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RESEARCH ARTICLE :

Response of fertilizer levels on growth and yield of *Kharif* greengram (*Phaseolus radiatus* L.)

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SUMMARY : A field experiment entitled "Response of fertilizer levels on growth and yield of *Kharif* greengram (*Phaseolus radiates* L.)" was conducted at Agriculture Research Farm, Saikrupa College of Agriculture, Ghargaon during season 2015. The trial was laid out in Randomized Block Design with eight treatment due to four fertilizer levels (0% No fertilizer, 75% 18.75 + 37.50, 100% 25.00 + 50.00 and 125% 31.25 + 62.50 of recommended dose ha^{-1}) replicated thrice. The soil of the experimental plot was well drained and grouped under inceptisol having depth of 35 cm. The soil was medium in available nitrogen, medium high in phosphorus, very high in available potash, medium in organic matter content and was slightly alkaline in reaction. The experimental crop was sown on 15th June 2015 by dibbling as per plant densities treatments. Fertilizer levels were applied as per treatments at the time of sowing. Amongst the growth attributes *viz*., plant height, number of branches, number of leaves, leaf area and dry matter $plant^{-1}$ were significantly influenced by fertilizer level of 125% RDF ha^{-1} over 0% RDF and 75% RDFha^{-1}. It was at par with 100% RDF ha^{-1}.The yield attributes *viz*., number of pods $plant^{-1}$, length of pod, weight of pods, number of grains pod^{-1}, test weight of grains were increased significantly with 125% RDF ha^{-1} over 0% RDF and 75% RDF ha^{-1}. It was at par with 100% RDFha^{-1}.The grain and straw yield, protein content, nutrients uptake by plant and available NPK in soil at harvest of crop, gross and net monetary returns along with B:C ratio were increased significantly with increase in fertilizer levels upto 125% RDFha^{-1} over 0% RDF and 75% RDF ha^{-1}. It was at par with 100% RDF ha^{-1}.Amongst the growth attributes plant height increased significantly as the plant population increased and row spacing decreased.

KEY WORDS :
Kharif greengram, Fertilizer level, RDF, Growth, Yield, Economics

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BACKGROUND AND OBJECTIVES

Pulses play an important role in agricultural economy of India. The pulse is defined as the split cotyledons of dry legume seeds boiled in Excess of water softened, macerated and used as soup. Pulses are important not only for their value as human food, but also for livestock because of high protein content. It has been important component of Indian agriculture enabling the land to restore fertility by fixing atmospheric nitrogen ranged between 20-25 kg N ha^{-1} per season, so as to produce reasonable yields of

succeeding crops and to meet out the demand of human dietary requirement regarding proteins, carbohydrates and other nutrient sources. Pulses are mostly used in crop rotation as well as double cropping under dryland condition on deep soils. The major impediment of present agricultural production is the intense dearth in production of pulses; the possibility of horizontal increase in production is also limited due to limited land resources. On the other hand high yielding varieties and hybrids are not available in pulses. The national statistics for per day consumption of pulses is 40 gm. However, the normal level of recommendation for per capita per day consumption of pulses is 104 g (ICMR). This low consumption of pulses is associated partly with low productivity and partly with replacement of pulse crops with high yielding cereals, sugarcane and other remunerative crops during the main growing season of *Kharif* and *Rabi* when irrigation facilities become available. Greengram is nutritious; its seed is more palatable, nutritive, digestible and non-flatulent than other pulses grown in country. The mungbean seeds contains approximately 25-28% protein,1.0-1.5oil,3.5-4.5% fibre, 4.5-5.5%ash and 62-65%carbohydrates on dry weight basis. Among the various factors that contribute towards the attainment of potential yield of green gram optimum plant spacing or plant population is of considerable importance. Optimizations of plant density for high yielding variety by following suitable inter and intra row spacing is essential for variety Vaibhav (Phule-9339). Our farmers have a wrong notion that greengram, being a legume crop does not need fertilizers. Whereas, nitrogen and phosphorus alone or in combination plays a remarkable role in increasing yield and improving the quality of greengram. Application of small amount of nitrogen as a starter dose has a beneficial effect on crop yield and quality. Similarly phosphorus plays a vital role in the formation and translocation of carbohydrates, root development, crop maturation and resistance to disease pathogens. Thus increase the greengram yield and improves its quality. Application of nitrogen in combination with phosphorus to greengram also increases its yield and yield components, while nitrogen uptake and protein content of greengram increases with increasing rate of applied phosphorus.Our farmers have a wrong notion that greengram, being a legume crop does not need fertilizers. Whereas, nitrogen and phosphorus alone or in combination plays a remarkable role in increasing yield and improving the quality of greengram. Application of small amount of nitrogen as a starter dose has a beneficial effect on crop yield and quality. Similarly phosphorus plays a vital role in the formation and translocation of carbohydrates, root development, crop maturation and resistance to disease pathogens. Thus increase the greengram yield and improves its quality. Application of nitrogen in combination with phosphorus to greengram also increases its yield and yield components, while nitrogen uptake and protein content of greengram increases with increasing rate of applied phosphorus. Hence, there is a dire need to investigate the suitable levels of nitrogen and phosphorus for obtaining higher yield and quality of green gram under agro-c1imatic conditions of Pune and eastern part of Pune.

RESOURCES AND METHODS

A field experiment was conducted on medium black soils at Agriculture Research Farm, Saikrupa College of Agriculture, Ghargaon situated at $16^0 41'$ North latitude and $74^0 16'$ East longitude. The altitude is 548 meter. Agro-ecologically this area comes under Western Maharashtra Scarcity zone of Maharashtra state with annual average rainfall of 750 mm. Out of which 80 per cent rainfall receives from south west monsoon from June to September while rest of rainfall from North East Monsoon.. The region experiences hot dry summer (March-May), cold winter (October-February) and wet humid with assured rainfall in monsoon (June-September), but due to vagaries of monsoon the crop production is always risky.The Soil was deep, black in colour with good drainage. Soil was clayey in texture. The chemical composition of experimental plots indicated that the soil was low in nitrogen, medium in phosphorus and rich in potassium content and slightly alkaline in reaction having pH 7.8. The experiment was laid out infactorial Randomized Block Design with sixteen treatment combinations and replicated thrice. The gross plot size was 5.4 x 4.5 m^2 and net size was 4.8 x 3.6 m^2 Fertilizer levels ($N+P_2O_5$kg/haNo fertilizer (0%)18.75 + 37.50 (75%) 25.00 + 50.00 (100%)31.25 + 62.50 (125%) Sowing was done 20 Jun 2015. Five plants were tagged at randomin net plot area for recording various yield components likenumber of pods per plant, number of seeds per pod, seedyield per plant (g), 100-seed weight (g), seed yield (kg ha^{-1})was computed by threshing pods from net plot, cleaned andthe seeds weight was recorded.

From this seed yield perhectare was computed. The net returns (Rs. ha^{-1}) was calculatedby deducting cost of cultivation (Rs. ha^{-1}) from gross returnsand B:C was worked out as a ratio of gross returns (Rs. ha^{-1}) tocost of cultivation (Rs. ha^{-1}). The variety used in experiment was Vaibhav (Phule-9339)is a medium duration brown seeded variety, which mature in 70 to 80 days. It is a high yielding variety and has wider adaptability and harvested on 20 and 21 September 2015.The crop received 464.9 mm rainfall during the experiments.

OBSERVATIONS AND ANALYSIS

The data on yield components, seed yield, stalk yield, huskyield, net returns and B:C are presented in Table 1 and 2.Thedifferences in the seed yield differed significantly among the two factors greengram. The data on mean seed yield (kg ha^{-1}) is revealed that seed yield was influenced significantly by different fertilizer level treatment and spacing's treatments. The average seed yield was 11.84 kg ha^{-1} recorded due to various treatments under study.The effect of fertilizer levels on seed yield was found to be significant. The fertilizer levels. Treatment of (31.25 + 62.50) was recorded highest seed yield 11.40 kg ha^{-1} and it was found to be significantly superior over spacing 11.84 kg ha^{-1}.The seed yield per hectare was influenced significantly due to various spacing treatments. The grain yield was gradually increased with increase in fertilizer levels. The grain yield was influenced significantly due to different fertilizer levels. The grain yield was significantly higher with application of 31.25 kg N and 62.50 kg P_2O_5 ha^{-1}(11.44 q ha^{-1}) over 18.75 kg N and 37.50 kg P_2O_5 ha^{-1} (10.50 q ha^{-1}) and 0 kg N and 0 kg P_2O_5 ha^{-1} (9.50 q ha^{-1}) and it was at par with 25 kg N and 50 kg P_2O_5 ha^{-1}(10.80 q ha^{-1}) level of fertilizer. The lowest grain yield ha^{-1} was recorded by 0 kg N and 0 kg P_2O_5 ha^{-1}.The differences in grain yield due to plant densities were significant.

The straw yield (q ha^{-1}) was gradually increased with increase in fertilizer levels. The straw yield (q ha^{-1}) was differed significantly due to different fertilizer levels. The straw yield (q ha^{-1}) was significantly higher with application of 31.25 kg Nand 62.50 kg P_2O_5 ha^{-1} (12.85 q ha^{-1}) over 18.75 kg N and 37.50 kg P_2O_5 ha^{-1} (11.41 q ha^{-1}) and 0 kg N and 0 kg P_2O_5 ha^{-1} (11.06 q ha^{-1}) and it was at par with 25 kg N and 50 kg P_2O_5 ha^{-1} (12.78 q ha^{-1}) level of fertilizer. The lowest straw yield (q ha^{-1}) was recorded by 0 kg N and 0 kg P_2O_5 ha^{-1}.(Table 1)The net monetary returns ha^{-1} was gradually increased with increase in fertilizer levels. The net monetary returns ha^{-1} was differed significantly due to different fertilizer levels. The net monetary returns ha^{-1} was significantly higher with application of 31.25 kg N and 62.50 kg P_2O_5

Table 1 : Yield and yield parameters of greengram genotypes as influenced by spacing and fertilizer levels

Treatments	No of pod per plant (g)	Length of pod per plant (cm)	1000 seed weight (g)	Seed yield (kg ha^{-1})	Straw yield (kg ha^{-1})
Fertilizer Levels (N and P_2O_5 Kg ha^{-1})					
F_1 - 0 + 0	13.12	7.65	37.33	9.50	46.17
F_2 -18.75 + 37.50	13.90	7.87	42.07	10.50	47.93
F_3- 25.00+50.00	15.27	8.81	44.10	10.80	45.72
F_4- 31.25 + 62.50	15.25	9.25	46.11	11.40	47.37
S.E. ±	.31	0.19	1.00	0.23	1.13
C.D. (P=0.05)	0.90	0.37	2.90	0.67	NS

NS=Non-significant

Table 2 : Economics of greengram genotypes as influenced by spacing and fertilizer levels

Treatments	Cost of cultivation	Gross returns	Net returns	B:C
Fertilizer levels (N and P_2O_5 Kg ha^{-1})				
F_1 – 0 + 0	20855	37857	17001	1.81
F_2 – 18.75 + 37.50	24613	47492	22879	1.92
F_3- 25.00+50.00	25868	50202	24334	1.94
F_4- 31.25 + 62.50	27115	52846	25730	1.95
S.E. ±	-	433.01	433.01	-
C.D. (P=0.05)	-	1250.63	1250.63	-

ha^{-1} (Rs. 25730) over 18.75 kg N and 37.50 kg P_2O_5 ha^{-1} (Rs. 22879) and 0 kg N and 0 kg P_2O_5 ha^{-1} (Rs. 17001) and it was followed by25 kg N and 50 kg P_2O_5 ha^{-1} (Rs. 24334) levels of fertilizer.These findings are in conformity with Patil and Dhonde (2009) and Khairnar and Solanke (2009).Increasing levels of fertilizer the value of B:C ratio increased. The maximum value of B:C ratio was recorded by the application at 31.50 kg N and 62.50 kg P_2O_5 ha^{-1} *i.e.*1.95 followed by 25 kg N and 50 kg P_2O_5 ha^{-1} *i.e.*1.94, 18.75 kg N and 37.50 kg P_2O_5 ha^{-1} *i.e.*1.92, 0 kg N and 0 kg P_2O_5 ha^{-1} *i.e.*1.81.The value of B:C ratio increased with increasing plantpopulation (Table 2).

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