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YIELD ATTRIBUTES, YIELD AND QUALITY OF BLACK GREENGRAM (*VIGNA RADIATA* L.) AS INFLUENCED BY ORGANIC MANURES, BIOFERTILIZER AND PHOSPHORUS FERTILIZATION

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ABSTRACT

A field experiment was conducted during rabi season of 2013-14 at College Farm, Navsari Agricultural University, Navsari to study "Effect of organic manures, biofertilizer and phosphorus fertilization on growth, yield and quality of black greengram(*Vignaradiata*(L.) under south Gujarat condition". Among different organic manures, biocompost 2 t/ha (M_2) rightly dominated and established its superiority in respect to almost all yield attributes. Application of biocompost 2 t/ha (M_2) produced significantly highest seed 909 kg/ha) and straw (1771.56 kg/ha) yields over other treatments. The percent increase in seed yield with application of biocom post 2 t/ha over FYM 4 t/ha and control were 7.63 and 23.75 respectively. Crop fertilized with biocompost 2 t/ha recorded significantly highest protein content and protein yield as compared to control. Significantly the highest seed (830.36 kg/ha) and straw (1607.70 kg/ha) yields were recorded with PSB inoculation. Seed and straw yields as well as yield attributes and quality of black greengram were significantly influenced by phosphorus application. In most of characters, Application of 40 kgP_2O_5/ha showed its superiority over control. Significantly the highest seed (852.42 kg/ha) and straw (1670.5 kg/ha) yields were recorded with application of 40 kg P_2O_5/ha over control.

INTRODUCTION

Among the pulses, Greengram (*Vignaradiata* L.) is one of the most important and extensively cultivated crop in India, Which is cultivated in arid and semi arid region. Greengram is locally known as "*moong*". It contains about 25 % protein, 1.3 % fat, 3.5 % mineral,4.1 % fiber and 56.7 % carbohydrate. Further, pulses are also known to increase soil fertility and consequently the productivity of succeeding crop. It fixes atmospheric nitrogen through symbiotic nitrogen fixation with the help of bacterium called *Rhizobia* (Pareek, 1978). Therefore, adequate supply of organic manure and other nutrients is essential for proper growth and development as well as nutritional quality of black greengram. Biocompost is compost prepared through microorganisms and adds more humus to soil. Application of biocompost favourably improves the physical properties of soil. This might be due to higher addition of humus through organics (Pandey *et al*. 2007). FYM is known to play an important role in improving the fertility and productivity of soils through its positive effects on soil physical, chemical and biological properties and balanced plant nutrition (Kumar *et al*., 2011). It improves the structure and water holding capacity of soil.

Phosphate solubilizing bacteria (PSB) are a group of beneficial bacteria capable of hydrolyzing organic and inorganic phosphorus from insoluble compounds. Many heterotrophic bacteria and fungi efficiently solubilize insoluble phosphate of soil and rock phosphates. Inoculation of phosphate solubilizing micro organisms increase crop yield by 5-10%. Phosphorus is second most critical plant nutrient, but for pulses, it assumes primary importance, owing to its important role in root proliferation and thereby atmospheric nitrogen fixation. The yield and nutritional quality of pulses is greatly influenced by application of phosphorus. It plays a key role in various physiological processes like root growth and dry matter production, nodulation and nitrogen fixation and also in metabolic activities especially in protein synthesis. It also helps in establishing seedling quickly and also hastens maturity as well as improves the quality of crop produce.

In south Gujarat mostly rice-rice cropping pattern is followed and *rabi* season is left out so cultivation of green gram in *rabi* season will increase production and income. It can replace the gram crop as the yield level of *rabi moong* is high as compare to gram. Now a days black green gram is also cultivated in *rabi* season. Yield potential of black green gram is high with good nutritive value. Presently black green gram is getting popularity among the farmers of south Gujarat. Keeping in view the above consideration, the present investigation is undertaken to study the Effect of organic manures, biofertilizer and phosphorus fertilization on growth, yield and quality of black green gram (vignaradiata (L.) under south Gujarat condition.

MATERIALS AND METHODS

A field experiment was conducted at the college Farm, N.M. College of Agriculture, Navsari Agricultural University, Navsari,

during *rabi* season of 2013-14. The soil of the experimental field was clayey in texture and alkaline in reaction. The soil was low in available nitrogen, medium in available phosphorus and fairly rich in availabl potassium.The experiment were laid out in factorial randomized block design with three replications, treatment considering three levels of organic manures *viz.*, M_0 (0t/ha), M_1 (FYM @ 4 t/ha) and M_2 (bio compost @ 2 t/ha), two levels of PSB *viz.*, B_0 (no inoculation) and B_1 (inoculation) and three levels of phosphorus P_0 (0 kg P_2O_5/ha) P_1 (20 kg P_2O_5/ha), P_2 (40 kg P_2O_5/ha). The black green garm variety GBM-1 was sown by opening of furrow at distance of 30 × 10 cm. The full dose of fertilizers was applied according to the treatments manually before sowing the seeds. The source of nitrogen and phosphorus were urea and SSP, respectively All the recommended cultural practices and plant protection measures were followed throughout the experimental periods

RESULTS AND DISCUSSION

Effect of organic manures

All the yield attributing parameters like pods per plant (21.61), seeds per pod (10.57), pod length (8.05 cm) and test weight (37.91 g) were significantly improved with bio compost @ 2t/ha (M_2). This was largely attributed to better growth of plant which resulted in adequate supply of photosynthates for developement of sink. This result corroborates the findings of Patel (2014) in green gram. Application of bio compost @ 2t/ha registered significantly higher seed and stover yields over the treatment FYM @ 4 t/ha (M_1) and control (M_0). Similar results were obtained by Patel (2014) in green gram. Significantly the highest protein content was obtained under treatment bio compost 2t/ha (M_2) over control (M_0). The probable reason of increase in protein content in seed because of favorable effect of bio compost on microbial activity. Similar type of result was also observed in case of protein yield. Protein yield was remarkably highest with bio compost 2t/ha (M_2) because of protein content and seed yield were also recorded higher under the same treatment. These results are in closed conformity with the finding of Patel (2014) in case of protein yield in green gram.

Effect of PSB

Significant boost up in number of pods per plant, seeds per pod, pod length and test weight were noted with treatment of PSB inoculation (B_1) as compared to control (B_0). The maximum improvement in yield attributes was recorded with seed inoculation with PSB (B_1) treatment which may be attributed to favourable on root growth and thereby increased root activity. Similar results were obtained by Gupta *et al*. (2006) in urdbean and Parmar and Thanki (2007) in green gram. Significantly the highest seed (830.36 kg/ha) and stover (1607.70 kg/ha) yields were recorded with PSB inoculation (B_1) over control (B_0). This might be due to significant and progressive effect of PSB inoculation on yield attributes viz., number of pods per plant, number of seeds per pod, pod length and test weight. It was also observed that inoculated plants were healthy and dark green because of absorption of more nutrients from the soil. The results are in consonance with those reported by Parmar and Thanki (2007) in greengram and Tiwari *et al*.

(2011) in pigeonpea. Significantly the highest protein content (19.92) and protein yield of 166.78 kg/ha were recorded with PSB inoculation (B_1) over control (B_0). The increase in protein content was due to efficient and effective working of N fixing bacteria. Further more increased availability and uptake of nitrogen because of better nitrogen fixation and increase availability of phosphorus due to phosphate solubilising bacteria inoculation (B_1) which ultimately increased in protein yield was mainly due to highest protein content and seed yields under PSB inoculation (B_1). Similar results were obtained by Tiwari *et al*. (2011) in pigeonpea + urdbean with respect to protein content.

Effect of Phosphorus

Application of 40 kg P_2O_5/ha (P_2) significantly increased number of pods per plant, number of seeds per pod, pod

Table 1: Effect of organic manures, biofertilizer and phosphorus on yield attributes, yield and quality of black greengram

Sr No.	Number of pods per plant	Number of seeds per pod	Pod length (cm)	Test weight (g)	Seed yield (kg/ha)	Stover yield (kg/ha)	Protein content (%)	Protein yield (kg/ha)
A) Organic manures(M)								
M_0 : Control	17.86	9.97	6.68	30.52	693.16	1297.07	17.84	123.92
M_1:FYM 4t/ha	19.54	10.29	7.36	34.21	844.60	1610.43	19.64	166.00
M_2:Biocompost 2t/ha	21.61	10.57	8.05	37.91	909.00	1771.56	21.44	195.18
S.Em. ±	0.48	0.08	0.14	0.80	10.66	34.77	0.22	2.64
C.D. (P = 0.05)	1.38	0.24	0.42	2.30	30.68	100.01	0.64	7.61
B) Biofertilizer (B)								
B0: Control	19.09	10.16	7.18	33.24	800.81	1511.67	19.37	156.62
B1 : PSB inoculation	20.26	10.37	7.55	35.19	830.36	1607.70	19.92	166.78
S.Em. ±	0.39	0.07	0.12	0.65	8.71	28.39	0.18	2.16
C.D. (P = 0.05)	1.13	0.20	0.34	1.88	25.05	81.66	0.52	6.21
C) Phosphorus levels (P)								
P0 : Control	18.20	10.02	6.92	31.76	774.42	1441.24	18.93	148.08
P1 : 20 kg/ha	19.67	10.27	7.37	34.25	819.92	1567.30	19.67	162.51
P2 : 40 kg/ha	21.15	10.53	7.80	36.62	852.42	1670.52	20.33	174.51
S.Em. ±	0.48	0.08	0.14	0.80	10.66	34.77	0.22	2.64
C.D. (P = 0.05)	1.38	0.24	0.42	2.30	30.68	100.01	0.64	7.61
D) Interaction Effect	NS	NS	NS	NS	NS	NS	NS	NS
C.V %	10.37	3.47	8.35	9.93	5.55	9.46	4.78	6.94

length (cm) and test weight (g) over control (P_0). The maximum values of number of pods per plant, number of seeds per pod, pod length and test weight were noted under 40 kgP_2O_5/ha (P_2) over control (P_0). These results were in accordance with those reported byPatil *et al*. (2011), Bairwa *et al*. (2012) and Kumawat *et al*. (2013).Significantly the highest yields of seed (852.42 kg/ha) and stover (1670.52 kg/ha) were recorded under 40 kgP_2O_5/ha (P_2) over control (P_0). Phosphorus is important for early root development, manufacture and translocation of food material in plant body which resulted in better uptake of nutrients and this turn to higher seed and stover yields. These results were in agreement with those of Mahetele and Kushwaha (2011), Bairwa *et al*. (2012), Kumawat *et al*. (2013), Patel *et al*. (2013),Tomar *et al*. (2013)Kokani *et al*. (2015).

Significantly higher protein content (20.33 per cent) and protein yield (174.51 kg/ha) were noted under 40 kgP_2O_5/ha (P_2) over control (P_0). The increase in protein content with increased phosphorus levels was probably due to efficient and effective working of N-fixing bacteria. Moreover, the increased availability of phosphorus might have favorably influenced the nitrogen uptake by plants and ultimately accumulated in seeds as protein. Further better root development which ultimately resulted in more uptake and provide more space for root nodulation. The increase in protein yield was mainly due to higher protein content in black green gram seed and proportionally higher seed yield under 40 kgP2O5/ha (P_2). Similar results were obtained by Soni and Gupta(1999) and Vikrant *et al*. (2005).

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