

Original Research Article

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Effect of Different Levels of Phosphorus and Biofertilizer Combination on Growth and Yield of *Kharif* Greengram (*Vigna radiata* L.)

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ABSTRACT

Keywords

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The field experiment was conducted in *Kharif* season comprised of Phosphorus levels (30, 40, 50) kg/ha and Biofertilizers [(PSB (Soil application-25 kg/ha.), Rhizobium (Seed inoculation-200gm/10 kg/seed)]. The experiment was conducted in Randomized Block Design with 3 Replications and 10 Treatments Application of 40 kg P₂O₅+25 kg PSB was recorded maximum Plant height (27.94 cm), Nodules (20.03), Dry weight (1.99 g), Pods per Plant (45.63) and Grain yield was 658.33kg/ha. and maximum benefit cost ratio was recorded in the treatment combination of 40 kg P₂O₅+Rhizobium was 2.16.

Introduction

Pulses are the important crops in our country and main source of vegetable and the major protein component of Indian diet comes from pulses and easily digestible and cheaper has high biological values and it contains 132mg of calcium, 6.74mg iron, 189mg magnesium, 367mg of phosphorus, with a good vitamins and proteins they require less water requirement and pulses are cheaper than meat and they often called as Poor man's crop. Greengram can be cultivated in arid and semiarid regions of the country and grown on a variety of soil and climatic conditions as it

is tolerant to drought and greengram contains about 25% Protein and it is rich in lysine which is deficient in cereal grains Being legume it has the capacity to fix nitrogen and helps in preventing soil erosion and restores soil fertility and Mungbean responds favorably to phosphorus fertilizer (Chovati *et al.*, 1993).

Materials and Methods

The experiment was carried out during *Kharif* season of 2019 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj which is

located at 25° 24' 42" N latitude, 81° 50' 56" E longitude and 98 m altitude above the mean sea level. This area is situated on the right side of the river Yamuna by the side of Allahabad Rewa Road about 5 km away from Prayagraj (Allahabad) and carried out with 10 treatments and 3 replications were carried out along with three levels of Phosphorus (30,40,50) NPK kg/ha and 2 biofertilizers (PSB (Soil application-25kg/ha,) Rhizobium (Seed inoculation 200gram/10kg seed.) with the treatment combination of following treatments T₁:30kgP₂O₅ + 25kgPSB, T₂:30kgP₂O₅ + Rhizobium, T₃:30kgP₂O₅ + 25kgPSB + Rhizobium, T₄:40kgP₂O₅ + 25kgPSB, T₅:40kgP₂O₅ + Rhizobium, T₆:40kgP₂O₅ + 25kgPSB + Rhizobium, T₇:50kgP₂O₅ + 25kgPSB, T₈:50kgP₂O₅ + Rhizobium, T₉: 50kgP₂O₅ + 25 kg PSB + Rhizobium, T₁₀: Control (20:40:20) NPK kg/ha. and the seeds were sown with the recommended agronomic practices. and seed rate was 20 kg/ha, and soil application with PSB 25 kg/ha and then seeds were inoculated with rhizobium culture 20 gram/10 kg. It is sown in various plots and all the fertilizers were applied at the basal dose (20:40:20) NPK kg/ha and plot size was 3x3m, the plants are spaced at 30x10cm followed by line sowing and parameters like Plant height, nodules, dryweight, post harvest observations (Number of Pods/ Plant, Seed yield kg/ha and B:C ratio and calculated on the basis of benefit cost ratio are calculated by dividing gross return and cost of cultivation. The data were analyzed by ANOVA and significance of different sources of variations were tested by error means of square of Fisher's F test at probability significance level of 0.05.

Results and Discussion

Plant height

The maximum plant height was recorded in the treatment combination 40 kg P₂O₅+25 kg

PSB was 27.94 cm and statically at par with 40 kg P₂O₅ + Rhizobium this might be due to the increase in such case may be due to increased cell division and elongation on one hand and also genetic character of the variety Prasad, S.K *et al.*, (2014).

No. of Nodules/plant

At 60 DAS the maximum number of root nodules/plant was recorded in the treatment combination of 40 Kg P₂O₅+25 Kg PSB was 20.03 was significantly higher among all the treatments and statically at par with 30 kg P₂O₅ + 25 kg PSB, 30 kg P₂O₅ + Rhizobium, 40 kg P₂O₅ + Rhizobium, 40 kg P₂O₅ + 25 kg PSB + Rhizobium, 50 kg P₂O₅ + 25 kg PSB.

The application of phosphate solubilizing bacteria proved to be effective in developing significantly higher number of root nodules/plant. It has beneficial effects on nodulation, root development, growth and also hastens the maturity quality of crop produce (Choudhary *et al.*, 2015). Such increase in nodulation, root and growth and might be due to increase in number of nodules which might have supplied sufficient nitrogen by nitrogen fixation and finally enhance productivity of greengram (Prasad *et al.*, 2014).

Dry-weight

The maximum dry weight w recorded in 60 DAS were in the treatment combination was 40kg P₂O₅ + 25kg PSB was 1.99 was recorded significantly higher among all the treatments and statically at par with, 30kg P₂O₅ + 25 kg PSB, 30 kg P₂O₅+Rhizobium, 30 kg P₂O₅ + 25 kg PSB + Rhizobium, 50 kg P₂O₅ + 25 kg PSB, 50 kg P₂O₅ + 25 kg PSB+ Rhizobium and minimum dry weight recorded in 60 DAS was recorded in treatment combination of Control (20:40:20) NPK Kg/ha was 1.15 (Table 1).

Table.1 Effect of different levels of phosphorus and biofertilizer combination on growth and yield attributes of greengram

Treatments	Plant height (cm)	Nodules/ Plant	Dry weight (gm)	Pods/plant	Grain yield (kg/ha)	B:C ratio
30 kg P₂O₅+25 kg PSB	23.20	18.56	1.59	44.33	540	1.75
30 kg P₂O₅+Rhizobium,	23.35	18.78	1.76	42.13	470	1.58
30 kg P₂O₅+25 kg PSB +Rhizobium	22.65	17.11	1.67	35.33	563.33	1.79
40 kg P₂O₅+ 25 kg PSB	27.94	20.03	1.99	45.63	658.33	2.12
40 kg P₂O₅+ Rhizobium	26.15	19.00	1.40	41.60	643.33	2.16
40 kg P₂O₅+ 25 kg PSB+ Rhizobium	22.43	19.22	1.43	37.47	563.33	1.78
50 kg P₂O₅+ 25kg PSB	23.70	18.11	1.60	36.43	570	1.83
50 kg P₂O₅+ Rhizobium,	23.63	17.20	1.49	37.67	490	1.63
50 kg P₂O₅+ 25 kg PSB +Rhizobium	22.92	17.33	1.59	35.60	590	1.86
Control (20:40:20) NPK kg/ha	19.98	13.83	1.15	39.00	453	1.55
SEm±	1.05	0.56	0.14	2.22	38.59	0.13
C.D(p=0.05)	3.12	2.56	0.42	6.61	114.65	0.38

The plants attained more vigorous with different combinations of Phosphorus as compared to control due to adequate supply and availability of nitrogen, phosphorus and potassium and spacing balanced combination increased root dry weight of plant (Erman *et al.*, 2009).

Pods/plant

Maximum Pods/plant recorded in the treatment combination of 40kg P₂O₅ + 25kgPSB) is 45.63 was significantly higher among all treatments and atpar with 30 kg P₂O₅ + 25 kg PSB, 30 kg P₂O₅ + Rhizobium, 40 kg P₂O₅+Rhizobium.This might be due to Higher number of pods/plant might have been possible due to more vigor and strength attained by the plant as result of better photosynthetic activity with sufficient availability of light and supply of nutrients in a balanced quantity.(Richardson *et al.*, 1957).

Grain yield

The maximum grain yield was recorded in the treatment combination of 40kg P₂O₅ + 25kgPSB) is 658.33 kg/ha was significantly higher among all treatments and at par with 30 kg P₂O₅+25 kg PSB+ Rhizobium, 40 kg P₂O₅ + Rhizobium, 40 kg P₂O₅ + 25 kg PSB + Rhizobium, 50 kg P₂O₅ + 25 kg PSB,50 kg P₂O₅ + 25 kg PSB + Rhizobium. This might due to the increase in yield by the application of 40 kg P₂O₅ per hectare in combination with PSB observed more yield (Rekha *et al.*, 2018).

Benefit cost ratio

The highest benefit cost ratio was found in treatment combination of 40kg P₂O₅ + Rhizobium was 2.16 (Shubhandu Mandal *et al.*, 2005). It may be concluded that and treatment with 40 kg P₂O₅ + Rhizobium was recorded benefit cost ratio 2.16 and treatment

with 40kg P₂O₅ + 25kg PSB recorded highest grain yield (658.33 kg/ha) which may be more profitable regarding grain yield. Hence variety SAMRAT can be recommended to the farmers.

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