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**Patel BN**
MSc Scholar, Dept. of Soil Science & Agril, Chemistry, NMCA, Navsari, Gujarat, India

**Patel KH**
Associate Professor, Dept. of Soil Science & Agril, Chemistry, NAU, Bharuch Campus, Gujarat, India

**Narendra Singh**
Assistant Research Scientist, Department of Soil Science, NAU, Navsari, Gujarat, India

**Alok Shrivastava**
Associate Professor, Dept. of Statistics, College of Agriculture, NAU, Bharuch Campus, Gujarat, India

**Corresponding Author:**
**Narendra Singh**
Assistant Research Scientist, Department of Soil Science, NAU, Navsari, Gujarat, India

# Effect of phosphorus, FYM and bio-fertilizer on yield and nutrient content of summer greengram (*Vigna radiate* L.)

**Patel BN, Patel KH, Narendra Singh and Alok Shrivastava**


## Abstract

A field experiment was conducted during 2018 to study the effect of phosphorus, FYM and bio-fertilizer on yield and quality of greengram. There were twelve treatments comprising of three phosphorus levels [Control ($P_0$), 20 kg $P_2O_5$ ha$^{-1}$ ($P_1$) and 40 kg $P_2O_5$ ha$^{-1}$ ($P_2$)] combined with two FYM levels [control ($F_0$) and 5 t FYM ha$^{-1}$($F_1$)] along with two levels of bio-fertilizer [control ($B_0$) and PSB inoculation ($B_1$)]. Phosphorus applied in the form of SSP and PSB as seed inoculation. The experiment was laid out in factorial RBD with three replications. The recommended dose of N was applied uniformly to all the treatments. Seed yield and stover yield of greengram was significantly increased by the phosphorus, FYM and bio-fertilizer treatments. The increased in seed yield due to $P_2$ and $P_1$ over $P_0$ (797.6 kg ha$^{-1}$) was 18.98 and 10.97 per cent, respectively. The treatment $F_1$ increased the seed yield by 14.55 per cent and $B_1$ increased 12.65 per cent, over their respective control $F_0$ (817.7 kg ha$^{-1}$) and $B_0$ (825.0 kg ha$^{-1}$).Similar trend in stover yield was noted by phosphorus, FYM and bio-fertilizer treatments. The interaction of P x F x B effect was significant on seed and stover yield indicate that nutrient use efficiency of P was higher when phosphorus was applied along with organic FYM @ 5 t ha$^{-1}$ and PSB inoculation to the seed. Nutrient content (N, P, K, Ca, Mg, S, Fe, Mn, Zn and Cu) was studied in both seed and stover. N in seed and stover was influenced by all three treatments. Phosphorus was significantly influenced in seed and stover by only phosphorus application.


**Keywords:** Phosphorus, FYM, PSB, yield, content

## 1. Introduction

Greengram (*Vigna radiata* L.) occupies prime position among pulses by virtue of its short growth period, high tonnage capacity and outstanding nutrient value as food, feed and forage. Among the pulses, greengram is one of the most important and extensively cultivated pulse crops. In India, greengram occupies an area of about 3.51 million hectares producing 1.80 million tonnes with the productivity of 511 kg ha$^{-1}$ (Anonymous, 2012) [2], whereas in Gujarat it is grown over 2.40 lakh hectares with production of 1.28 lakh tonnes and productivity of 525 kg ha$^{-1}$ (Anonymous, 2012a) [3].

Phosphorus (P) is one of the most needed elements for pulse production. Phosphorus, although not required in large quantities, is critical to green gram yield because of its multiple effects on nutrition. Phosphorus 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.

Farm yard manure (FYM) application to the crop is an age old practice. The yield and nutritional quality of green gram is greatly improved by application of FYM and nutrient elements. 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 of soils and balanced plant nutrition.

Phosphorus solubilizing microorganisms (bacteria and fungi) enable P to become available for plant uptake after solubilization. Several soil bacteria, particularly those belonging to the genera Bacillus and Pseudomonas and fungi belonging to the genera Aspergillus and Penicillium possess the ability to bring insoluble phosphates in soil into soluble forms by secreting organic acids such as formic, acetic, propionic, lactic, glycolic, fumaric, and succinic acids. These acids lower the pH and bring about the dissolution of bound forms of phosphates.

Very high cost of phosphatic fertilizer also demand the need for recycling and exploitation of fixed phosphorus to improve crop production. The availability of phosphorus to the crop can be augmented by providing appropriate strains of microbes which are known to solubilise the fixed phosphorus and mobilize the deeply placed phosphorus to root zone by their activity. Besides increasing the availability of native P in the soil also help in enhancing the use efficiency of applied phosphorus (Thenua and Kumar, 2007) [15]. FYM additions were also found to mobilize the fixed phosphates in the soil thus increasing the available P to crops (Venkateswarlu, 2000) [16].

## 2. Materials and Methods

A field experiment was conducted during summer season of 2018 at the college farm, Navsari Agricultural University, Navsari to study the "Phosphorus Management in greengram (*Vigna radiate* L.) under south Gujarat condition.". The soil of the experimental field was clay in texture having medium to poor drainage, medium in available nitrogen, available phosphorus and potash. Total twelve treatment combinations comprising of all possible treatments of three levels of phosphorus *viz*., $P_0$ (0 kg $P_2O_5$ ha-$^1$), $P_1$ (20 kg $P_2O_5$ ha-$^1$) and $P_2$ (40 kg $P_2O_5$ ha-$^1$), two levels of FYM *viz*., $F_0$ (0 t ha$^{-1}$) and $F_1$ (5 t ha$^{-1}$) and two levels of bio-fertilizer *viz*., $B_0$ (No inoculation) and $B_1$ (PSB inoculation) were tested in factorial randomized block design with three replications. Greengram variety Meha was sown by opening of furrow at a distance of 30 x 10 cm. The full dose of fertilizers was applied according to the treatments manually before sowing the seeds. PSB was applied as seed inoculation. The phosphorus was SSP. All the recommended cultural practices and plant protection measures were followed throughout the experimental periods.

## 3. Result and Discussion

### 3.1 Effect of phosphorus

The seed yield of greengram was significantly influenced by the effect of phosphorus. Application of 40 kg $P_2O_5$ ha$^{-1}$ ($P_2$) recorded significantly higher seed yield (949.0 kg ha$^{-1}$) over control ($P_0$) (797.6 kg ha$^{-1}$). Application of 20 kg $P_2O_5$ ha$^{-1}$ ($P_1$) recorded significantly higher seed yield (885.1 kg ha$^{-1}$) over control $P_0$. However, seed yield recorded under $P_2$ and $P_1$ were at par. The percentage increase in seed yield due to $P_2$ and $P_1$ over $P_0$ was 19.0 and 11.0 respectively.

Nitrogen and phosphorus content in seed and stover was significantly influenced by the application of phosphorus. N and P content was observed higher in treatment $P_2$ in both seed and stover. In the present study phosphorus significantly increased availability of nitrogen which could have resulted in significant increase in N content in seed due to the fact that plant absorbed proportionately high amount of N as the pool of available phosphorus increased in the soil by adding higher doses of phosphorus. These result supported by research finding of Kumawat *et al.* (2014) [9] and Das (2017) [6].

All other nutrient content (K, Ca, Mg, S, Fe, Mn, Zn and Cu) was not significantly influenced by the application of phosphorus.

### 3.2 Effect of FYM

Seed yield of the greengram was significantly influenced by FYM application. Seed yield significantly increased with application of FYM @ 5 t ha$^{-1}$ ($F_1$) over control ($F_1$). The highest seed yield (936.7 kg ha$^{-1}$) was recorded by $F_1$. The percentage increase in seed yield due to $F_1$ over $F_0$ was 14.6. In the present investigation significant increase in No. of nodules per plant, protein content, N, K, S, Fe and Zn content were observed due to FYM application. FYM application generally improves physical, chemical and biological properties of soil and thereby increases productivity. Further application of FYM helps in increasing availability of major and micro nutrient. The above findings are in complete agreement with research reported by Shete *et al.* (2011) [14] and Rekha *et al.* (2018).

An appraisal of data indicated that effect of farm yard manure on stover yield was found significant. Treatment $F_1$ (FYM 5 t ha$^{-1}$) recorded significantly higher stover yield (2155.5 kg ha$^{-1}$) of greengram over treatment $F_0$ Control *i.e.*1874.4 kg ha$^{-1}$. Application of FYM @ 5 t ha$^{-1}$ ($F_1$) produced significantly higher stover yield which was to the tune of 14.99 per cent higher as compared to control ($F_0$). The results for stover yield are similar to those of seed yield. The effect of FYM on seed yield was discussed earlier. The discussion holds true for the results of stover yield affected by FYM. In the case of FYM, there were N content in seed and stover, K content in seed and stover, S content in seed, Fe content in seed and stover and Zn content in seed and stover significantly increased in greengram. In the present study, availability of nutrients was increased due to FYM supplementation, which could have increased the nutrient content in greengram. Improvement in soil physicochemical properties through incorporation of FYM resulted in increasing the availability of nutrients. These resultsare in accordance Ranpariya *et al.* (2017) [12] and Rekha *et al.* (2018).

### 3.3 Effect of bio-fertilizer

Data presented in Table 1 revealed that seed yield of greengram found significantly influenced by PSB inoculation. Significantly higher seed yield was recorded under inoculation of PSB ($B_1$) (929.4 kg ha$^{-1}$) over control ($B_0$) (825.0 kg ha$^{-1}$).Percentage increasing in the seed yield under the treatment $B_1$ over $B_0$ was 12.65. This result could be attributed due to PSB solubilized the unavailable form of P leading to more uptake of nutrients and reflected in significantly higher no. of nodules per plant, protein content and N content which resulted in increase in growth and seed yield of greengram. Similar earlier research findings were also reported by Ade *et al.* (2018) [1] and Bhavya *et al.* (2018) [4].

An appraisal of data showed that stover yield were significantly influenced by PSB inoculation. Significantly higher stover yield was recorded under treatment $B_1$ (2138.2 kg ha$^{-1}$) (PSB inoculation), over treatment $B_0$ (1891.7 kg ha$^{-1}$).Treatment $B_1$ increase stover yield by 13.03 per cent over control $B_0$. The results of PSB inoculation on stover yield are similar to those of seed yield. The effect of bio-fertilizer on seed yield was discussed earlier. The discussion holds true for the results of stover yield affected by PSB inoculation.

In the case of bio-fertilizer, inoculation of PSB only significantly influenced nitrogen content in seed. N content in seed was increased by 5.48 % over control. This is due to inoculation of PSB improve the root system of greengram plant and increase the nodulation in root, so plant can easily fix the N and increase the N uptake resulted in higher N content in seed of greengram. Similar result were reported by Rani *et al.* (2016) [11] and Dhakal *et al.* (2016) [7].

### 3.4 Interaction effect

Data presented in Table 3 revealed that the treatment combination of $P_2F_1B_1$ (40 kg $P_2O_5$ ha$^{-1}$, 5 t ha$^{-1}$ FYM along with PSB inoculation) recorded significantly the higher seed yield (1103.3 kg ha$^{-1}$) as compared to rest of the treatment combinations but it was at par with $P_1F_1B_1$ (1073.8 kg ha$^{-1}$). Treatment $P_2F_1B_1$ recorded 35.1 per cent higher seed yield over $P_2F_0B_0$ similarly $P_1F_1B_1$ recorded 31.8 per cent higher seed yield than $P_1F_0B_0$. In the present investigation, the effect of phosphorus significantly increased in the presence of FYM and PSB inoculation. These results revealed a distinct synergistic interaction between phosphorus, FYM and PSB inoculation. Decomposition of FYM is known to supply numerous chelating agents that aid in maintaining the solubility of nutrients. Chelation can help in increasing the solubility, in exchange and release of ions and slow release of ions to the crop (Rekha *et al.*, 2018). Phosphorus fertilizer application increases the root development of greengram and increase the availability of macro and micronutrient to the crop (Kumar *et al.* 2012 and Patel *et al.* 2013) [8, 10]. PSB help in the solubilization activity of phosphorus which bound with Ca, Fe and Al in the soil and get available to the greengram (Rathour *et al.* 2015) [13]. The concentration of nutrients, particularly of P and N in solution and quantity transported to the root by mass flow and diffusion could have greatly increased through complexation of phosphatic fertilizer with FYM as a chelating compound and PSB in the soil.

Data presented in Table 2 revealed that the treatment combination of $P_2F_1B_1$ was recorded significantly higher stover yield (2548 kg $ha^{-1}$) as compared to rest of the treatment combination but it was at par with $P_1F_1B_1$ (2479 kg $ha^{-1}$). Whereas, the lowest stover yield (1619 kg $ha^{-1}$) was recorded under the $P_0F_0B_0$. These results may be due to the synergetic effect of phosphatic fertilizer with FYM and PSB. The result of interaction P x F x B on stover yield were similar to those of seed yield. There for reasoning and discussion given for seed yield holds true for stover yield also.

**Table 1:** Yield and macro nutrient content as influenced by phosphorus, FYM and bio-fertilizer

| **Treatments** | **Seed yield (kg $ha^{-1}$)** | **Stover yield (kg $ha^{-1}$)** | **N content (%)** | | **P content (%)** | | **K content (%)** | | **Ca content (%)** | | **Mg content (%)** | | **S content (%)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Seed** | **Stover** | **Seed** | **Stover** | **Seed** | **Stover** | **Seed** | **Stover** | **Seed** | **Stover** | **Seed** | **Stover** |
| **Phosphorus (P)** | | | | | | | | | | | | | | |
| $P_0$ – 0 $P_2O_5$ kg $ha^{-1}$ | 797.6 | 1826.9 | 2.847 | 0.812 | 0.602 | 0.527 | 0.950 | 1.134 | 1.165 | 0.621 | 0.256 | 0.332 | 0.147 | 0.096 |
| $P_1$ – 20 $P_2O_5$ kg $ha^{-1}$ | 885.1 | 2033.6 | 3.032 | 0.865 | 0.646 | 0.546 | 0.961 | 1.148 | 1.188 | 0.638 | 0.261 | 0.341 | 0.151 | 0.099 |
| $P_2$ – 40 $P_2O_5$ kg $ha^{-1}$ | 949.0 | 2184.3 | 3.219 | 0.918 | 0.648 | 0.554 | 0.978 | 1.170 | 1.204 | 0.646 | 0.267 | 0.345 | 0.152 | 0.102 |
| S.Em ± | 22.91 | 54.15 | 0.041 | 0.013 | 0.007 | 0.006 | 0.011 | 0.014 | 0.017 | 0.009 | 0.004 | 0.005 | 0.002 | 0.001 |
| CD at 5% | 67.22 | 158.8 | 0.121 | 0.039 | 0.021 | 0.018 | NS | NS | NS | NS | NS | NS | NS | NS |
| **FYM (F)** | | | | | | | | | | | | | | |
| $F_0$- 0 t $ha^{-1}$ | 817.7 | 1874.4 | 2.915 | 0.835 | 0.626 | 0.535 | 0.944 | 1.126 | 1.175 | 0.626 | 0.257 | 0.333 | 0.145 | 0.097 |
| $F_1$- 5 t $ha^{-1}$ | 936.7 | 2155.5 | 3.151 | 0.896 | 0.638 | 0.549 | 0.982 | 1.175 | 1.197 | 0.644 | 0.265 | 0.345 | 0.155 | 0.100 |
| S.Em ± | 18.70 | 44.21 | 0.034 | 0.010 | 0.006 | 0.005 | 0.009 | 0.011 | 0.014 | 0.007 | 0.003 | 0.004 | 0.001 | 0.001 |
| CD at 5% | 54.91 | 129.6 | 0.100 | 0.032 | NS | NS | 0.026 | 0.034 | NS | NS | NS | NS | 0.004 | NS |
| **Bio-fertilizer (B)** | | | | | | | | | | | | | | |
| $B_0$ – No inoculation | 825.0 | 1891.7 | 2.952 | 0.850 | 0.625 | 0.537 | 0.952 | 1.135 | 1.175 | 0.628 | 0.257 | 0.330 | 0.148 | 0.097 |
| $B_1$ – PSB inoculation | 929.4 | 2138.2 | 3.114 | 0.879 | 0.639 | 0.547 | 0.975 | 1.166 | 1.198 | 0.642 | 0.265 | 0.344 | 0.152 | 0.100 |
| S.Em ± | 18.70 | 44.21 | 0.034 | 0.010 | 0.006 | 0.005 | 0.009 | 0.011 | 0.014 | 0.007 | 0.003 | 0.004 | 0.001 | 0.001 |
| CD at 5% | 54.91 | 129.7 | 0.100 | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| **Interaction** | | | | | | | | | | | | | | |
| P×F S.Em ± | 32.40 | 76.58 | 0.059 | 0.018 | 0.010 | 0.009 | 0.015 | 0.020 | 0.025 | 0.013 | 0.006 | 0.007 | 0.002 | 0.002 |
| CD at 5% | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| P×B S.Em ± | 32.40 | 76.58 | 0.059 | 0.018 | 0.010 | 0.009 | 0.015 | 0.020 | 0.025 | 0.013 | 0.006 | 0.007 | 0.002 | 0.002 |
| CD at 5% | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| F×B S.Em ± | 26.45 | 62.52 | 0.048 | 0.015 | 0.008 | 0.007 | 0.012 | 0.0167 | 0.020 | 0.011 | 0.005 | 0.006 | 0.002 | 0.0017 |
| CD at 5% | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| P×F×B S.Em ± | 45.82 | 108.3 | 0.083 | 0.026 | 0.014 | 0.012 | 0.022 | 0.029 | 0.035 | 0.019 | 0.009 | 0.010 | 0.003 | 0.003 |
| CD at 5% | 134.4 | 317.6 | 0.244 | NS | NS | NS | NS | NS | NS | NS | NS | NS | 0.010 | NS |
| **CV (%)** | 9.05 | 9.31 | 4.75 | 5.37 | 3.90 | 4.12 | 4.01 | 4.36 | 5.16 | 5.28 | 5.92 | 5.34 | 4.10 | 5.34 |

**Table 2:** Micro nutrient content as influenced by phosphorus, FYM and bio-fertilizer

| **Treatments** | **Content in seed (mg kg $^{-1}$)** | | | | **Content in stover (mg kg $^{-1}$)** | | | |
|---|---|---|---|---|---|---|---|---|
| | **Fe** | **Mn** | **Zn** | **Cu** | **Fe** | **Mn** | **Zn** | **Cu** |
| **Phosphorus (P)** | | | | | | | | |
| $P_0$ – 0 $P_2O_5$ kg $ha^{-1}$ | 42.97 | 24.82 | 21.81 | 6.151 | 142.0 | 42.98 | 18.81 | 5.351 |
| $P_1$ – 20 $P_2O_5$ kg $ha^{-1}$ | 42.97 | 25.32 | 22.49 | 6.357 | 142.1 | 43.52 | 19.51 | 5.485 |
| $P_2$ – 40 $P_2O_5$ kg $ha^{-1}$ | 42.99 | 25.45 | 22.56 | 6.471 | 143.0 | 43.66 | 19.54 | 5.518 |
| S.Em ± | 0.57 | 0.33 | 0.30 | 0.09 | 1.82 | 0.59 | 0.26 | 0.06 |
| CD at 5% | NS | NS | NS | NS | NS | NS | NS | NS |
| **FYM (F)** | | | | | | | | |
| $F_0$- 0 t $ha^{-1}$ | 41.53 | 24.81 | 21.58 | 6.224 | 139.2 | 42.74 | 18.57 | 5.384 |
| $F_1$- 5 t $ha^{-1}$ | 44.43 | 25.58 | 23.00 | 6.429 | 145.5 | 44.02 | 20.01 | 5.518 |
| S.Em ± | 0.47 | 0.27 | 0.25 | 0.07 | 1.48 | 0.49 | 0.21 | 0.05 |
| CD at 5% | 1.37 | NS | 0.72 | NS | 4.4 | NS | 0.61 | NS |
| **Bio-fertilizer (B)** | | | | | | | | |
| $B_0$ – No inoculation | 42.30 | 24.93 | 21.98 | 6.230 | 140.3 | 42.99 | 18.99 | 5.390 |
| $B_1$ – PSB inoculation | 43.66 | 25.47 | 22.61 | 6.428 | 144.4 | 43.78 | 19.59 | 5.511 |
| S.Em ± | 0.47 | 0.27 | 0.25 | 0.07 | 1.48 | 0.49 | 0.21 | 0.05 |
| CD at 5% | NS | NS | NS | NS | NS | NS | NS | NS |
| **Interaction** | | | | | | | | |
| P×F S.Em ± | 0.81 | 0.47 | 0.43 | 0.13 | 2.57 | 0.84 | 0.36 | 0.08 |
| CD at 5% | NS | NS | NS | NS | NS | NS | NS | NS |
| P×B S.Em ± | 0.81 | 0.47 | 0.43 | 0.13 | 2.57 | 0.84 | 0.36 | 0.08 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CD at 5% | NS | NS | NS | NS | NS | NS | NS | NS |
| F×B S.Em ± | 0.66 | 0.39 | 0.35 | 0.10 | 2.10 | 0.69 | 0.30 | 0.06 |
| CD at 5% | NS | NS | NS | NS | NS | NS | NS | NS |
| P×F×B S.Em ± | 1.14 | 0.67 | 0.60 | 0.18 | 3.63 | 1.19 | 0.51 | 0.11 |
| CD at 5% | NS | NS | NS | NS | NS | NS | NS | NS |
| CV (%) | 4.61 | 4.59 | 4.68 | 4.85 | 4.42 | 4.75 | 4.61 | 3.57 |

There were N content in seed and sulphur content in seed was significantly influenced by the interaction effect between phosphorus, FYM and bio-fertilizer.

In the case of N content in seed (table 2) $P_2F_1B_1$ combination yielded significantly higher N content (3.43 %) which were at par withcombinations$P_1F_1B_1$ and $P_1F_1B_0$. This result could be attributed due to synergistic effect of phosphorus with FYM and PSB inoculation.

In the case of S content in seed interaction between phosphorus, FYM and bio-fertilizer (PxFxB) produced significant effect. The combination of $P_1F_1B_1$ gave a significantly higher S content (0.17%). which was at par with value of $P_2F_1B_1$ and $P_0F_1B_0$. The combination of $P_0F_0B_0$ showed lowest (0.14%) S content in seed. The result revealed that the synergistic effect of FYM with phosphorus and PSB inoculation increase the S content in seed of greengram.

**Table 3:** P x F x B interaction effect on seed yield, stover yield and nutrient content of greengram

| Treatments | Seed yield (kg ha$^{-1}$) | Stover yield (kg ha$^{-1}$) | N content in seed | S content in seed |
|---|---|---|---|---|
| $P_0F_0B_0$ | 709.6 | 1619.1 | 2.66 | 0.14 |
| $P_0F_0B_1$ | 816.9 | 1872.7 | 2.84 | 0.15 |
| $P_0F_1B_0$ | 829.5 | 1902.5 | 2.91 | 0.16 |
| $P_0F_1B_1$ | 834.2 | 1913.4 | 2.98 | 0.15 |
| $P_1F_0B_0$ | 814.7 | 1867.5 | 2.66 | 0.15 |
| $P_1F_0B_1$ | 820.1 | 1880.1 | 3.05 | 0.14 |
| $P_1F_1B_0$ | 831.8 | 1970.7 | 3.19 | 0.15 |
| $P_1F_1B_1$ | 1073.8 | 2479.3 | 3.23 | 0.17 |
| $P_2F_0B_0$ | 816.7 | 1872.2 | 3.14 | 0.15 |
| $P_2F_0B_1$ | 928.1 | 2135.0 | 3.15 | 0.15 |
| $P_2F_1B_0$ | 947.8 | 2181.6 | 3.16 | 0.15 |
| $P_2F_1B_1$ | 1103.3 | 2548.7 | 3.43 | 0.16 |
| S.Em ± | 45.82 | 108.3 | 0.083 | 0.003 |
| CD at 5% | 134.4 | 317.6 | 0.24 | 0.01 |

## 4. Conclusion

From the result of experimentation, it can be concluded that greengram (Var. Meha) should be fertilized with application of P2O5 @ 20 kg ha-1 along with FYM @ 5 t ha-1 and seed inoculation 10 ml kg-1 seed with PSB in summer season under south Gujarat condition for getting higher yield, profit and maintenance the soil fertility.

## 5. References


1. Ade UK, Dambale AS, Jadhav DB. Growth and Yield of Pigeonpea (*Cajanus cajan* L. Millsp) as Influenced by Phosphorus and Biofertilizer. Int. J Curr. Microbiol. App. Sci. 2018; 6:1427-1434.
2. Anonymous. Ministry of Agriculture and Co-operation, GOI. Agriculture Statistics at a glance, 2012a.
3. Anonymous, Economic Survey. Government of India, 2012.
4. Bhavya G, Shaker KC, Jayasree G, Reddy MM. Effect of Integrate Use of Phosphorus, PSB and Vermicompost on Acid and Alkaline Phosphatase Activity and Yield of Greengram (*Vigna radiata* L.). Int. J Curr. Microbiol. App. Sci. 2018; 7(1):1465-1468.
5. Chaudhary N, Patel IM, Patel JK. Effect of FYM, phosphorus and PSB on yield, nutrient content and uptake by greengram (*Vigna radiata* (L.) Wilckzek) on loamy sand. Indian Journal of Chemical Studies. 2018; 6(2):1026-1029.
6. Das SK. Effect of phosphorus and sulphur on yield attributes, yield, nodulation and nutrient uptake of greengram [*Vigna radiate* (L.) wilczek]. Legume Research. 2017; 40(1):198143.
7. Dhakal Y, Meena RS, Kumar S. Effect of INM on nodulation, yield, quality and available nutrient status in soil after harvest of greengram. Legume Research. 2016; 39(4):590-594.
8. Kumar R, Singh YV, Singh S, Latare AM, Mishra PK, Supriya. Effect of phosphorus and sulphur nutrition on yield attributes, yield of mungbean (*Vigna radiata* L. Wilczek). Journal of Chemical and Pharmaceutical Research. 2012; 4(5):2571-2573.
9. Kumawat SR, Khistriya MK, Yadav SL, Manoj K. Effect of phosphorus fertilization on yield, nutrient content, uptake and quality of summer greengram [*Vigna radiata* (L.) Wilczek]. Environment and Ecology. 2014; 32(2A):785-788.
10. Patel HR, Patel HF, Maheriya VD, Dodia IN. Response of kharif greengram (*Vigna radiata* L. Wilczek) to sulphur and phosphorus fertilization with and without biofertilizer application. The Bioscan. 2013; 8(1):149-152.
11. Rani M, Prakash V, Khan K. Response of mungbean [*Vigna radiata* (L.) Wilczek] to phosphorus, sulphur and PSB during summer season. Agricultural Science Digest-A Research Journal. 2016; 36(2):146-148.
12. Ranpariya VS, Polara KB, Hirpara DV, Bodar KH. Effect of potassium, zinc and FYM on content and uptake of nutrients in seed of summer greengram (*Vigna radiata* L.) and post-harvest soil fertility under medium black calcareous soil. Indian Journal of Chemical Studies. 2017; 5(5):1055-1058.
13. Rathour DK, Gupta AK, Choudhary RR, Sadhu AC. Effect of integrated phosphorus management on growth, yield attributes and yield of summer greengram (*Vigna radiata* L.). The Bioscan. 2015; 10(1):05-07.
14. Shete PG, Thanki JD, Baviskar VS, Bhoye KP. Yield, nutrient uptake and economics of greengram as influenced by land configuration, inorganic fertilizers and FYM levels. Green Farming. 2011; 2(4):425-427.
15. Thenua OVS, Kumar P. Effect of intercropping, phosphorus levels and bio-fertilizers on the performance of blackgram. Annals Agricultural Research (New Series). 2007; 28(3 and 4):213-218.
16. Venkateswarlu B. Land configurations and fertilizer management for sustainable groundnut production. Ph.D. thesis. Gujarat Agricultural University, Sardar Krishinagar, Gujarat, 2000.