

International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; SP-10(9): 628-632
www.biochemjournal.com
Received: 19-06-2026
Accepted: 22-07-2026

Yogita Najukrao Shelke
PG Scholar, Department of
Agronomy, Post Graduate
Institute, Dr. Panjabrao Deshmukh
Krishi Vidyapeeth, Akola,
Maharashtra, India

Dr. Arvind R Tupe
Associate professor
(Agrometeorology), Department of
Agronomy, Post Graduate
Institute, Dr. Panjabrao Deshmukh
Krishi Vidyapeeth, Akola,
Maharashtra, India

Sangeeta M Sawadhakar
Assistant professor, Department of
Agronomy, Post Graduate
Institute, Dr. Panjabrao Deshmukh
Krishi Vidyapeeth, Akola,
Maharashtra, India

Dr. Anita B Chorey
Head, Department of Agronomy,
Post Graduate Institute, Dr.
Panjabrao Deshmukh Krishi
Vidyapeeth, Akola, Maharashtra,
India

Sachin T Morey
Young Professional-II, AICRP on
Agrometeorology, Post Graduate
Institute, Dr. Panjabrao Deshmukh
Krishi Vidyapeeth, Akola,
Maharashtra, India

Dr. SS Lande
Pulses Breeder, Department of
Botany, Post Graduate Institute,
Dr. Panjabrao Deshmukh Krishi
Vidyapeeth, Akola, Maharashtra,
India

Harsh Mahesh Dixit
PG Scholar, Department of
Agronomy, Post Graduate
Institute, Dr. Panjabrao Deshmukh
Krishi Vidyapeeth, Akola,
Maharashtra, India

Gyanashree Pusti
PG Scholar, Department of
Agronomy, Post Graduate
Institute, Dr. Panjabrao Deshmukh
Krishi Vidyapeeth, Akola,
Maharashtra, India

Corresponding Author:
Yogita Najukrao Shelke
PG Scholar, Department of
Agronomy, Post Graduate
Institute, Dr. Panjabrao Deshmukh
Krishi Vidyapeeth, Akola,
Maharashtra, India

Growth response of black Gram Varieties (*Vigna Mungo*L.) Under Different Sowing Windows

Yogita Najukrao Shelke, Arvind R Tupe, Sangeeta M Sawadhakar, Anita B Chorey, Sachin T Morey, SS Lande, Harsh Mahesh Dixit and Gyanashree Pusti

DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i9Sh.9890>

Abstract

The present investigation, entitled “Effect of Sowing Windows and Varieties on Growth Attributes of Black Gram (*Vigna mungo* L.)”, was conducted at the Farm Section of the Department of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, during the *kharif* season of 2025-26. The study was undertaken to assess the effects of different sowing windows on the growth responses of five black gram Varieties, viz., V₁ - PDKV Black Gold, V₂ - AKU-15, V₃ - TAU-1, V₄ - AKU-23/5, and V₅ - BDU-1. The crop was sown during four different sowing windows, namely D₁ - 24 MW (16 June), D₂ - 26 MW (30 June), D₃ - 28 MW (14 July), and D₄ - 30 MW (28 July). The experiment was conducted in a factorial randomized block design with three replications, comprising twenty treatment combinations, on medium-deep black soil. The results revealed that the different sowing windows significantly influenced the growth attributes of black gram. Crop sown during the 24th MW resulted in significantly superior growth attributes, including higher plant height, number of branches plant⁻¹, leaf area, leaf area index, dry matter weight plant⁻¹, and number of nodules plant⁻¹, compared with the later sowing windows. Among the different varieties, PDKV Black Gold performed better for several growth attributes and remained comparable with BDU-1 for certain growth parameters. The interaction effect between sowing windows and Varieties was found to be non-significant for the growth parameters.

Keywords: Black gram, sowing windows, growth attributes, varieties

Introduction

Pulses, also known as “grain legumes,” are important food crops after cereals and constitute a key component of vegetarian diets worldwide (Ray *et al.* 2023) [7]. Black gram, also known as urdbean, is an important pulse crop and a rich source of nutrients. It contains approximately 20-25 per cent protein, making it an important component of a balanced vegetarian diet (Singh, 2011) [10] Sunilkumar *et al.* 2018; Yadav *et al.* 2019) [11, 14]. When combined with cereals, pulses provide an ideal combination of proteins with high biological value (Andrews and Hodge, 2010; Ali and Gupta, 2012; Tomar *et al.* 2021) [2, 4, 12]. Thus, pulses play an important role in ensuring food and nutritional security, particularly in India. After cereals, pulses constitute the second-largest source of dietary protein, contributing about 27 per cent compared with 55 per cent from cereals. Food legumes are sometimes referred to as “rich man’s vegetable” and “poor man’s meat” because of their high protein content, affordability, and accessibility to economically weaker sections of society. Pulses also contribute to soil fertility through biological nitrogen fixation, as they have the ability to fix atmospheric nitrogen (Sunilkumar *et al.* 2018) [11].

Black gram is consumed in various forms, including fermented and unfermented flour, as well as dried whole or split grains commonly known as dal. Black gram flour is widely used in the preparation of popular Indian foods such as idli, dosa, and vada. It is also used in the preparation of cookies, cakes, biscuits, and various snack products. The seeds have potential applications in the pharmaceutical and cosmetic industries and are also used as functional food and nutraceutical products. In addition to its food value, black gram can be utilized as a green manure crop and may also serve as a catch crop, intercrop, and cover crop, thereby contributing to soil conservation and reducing soil erosion (Amuthaselvi *et al.* 2023) [3].

Black gram is cultivated on approximately 4.63 million hectares in India, with a production of 2.78 million tonnes and productivity of 600 kg ha⁻¹. Madhya Pradesh has the largest area under black gram cultivation, followed by Uttar Pradesh and Maharashtra, while Andhra Pradesh has reported the highest productivity of 915 kg ha⁻¹ (Anonymous, 2024). In Maharashtra, black gram is cultivated on approximately 3.68 lakh hectares, producing 2.34 lakh tonnes with a productivity of 635 kg ha⁻¹, accounting for nearly 7 per cent of India's total production (Anonymous, 2024).

Materials and Methods

The field experiment was conducted at the Farm of the Department of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, during the *kharif* season of 2025. The experimental site is situated at a latitude of 20.69° N and a longitude of 77.02° E and falls under the Western Vidarbha Zone of the agro-climatic region of Maharashtra. The gross plot size was 3.6 m × 3.2 m, while the net plot size was 2.5 m × 2.8 m. The experiment was laid out in a Factorial Randomized Block Design (FRBD) with 20

treatment combinations and three replications. The treatments consisted of four sowing windows and five black gram Varieties. The four sowing windows were D₁ - 24 MW (16 June), D₂ - 26 MW (30 June), D₃ - 28 MW (14 July), and D₄ - 30 MW (28 July). The five Varieties were V₁ - PDKV Black Gold, V₂ - AKU-15, V₃ - TAU-1, V₄ - AKU-23/5, and V₅ - BDU-1.

Black gram was sown at a 45 cm × 10 cm distance. The recommended basal dose of nitrogen (20 kg N ha⁻¹), phosphorus (40 kg P₂O₅ ha⁻¹), and potassium (40 kg K₂O ha⁻¹) was applied through urea, di-ammonium phosphate (DAP), and muriate of potash (MOP), respectively. During the crop-growing season, a total rainfall of 773.4 mm was received, distributed over 46 rainy days. The soil of the experimental field was clayey in texture and nearly neutral in reaction (pH 7.68). The soil was low in organic carbon (0.57%), medium in available nitrogen (198 kg ha⁻¹) and available phosphorus (20.24 kg ha⁻¹), and high in available potassium (328 kg ha⁻¹). The bulk density of the soil was 1.40 Mg m⁻³, and the electrical conductivity was 0.28 dS m⁻¹.

Table 1: Treatment details

Factor A-Sowing	
	D ₁ - 24 MW(16 June)
	D ₂ - 26 MW (30 June)
	D ₃ - 28 MW (14 July)
	D ₄ - 30 MW (28 July)
Factor B-Varieties	
	V ₁ - PDKV Black Gold
	V ₂ - AKU-15
	V ₃ - TAU-1
	V ₄ - AKU-23/5
	V ₅ - BDU-1

Meteorological data, viz., rainfall, relative humidity, maximum and minimum temperatures, bright sunshine hours and day length were recorded from the Agrometeorological observatory of Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India.

Results and Discussions

Effect on Growth attributes

Plant height (cm)

Plant height at harvest was significantly influenced by different sowing windows. Crop sown during 24 MW (16 June) recorded significantly higher plant height (53.7 cm) than the later sowing windows. Crop sown during 30 MW (28 July) recorded significantly lower plant height (42.7 cm). The greater plant height observed with early sowing can be attributed to favorable temperatures, sufficient soil moisture, a longer vegetative growth period, and improved solar radiation, which boosted photosynthesis and nutrient absorption, resulting in taller plants.

In contrast, delayed sowing reduced the growth period and exposed the plants to less favorable environmental conditions, leading to lower plant height. Similar results were reported by Singh *et al.* (2014) [9].

Among the Varieties, PDKV Black Gold (V₁) recorded significantly higher plant height (50.0 cm) than AKU-15 (47.6 cm), TAU-1 (45.4 cm), AKU-23/5 (46.4 cm), and BDU-1 (47.7 cm). TAU-1 recorded the lowest plant height (45.4 cm). Similar results were reported by Patidar *et al.* (2018) [6]. The interaction between sowing windows and varieties was non-significant for plant height.

Number of branches plant⁻¹

The number of branches plant⁻¹ at harvest was significantly influenced by different sowing windows. Crop sown during 24 MW (16 June) recorded significantly higher number of branches plant⁻¹ (8.18), which was statistically at par with 26 MW (30 June) (7.60). Crop sown during 30 MW (28 July) recorded significantly lower number of branches plant⁻¹ (6.72). Similar results were reported by Aher *et al.* (2006) [11].

Among the Varieties, PDKV Black Gold (V₁) recorded higher number of branches plant⁻¹ (7.75), which was statistically at par with BDU-1 (7.62), AKU-15 (7.48), and TAU-1 (7.40), but was significantly superior to AKU-23/5 (7.03). Similar results were reported by Aher *et al.* (2006) [11]. The interaction between sowing windows and varieties was non-significant for number of branches plant⁻¹.

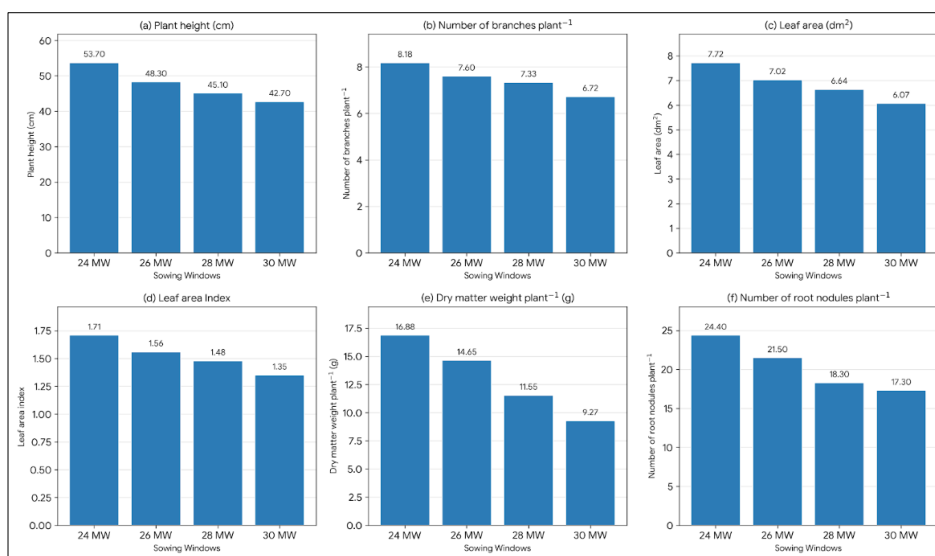
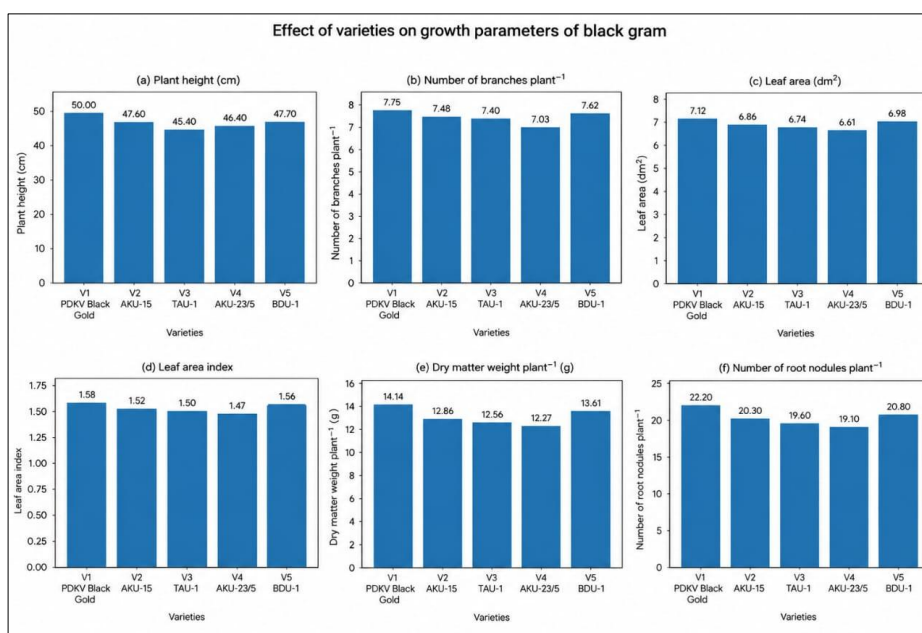
Leaf area plant⁻¹ (dm²)

Leaf area at 60 DAS was significantly influenced by different sowing windows. Crop sown during 24 MW (16 June) recorded significantly higher leaf area (7.72 dm²), whereas crop sown during 30 MW (28 July) recorded significantly lower leaf area (6.07 dm²). Similar results were reported by Singh *et al.* (2014) [9].

Among the Varieties, PDKV Black Gold (V₁) recorded higher leaf area (7.12 dm²), which was statistically at par with AKU-15 (6.86 dm²) and BDU-1 (6.98 dm²), while it was significantly superior to TAU-1 (6.74 dm²) and AKU-23/5 (6.61 dm²). The interaction between sowing windows and varieties was non-significant for leaf area.

Table 2: Effect of different sowing windows and Varieties on growth attributes

Treatments	Plant height (cm) (At harvest)	No. of branches plant ⁻¹ (At harvest)	Leaf area plant ⁻¹ (dm ²) (At 60 DAS)	Leaf area index (At 60 DAS)	Dry matter weight plant ⁻¹ (g) (At harvest)	No. of root nodules plant ⁻¹ (At 40 DAS)
Factor A: Sowing windows						
D ₁ -24 MW (16 th June)	53.7	8.18	7.72	1.71	16.88	24.4
D ₂ -26 MW (30 th June)	48.3	7.60	7.02	1.56	14.65	21.5
D ₃ -28 MW (14 th July)	45.1	7.33	6.64	1.48	11.55	18.3
D ₄ -30 MW (28 th July)	42.7	6.72	6.07	1.35	9.27	17.3
S.E. (m)±	1.01	0.21	0.17	0.04	0.38	0.56
C. D. at 5%	3.50	0.71	0.59	0.13	1.33	1.94
Factor B: Varieties						
G ₁ - PDKV Black Gold	50.0	7.75	7.12	1.58	14.14	22.1
G ₂ - AKU-15	47.6	7.48	6.86	1.52	12.86	20.3
G ₃ - TAU-1	45.4	7.40	6.74	1.50	12.56	19.6
G ₄ - AKU-23/5	46.4	7.03	6.61	1.47	12.27	19.1
G ₅ - BDU-1	47.7	7.62	6.98	1.55	13.61	20.8
S.E. (m)±	0.73	0.15	0.12	0.03	0.26	0.40
C. D. at 5%	2.10	0.42	0.34	0.08	0.75	1.16
Interaction (AXB)						
S.E. (m)±	1.46	0.29	0.05	0.05	0.52	0.8
C. D. at 5%	NS	NS	NS	NS	NS	NS
GM	47.4	7.46	6.86	1.52	13.09	20.4

**Fig 1:** Effect of sowing windows on growth parameters of black gram**Fig 2:** Effect of varieties on growth parameters of black gram

Leaf area index

Leaf area index at 60 DAS was significantly influenced by different sowing windows. Crop sown during 24 MW (16 June) recorded significantly higher leaf area index (1.71), whereas crop sown during 30 MW (28 July) recorded significantly lower leaf area index (1.35).

Among the varieties, PDKV Black Gold (V_1) recorded higher leaf area index (1.58), which was statistically at par with BDU-1 (1.55) and AKU-15 (1.52). AKU-23/5 (1.47) recorded the lowest leaf area index. The interaction between sowing windows and varieties was non-significant for leaf area index.

Dry matter weight plant⁻¹ (g)

Dry matter weight plant⁻¹ at harvest was significantly influenced by different sowing windows. Crop sown during 24 MW (16 June) recorded significantly higher dry matter weight plant⁻¹ (16.88 g), whereas crop sown during 30 MW (28 July) recorded significantly lower dry matter weight plant⁻¹ (9.27 g). This could be attributed to comparatively less favourable weather conditions encountered across the growing period by later sown crop which consequently reduced the dry matter accumulation. Besides, growth period of the crop also decreased with each successive delay in sowing which also reflected in reduced dry matter weight in later sowings. Similar results were reported by Vijayalaxmi (2012).

Among the varieties, PDKV Black Gold (V_1) recorded higher dry matter weight plant⁻¹ (14.14 g), which was statistically at par with BDU-1 (13.61 g), but significantly superior to AKU-15 (12.86 g), TAU-1 (12.56 g), and AKU-23/5 (12.27 g). Similar results were reported by Singh *et al.* (2010) [8]. The interaction between sowing windows and Varieties was non-significant for dry matter weight plant⁻¹.

Number of root nodules plant⁻¹

The number of root nodules plant⁻¹ at 40 DAS was significantly influenced by different sowing windows. Crop sown during 24 MW (16 June) recorded significantly higher number of root nodules plant⁻¹ (24.4) than the later sowing windows. Crop sown during 30 MW (28 July) recorded significantly lower number of root nodules plant⁻¹ (17.3). The higher nodulation under early sowing 24 MW may be attributed to favourable environmental conditions and optimum soil moisture during the vegetative period, which promoted better root growth, extensive lateral root development and enhanced rhizobial activity in the rhizosphere. Similar results were reported by Zammurad *et al.* (2006) [15].

Among the Varieties, PDKV Black Gold (V_1) recorded significantly higher number of root nodules plant⁻¹ (22.1) than the other Varieties, whereas AKU-23/5 (V_4) recorded the lowest number of root nodules plant⁻¹ (19.1). The interaction between sowing windows and Varieties was non-significant for number of root nodules plant⁻¹.

Conclusion

Based on the results of the present investigation, sowing of black gram during 24 MW (16 June) was found to be significantly superior for obtaining better growth attributes under the agro-climatic conditions of Akola. The crop sown during 24 MW recorded significantly higher plant height, number of branches plant⁻¹, leaf area, leaf area index, dry

matter weight plant⁻¹, and number of root nodules plant⁻¹ compared with the later sowing windows.

Among the varieties, PDKV Black Gold performed better with respect to growth attributes. It recorded significantly higher plant height and number of root nodules plant⁻¹, while for number of branches plant⁻¹, leaf area, leaf area index, and dry matter weight plant⁻¹, it was statistically at par with one or more varieties, particularly BDU-1. The overall performance of the was followed by BDU-1, AKU-15, TAU-1, and AKU-23/5, with AKU-23/5 generally recording comparatively lower growth attributes.

References

1. Aher SK, Mate SN, Tagad LN. Effect of morpho-physiological parameters on yield and yield contributing characters in germplasm of black gram (*Vigna mungo* L.). Legume Research. 2006;20(2):154-156.
2. Ali M, Gupta S. Carrying capacity of Indian agriculture: Pulse crops. Current Science. 2012;102:874-881.
3. Amuthaselvi G, Anand G, Vijayalakshmi R, Khanif NAK, Dhanushkodi V, Gayathri M, *et al.* Yield gap analysis through frontline demonstration in blackgram at Tiruchirapalli district. Legume Research. 2023;46(7):898-901.
4. Andrews M, Hodge S. Legume cultivars for stress environments. In: Yadav SS, Redden R, editors. Climate Change and Management of Cool Season Grain Legume Crops. 2010. p. 243-281.
5. Directorate of Economics and Statistics, Government of Maharashtra. Economic Survey of Maharashtra 2024. Mumbai: Government of Maharashtra; 2024.
6. Patidar K, Singh T. Effect of genotypes and dates of sowing on growth, yield and quality of black gram (*Vigna mungo* L.). Journal of Annals of Plant and Soil Research. 2018;20(4):428-431.
7. Ray LIP, Swetha K, Singh AK, Singh NJ. Water productivity of major pulses—A review. Agricultural Water Management. 2023.
8. Singh GSH, Sekhon H, Ram H, Gill KK, Sharma P. Effect of date of sowing on nodulation, growth, thermal requirement and grain yield of *kharif* mungbean genotypes. Journal of Food Legumes. 2010;23(2):132-134.
9. Singh M, Kumar R. Effect of date of sowing and seed rate on the growth of *kharif* mash (*Vigna mungo* L.). Agricultural Science Digest. 2014;34(3):211-214.
10. Singh RP. Status paper on pulses. Bhopal: Directorate of Pulses Development, Government of India, Ministry of Agriculture (Department of Agriculture and Co-operation); 2011. 116 p.
11. Sunilkumar NM, Jadhav RL, Bhavani K, Mallikarjun N, Ravi S. Demonstration of black gram integrated crop management technology through frontline demonstrations (FLDs) in Bidar district of Hyderabad Karnataka region. Journal of Pharmacognosy and Phytochemistry. 2018.
12. Tomar SK, Rao AP, Yadav SK, Singh SN, Naresh RK, Pandey N, *et al.* Enhancing the productivity and production of pulses through cluster frontline demonstration and yield gap analysis in Tarai belt of eastern Uttar Pradesh. The Pharma Innovation. 2021;SP-10(6):350-354.

13. Vijayalakshmi. Effect of late planting on phenology, morpho-physiological traits and dry matter distribution in urdbean. Legume Research. 2012;35(2):104-106.
14. Yadav AS, Kumar S, Kumar N, Ram H. Pulse production and productivity: Status, potential and way forward for enhancing farmers' income. International Journal of Current Microbiology and Applied Sciences. 2019.
15. Zammurad I, Ahmed MS, Anjum MA, Rauf A. Effect of *Rhizobium* inoculation on growth and nodule formation of green gram. International Journal of Agriculture & Biology. 2006;8(2):235-237