DAS + *Trichoderma harzianum* at 2.5 kg ha^{-1} at time of sowing	1191	50.18	7.25	16.13
S.Em. ±		45.09	1.94	0.39	0.79
C.D.(P=0.05)		133.96	5.77	1.15	2.35

Table 2
Response of different INM treatments on NPK content, uptake in seed and straw of green gram over RDF and control (Pooled data of 2012-13 and 2013-14)

Treatments	*Nutrient content in plant sample (%)*						*Nutrient uptake by plant sample (kg ha^{-1})*					
	N		*P*		*K*		*N*		*P*		*K*	
	Seed	*Straw*	*Seed*	*Straw*	*Seed*	*Straw*	*Seed*	*Straw*	*Seed*	*Straw*	*Seed*	*Straw*
T_1	3.05	1.11	0.27	0.13	0.67	0.76	24.17	14.71	2.15	1.68	5.32	10.08
T_2	3.23	1.25	0.32	0.15	0.73	0.79	32.10	19.00	3.15	2.28	7.28	12.03
T_3	3.33	1.31	0.32	0.16	0.75	0.81	33.64	20.37	3.21	2.56	7.59	12.67
T_4	3.42	1.35	0.35	0.17	0.76	0.87	37.27	21.43	3.79	2.66	8.24	13.77
T_5	3.45	1.37	0.37	0.19	0.78	0.88	39.12	22.68	4.18	3.07	8.80	14.52
T_6	3.56	1.44	0.39	0.20	0.80	0.91	40.73	23.92	4.43	3.31	9.23	15.14
T_7	3.58	1.45	0.42	0.22	0.82	0.94	41.41	24.29	4.91	3.77	9.46	15.75
T_8	3.59	1.47	0.47	0.23	0.82	0.96	42.11	24.93	5.54	3.94	9.61	16.25
T_9	3.64	1.50	0.48	0.24	0.87	0.99	43.61	25.81	5.74	4.09	10.35	16.96
S.Em. ±	0.13	0.05	0.02	0.01	0.03	0.04	2.11	1.03	0.22	0.21	0.60	0.73
C.D.(P=0.05)	0.37	0.15	0.05	0.03	0.10	0.12	6.28	3.05	0.64	0.63	1.77	2.18

number of branches, number of pods per plant and seed yield of green gram was 36.3, 45.3, 41.8 and 50 % more under treatment T_9 over control (T_1). It might be due to improvement in uptake of NPK ha^{-1}, associated with higher seed and straw yields. This might also be attributed to better availability of nutrients in the soil under organic and inorganic fertilization in integrated manner. The application of chemical fertilizers along with any organic input to green gram significantly influenced the yield and yield attributing characters of green gram as reported in earlier research works of Amit *et al.*, (2010), Narend *et al.,* (2009), Ved Ram *et al.,* (2008). Conversely, significantly the lowest seed and straw yields were noted under T_1 (control).

Response of different INM treatments on Nutrient Uptake

Different INM treatments significantly improved the content and uptake of major (N, P and K) nutrients by seed and straw over the control (Table 2). Application of T_9 -RDF (20:40:20, NPK, kg ha^{-1}) + 20 kg S ha^{-1} + FYM at 5t ha^{-1} + *Rhizobium* at 20 g kg^{-1} seed + PSB 20g kg^{-1} seed + 1% $FeSO_4$ + $ZnSO_4$ at 1% foliar spray at 30 and 45 DAS + *Trichoderma harzianum* at 2.5 kg ha^{-1} at time of sowing, recorded significantly higher content and uptake of (N, P and K) nutrients by seed and straw over control. Thus, significant improvement in uptake of (N, P and K) nutrients might be due to increase their concentration in seed and straw. Percent increase in nutrient uptake of N, P and K in green gram were 80.4, 166 and 94.5 % more under treatment T_9 over control (T_1) in seed of green gram. The increased nutrient content and their uptake, present investigations are in close agreements with the findings of Yadav *et al.,* (2015).

CONCLUSION

It seems quite logical to conclude that potential production and nutrient uptake was more by INM over RDF as well as control in green gram in sandy soil can be achieved highest under treatment of RDF (20:40:20, NPK kg ha^{-1}) + 20 kg S ha^{-1} + FYM at 5t ha^{-1} + *Rhizobium* at 20 g kg^{-1} seed + PSB 20g kg^{-1} seed + 1% $FeSO_4$ + $ZnSO_4$ at 1% foliar spray at 30 and 45 DAS + *Trichoderma harzianum* at 2.5 kg ha^{-1} at time of sowing. The growth and yields of RDF and control grown green gram was generally less compared with that of all INM treatments.

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