Effect of seed treatment and phosphorus on growth and yield of green gram (*Vigna radiata* L.)

Abstract

The subject test changed into performed all through the *Kharif* season (2021) at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj **(U.P)**. The dirt of the trial plot changed into sandy loamy in surface, practically unbiased in soil response (pH 7.1), low in regular carbon (0.36%), to be had N (171.48 kg/ha), to be had P (15.2 kg/ha) and to be had K (232.5kg/ha). The treatments comprised of phosphorus (40,50 and 60 kg/ha) and seed treatment (Dry seed, Hydro priming, and KCl) Viz., whose effect is found on the unpracticed gram (var. SAMRAT). The study used a Randomized Block Design, with 10 treatments that were replicated three times. Results showed that application of 60kg/ha phosphorus + 1% KCl exhibited the tallest plants (38.46cm), the highest number of branches (4.48), plant dry weight g (5.44), number of pods per plant (17.07), seeds per pod (9.41), test weight (37.80g), grain yield (2.05 t/ha), stover yield (5.15 t/ha) and harvest index (32.30%). As a result, the application of 60kg/ha phosphorus + KCl (1%) can be most productive and cost effective.

Keywords: Dry seed , Hydro priming, KCl, Phosphorus, growth and yield

1. Introduction

Greengram [*Vigna radiata* (L.) wilczek] is a nutritious legume crop. It has roughly 25% protein, as well as amino acids like arginine, histidine, lysine, and tryptophan. It is also regarded as a low-cost protein and mineral source. It has a good taste and digestion. Whole grains and uncooked grains are legumes and vegetables in the human diet. Its curry is often advised for patients due to its healthy digestion. The mung bean is under cultivation since pre-historic time in India. It is also known as greengram and serve are a major source of dietary protein for the vast majority of people. Pulses are considered as lifeblood of Agriculture. Pulses occupy a unique position in every farming system *viz.*, main, catch, cover, green manure, intercrop and mix crop. Their inclusion in rotation kept the soil alive and productive. Pulse crops enrich the soil fertility by means of addition of organic matter and fixation of atmospheric nitrogen mediated by root nodule of Rhizobium bacteria. They are the cheapest source of quality protein for the human being. In general, pulses have two to three times more protein than the cereals or any other group of plants besides supply of micronutrients, low fat, high dietary fiber and complex carbohydrates. Thus pulses occupy a unique position in the diet of our people by supplying the major portion of the balance protein requirement and also serve as excellent forage as a feed of the large cattle population in the country.It is a native of India and Central Asia. It occupies prime position among pulses by virtue of its short growth period, high biomass and outstanding nutrient value as food, feed and forage among which Rajasthan occupies larger area and production (1020 thousand ha and 391.2 thousand tones, respectively). Tamil Nadu leads first in productivity with an average yield of 775 kg ha-1. Its contain, 24.7 % protein, % fat, 0.9 % fiber and 3.7 % ash as well as sufficient quantity of calcium, phosphorus and important vitamins. Due to cheaper protein

source it is designated as “poor man’s meat.”It is essential not just for human nutrition but also for enhancing soil fertility by stabilising atmospheric nitrogen levels. Due to its short lifetime, this crop is ideal for intercropping with other main crops (Singh *et al.,* 2017).

Seed treatment before sowing promotes germination, enhances vigour and root system growth, enhances drought tolerance and aids in high nutrient uptake, resulting in higher crop yields in low soil moisture conditions (Khan and Khan 2001). Phosphorus is a component of all biological substances that allow plants to exist. It is necessary for green plants to grow and develop normally. When gram phosphorus is applied to greengram, the plant's growth, yield qualities, and grain yield improve. Early root growth and lateral, fibrous formation are aided by phosphorus, which is also a vital healthy source for nodule production and nitrogen stabilisation in the atmosphere (Singh *et al*., 2008 and Vikram *et al.,* 2017).

2. Materials and Methods

The current experiment was conducted at the Crop Research Farm during *Kharif* season, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj (U.P.), situated at 250 30' 42"N scope, 810 60' 56" E longitude and elevation of 98 m height above sea level. The soil of the test plot was sandy with a of pH 7.1, low in natural carbon (0.36 %), accessible N (171.48 kg/ha), accessible P (15.2 kg/ha), and accessible K (232.5 kg/ha). The seed alots of the various treatments combinations were planted on 30th June 2021 utilizing the assortment Nidhi Samrat. The experiment was laid out in a Randomized Block Design with 3 replications a total of 10 treatment combinations including T1: Phosphorus 40 kg/ha + Dry seed, T2: Phosphorus 40 kg/ha + Hydro preparing, T3: Phosphorus 40 kg/ha + KCl (1%), T4: Phosphorus 50kg/ha + Dry seed, T5: Phosphorus 50 kg/ha + Hydro preparing, T6: Phosphorus 50 kg/ha + KCl (1%), T7: Phosphorus 60 kg/ha + Dry seed, T8: Phosphorus 60 kg/ha + Hydro preparing, T9: Phosphorus 60 Kg/ha + KCl (%) and T10: Control were used for the study (Table 1). All supplements were applied through the dirt as Urea, Single Super Phosphate (SSP), and Muriate of Potash (MOP). A full portion of N and K was applied in all plots and Phosphorus is applied per medicines in particular plots. The development boundaries were recorded at periodical timespans and 60 Days After Sowing from arbitrarily chose five plants in every treatment. Genuinely, examination was done, and the mean was looked at a 5 % likelihood level of huge outcomes.

Table 1: Treatment combinations utilized in the study

S.N	Treatments	Treatment combinations
1	T1	Phosphorus 40kg/ha + Dry seed
2	T2	Phosphorus 40kg/ha + Hydro priming
3	T3	Phosphorus 40kg/ha + KCl (1%)

4	T4	Phosphorus 50kg/ha + Dry seed
5	T5	Phosphorus 50kg/ha + Hydro priming
6	T6	Phosphorus 50kg/ha + KCl (1%)
7	T7	Phosphorus 60kg/ha + Dry seed
8	T8	Phosphorus 60kg/ha + Hydro priming
9	T9	Phosphorus 60kg/ha + KCl (1%)
10	T10	Control

3. Results and Discussion

Growth traits

Seed treatment and phosphorus management significantly influenced the growth parameters (Plant height, number of branches and dry weight) of Greengram (Table 2). The application of 60 kg/ha Phosphours + 1% KCl produced the tallest plants (38.46cm) similar to 5 treatment combinations with plant height ranging between 34.59cm and 37.90cm. While control plots had the shortest plants (24.90cm). The result indicates the seed priming with varying levels of phosphorus application influence shoot growth in greengram. Similar finding were obtained from **Ramamurthy *et al*.(1997)** in Blackgram.

No. of Branches

The results indicate that there was a substantial difference between the treatments, with the applications of Phosphorus 60 kg/ha+ KCl (1 %) having the highest number of branches per plant (4.48) and the treatment control having the lowest value (2.24). However, Phosphorus 50 kg/ha + KCl (1%) (4.14), Phosphorus 40 kg/ha + KCl (1%) (4.08) and Phosphorus 50 kg/ha + Hydro priming (3.81) were statistically at par with Phosphorus 60 kg/ha + KCl (1%). Similar findings were obtained from **Singh *et al.* (2004)** in green gram.

Dry Weight (g/plant)

The analysis revealed that there was a substantial difference between the treatments, with the maximum Dry weight (g/plant) (5.44) recorded with Phosphorus 60 kg/ha+ KCl (1%), and the lowest value (2.32) observed with control. However, Phosphorus 50 kg/ ha + KCl (1%) (5.21) and Phosphorus 40 kg/ha + KCl (1%) (5.09) were statistically at par with Phosphorus 60 kg/ ha + KCl (1%). Similar findings were obtained from **Singh *et al.* (2004)** in greengram.

Effect of Seed treatment and phosphours on Yield and Yield attributes of greengram

Number of pods per plant

The result showed that there was a signficant difference between the treatments, with the maximum number of pods per plant (17.07)observed in the application of Phosphorus 60 kg/ha+ KCl (1%) However, Phosphorus 50kg/ha + KCl (1%) (16.53) is statistically at par with Phosphorus 60 kg/ha+ KCl (1%). Similar findings were obtained by **Ardeshna *et al.* (1993**) in greengram.

Number of seeds per pod

The results showed that there was significant difference between the treatments, with the maximum number of seed per pod (9.41) observed in the application of Phosphorus 60 kg/ha + KCl (1%), However, Phosphorus 50 kg/ha + KCl (1%) (8.60) is statistically comparable to Phosphorus 60 kg/ha + KCl (1%). Similar findings were obtained by **Ardeshna *et al*.(1993)** in greengram.

Test weight (g)

The results showed that there was significant difference between the treatments, with the maximum test weight (37.80g) being observed in the application of Phosphorus 60 kg/ha+ KCl (1%). However, Phosphorus 40 kg/ha +Hydro priming (36.09) is statistically comparable to Phosphorus 60 kg/ha + KCl (1%).

Grain yield (t/ha)

The results demonstrated a significant difference between the treatments, with the maximum Grain yield (2.05 t/ha) was observed in the application of Phosphorus 60 kg/ha + KCl (1%), However, Phoshorus 50 kg/ha + KCl (1%) (1.90) is statistically comparable to Phosphorus 60 kg/ha + KCl (1%). Similar findings were obtained by **Deka and Kakati (1996**) in greengram.

Stover yield (t/ha)

The results demonstrated a significant difference between the treatments, with the maximum Stover yield (5.15 t/ha) was observed in the application of Phosphorus 60 kg/ha+ KCl (1 %). However, Phosphorus 60 kg/ha + KCl (1%) (5.15) is statistically comparable to Phosphorus 60 kg/ha + Hydro priming. Similar findings were obtained by **Chovatia *et al.*, (1993**) in greengram.

Harvest index (%)

The results demonstrated a significant difference between the treatments, with the maximum Harvest index (32.30%) was observed in the application of Phosphorus 60 kg/ha+ KCl (1%).However, Phosphorus 50 kg/ha + KCl (1%) (27.60) is statistically comparable to Phosphorus 60 kg/ha + KCl (1%). Similar findings were obtained by **Chovatia *et al.*, (1993)** in greengram.

Table 2: Effect of seed treatment and phosphorus on growth parameters of Greengram

S.N	Treatment combinations	Plant Height (cm)	No of Branches	Dry Weight (g/plant)
1.	Phosphorus 40 kg/ha+ Dry seed	34.59	3.46	4.23
2.	Phosphorus 40 kg/ha+ Hydro priming	34.75	3.54	4.04
3.	Phosphorus 40 kg/ha+ KCl (1%)	37.10	4.08	5.09
4.	Phosphorus 50 kg/ha+ Dry seed	32.16	3.30	3.42
5.	Phosphorus 50 kg/ha+ Hydro priming	33.63	3.81	3.66
6.	Phosphorus 50 kg/ha+ KCl (1%)	37.90	4.14	5.21
7.	Phosphorus 60 kg/ha+ Dry seed	32.86	3.36	3.77
8.	Phosphorus 60 kg/ha+ Hydro priming	35.66	3.66	3.77
9.	Phosphorus 60 kg/ha+ KCl (1%)	38.46	4.48	5.44
10.	Control	24.90	2.24	2.32
	F-Test	**S**	**S**	**S**
	SEm(±)	**1.308**	**0.180**	**0.342**
	CD at 0.5%	**3.886**	**0.534**	**1.015**

SN= Serial number

CD= Critical difference

Table 3: Effect of seed treatment and phosphorus on yield attributes of Greengram

S.N	Treatment Combinations	Yield and yield attributes					
		No. of pods per plant	**Seeds/ pod**	**Test weight (g)**	**Grain yield (t/ha)**	**Stover yield (t/ha)**	**Harvest index (%)**
1.	Phosphorus 40 kg/ha+ Dry seed	12.43	6.16	34.03	1.35	4.17	24.41
2.	Phosphorus 40 kg/ha+ Hydro priming	14.30	6.54	36.09	1.58	4.44	26.28
3.	Phosphorus 40 kg/ha+ KCl (1%)	15.29	8.42	34.64	1.75	4.70	27.13
4.	Phosphorus 50 kg/ha+ Dry seed	13.04	6.45	32.94	1.48	4.08	26.56
5.	Phosphorus 50 kg/ha+ Hydro priming	13.49	6.42	34.39	1.44	4.55	24.07
6.	Phosphorus 50 kg/ha+ KCl (1%)	16.53	8.60	35.91	1.90	4.97	27.60
7.	Phosphorus 60 kg/ha+ Dry seed	13.39	7.10	32.66	1.45	4.75	23.43
8.	Phosphorus 60 kg/ha+ Hydro priming	13.33	7.49	30.74	1.67	5.33	24.00
9.	Phosphorus 60 kg/ha+ KCl (1%)	17.07	9.41	37.80	2.05	5.15	32.30
10.	Control	10.51	5.39	23.01	1.06	4.09	20.98
	F- Test	**S**	**S**	**S**	**S**	**S**	**S**
	SEm(±)	**1.01**	**0.36**	**1.485**	**0.072**	**0.229**	**1.876**
	CD at 0.5%	**3.016**	**1.086**	**4.413**	**0.215**	**0.680**	**5.574**

4. Conclusion

Based on findings of the research it may be concluded that the phosphorus 60 kg/ha + KCl (1%) produced the maximum plant height, dry weight and harvest index in greengram during the *Kharif* season and the maximum Gross returns, Net returns and Benefit Cost Ratio were also recorded .

Reference

1. Ahmed, S.A. (1999). Filed performance of hardened Greengram (*Vigna radiata*) seeds. *Legume Research*.**22**(3): 207-8.
2. Ardeshna, R.B., Modhwadia, M.M., Khanpara, V.D. and Patel, J.C. (1993), Response of greengram (*Phaseolus radiatus*) to nitrogen, phosphorus and Rhizobium inoculation *Indian Journal of Agronomy*.**38**(9):490-492.
3. Chovatia, P. K., Ahlawat, R.P.S. and Trivedi, S.J. (1993). Growth and yield of summer Greengram (*Phaseolus radiatus*) as affected by different dates of sowing, rhizobium inoculation, and levels of phosphorus. *Indian Journal of Agronomy*.**38**(3): 492-494.
4. Khan, M.S. and Khan, N.A. (2001). Response of mustard and wheat to pre-sowing sced treatment with pyridoxine and basal level of calcium. *Indian Journal of Plant Physiology*, **6**(3): 300-5.
5. Lokhande, P.B., Indulkar, B.S., Vaidya, P.H., Padghan, A.D., Wagh, C.B., Ingole A.J, Patil, N.M., Aundhkar A.V., (2018). Effect of Phosphorus and Zinc on yield and quality of greengram (*Vigna radiata* L.) in Inceptisol. *International Journal of Engineering Science and Computing*, Vol.**8**(7).
6. Ramamoorthy, K., Balasubramanian, A., and Arokiaraj, A, (1997). Response of rainfed black gram (*Phaseolus mungo*) Phosphorus and Sulphur nutrition in red lateritic soils. *Indian Journal of Agronomy***.42**(1):191-193.
7. Sarkar, R.K. and Pal, P.K. (2006). Effect of pre-sowing seed treatment and foliar spray of nitrate salts on growth and yield of greengram (*Vigna radiata*). *Indian Journal of Agricultural Sciences*, 7**6** (1): 62-5.
8. Shukla, S. K. and Dixit, R. S. (1994). Effect of rhizobium inoculation, plant population, and phosphorus on growth and yield of summer greengram (*Phaseolus radiatus*) *Indian Journal of Agronomy*. **41**(4): 611-615.
9. Singh, A.P., Chaturvede, S., Tripathi, M.K. and Sharma, S. (2004). Growth and yield of greengram [(*Vigna radiata* L.) *Wilczek*] as influenced by bio-fertilizers and phosphorus application. *Annals of Biology*.**20**(2):227-232.
10. Singh, G., Sekhon, H.S. and Sharma, P. (2008). Effect of fertilizer application on nodulation, growth and yield of summer mungbean (*Vigna radiata* L.). *Indian Journal of Ecology***, 35**: 28-30.
11. Singh, V., Sharma, S.K., Thakral, S.K. and Sharma, M.K. (2017). Effect of phosphorus on the performance of greengram (*Vigna radiata* L.) varieties during summer. *Legume Research*. DOI: 10.18805/LR-3885.