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Original Research Article

Effect of Inorganic and Organic Nutrients on N and P Content and Uptake from Seed and Haulm of Summer Green Gram (*Vigna radiata* L. wilczek)

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A B S T R A C T

A field experiment was carried out during the summer season of the year 2019 at the College Agronomy Farm, B. A. College of Agriculture, Anand Agricultural University, Anand (Gujarat), with a view to study the inorganic and organic nutrients on growth and yield of summer green gram (*Vigna radiata* L. wilczek). The experiment was laid out in a Randomized Block Design with eight treatments and four replications. Significantly higher nitrogen and phosphorus content and uptake by seed as well as haulm was recorded under treatment T_8 (50% RDF + 0.5 t ha^{-1} vermicompost + seed treatment with BioNP + Jeevamrut spraying).

Keywords

Green gram, Nitrogen, Phosphorus, Content, Uptake

Introduction

Green gram (*Vigna radiata* L. Wilczek) is one of the most ancient and widely grown leguminous crops of India. It is mainly a rainy season crop but with the development of early maturing varieties, it has also proved to be an ideal crop for spring and summer seasons. Green gram is supposed to be easily digestible hence, it is ideal for patients. The sprouted seeds of green gram are rich in ascorbic acid (vitamin C), riboflavin and thiamine (Choudhary *et al.*, 2003).

In spite of being widely amended crop in India, its productivity is very low. The green revolution brought remarkable gains in food production but due to intensive use of agro-chemicals soil biodiversity is being affected. There is now terrific pressure on growers to use integrated nutrient management approach to increase productivity and sustain soil health. Organic amendment offers an alternative or supplementing control scheme to increase production (Meena *et al.*, 2015). During the last few years, considerable progress has been made in the utilization of vermicompost and seed inoculation with *Rhizobium* and PSB for integrated nutrient management approach. Organic sources of nutrients like vermicompost, BioNP consortium, jeevamrut are extensively used in various crops. These organic additives can be used to encourage the development of beneficial organisms in the soil. Some workers used organic additives to enhance N and P content and uptake from seed and haulm also. Organic amendments also proliferation the efficiency of bio-fertilizers. Such bio-fertilizers are cheaper, eco-friendly

and based on renewable energy sources has expanded momentum in recent years to supplement the parts of chemical fertilizers. The rhizosphere is inhabited by actively growing microbial population that immeasurably affects the root and plant metabolic activities. *Rhizobium* and PSB are beneficial for root nodule formation collectively known as *Rhizobia*, as latent microbial inoculants have been convincingly emphasized in recent years for its nitrogen and phosphorus fixing ability.

Today an increasing number of farmers and agriculturists are turning to the use of organic manures and bio-fertilizers to enhance the crop production as these are gentler on the soil as compared with the chemical fertilizers. Soil microorganisms play an important role in soil processes that determine plant productivity. In the present study, the use of microorganisms as bio-fertilizer was *Rhizobium* and phosphobacteria, in which *Rhizobium* fixes atmospheric nitrogen whereas, phosphobacteria solubilizes the insoluble phosphorus and converts it in soluble form to crop plants. Therefore, both activities are important for the growth and development of crop plants to enhance the crop yield. For a long period bio-fertilizers were mainly used for assisting plants to uptake nutrients from the environment or preventing plant diseases.

Materials and Methods

A field experiment was carried out during the summer season of the year 2019 at College Agronomy Farm, B. A. College of Agriculture, Anand Agricultural University, Anand, Gujarat. The soil of experimental site was loamy sand in texture, having low in organic carbon (0.29%) and available nitrogen (219.50 kg ha^{-1}) and medium in available P_2O_5 (35.45 kg ha^{-1}) with slightly alkaline (pH 7.96) in reaction. Green gram variety Gujarat Anand Mungbean 5 (GAM 5) was used as a test crop in the study. Crop was sown on 7th march, 2020. The experiment was arranged in randomized block design with four replications, consisting of eight treatments *viz.*, T_1 [100% RDF (20-40-00 kg NPK ha^{-1})], T_2 [50% RDF (10-20-00 kg NPK ha^{-1}) + 0.5 t ha^{-1} vermicompost], T_3 [Seed treatment with BioNP @ 5 ml kg^{-1} seed (*Rhizobium* + PSB)], T_4 [Jeevamrut spraying at 30 & 45 DAS (500 lit ha^{-1})], T_5 [T_3 + T_4], T_6 [T_2 + T_3], T_7 [T_2 + T_4], T_8 [T_2 + T_5], each plot being 3.60 m × 5.00 m. Inorganic sources of N & P is urea and DAP respectively, while organic sources are vermicompost, BioNP (*Rhizobium* + PSB) and jeevamrut. The seeds were inoculated with respective strains of *Rhizobium* + PSB according to the treatment. Crop was harvested (3 consecutive picking of pods) on 10th, 18th and 25th May, 2020. The data recorded during the course of investigation were subjected to statistical analysis as per method of analysis of variance (Cochran and Cox, 1957).

Results and Discussions

Nutrient content (N and P) in seed

N content in seed (%)

In respect to N content in seed as influenced by different treatments are presented in Table 1 and graphically represented in Fig. 1. Data indicate that the treatments have significant influence on seed N content. Higher nitrogen content (3.78%) in seed is obtained under treatment T_8. The highest seed N content under T_8 may be attribute to greater availability of N under this treatment and its competent and effective absorption by the root system and greater availability of nutrients in rhizosphere. The findings are in close proximity with the findings of Arsalan *et al.,* (2016), Dhakal *et al.,* (2016),

Rajkhowa *et al.,* (2017), Saha *et al.,* (2017) and Khan *et al.,* (2017).

P content in seed (%)

By observing the data given in Table 1 and graphically shown in Fig. 1 that the P content of seed is not significantly influenced by different treatments.

Nutrient content (N and P) in Haulm

N content in haulm (%)

Data given in the Table 1 and graphically depicted in fig. 1, it was observed that significantly higher N content (0.69%) in haulm was recorded under treatment T_8. The increase in N content in haulm with application of T_8 was quite markly because under this treatment, inorganic sources of fertilizer with organic sources of fertilizer will give away the N is available and easily absorbable form which stemmed into more content of N in haulm. Similar results were published by Arsalan *et al.,* (2016), Dhakal *et al.,* (2016), Saha *et al.,* (2017) and Khan *et al.,* (2017).

P content in haulm (%)

Mean data pertaining to the P content in haulm of green gram as influenced by different treatments are presented in Table 1 and presented in Fig. 1. It showed that numerous treatments not significantly influenced P content in haulm.

Nutrient uptake (N and P) by seed

N uptake by seed (kg ha^{-1}):

Data pertaining to the N uptake by green gram seed is furnished in Table 1 and graphically shown in Fig. 2 which showed that the different treatments significantly influenced the N uptake by the crop. Treatment T_8 resulted in highest uptake of N (51.22 kg ha^{-1}). The reason behind the highest uptake of N (kg ha^{-1}) under treatment T_8 is directly related with the yield and N content in seed. This treatment (T_8) received maximum yield and N content in seed which would have resulted in generally higher N uptake with this treatment. The findings are in close proximity with the findings of Kumari and Kumari (2002), Sutaria *et al.,* (2010), Sharma and Guled (2012), Tyagi *et al.,* (2014), Khan *et al.,* (2017) and Kalaiyarasi *et al.,* (2019).

P uptake by seed (kg ha^{-1})

The data which shows the uptake of P in seeds is given in Table 1and graphically presented in Fig. 2. A close exanimation of data indicated that various treatment manifest significant influence on the P uptake by green gram seeds. Significantly the highest P uptake (6.91 kg ha^{-1}) was recorded in the seeds of treatment T_8. As the uptake is a product of nutrient content and seed yield, so in accordance with this T_8 having higher P content and seed yield contributed to higher uptake of P. The findings are in close proximity with the findings of Kumari and Kumari (2002), Sutaria *et al.,* (2010), Sharma and Guled (2012), Tyagi *et al.,* (2014), Khan *et al.,* (2017) and Kalaiyarasi *et al.,* (2019).

Nutrient uptake (N and P) haulm

N uptake by haulm (kg ha^{-1})

Data regarding the uptake of N (kg ha^{-1}) by haulm is furnished in Table 1 and it is presented through graph in Fig. 2. It clearly revealed that the differences in N uptake due to application of treatment are significant. The treatment T_8 was found significantly superior with 14.66 kg ha^{-1} of N uptake in haulm. Treatment T_8 in respect to N uptake

indicated conspicuous differences from various treatment because the N content and haulm yield under this specific treatment is high which together succeed in giving higher N uptake in haulm. The findings are in close contiguity with the findings of Meena *et al.,* (2013), Gorade *et al.,* (2014), Arsalan *et al.,* (2016) and Khan *et al.,* (2017).

P uptake by haulm (kg ha^{-1})

The value of P uptake (kg ha^{-1}) as influenced by varied treatments is presented in tabulated form in Table 1 and graphically shown in fig. 2. P uptake by haulm (kg ha^{-1}) of green gram was found significant due to different treatments. Highest uptake of P (3.43 kg ha^{-1}) by haulm among all the treatments was observed with treatment T_8. Uptake is the product of nutrient content in haulm and haulm yield, recognized to this fact it is evident that P uptake in haulm is higher under T_8 owing to higher P content in haulm and haulm yield. The findings are in close proximity with the findings of Meena *et al.,* (2013), Gorade *et al.,* (2014), Arsalan *et al.,* (2016) and Khan *et al.,* (2017).

Table.1 Effect of inorganic and organic nutrients on N and P content and uptake from seed and haulm of summer green gram (*Vigna radiata* L. wilczek)

Treatment	N content (%)		P content (%)		N uptake (kg ha^{-1})		P uptake (kg ha^{-1})	
	Seed	Haulm	Seed	Haulm	Seed	Haulm	Seed	Haulm
T_1	3.58	0.58	0.48	0.156	43.00	11.85	5.79	3.18
T_2	3.54	0.55	0.47	0.154	40.92	10.71	5.46	3.03
T_3	3.15	0.45	0.44	0.151	24.69	6.98	3.81	2.31
T_4	3.28	0.47	0.45	0.151	31.13	8.04	4.28	2.58
T_5	3.38	0.50	0.46	0.153	36.89	8.74	5.02	2.68
T_6	3.73	0.65	0.50	0.159	48.30	13.08	6.44	3.19
T_7	3.68	0.64	0.49	0.158	46.74	12.90	6.21	3.22
T_8	3.78	0.69	0.51	0.160	51.22	14.66	6.91	3.43
S. Em. ±	0.12	0.02	0.02	0.005	2.11	0.63	0.32	0.19
C.D. at 5%	0.35	0.06	NS	NS	6.22	1.85	0.94	0.55
C.V.%	6.75	6.90	7.01	6.85	10.48	11.56	11.69	12.71

In the view of the results obtained from the present investigation, it can be concluded that, N and P content and uptake from the seed and haulm of green gram, the crop should be fertilized with 50% RDF + 0.5 t ha^{-1} vermicompost + seed treatment with BioNP + Jeevamrut spraying.

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