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Effect of integrated nutrient management on summer Greengram (*Vigna radiata* L.) under south Gujarat condition

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Abstract
A field experiment entitled "Effect of integrated nutrient management on summer Greengram (*Vigna radiata* L.) under south Gujarat condition" was conducted during summer season of 2019 at the college farm, Navsari Agricultural University, Navsari (Gujarat). Recommended dose of fertilizer recorded significantly highest growth and yield attributes *viz*., plant height, number of branches per plant, dry matter accumulation per plant, pod length, number of pods per plant and number of seeds per pod, seed yield and stover yield of Greengram. All above parameters except dry matter accumulation per plant and number of pods per plant were statistically at par with 75% RDF. An application of vermicompost @ 2.5 t/ha recorded significantly the highest growth as well as yield attributing characters and yield of Greengram. All the growth attributes, yield attributes and yield of Greengram recorded significantly highest under seed inoculation with Rhizobium + PSB over no seed inoculation.

Keywords: Greengram, FYM, vermicompost, Bio-fertilizers

Introduction
Greengram is the third important pulse crop cultivated through India. Pulses from an integral part of vegetarian diet of large population of India. Besides being rich source of protein and amino acids, they maintain soil fertility through the process of nitrogen fixation in symbiotic association with *Rhizobium* bacteria present in their nodules. Thus, they play a vital role as nitrogen fixation manufactories, which help in sustain productivity of agricultural soil (Jat *et al*., 2012) [6].

Recently, integrated nutrient management has emerged as a sustainable practice which is able to boost up production, productivity and quality of the product as well as without causing any negative hazardous effect on crop and environment. The integrated nutrient management is one of the most important component of the production technology to sustain soil fertility and crop productivity in the future. Plant nutrients can be supplied from different sources i.e. organic manures, vermicompost, crop residues, green manure, bio-fertilizers and chemical fertilizers. The combined use of organic and inorganic sources of plant nutrient not only pushed the production and profitability of field crops, rather it helps in maintaining the permanent fertility status of soil (Dubey and Gupta, 1996; Kumar and Singh, 2010) [4, 8].

Among different plant nutrients, nitrogen is the most important nutrient for plant growth and development. Nitrogen as chief constituents of plant nutrition plays an important role in synthesis of chlorophyll and amino acid (Masclaux *et al*., 2006) [9]. Insufficient nitrogen may reduce yield drastically and deteriorates the quality of produce specially protein content.

Phosphorus plays a key role in the balance nutrition of plants. The beneficial effects of phosphorus have been observed on nodulation, aerial growth, root development, synthesis and breakdown. Potassium is the third most important essential nutrient after nitrogen and phosphorus. The potassium activates more than 60 enzymes and enzymatic catalyst in system involved in photosynthesis, metabolism and translocation of carbohydrate and proteins, membrane permeability, stomatal regulation and water utilization. Generally, there is no need to apply potassium where high K_2O status of soil.

Farm yard manure (FYM) is though not useful as a sole source of nutrients but a good complimentary and supplementary source with mineral fertilizers.

Farmyard manure is good source of all the essential nutrients which supplies nitrogen, phosphorus, potassium and micronutrients like Fe, S, Mo and Zn etc. The application of FYM not only provides nutrition to crop on decomposition but it also improves physical and chemical properties and health of soil such as aggregation, aeration, permeability, water holding capacity, stimulation of soil flora and fauna. Addition of FYM also restricts the phosphate depletion from soil and maintains phosphate balance by reducing its fixation. The use of farmyard manure (FYM) along with inorganic fertilizer increases the nutrient use efficiency (Shroti *et al*., 2018) [17].

Vermicompost enhances soil biodiversity by promoting beneficial microbes, which enhances plant growth directly by production of plant growth regulating substances (hormones and enzymes) and indirectly by controlling plant pathogens, nematodes and other pests, thereby enhancing plant health and minimizing the yield loss (Pathama and Sakthivel, 2012) [13].

Bio-fertilizer have come up as relatively inexpensive nitrogen and supplement for crop production during the recent year, which provide scope for nitrogen economy. They help in improving soil fertility by way of accelerating biological nitrogen fixation from atmosphere, solubilization of insoluble nutrients present in the soil, stimulating plant growth and development, maintaining soil reaction and improving physical and biological properties of soil and thereby making nutrient easily available to the plant (Desai *et al*., 2020) [2].

Materials and Methods

A field experiment was conducted in summer season of 2019 at the college farm, Navsari Agricultural University, Navsari, Gujarat. The soil of the experimental field was clayey in texture having medium to poor drainage, soil pH 7.35, EC 0.35 ds/m and organic carbon content 0.40%. The soil is low in available nitrogen (141.74 kg/ha), medium in available phosphorus (53.57 kg/ha) and high in available potassium (358.17 kg/ha) were determined by Kjeldahl's method, Olsen's method and Flame photometric method, respectively. An experiment was laid out on a factorial randomized block design with twelve treatment combinations replicated thrice. The factors consisted of three levels of fertilizers (F_1: 50% RDF, F_2: 75% RDF and F_3: 100% RDF *i.e*. 20-40-00 kg NPK ha^{-1}), two sources of organic manures (O_1: FYM @ 2.5 t/ha and O_2: vermicompost@2.5t/ha) and two treatments of bio-fertilizers (B_1: no inoculation and B_2: *Rhizobium* + PSB inoculation). Greengram variety "GM 6" seeds were sown on 18 February 2019 using seed rate 20 kg/ha with row spacing 30 cm and plant spacing 10 cm spacing. All other operation was performed as per recommendations of the crops. The crop was harvested on 15 May 2019. The data on growth and yield attributes were recorded from randomly selected five plants in each plot and seed yield and stover yield recorded from net plot and converted on hectare basis. The results were analysis statistically to draw suitable interference as per the standard ANOVA techniques suggested by Gomez and Gomez (1984) [5].

Results and Discussions

Effect of inorganic fertilizers

The periodical plant height, number of branches per plant and dry matter accumulation per plant were significantly highest under the application of 100% RDF. All above parameters except dry matter accumulation per plant were statistically at par with 75% RDF. This might be due to nitrogen application increased growth of the plant, since nitrogen as major component of protoplasm helps in photosynthesis and enhances metabolic rate, cell division and cell elongation which thereby, allow the plant grow to faster and phosphorus enhances the root elongation, leaf expansion and helps in cell elongation. The present findings are in close agreement with those reported by Priyadarshini *et al*. (2017) [15] in clusterbean, Pargi *et al*. (2018) [12] in cowpea, Beniwal and Ajay (2019) [1] in blackgram and Desai *et al*. (2020) [2] in Indian bean. Significantly the highest pod length, number of pods per plant, number of seeds per pod and seed and stover yields were found superior under application of 100% RDF. All the parameters, except number of pods per plant were statistically at par with 75% RDF. The increase in the seed yield ha^{-1} of greengram owing to increase in the fertility level was due to the fact that application of adequate of nutrients in the balanced proportion enhanced the growth of the crop and better utilization of soil moisture and other resources led to better development of the yield attributes. Moreover, the improvement in yield attributes and consequent to higher yield might possibly be due to the enhanced synthesis of carbohydrates and proteins and their transport to the sink through efficient physiological activities in plants, as evident from improved physiological parameter like LAI and CGR. Higher seed yield of greengram was mainly owing to significantly superior yield attributes like pod length, number of pods per plant, number of seeds per pod and test weight. The increase in stover yield due to increase in plant height and dry matter production at higher nutrient levels. The increase in stover yield with application of RDF might have attributed to the higher photosynthetic activity in greengram plant leading to a better supply of carbohydrates resulted in more number of branches and dry matter. Similar findings were also reported by Singh *et al*. (2016) [18] in black gram, Joshi *et al*. (2018) [7] in cowpea, Mehetre *et al*. (2019) [10] in soybean and Desai *et al*. (2020) [2] in Indian bean.

Effect of organic manures

Significantly the highest growth and yield attributes were recorded under the application of vermicompost @ 2.5 t/ha as compared to the application of FYM @ 2.5 t/ha. Similarly, the highest seed and stover yields were recorded under the application of vermicompost @ 2.5 t/ha. The positive response of vermicompost may probably due to enhanced supply of macro as well as micro nutrients which leds to high assimilation of food and its subsequent portioning in sink. It improved yield components due to vegetative and reproductive growth led to higher seed and stover yield. Similar findings were also reported by Sharma and Abraham (2010) [16] in blackgram and Yadav *et al*. (2017) [21] in chickpea.

Effect of bio-fertilizers

An application of bio-fertilizer (*Rhizobium* +PSB) was resulted in significantly the highest growth and yield attributes and seed and stover yields over without bio-fertilizer application. This might be due to the provision of fixation of nitrogen by *Rhizobium* and possible solubilisation of fixed P as well as applied P besides

synthesis of growth promoting substances like auxins and gibberellins and produce vitamins which augmented plant growth by phosphorus solubilising species might have improved vigour and resulted in recording higher values of morphological parameters and ultimately increased N and P uptake which enhanced the yield of the crop. These findings corroborate the results of Dongare *et al.* (2016) [3] in greengram, Nadeem *et al.* (2016) [11] in cowpea, Pargi *et al.* (2018) [12] in cowpea and Desai *et al.* (2020) [2] in Indian bean.

Interaction effect

Interaction effect of inorganic fertilizers, organic manures and bio-fertilizers were found to be significant for seed yield of greengram. The treatment combination involving 100% RDF along with vermicompost 2.5 t/ha and seed inoculation of *Rhizobium* + PSB ($F_3O_2B_2$) obtained significantly the higher seed yield and it was found statistically at par with treatment combination of 100% RDF along with vermicompost @ 2.5 t/ha and without seed inoculation of *Rhizobium* + PSB ($F_3O_2B_1$), 100% RDF along with FYM @ 2.5 t/ha and seed inoculation of *Rhizobium* + PSB ($F_3O_1B_2$) and 75% RDF along with vermicompost @ 2.5 t/ha and seed inoculation of *Rhizobium* + PSB ($F_2O_2B_2$). Prajapati (2014) [14] in grrengram, Tyagi *et al.* (2015) [20] in greengram and Tyagi and Singh (2019) [19] in blackgram also noted similar results.

Table 1: Effect of inorganic fertilizers, organic manures and bio-fertilizers on growth and yield attributes of greengram

Treatments	Plant height (cm)		Number of branches per plant		Dry matter accumulation per plant (g)	Pod length (cm)	Number of pods per plant	Number of seeds per pod	Test weight (gm)
	At 30 DAS	At 30 DAS	At 30 DAS	At 60 DAS					
Inorganic fertilizers (F)									
F_1: 50% RDF	21.07	50.85	2.22	3.10	13.05	7.56	13.53	10.70	51.36
F_2: 75% RDF	22.54	53.29	2.28	3.27	15.07	8.23	14.77	11.43	53.31
F_3: 100% RDF	23.54	55.27	2.52	3.40	16.70	8.70	16.42	11.73	54.16
SEm±	0.37	0.92	0.05	0.06	0.37	0.19	0.42	0.21	0.82
CD at 5%	1.09	2.70	0.15	0.17	1.07	0.55	1.22	0.60	NS
Organic manures (O)									
O_1: FYM 2.5 @ t/ha	21.82	52.03	2.24	3.14	14.31	7.83	13.97	10.93	52.04
O_2: Vermicompost @ 2.5 t/ha	22.95	54.24	2.43	3.37	15.57	8.49	15.84	11.64	53.84
SEm±	0.30	0.75	0.04	0.05	0.30	0.15	0.34	0.17	0.67
CD at 5%	0.89	2.20	0.12	0.14	0.88	0.45	0.99	0.49	NS
Bio-fertilizers (B)									
B_1: No bio-fertilizer	21.94	52.01	2.28	3.18	14.46	7.90	14.32	11.03	51.99
B_2: *Rhizobium* + PSB	22.82	54.26	2.40	3.33	15.42	8.42	15.49	11.54	53.89
SEm±	0.30	0.75	0.04	0.05	0.30	0.15	0.34	0.17	0.67
CD at 5%	NS	2.20	NS	0.14	0.88	0.45	0.99	0.49	NS
Significant interaction	--	--	--	--	--	--	--	--	--
CV%	5.74	6.00	7.72	6.09	8.49	7.89	9.65	6.33	5.36

Table 2: Effect of inorganic fertilizers, organic manures and bio-fertilizers on seed and Stover yield of Greengram

Treatment	Seed yield (kg/ha)	Stover yield (kg/ha)	Harvest index (%)
Inorganic fertilizers (F)			
F_1: 50% RDF	798	1694	32.08
F_2: 75% RDF	1033	2153	32.44
F_3: 100% RDF	1258	2525	33.21
SEm±	21.55	54.57	0.72
CD at 5%	63.20	160.07	NS
Organic manures (O)			
O_1: FYM 2.5 @ t/ha	926	1910	32.61
O_2: Vermicompost @ 2.5 t/ha	1134	2338	32.54
SEm±	17.59	44.56	0.58
CD at 5%	51.60	130.70	NS
Bio-fertilizers (B)			
B_1: No bio-fertilizer	954	2024	32.02
B_2: *Rhizobium* + PSB	1106	2224	33.14
SEm±	17.59	44.56	0.58
CD at 5%	51.60	130.70	NS
Significant interaction	FxOxB	--	--
CV%	7.25	8.90	7.62

Table 3: Interaction effect of inorganic fertilizers, organic manures and bio-fertilizers on seed yield of greengram

Treatment	B_1	B_2
F_1O_1	683	760
F_1O_2	800	950
F_2O_1	816	983
F_2O_2	1050	1283
F_3O_1	1023	1290
F_3O_2	1350	1370
S.Em±	43.09	
CD at 5%	126.40	

References

1. Beniwal V, Tomer A. Effect of integrated nutrient management on growth parameters of blackgram (*Vigna mungo* L.). Int J Curr Microbiol Appl Sci. 2019;8(6):2045-2053.
2. Desai NB, Leva RL, Khadadiya MB, Patel UJ. Integrated nutrient management in Rabi Indian bean (*Dolichos lablab* L.). J Pharmacogn Phytochem. 2020;9(4):457-459.
3. Dongare DM, Pawar GR, Murumkar SB, Chavan DA. To study the effect of different fertilizer and biofertilizer levels on growth and yield of summer greengram. Int J Agric Sci. 2016;12(2):151-157.
4. Dubey SK, Gupta PK. Bio-organic fertilizers for improving productivity of legumes in vertisols of M.P. Fertilizers News. 1996;41(8):33-39.
5. Gomez KA, Gomez AA. Statistical Methods for Agricultural Research. John Wiley and Sons; c1984. p. 139-264.
6. Jat SK, Sivay YS, Parihar CM, Meena HN. Evaluation of summer legumes for their economic feasibility, nutrient accumulation and soil fertility. J Food Legumes. 2012;25:239-242.
7. Joshi JR, Patel VM, Basrad HL, Macwan SM, Ehsas J. Effect of land configuration and fertilizer management practices on growth, yield and yield attributes and economics of summer cowpea (*Vigna unguiculata* L.) under south Gujarat condition. Int J Curr Microbiol Appl Sci. 2018;7(1):1148-1155.
8. Kumar V, Singh SY. Integrated nutrient management an ideal approach for enhancing agricultural production and productivity. Indian J Fertilizer. 2010;1(6):41-53.
9. Masclaux DC, Reisdorf CM, Pageau K, Lelandais M, Grandjean O, Kronenberger J, *et al*. Glutamine synthetase glutamate synthase pathway and glutamate dehydrogenase play distinct role in the sink-source nitrogen cycle in tobacco. Plant Physiology. 2006;140(2):444-456.
10. Mehetre AN, Suryawanshi GB, Surve US, Panchal VV. Yield, nutrient uptake and available nutrient of soybean as influenced by organic and inorganic nutrient management. Bull Environ Pharmacol Life Sci. 2019;8(7):11-17.
11. Nadeem MA, Singh V, Dubey RK, Pandey AK, Singh B, Kumar N, *et al*. Influence of phosphorus and bio-fertilizers on growth and yield of cowpea [*Vigna unguiculata* (L.) Walp.] in acidic soil of NEH region of India. Legume Res. 2016:1-4.
12. Pargi KL, Leva RL, Vaghasiya HY, Patel HA. Integrated nutrient management in summer cowpea (*Vigna unguiculata* L.) under south Gujarat condition. Int J Curr Microbiol Appl Sci. 2018;7(9):1513-1522.
13. Pathama J, Sakthivel N. Microbial diversity of vermicompost bacterial and exhibit useful agricultural traits and waste management potential. SpringerPlus. 2012:26.
14. Prajapati SK. Effect of integrated nutrient management on growth, yield, quality and economics of summer green gram [*Vigna radiata* (L.) Wilkzek]. Thesis submitted to Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur. 2014.
15. Priyadarshini S, Rawat GS, Dwibedi SK. Effects of levels of primary plant nutrients and spacing on growth and yield attributes of some promising varieties of cluser bean (*Cyamosis tetragonoloba* L.). Int J Curr Microbiol Appl Sci. 2017;6(12):17-27.
16. Sharma V, Abraham T. Response of blackgram (*Phaseolus mungo*) to nitrogen, zinc and farmyard manure. Legume Res. 2010;33(4):295-298.
17. Shroti SK, Pathak A, Tiwari A, Gupta A, Chauhan SK. Morphological, physiological and yield analysis of black gram under different levels of FYM, PSB and phosphorus. Int J Chem Stud. 2018;6(3):403-411.
18. Singh G, Choudhary P, Meena BL, Rawat RS, Jat BL. Integrated nutrient management in blackgram under rainfed condition. Int J Recent Sci Res. 2016;7(10):13875-13894.
19. Tyagi PK, Singh VK. Effect of integrated nutrient management on growth, yield, and nutrients uptake of summer blackgram (*Vigna mungo*). Ann Plant Soil Res. 2019;21(1):30-35.
20. Tyagi PK, Upadhyay AK. Effect of integrated nutrient management on yield, quality, nutrients uptake and economics of summer greengram. Ann Plant Soil Res. 2015;17(3):242-247.
21. Yadav JK, Sharma M, Yadav RN, Yadav SK, Yadav S. Effect of different organic manure on growth and yield of chickpea (*Cicer arietinum* L.). J Pharmacogn Phytochem. 2017;6(5):1857-1860.