The Andhra Agric. J 72 (4): 401-405, 2025
doi :10.61657/aaj.2025.227

Growth and yield of newly released blackgram varieties at different nutrient levels and liquid biofertilizers

K Susanna Grace, N Venkata Lakshmi, S Jafar Basha and V Sailaja
Department of Agronomy, Acharya N G Ranga Agricultural University,
Agricultural College, Bapatla - 522101, Andhra Pradesh, India

ABSTRACT

A field experiment was carried out on clay loam soils during *rabi*, 2024-2025 at Regional Agricultural Research Station, Lam, Guntur to study the response of newly released blackgram varieties to liquid biofertilizers at graded nutrient levels. The experiment was laid out in randomised block design with factorial concept with 3 varieties *viz.,* LBG-884, LBG904, LBG-752(check variety) as factor - I and nutrient levels –Absolute control, *Rhizobium* seed treatment + soil application of PSB & KRB alone, 100 % RDF, 75% RDF + *Rhizobium* seed treatment + PSB+ KRB and 50% RDF + *Rhizobium* seed treatment + PSB+ KRB as factor - II, in three replications. The results of the investigation revealed that among the varieties, LBG-904 (M_2) recorded the highest drymatter accumulation at harvest (5129 kg ha^{-1}), number of pods plant^{1}(17.1), number of seeds pod^{-1} (6.7), seed yield (1989 kg ha^{-1}) and haulm yield (2988 kg ha^{-1}) over LBG -884 (M_1) and LBG752 (M_3). Application of 100% RDF recorded taller plants, (40.0 cm), drymatter accumulation at maturity (5529 kg ha^{-1}), number of pods plant^{-1}(19.3), number of seeds pod^{-1}(7.8), seed yield (2107 kg ha^{-1}) and haulm yield (3029 kg ha^{-1}) and found at par with (S_4) - 75% RDF + *Rhizobium* seed treatment + PSB+ KRB over (S_5) - 50% RDF + *Rhizobium* seed treatment + PSB+ KRB, (S_2) - *Rhizobium* seed treatment + soil application of PSB, KRB alone and (S_1) - Absolute control.

Keywords: *Blackgram, KRB, Liquid biofertilizers, Nutrient levels, PSB, Rhizobium and Varieties*

Blackgram (*Vigna mungo* L.) is a highly nutritious grain legume crop mainly grown in Asian countries. Blackgram is often grown on marginal lands with little or no fertilizer and pesticide use. However, adequate fertilization with biofertilizers is crucial for improving economic returns. Biofertilizers are substances that supply nutrients by naturally fixing atmospheric nitrogen, solubilizing native phosphorus, and promoting plant growth by producing growth promoting substances (Suhag, 2016). Biofertilizers such as Rhizobium and PSB (Phosphate Solubilizing Bacteria) play a crucial role in enhancing the availability of nitrogen and phosphorus (Harika *et al.,* 2023). The influence of potassium enhances carbohydrate synthesis and the translocation of photosynthetic products, contributed to increase in yield attributes (Chaudhari *et al.,* 2018). Various field studies suggest that applying 20-40 kg of K, O ha^{-1} is beneficial for attaining higher pulse yields (Ali and Srinivasa Rao, 2001). Adding an appropriate rhizobium inoculation to the grain in pulse crops contributes to improved soil fertility (Shekhawat *et al*., 2018). Biofertilizers are less expensive and typically more successful agronomic technique for guaranteeing enough nitrogen feeding of legumes than applying nitrogen fertilizer (Heisnam *et al.,* 2017).

Hence, research efforts are required to find out the ideal combination of nutrient levels with phosphate solubilizing bacteria and potassium releasing bacteria to satisfy the overall nutrient requirement of blackgram crop without impairing the soil health.

MATERIAL AND METHODS

A field experiment was conducted at Regional Agricultural Research Station, Lam, Guntur during *rabi*, 2024-25. The soil of the experimental field was clay in texture, slightly alkaline in reaction with pH 7.7, electrical conductivity 0.43 dS m^{-1}, non-saline, low in organic carbon (0.45), low in available nitrogen (258.0 kg ha^{-1}), medium in available phosphorus (49.0 kg ha^{-1}) and high in available potassium (695

kg ha^{-1}). Average mean maximum temperature was 33.1 ^{0}C and minimum temperature was 20.9 ^{0}C during the crop growth period. A total amount of rainfall received was 24 mm in three rainy days. The experiment was laid out in a Factorial Randomized Block Design (FRBD) with 3 varieties *i.e.*, M_1: LBG-884, M_2: LBG-904 and M_3: LBG-752(check variety) as factor - I and nutrient levels (5) *i.e.,* S_1: Absolute control, S_2: Rhizobium seed treatment + soil application of PSB & KRB alone, S_3: 100% RDF (20-500 kg NPK ha^{-1}) S_4: 75% RDF + Rhizobium seed treatment + PSB+ KRB and S_5: 50% RDF + Rhizobium seed treatment + PSB+ KRB as factor – II and replicated thrice. Nitrogen and phosphorus was applied in the form of urea and single super phosphate (SSP) respectively. Sowing was done with a spacing of 30 cm x 10 cm on 3rd December, 2024. Need based irrigation was applied at weekly intervals to the entire plots. The recommended plant protection measures were followed whenever necessary. Five plants from each plot were selected randomly to record the biometric observations like plant height, drymatter accumulation (kg ha^{-1}), number of branches plant^{-1} and yield attributes. Different varieties of blackgram was harvested after attaining maturity and threshing was done separately for each variety and recorded the seed and haulm yield for each plot. The data was analyzed statistically following the standard procedures as described by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Growth Parameters

Growth parameters of different varieties were significantly affected by different nutrient levels (Table 1). Among the varieties tested, highest plant height at 30 DAS, 60 DAS and at Maturity (20.4 cm, 40.2 cm and 41.5 cm) was noticed with LBG-752 due to its genetic nature, whereas, the lowest (15.1 cm, 36.2 cm and 38.2 cm) was recorded with LBG-884.

Table 1. Plant height, drymatter accumulation (kg ha^{-1}), number of branches plant^{-1} in blackgram varieties as influenced by liquid biofertilizers and graded nutrient levels

Treatments	Plant height (cm)			Drymatter accumulation (kg ha-1)			Number of branches plant-1		
	30 DAS	60 DAS	Maturity	30 DAS	60 DAS	Maturity	30 DAS	60 DAS	Maturity
Varieties									
M_1 – LBG - 884	15.10	36.20	38.20	1032.00	3017.00	4692.00	4.40	6.20	7.90
M_2 – LBG - 904	18.30	39.40	40.10	1126.00	3382.00	5129.00	4.50	6.90	8.30
M_3 – LBG – 752 (check variety)	20.40	40.20	41.50	835.00	2584.00	4260.00	4.30	5.00	7.00
SEm±	0.71	0.44	0.30	24.20	72.10	95.70	0.12	0.53	0.33
CD (P = 0.05)	2.10	1.30	0.80	70.00	210.00	270.00	NS	NS	1.00
Nutrient levels									
S_1 - Absolute control (No fertilizer/ biofertilizer)	9.30	32.10	33.20	945.00	2641.00	3923.00	3.90	3.00	5.50
S_2 - *Rhizobium* seed treatment + soil application of PSB & KRB alone	12.20	35.00	36.10	1029.00	2837.00	4172.00	4.30	4.40	7.00
S_3 -100 % RDF (20-50-0 kg NPK ha^{-1})	20.70	39.80	40.00	1248.00	3426.00	5529.00	4.80	7.40	9.50
S_4 -75% RDF + *Rhizobium* seed treatment + PSB+ KRB	18.20	38.30	39.70	1152.00	3359.00	5144.00	4.60	6.70	8.80
S_5 - 50% RDF + *Rhizobium* seed treatment + PSB+ KRB	15.00	37.60	38.90	1097.00	3247.00	4661.00	4.40	6.00	8.20
SEm±	0.92	0.57	0.39	28.60	80.20	105.60	0.17	0.70	0.40
CD (P = 0.05)	2.60	1.80	1.00	80.00	230.00	300.00	0.20	NS	1.20
Interaction									
SEm±	1.35	1.01	0.55	28.10	93.20	272.60	0.27	1.18	0.75
CD (P = 0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV (%)	12.40	7.10	7.90	8.00	7.50	8.50	10.50	9.50	11.90

Among the nutrient levels tested, application of 100% RDF resulted in higher plant height (20.7 cm, 39.8 cm and 40.0 cm) in blackgram followed by 75% RDF + *Rhizobium* seed treatment + PSB+ KRB (S_4). Similar results were reported by Shamsi (2010). LBG-904 variety recorded significantly higher drymatter accumulation at 30 DAS, 60 DAS and at Maturity (1126 kg ha^{-1}, 3382 kg ha^{-1} and 5129 kg ha^{-1}) over LBG – 884 and LBG – 752 and the lowest (4260 kg ha^{-1}) was recorded at maturity with LBG-752. Among the nutrient levels tested, higher drymatter accumulation (5529 kg ha^{-1}) was recorded with the application of 100% RDF at 30 DAS, 60 DAS and at maturity, whereas lowest accumulation of drymatter (3923 kg ha^{-1}) was recorded with Absolute control. These findings are similar with that of Ragavendra *et al*. (2017). It might be due to the genetic potential of the respective variety and higher nutrient availability to the plant at 100% recommended dose. Number of branches per plant was influenced significantly by varieties at maturity and by nutrient levels at 30 DAS and at harvest. However, higher number of branches per plant was noticed with 100% RDF (9.5) followed by 75% RDF + Rhizobium seed treatment + PSB+ KRB (S_4). Similar results are noticed by to Khan *et al*. (2022).

Yield Attributes

In blackgram, among the varieties tested, highest number of pods plant^{1} (17.1) was recorded in LBG-904 and the lowest (9.3) was observed in LBG-752. Among the nutrient levels investigated, application of 100% RDF resulted in higher number of pods plant^{-1} (19.3). The lowest number of pods plant^{-1} (14.5) were noticed with absolute control. (Table 2). These results are in confirmation with Sahil *et al*. (2025). Among the blackgram varieties evaluated, the highest number of seeds pod^{-1} (6.7) were recorded by LBG-904 which was comparable to LBG-884 (6.2). The lowest number of pods plant^{-1} (5.8) was observed with LBG-752. The treatment supplied with 100% RDF recorded the higher number of pods plant^{-1} (7.8), whereas the treatment absolute control registered the lowest (5.0). Similar results

Table 2: Number of pods plant^{-1}, number of seed pod^{-1}, test weight (g) seed and haulm yield (kg ha^{-1}) as influenced by liquid biofertilizers and graded nutrient lev els

Treatments	Number of pods plant^{-1}	Number of seeds pod^{-1}	Test weight (g)	Seed yield (kg ha-1)	Haulm yield
Varieties					
M_1 – LBG - 884	15.10	6.20	40.30	1687.00	2811.00
M_2 – LBG - 904	17.10	6.70	41.20	2060.00	2988.00
M_3 – LBG – 752 (check variety)	9.30	5.80	39.90	1490.00	2654.00
SEm±	0.43	0.15	1.12	33.10	72.00
CD (P = 0.05)	1.30	0.50	NS	99.30	216.00
Nutrient levels					
S_1 - Absolute control (No fertilizer/ biofertilizer)	14.50	5.00	37.90	1166.00	2507.00
S_2 - *Rhizobium* seed treatment + soil application of PSB & KRB alone	16.00	6.10	37.90	1517.00	2707.00
S_3 - 100 % RDF (20-50-0 kg NPK ha^{-1})	19.30	7.80	41.00	2176.00	3029.00
S_4 - 75% RDF + *Rhizobium* seed treatment + PSB+ KRB	17.90	7.20	38.10	2102.00	2883.00
S_5 - 50% RDF + *Rhizobium* seed treatment + PSB+ KRB	17.50	6.80	38.00	1769.00	2796.00
SEm±	0.56	0.20	2.70	42.80	92.90
CD (P = 0.05)	1.70	0.60	NS	128.40	278.90
Interaction					
SEm±	1.01	0.33	2.80	74.10	161.00
CD (P = 0.05)	NS	NS	NS	S	S
CV (%)	12.60	8.73	6.10	7.30	10.20

were reported by Dwivedi and Singh (2020). Among the varieties and nutrient levels tested, no significant difference was found in test weight of blackgram. However, a slight increase was noticed with the increase in the nutrient levels and found higher (41.0 g) at 100% RDF and lower (37.9 g) in absolute control. The superior performance of the varieties can be attributed to their inherent genetic potential, which was further enhanced by the continuous and adequate supply of nutrients throughout the crop growth period under high nutrient levels.

Yield

Among the varieties tested, significantly higher seed and haulm yield (2060 and 2988 kg ha^{-1} respectively) were recorded with LBG-904 followed by LBG-884 (1687 and 2811 kg ha^{-1}) and the lowest was noticed with LBG-752 (1490 and 2654 kg ha^{-1}). The varieties outstanding performance might be due to their favourable physiological characteristics and innate genetic potential (Table.2). The highest seed and haulm yield (2176 and 3029 kg ha^{-1}) was recorded with 100% RDF over Absolute control. The increased yield with increased fertilizer application might be due to better nutrient availability throughout the crop's growth. These results are in accordance with Panotra *et al*. (2016) and Tyagi and Singh (2019).

CONCLUSION

Based on the above results, it can be concluded that newly released varieties of blackgram *ie,* LBG-904 and LBG-884 responsed to liquid biofertilizers and recorded higher seed yield and haulm yield and comparable with 75% RDF + *Rhizobium* seed treatment + PSB+ KRB compare to 100% RDF.

LITERATURE CITED

Ali M and Rao C S 2001. Role of potassium fertilization in improving productivity of pulse crops. In Proceeding of international symposium held in New Delhi, India 261-267.

Chaudhari A V, Mane S S, Chadar B R 2018. Effect of graded levels of potassium on growth, yield and quality of blackgram. *International Journal of Current Microbiology and Applied Sciences* 2018;(6):1607-1612.

Dwivedi V and Singh T 2020. Influence of Integrated nutrient management on growth, yield and quality of Blackgram (*Vigna mungo* L.). *Journal of Pharmacognosy and Phytochemistry*. 9(5): 1414-1416.

Gomez K A and Gomez A 1984. *Statistical Procedures for Agricultural Research*. 1st ed. John Wiley & Sons, New York.

Harika D, Debbarma V and Thrupthi M G 2023. Influence of phosphorus and bio-fertilizers on growth and yield of blackgram (*Phaseolus mungo* L.). *International Journal of Plant & Soil Science*. *35*(13): 43-51.

Heisnam P, Sah D, Moirangthem A, Singh M.C., Pandey P K and Mahato N K 2017. Effects of rhizobium, PSB inoculation and phosphorus management on soil nutrient status and performance of cowpea in acid soils of Arunachal Pradesh, India. *International Journal of Current Microbiology and Applied Sciences*. 6(8): 937-942.

Khan P M I, Verma R, Dawson J and Singh M 2022. Effect of panchagavya and organic manures on growth and yield of black gram (*Vigna mungo* L.). *Pharma Innovation*. (11): 1483-1487.

Panotra N, Kumar A and Singh O P 2016. Effect of varieties and dates of sowing on growth parameters, yield attributes and yield of blackgram (*Vigna mungo* L.). *International Journal of Science, Environment and Technology*. 5(6): 3821-3826.

Ragavendra T, Jayalakshmi V and Basha S J 2017. Physiological characters and yield of chickpea as influenced by dates of sowing, varieties and irrigation regimes in vertisols of scarce rainfall zone of Andhra Pradesh. *Bulletin of Environment, Pharmacology and Life Sciences*. 6(3): 81-83.

Sahil A B, Sharma A, Bochalya R S, Kamboj M. and Singh M 2025. Yield optimization of blackgram (*Vigna mungo* L.) using integrated nutrient. *Plant Archives*. 25(2):1327-1330.

Shamsi K 2010. The effect of sowing date and row spacing on yield and yield components on Hashem chickpea variety under rainfed condition. *African Journal of Biotechnology*. 9(1): 7-11

Shekhawat A S, Purohit H S, Jat G, Meena R and Regar M K 2018. Efficacy of phosphorus, vermicompost and biofertilizers on soil health and nutrient content & uptake of black gram (*Vigna mungo* L.) *International Journal of Chemical Studies.* 6(2):3518-3521.

Suhag M 2016. Potential of biofertilizers to replace chemical fertilizers. *International Advanced Research Journal in Science, Engineering and Technology*. 3(5): 163-167.

Tyagi P K and Singh V K 2019. Effect of integrated nutrient management on growth, yield and nutrients uptake of summer black gram (*Vigna mungo* L.). *Annals of Plant and Soil Research*. 21(1): 30-35.

Received on 15.07.2025 and Accepted on 28.08.2025