

**EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH
PARAMETERS, YIELD ATTRIBUTES AND YIELD OF SUMMER GREENGRAM
(*Vignaradiata*L.) UNDER SOUTH GUJARAT CONDITION**

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ABSTRACT

*A field experiment was conducted at College Farm, N.M. College of Agriculture, Navsari Agricultural University, Navsari during the summer 2013 to study the “Effect of integrated nutrient management on growth parameters, yield attributes and yield of summer greengram (*Vignaradiata* L.) under South Gujarat condition”. The experiment results revealed that application of 100 % RDF (20-40-00 kg/ha NPK) recorded significantly higher plant height (59.61 cm) , number of branches per plant (3.92), number of seed per pod (18.60), number of pod per plant (8.25) and test weight (38.26 gm) as well as in seed yield (1000 kg/ha) and stover yield (2668 kg/ha). Also, the application of biocompost(5t/ha) found significantly superior as compared with application of FYM (5 t/ha)with respect to growth parameters, yield attributes and yield. Similarly, dual inoculation of rhizobium and PSB significantly increased seed and stover yield of greengram as compared to without inoculation. Highest net realization (₹ 66284/ha) was obtained under the treatment R₃ (100% RDF) with the BCR value of 3.86 followed by the treatment R₂ (75% RDF) which recorded the net realization of ₹ 57977/ha with the BCR value of 3.46. The highest net realization (₹ 60223/ha) was recorded under the treatment O₂ (Biocompost @ 5t/ha) with the BCR value of 3.49 followed by the treatment O₁ (FYM @ 5t/ha) with lower net realization of ₹ 51250/ha and BCR value of 3.15. Highest net realization (₹ 58294/ha) was obtained under the treatment B₁ (rhizobium + PSB) with the BCR value of 3.45, which was higher as compared to control.*

KEY WORDS: *Economics, greengram, growth parameters, Integrated Nutrient Management, Yield*

INTRODUCTION

Pulses constitute an important group of crops in Indian agriculture, as they restore soil fertility, improve physical condition of soil and provide nutritious food and fodder. Increasing yield of pulse crops should be the top priority to fill up the existing gap in the requirement

and availability of pulses. Excess and indiscriminate use of synthetic agro-chemicals has resulted in deterioration of natural resources by polluting crop environment leading to unsustainable productivity of land. The deteriorating productivity was found to be associated with deterioration of soil physical and

biological qualities besides imbalance in nutrient management.

Greengram is an important pulse crop of India, as it is grown an area of 3.44 million hectares with total production of 1.4 million tonnes and productivity of 406.98 kg/ha. In India, major greengram producing states are Odissa, Madhya Pradesh, Rajasthan, Maharashtra, Gujarat and Bihar. In Gujarat, it is cultivated in about 2.3 lakh hectares with an annual production of 1.21 lakh tonnes and average productivity of 526.09 kg /ha(Anonymous, 2011).

The unprecedented like in cost of chemical fertilizers in the recent past has adversely affected consumption of chemical fertilizers and has aggravated the problems. Further, it is now being realized that no single nutrient source could fully meet the nutritional requirement of crop. Moreover, injudicious use of chemicals enhanced the soil and plant health problems. In this context, use of alternative sources of plant nutrients such as bio-fertilizers and organic manures are the need of the time.

Among various bio-fertilizers, *rhizobium* inoculation is a cheapest, easiest and safest way of supplying nitrogen to green gram through well known symbiotic nitrogen fixation process. Phosphate Solublizing Bacteria (PSB) have the consistent capacity to increase the availability of phosphate to plant by mineralizing organic phosphorus compounds. Manures contribute to the fertility of the soil by adding organic matter and nutrients, such as nitrogen, that are trapped by bacteria in the soil. FYM and biocompost helps for better crop yield by improving soil fertility and soil structure. Hence, adoptions of appropriate nutrient management

strategies hold a great potential in boosting the greengram yield in a suitable manner. Therefore, integrated nutrient management is crucial not only for increasing the yield, but also for the improvement of soil health. Keeping all these factors in view, the present research work entitled “Effect of integrated nutrient management on growth parameters, yield attributes and yield of summer greengram (*Vignaradiata*L.) under South Gujarat condition” was planned.

MATERIALS AND METHODS

The field experiment was conducted during the summer 2013 at College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat. The experimental soil was clay in texture, low in available nitrogen (237.15 kg/ha), medium in available phosphorus (15.78 kg/ha), medium in available sulphur (24.01kg/ha) and slightly alkaline in reaction (pH 7.7). Total twelve treatment combinations consisting of three levels of inorganic fertilizer (R₁: 50 per cent RDF, R₂: 75 per cent RDF and R₃: 100 per cent RDF i.e. 20-40-00 kg NPK/ha), two sources of organic manure (O₁:FYM @ 5t/ha and O₂:Biocompost @ 5t/ha) and two treatments of biofertilizers (B₁: no seed inoculation, B₂:*rhizobium* + Phosphate solubilizing bacteria (PSB) seed inoculation) were evaluated in factorial randomized block design with three replications. Greengram cv. Meha was sown with spacing of 30 cm x 10 cm on 5th March and harvested on 3rd June, 2013. Other cultural practices and plantprotection measures were taken as per recommendations. The data on plant height, number of branches / plant, number of pods / plant and number

of seeds/pod were recorded from randomly selected five plants in each netplot as well as seed and stover yield recorded from net plot and converted on hectare basis. The data related to each parameter of the experiment were statistically analyzed using MSTATC software. The purpose of analysis of variance was to determine the significant effect of treatments on greengram. LSD test at 5% probability level was applied when analysis of variance showed significant effect for treatments (Steel and Torrie, 1980). The net realization was calculated by deducting the total cost of cultivation from the gross realization for each treatment. The benefit cost ratio (BCR) was calculated on the basis of the formula given below:

$$\text{BCR} = \frac{\text{Net realization (₹/ha)}}{\text{Cost of cultivation (₹/ha)}}$$

RESULTS AND DISCUSSION

Effect of inorganic fertilizer

At harvest, treatment having 100% RDF (R₃) recorded significantly the highest plant height (59.61 cm) and number of branches (3.92), which was found statistically at par with treatment having 75% RDF (R₂) (56.36 cm) and (3.71) (Table 1). This might be due to favourable function of nitrogen being a major structural constituent of cell helps in stimulating the cell division and cell enlargement, which increased plant height as well as number of branches. Similar results are in accordance with the findings of Yakadriet *al.* (2004) and Ghanshyamet *al.* (2010). Significantly highest number of pods per plant (18.60), seed per pod (8.25) and test weight (38.26) was recorded with application of 100% RDF (R₃) as compared to all the treatments having except treatment having 75% RDF found statistically at par for number of seeds per pod (Table 1). The treatment R₃ i.e. 100 % RDF recorded significantly higher

seed yield, stover yield, harvest index (1000 kg/ha, 2668 kg/ha, 27.41 %, respectively), which was comparable with the treatment R₂ i.e. 75 % RDF (896 kg/ha, 2555 kg/ha, 26.08 %, respectively) (Table 1). This was largely attributed to better growth of plant which resulted in adequate supply of photosynthates for development of sink under higher level of inorganic fertilizer. Positive response in terms of yield attributes to inorganic fertilizers has also been reported by Singh *et al.*, (2009) and Patel (2012) with respect to yield attributes and yield characters.

Effect of organic manure

Plot treated with biocompost @ 5t/ha (O₂) recorded significantly the highest plant height (56.93 cm), number of branches per plant (3.65), number of pod per plant (17.06), number of seeds per pod (7.94), test weight (37.01g), seed yield (929 kg/ha) and stover yield (2575 kg/ha) as compared to the treatment having application of FYM @ 5 t/ha (O₁) (Table 1). This might be due to the favourable effect of biocompost on chemical physical and biological properties of soil leads to easy availability of nutrients might have reflected in higher growth parameter and yield attributes. Data revealed that the harvest index was not influenced by different organic manures.

Effect of biofertilizer

Seed treated with *rhizobium* + PSB (B₁) recorded significantly the highest plant height (57.14 cm), number of branches per plant (3.86), number of pods per plant (17.08), number of seeds per pod (7.94), test weight (37.27 gm), seed yield (901 kg/ha) and stover yield (2517 kg/ha) as compared to no seed inoculation with biofertilizer (Table 1). This might be due to dual inoculation

benefited the plants by providing atmospheric N and rendering the insoluble phosphorus into available form. The enhanced availability of P favoured N fixation and rate of photosynthesis and consequently led to better plant height and branches per plant. Almost similar findings were also reported by Sahay *et al.* (2011) in urdbean and Patel (2012) in mungbean. The harvest index did not reach to the level of significance due to the effect of various biofertilizers treatments.

Interaction effect

Interaction effects of inorganic fertilizers, organic manure and biofertilizer were found to be absent on plant height, number of branches, number of pod per plant, number of seed per pod, test weight, stover yield and harvest index, while seed yield found significant due to interaction.

Data presented in Table 2 revealed that the treatment combination $R_3O_2B_1$ (100 per cent RDF along with biocompost @ 5t/ha and seed inoculation with *rhizobium* + PSB) recorded significantly higher seed yield (1071 kg/ha) and it was found statistically at par with the treatment combinations $R_3O_2B_0$, $R_3O_1B_1$, $R_3O_1B_0$ and $R_2O_2B_1$. The lowest seed yield (626 kg/ha) was recorded with treatment combination $R_1O_1B_0$ (50 per cent RDF along with FYM 5t/ha and without biofertilizer inoculation). Similar findings were also reported by Beg and Singh (2009), Tanvare *et al.* (2010) and Patel (2012) with respect to seed yield.

Economics

A perusal of data presented in Table 3 revealed that the highest net realization (₹ 66284/ha) was obtained under the treatment R_3 (100% RDF) with the BCR value of 3.86 followed by the treatment R_2

(75% RDF) which recorded the net realization of ₹ 57977/ha with the BCR value of 3.46. Similar results were also reported by Saini and Chongtham (2011) and Patel (2012) with respect to higher net income and BCR. The highest net realization (₹ 60223/ha) was recorded under the treatment O_2 (Biocompost @ 5t/ha) with the BCR value of 3.49 followed by the treatment O_1 (FYM @ 5t/ha) with lower net realization of ₹ 51250/ha and BCR value of 3.15. A perusal of data presented in Table 3 also revealed that the highest net realization (₹ 58294/ha) was obtained under the treatment B_1 (*rhizobium* + PSB) with the BCR value of 3.45 which was higher as compared to control. Similar results were obtained by Beg and Singh (2009) and Patel *et al.* (2010).

CONCLUSION

From the results, it can be evident that application of 100 % RDF (20-40-00 kg/ha NPK) recorded significantly higher plant height, number of branches per plant, number of seed per pod, number of pod per plant and test weight as well as in seed yield and stover yield. Also, the application of biocompost (5 t/ha) found significantly superior as compared with application of FYM (5 t/ha) with respect to growth parameters, yield attributes and yield. Similarly, dual inoculation of *rhizobium* and PSB significantly increased seed and stover yield of greengram as compared to without inoculation.

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Table 1: Effect of various inorganic fertilizer, organic manure and biofertilizer on growth, yield attributes and yield of summer greengram.

Treatments	Plant Height(cm)	Number of Branches	Number of Pod Per Plant	Number of Seed Per Pod	Test Weight (gm)	Seed Yield (Kg/ha)	Stover Yield (kg/ha)	Harvest Index (%)
(A) Inorganic Fertilizer								
R₁ 50% RDF	50.65	3.02	13.25	7.17	33.84	711	2088	25.41
R₂ 75% RDF	56.36	3.71	16.54	7.74	36.08	896	2555	26.08
R₃ 100% RDF	59.93	3.92	18.60	8.25	38.26	1000	2668	27.41
S.Em.±	1.04	0.07	0.43	0.18	0.53	18.44	97.53	0.54
CD at 5%	3.07	0.22	1.25	0.53	1.58	54.11	286.07	1.59
(B) Organic Manure								
O₁(FYM 5t/ha)	54.15	3.45	15.19	7.50	35.10	809	2299	26.00
O₂(Biocompost 5t/ha)	56.93	3.65	17.06	7.94	37.01	929	2575	26.61
S.Em.±	0.93	0.06	0.35	0.14	0.44	15.06	79.63	0.44
CD at 5%	2.74	0.18	1.02	0.43	1.29	44.18	233.57	NS
(C) Biofertilizer								
B₀(No inoculation)	53.94	3.23	14.56	7.49	34.85	837	2357	26.16
B₁(<i>Rhizobium</i> + PSB)	57.14	3.86	17.69	7.94	37.27	901	2517	26.44
S.Em.±	0.93	0.06	0.35	0.14	0.44	15.06	79.63	0.44
CD at 5%	2.74	0.18	1.02	0.43	1.29	44.18	NS	NS
Interaction Effect								
R × O	NS	NS	NS	NS	NS	NS	NS	NS
R × B	NS	NS	NS	NS	NS	NS	NS	NS
B × O	NS	NS	NS	NS	NS	NS	NS	NS
R × B × O	NS	NS	NS	NS	NS	S	NS	NS
CV %	7.15	7.43	9.21	8.24	5.18	7.35	13.86	7.14

Table 2: Seed yield (kg/ha) as influenced due to RXFXB interaction

Treatments	B ₀	B ₁
R ₁ O ₁	626	628
R ₁ O ₂	708	880
R ₂ O ₁	775	886
R ₂ O ₂	957	965
R ₃ O ₁	964	975
R ₃ O ₂	991	1071
S.E.m.±	36.89	
C.D. (P=0.05)	108.22	

Table 3: Economics of summer greengram as influenced by inorganic fertilizer, organic manure and biofertilizers

Treatment	Yield (kg/ha)		Gross Realization (₹/ha)	Cost of Production (₹/ha)	Net Realization (₹/ha)	B:C Ratio
	Seed	Stover				
A) Inorganic Fertilizer						
R ₁ (50 % RDF)	711	2088	59313	16364	42949	2.62
R ₂ (75 % RDF)	896	2555	74728	16751	57977	3.46
R ₃ (100 % RDF)	1000	2668	83422	17138	66284	3.86
B) Organic Manure						
O ₁ (FYM 5t/ha)	809	2299	67501	16251	51250	3.15
O ₂ (Biocompost 5t/ha)	929	2575	77474	17251	60223	3.49
C) Biofertilizer						
B ₀ (No biofrtilizer)	837	2357	69811	16631	53180	3.19
B ₁ (<i>Rhizobium</i> +PSB)	901	2517	75165	16871	58294	3.45

Greengram Seed : ₹ 50 /kg (Meha) Greengram Stover : ₹ 2 /kg

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