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Hariom Saran Singh
M.Sc. Scholar, Department of Agronomy, Naini Agricultural institute, SHUATS, Prayagraj, Uttar Pradesh, India

Porika Samhitha
M. Sc. Scholar, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj, Uttar Pradesh, India

Corresponding Author:
Hariom Saran Singh
M.Sc. Scholar, Department of Agronomy, Naini Agricultural institute, SHUATS, Prayagraj, Uttar Pradesh, India

Influence of phosphorus and panchagavya levels on summer blackgram

Hariom Saran Singh and Porika Samhitha

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Abstract
A field experiment was conducted during zaid (summer) season of 2023 at Crop Research Farm Department of Agronomy. The treatments consisted of 3 levels of phosphorus [100% (40 kg/ha), 75% (30 kg/ha) and 50% (20 kg/ha)] and panchagavya (2, 4 and 6%) along with recommended doses of nitrogen and potash and a control (20-40-20 kg N-P-K/ha). The experiment was laid out in a Randomized Block Design with 10 treatments and replication thrice. Application of 100% phosphorus (40 kg/ha) along with foliar spray panchagavya 4% (Treatment 2) recorded highest plant height (32.70 cm), highest number of branches per plant (9.27), highest number of nodules per plant (17.00), highest dry weight (13.4 g), pods per plant (17.93), seeds per pod (8.33), test weight (37.73 g), seed yield (932.13 kg/ha) and stover yield (1894.53 kg/ha). The aforesaid treatment also recorded maximum gross return (INR 82148.80/ha), net return (INR 53299.80/ha) and B:C ratio (1.85).

Keywords: Blackgram, phosphorus, panchagavya, economic and yield

Introduction
Due to their excellent protein content and low cost, pulses are a significant crop in India. They are crucial in ensuring that people's diets have a healthy amount of protein. Blackgram [*Vigna mungo* (L.)], holds a special place in agriculture for its usage as a vegetable, and it is produced alongside other millets like sorghum, maize, and cotton as well as pure crops. (Ajaykumar *et al.*, 2022) [1]. Blackgram's low yield is caused by a number of problems, including inadequate management techniques, different physiological, biochemical, and crop-specific variables. Phosphorus is a very crucial element for growth and development of blackgram. Enzymatic activation or inactivation, membrane synthesis, respiration, redox processes, nucleic acid synthesis, photosynthesis, glycolysis, energy production, and signaling all depend on phosphorus. Thus, low phosphorus levels in the soil will have a significant impact on crop growth and development. (Hussain, 2017) [4]. In India, the use of foliar application of panchagavya in the development of numerous plantation crops has a well-established history (Selvaraj, 2003) [9]. Effective microorganisms (EM) and fermented liquid organic fertilizers have been used as foliar fertilizers in modern agriculture in order to produce food that is safe and of high quality. (Galindo *et al*., 2007) [3]. The present experiment was conducted to develop appropriate quantities of phosphorus and foliar applied panchagavya to boost the productivity of irrigated black gram, taking into account the available background knowledge.

Materials and Methods
A field trial was conducted during summer season of 2023 in sandy soil at the Crop Research Farm of the Department of Agronomy, SHUATS, Prayagraj, Uttar Pradesh. There were 10 treatment combinations comprising of three doses of phosphorus (100% phosphorus (40 kg/ha), 75% phosphorus (30 kg/ha) and 50% phosphorus (20 kg/ha)) and foliar spray of 3 levels of panchagavya (2, 4 and 6%) at 15 and 30 days after sowing and tested in randomized block design with factorial concept and replicated thrice. The soil of experimental field was loamy sand in texture, slightly alkaline in reaction (pH 7.30), electrical conductivity 0.64 dS/m, medium in available nitrogen (229 kg/ha) and potassium (229.8 kg/ha), and low in available phosphorous (24.9 kg/ha).

The nutrient sources were urea and murate of potash (MOP), applied as per the recommended dose of nitrogen 20 kg/ha and potassium 20 kg/ha Phosphorous in form of SSP and well fermented panchagavya was applied as per the treatments. Blackgram seeds were sown at a spacing of 30*10 cm. Throughout the experiment, a variety of crop growth and yield-related characteristics were measured and examined.

Results and Discussion

Plant height: At 60 DAS, highest plant height (32.70 cm) was observed with the application of 100% Phosphorous (40 kg/ha) + panchagavya 4% which was significantly superior with others and statistically at par with treatment of 75% Phosphorous (30 kg/ha) + panchagavya 4% (32.37 cm) and 50% Phosphorous (20 kg/ha) + panchagavya 2% (31.13 cm).

Branches per plant: At 60 DAS, significantly higher branches per plant (9.27) was shown with the treatment of 100% Phosphorous (40 kg/ha) + panchagavya 4% which was found statistically at par with treatment of 75% Phosphorous (30 kg/ha) + panchagavya 4% (9.00).

Nodules per plant: At 60 DAS, maximum nodules per plant (17.00) was recorded with the treatment of 100% Phosphorous (40 kg/ha) + panchagavya 4% which was significantly superior with others and statistically at par with treatment of 75% Phosphorous (30 kg/ha) + panchagavya 4% (16.60).

Plant dry weight: At 60 DAS, plant dry weight (13.40) was noted with the treatment of 100% Phosphorous (40 kg/ha) + panchagavya 4% which was significantly superior with others and statistically at par with treatment of 75% Phosphorous (30 kg/ha) + panchagavya 4% (13.30).

Pods per plant: At 60 DAS, application of 100% Phosphorous (40 kg/ha) along with foliar spray of panchagavya 4% was recorded significantly higher number of pods per plant (17.93).

Seeds per pod: At 60 DAS, application of 100% Phosphorous (40 kg/ha) along with foliar spray of panchagavya 4% was recorded highest number of pods per plant (8.33) which was significantly superior over all other treatments.

Test Weight: Application of 100% Phosphorous (40 kg/ha) along with foliar spray of panchagavya 4% was observed to have highest test weight (37.73 g) which was significantly superior over all other treatments and statistically at par with treatment 75% Phosphorous (30 kg/ha) + panchagavya 4% (37.50) and 50% Phosphorous (20 kg/ha) + panchagavya 4% (37.67 g).

Seed yield: Application 100% Phosphorous (40 kg/ha) along with foliar spray of panchagavya 4% was recorded maximum number of seed yield (932.13 kg/ha) which was significantly superior over all other treatments and statistically at par with treatment 75% Phosphorous (30 kg/ha) + panchagavya 4% (898.57 kg/ha).

Table 1: Effect of phosphorus and panchagavya on yield and yield attributes of blackgram

S. No.	Treatments	Plant height (cm)	Branches/plant	Nodules/plant	Dry Weight (g)	Pods/plant	Seed/Pods	Test Weight (g)	Seed yield (kg/ha)
1.	100% Phosphorous (40 kg/ha) + Panchgavya 2%	30.77	8.13	12.87	10.5	16.00	7.27	31.50	719.97
2.	100% Phosphorous (40 kg/ha) + Panchgavya 4%	32.70	9.27	17.00	13.4	17.93	8.33	37.73	932.13
3.	100% Phosphorous (40 kg/ha) + Panchgavya 6%	28.83	8.33	14.00	11.2	16.47	6.93	35.30	759.53
4.	75% Phosphorous (30 kg/ha) + Panchgavya 2%	31.03	8.33	13.53	12.4	15.87	6.73	35.70	748.20
5.	75% Phosphorous (30 kg/ha) + Panchgavya 4%	32.37	9.00	16.60	13.3	17.13	8.07	37.50	898.57
6.	75% Phosphorous (30 kg/ha) + Panchgavya 6%	29.53	8.20	15.13	11.4	16.20	6.20	33.57	720.70
7.	50% Phosphorous (20 kg/ha) + Panchgavya 2%	31.13	8.47	13.80	11.1	15.07	6.67	36.17	653.80
8.	50% Phosphorous (20 kg/ha) + Panchgavya 4%	30.77	8.47	13.73	11.1	15.53	7.33	37.67	716.97
9.	50% Phosphorous (20 kg/ha) + Panchgavya 6%	29.83	8.27	11.87	10.6	16.87	7.20	35.43	726.70
10	Control (RDF)	30.23	8.53	12.33	11.3	14.67	6.67	34.17	694.00
	F – test	S	S	S	S	S	S	S	S
	S Em (±)	0.53	0.18	0.49	0.30	0.49	0.25	1.15	23.70
	CD (p=0.05)	1.58	0.52	1.45	0.88	1.47	0.75	3.42	70.43

Conclusion

From this research, it is concluded that application 100% Phosphorous (40 kg/ha) along with foliar spray of panchagavya 4% increase plant height, branches/plant, nodules/plant, dry matter accumulatiom, yield and yield attributes and economics of Blackgram. Consequently, it is suggested as an integrated source of essential nutrients for Blackgram grown organically.

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