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Effect of seed treatment and phosphorus on yield and economics of greengram (*Vigna radiata* L.)

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Abstract
The field experiment was laid during the *Kharif* season (2021) at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P). The soil of the test plot was sandy loamy on the surface, almost nonpartisan in soil response (pH 7.1), low in natural carbon (0.36%), accessible N (171.48 kg/ha), accessible P (27.0 kg/ha), and accessible 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 impact is seen on the Greengram (var. SAMRAT). The investigation was spread out in Randomized Block Design, with 10 treatments that are replicated thrice. Results revealed that the maximum pods per plant (17.07), Test weight (37.80g), Grain yield (2.05kg/ha), stover yield(5.15kg/ha), and Harvest Index (32.30%) were fundamentally impacted with the utilization of 60kg/ha phosphorus + KCL (1%).However, Maximum gross returns(1,29,150.00 ₹/ha), net returns of (95,855.00 ₹/ha) and B.C proportion (2.87) were recorded in treatment with use of 60kg/ha Phosphorus + KCL (1%).Therefore it very well may be reasoned that the use of 60kg/ha Phosphorus + KCL (1%) was the most useful and Economical.

Keywords: Seed, phosphorus, economics, greengram, *Vigna radiata* L.

Introduction
In India, all-out beats are developed on a 23.46 million ha region with the creation of 19.27 million metric tons and normal usefulness of 789 kg/ha (DES, 2015). Greengram is a rainfed crop prevalently filled in *Kharif* in the territory of Rajasthan. In Rajasthan, Greengram involves a 1.019 lakh ha region with the creation of 0.391 lakh tons. It is fundamentally developed in bone-dry and semi-bone-dry areas including Nagar, Jaipur, Jodhpur, Sikar, Pali, and Ajmer. The low productivity of green manure comes from cultivating this crop in marginal and marginal lands with poor management practices. Agricultural production technology is very important to achieve the full production capacity of any type of crop. In India, there are many reasons why raw grain does not grow properly and has low yields (Vakeswaran *et al.*, 2016) [15].

Pre-sowing seed treatment with synthetics is a basic and modest technique for expanding beat creation under restricted soil dampness (Ahmed 1999) [1]. Pre-planting seed treatment upgrades germination further develops force and development of root framework, builds dry season resistance helps in higher supplement take-up prompting a higher monetary yield of harvests under restricted soil dampness.

Phosphorus helps in better modulation and proficient working of knob microbes for the obsession of N to be used by plants during grain-the improvement stage, which thus prompted an increment in green yield. Plants secure phosphorus from soil arrangements like phosphate and anion. Phosphorus advances early root development Use of Phosphorus Solubilizing microbes as inoculants increment phosphorus take-up. These microorganisms additionally increment the possibilities of utilizing phosphatic rocks in crop Production. More prominent effectiveness of phosphorus solubilizing microbes has been displayed through co-vaccination with other advantageous microorganisms and mycorrhiza (White *et al.*, 1953) [16].

Materials and Methods
The Experiment was completed during the *Kharif* period of 2021 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj (U.P.), situated at 250 30' 42"N scope, 81^0 60' 56" E longitude and 98 m elevation above mean ocean level. The dirt of the exploratory plot was sandy topsoil in the surface, almost nonpartisan in soil response (PH 7.1), low in natural carbon (0.44%), accessible N (171.48 kg/ha), accessible P (27.0 kg/ha), and accessible K (232.5 kg/ha).

The harvest was planted on 30 June 2021 utilizing the assortment, Nidhi Samrat. The test was laid out in Randomized Block Design involved 3 replications and an aggregate of ten treatments *viz*., T_1: Phosphorus 40 kg/ha + Dry seed, T_2: Phosphorus 40 kg/ha + Hydro priming, T_3: Phosphorus 40 kg/ha + KCL (1%), T_4: Phosphorus 50kg/ha + Dry seed, T_5: Phosphorus 50 kg/ha + Hydro priming, T_6: Phosphorus 50 kg/ha + KCL (1%), T_7: Phosphorus 60 kg/ha + Dry seed, T_8: Phosphorus 60 kg/ha + Hydro priming, T_9: Phosphorus 60 Kg/ha + KCL (%) and T_{10}: Control (N/K). All supplements were applied through the dirt as Urea, Single Super Phosphate (SSP), and Muriate of Potash (MOP). A full portion of Nand K was applied in all plots and Phosphorus is applied as per treatments in individual plots. The development boundaries were recorded at periodical time frames and 60 DAS from arbitrarily chosen five plants in every treatment. Genuinely, the investigation was done and the mean was thought about at a 5% likelihood level of critical outcomes.

Table 1: Treatment Combinations

S. No	Treatment Combinations
1	Phosphorus 40kg/ha + Dry seed
2	Phosphorus 40kg/ha + Hydro priming
3	Phosphorus 40kg/ha + KCL (1%)
4	Phosphorus 50kg/ha + Dry seed
5	Phosphorus 50kg/ha + Hydro priming
6	Phosphorus 50kg/ha + KCL (1%)
7	Phosphorus 60kg/ha + Dry seed
8	Phosphorus 60kg/ha + Hydro priming
9	Phosphorus 60kg/ha + KCL (1%)
10	Control (N/K)

Results and Discussion

The effect of seed treatment and phosphorus Management on the yield parameters of a Greengram are presented in Table 2.

Yield and yield attributes

Number of pods/plant

The result revealed that there was a substantial difference between the treatments, with the application of Phosphorus 60 kg/ha+ KCL (1%) producing the Maximum number of pods per plant (17.07), whereas the control produced the lowest number of pods per plant (10.51). Similar results were found in Ardeshna *et al.*, (1993) [2] in greengram.

Test weight (g)

The results demonstrated that there was a big variation between the treatments, with the application of Phosphorus 60 kg/ha+ KCL (1%) producing the highest test weight (37.80g), while the control produced the lowest test weight (23.01g).

Grain yield (t/ha)

The results revealed that there was a significant difference between the treatments and maximum Grain yield (2.05 t/ha) was observed by the application of Phosphorus 60 kg/ha+ KCL (1%), whereas the lowest value Grain yield (1.06 t/ha) was observed in treatment control. Similar findings were obtained from Deka and Kakati (1996) in greengram.

Stover yield (t/ha)

The results demonstrated that there was a substantial difference between the treatments, with the application of Phosphorus 60 kg/ha+ KCL (1%) producing the highest Stover yield (5.15 t/ha) and the control producing the lowest value Stover yield (4.09 t/ha). Similar findings were obtained from Chovatia *et al.*, (1993) in greengram.

Harvest index (%)

The results demonstrated that there was a substantial difference between the treatments, with the application of Phosphorus 60 kg/ha+ KCL (1%) producing the highest Harvest index (32.30%), while the control generated the lowest Harvest index (20.98%). Similar findings were obtained from Chovatia *et al.*, (1993) in greengram.

Economics

Effect of Seed treatment and Phosphorus on Yield and Economics of Greengram is presented in Table 3. The highest gross return (1,29,150 INR/ha), higher net returns (95,855 INR/ha) and maximum B:C ratio (2.87) recorded in treatment with the application of Phosphorus 60 kg/ha+ KCL (1%).

Table 2: Effect of seed treatment and phosphorus on yield attributes and yield of greengram.

S. No.	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 (N/K)	10.51	5.39	23.01	1.06	4.09	20.98
	F- Test	S	S	S	S	S	S
	S.Em(+)	1.01	0.36	1.485	0.072	0.229	1.876
	C.D. at 0.5	3.016	1.086	4.413	0.215	0.680	5.574

Table 3: Effect of Seed treatment and phosphorus on economics of greengram.

Economics					
Treatments No.	**Treatment Details**	**Total cost of cultivation (₹/ha)**	**Gross return (₹/ha)**	**Net return (₹/ha)**	**B:C ratio**
1.	Phosphorus 40 kg/ ha + Dry seed	32,890	85,050.00	52,160.00	1.58
2.	Phosphorus 40 kg/ ha + Hydro priming	32,890	99,540.00	66,650.00	2.02
3.	Phosphorus 40 kg/ ha + KCL (1%)	32,895	1,10,250.00	77,355.00	2.35
4.	Phosphorus 50 kg/ ha + Dry seed	33,090	93,240.00	60,150.00	1.81
5.	Phosphorus 50 kg/ ha + Hydro priming	33,090	90,720.00	57,630.00	1.74
6.	Phosphorus 50 kg/ ha + KCL (1%)	33,095	1,25,370.00	92,275.00	2.78
7.	Phosphorus 60 kg/ ha + Dry seed	33,290	91,350.00	58,060.00	1.74
8.	Phosphorus 60 kg/ ha + Hydro priming	33,290	1,05,210.00	71,920.00	2.16
9.	Phosphorus 60 kg/ ha + KCL (1%)	33,295	1,29,150.00	95,855.00	2.87
10.	Control (N/K)	32,090	66,780.00	33,490.00	1.00

Conclusion

Based on the findings of the investigation it may be concluded of treatment Phosphorus 60 kg/ha +KCL(1%) performed exceptionally in obtaining the highest gross, net returns and B:C ratio.

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