



ISSN Print: 2618-060X
 ISSN Online: 2618-0618
 NAAS Rating (2026): 5.20
 IJRA 2026; 9(9): 1485-1487
www.agronomyjournals.com
 Received: 23-07-2026
 Accepted: 24-08-2026
 Published: 30-09-2026

SR Bhujje

PG Scholar, Department of Agronomy, College of Agriculture, Latur-413512 (Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India.)

VP Suryavanshi

Professor Department of Agronomy, College of Agriculture, Latur-413512 (Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India.)

M.J Patange

Assistant Professor, Department of Agronomy, College of Agriculture, Latur-413512 Department of Agronomy, College of Agriculture, Latur, VNMKV, Parbhani (MH), India

MR Kakde

PG Scholar, Department of Agronomy, College of Agriculture, Latur-413512 (Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India.)

PS Lomate

PG Scholar, Department of Agronomy, College of Agriculture, Latur-413512 (Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India.)

Corresponding Author:

VP Suryavanshi

Professor Department of Agronomy, College of Agriculture, Latur-413512 (Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India.)

Resource constraints analysis in pigeon pea (*Cajanus cajan* L.)

SR Bhujje¹, VP Suryavanshi², M.J Patange³, MR Kakde⁴, PS Lomate⁵

DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i9t.6721>

ABSTRACT

A field trial was conducted during kharif season, 2025 at Experimental Farm, Department of Agronomy, College of Agriculture, Latur (Maharashtra), to study the Resource constraints analysis in pigeon pea (*Cajanus cajan* L.) the soil of experimental field was clayey in texture, black in colour with good drainage with chemical composition such as low in available nitrogen (140.61 kg ha⁻¹), medium in available phosphorous (16.56 kg ha⁻¹) and very high in available potassium (694.72 kg ha⁻¹). The soil was slightly alkaline with pH 7.6. The mean maximum and minimum temperature during crop growth period was 26.54 °C and 17.18 °C respectively. The mean humidity during morning and evening was 87.59 % and 49.92 % respectively.

The experimental field was laid out in a Randomized Block Design (RBD) with seven treatments replicated three times. The treatments were T_1 : Full package of practices, T_2 : T_1 - Fertilizer, T_3 : T_1 - Weeding, T_4 : T_1 - Plant protection, T_5 : T_1 - Seed treatment, T_6 : T_1 - Nipping and T_7 : T_1 - Multimicronutrient. The recommended dose of fertilizer was 25: 50: 00 NPK kg ha⁻¹. The gross plot size of each experimental unit was 5.40 m x 4.50 m and net plot size was 3.60 m x 3.90 m. The results indicated that adoption of full package of practices recorded significantly higher growth and yield attributes viz., plant height (181 cm), functional leaves (54.67), leaf area (2.63), number of branches (8.37) and dry matter accumulation per plant (173.60 g) over rest of the treatments. Highest number of pods per plant (220.67), number of seeds per pod (4.80), number of seeds per plant (754), seed yield per plant (90.48 g), seed index (13.67 g) and seed yield (2996 kg ha⁻¹) were recorded with the adoption of full package of practices. Among the various single production factor constraints, fertilizer was found to be the most crucial factor causing yield loss up to 33 per cent, followed by plant protection (31%), nipping (18%), weeding (10%), seed treatment (8%) and multimicronutrient (3%). Thus, fertilizer and plant protection were found to be the major resource constraints in pigeonpea production.

Keywords: Pigeonpea, Resource constraints, Growth and yield

Introduction

Pulses play a vital role in providing nutrition to millions of people across the globe. They are rich sources of protein, dietary fiber, minerals, and vitamins, making them an essential component of a balanced diet. As the saying goes, “a bowl of pulses a day keeps the doctor away,” emphasizing their importance in maintaining good health. Recognizing their value, the Food and Agriculture Organization (FAO) of the United Nations declared 2016 as the International Year of Pulses to promote awareness about their nutritional benefits and their contribution to sustainable food systems. Common types of pulses include chickpea, pigeon pea, lentil, and various types of beans. Pulses not only support human nutrition but also improve soil fertility through biological nitrogen fixation, making them vital for sustainable agriculture. India is the leading country in the world when it comes to pulse production and consumption contributing about 27% to global consumption, 25% to production, and 14% to global imports. Pulses occupy nearly 20% of India's cultivated area and contribute around 7–10% of total food grain output. During 2022–23, it was estimated that 8.37 million tonnes of kharif pulses would be produced in the country (Anonymous, 2023) [1]. Among the various pulses, pigeon pea (*Cajanus cajan* [L.] Millsp.)—also known as red gram, Congo pea, or arhar is an important legume crop widely grown by small and marginal farmers. It thrives well under low input and rainfed conditions, making it suitable for dryland agriculture. Pigeon pea provides food, fodder, and fuelwood, making it a multipurpose crop. India is the world's largest producer and consumer of pigeon pea, where it is commonly used as split pulse (dal) or consumed as a green vegetable. Its by-products are valuable as fodder and milling residues used for animal feed. The seeds contain about 20–22% protein and are rich in essential amino acids and minerals (Saxena et al., 2008) [2].

Pigeon pea is an important pulse crop grown mainly in dryland farming. However, its productivity is often low, so efforts are needed to increase the yield per hectare. Various factors such as fertilizer application, weeding, and plant protection play key roles in establishing a healthy crop stand, promoting plant growth, and ultimately improving yield. These factors are collectively referred to as “resource constraints,” but their

individual contributions have not yet been clearly measured. a resource constraint refers to a limit on what can be achieved due to the shortage of available resources. When solving agricultural problems, it is essential to identify which constraint exists so that effective measures can be taken to overcome it. Resource constraints often involve limitations in essential agricultural practices like weeding, fertilization, and pest management, all of which are crucial for better crop growth, higher yields, and economic returns.

Studying resource constraints helps farmers in dryland and rainfed farming systems decide which operation—under limited financial resources—should be prioritized to achieve maximum yield and income. Although input management (such as fertilizer, weeding, plant protection, seed treatment, nipping, and multi micronutrient) has been recognized as important, the exact percentage contribution of each factor or the potential yield loss due to their absence in pigeon pea cultivation has not yet been quantified.

Materials and Method

The experiment was conducted during *kharif* season, 2025-2026 at Experimental Farm of Agronomy Section, College of Agriculture, Latur (Maharashtra) to study the Resource constraints analysis in pigeon pea (*Cajanus cajan* L.) the soil was clayey in texture, moderately alkaline, low in available phosphorus, moderate in nitrogen and high in potassium. The experiment was laid out in Randomized Block Design (RBD) with seven treatments. The treatments were T₁: (Full package of practices), T₂: (T₁ – Fertilizer), T₃: (T₁ – Weeding), T₄: (T₁ – Plant protection), T₅: (T₁ – Seed treatment), T₆: (T₁ – Nipping) and T₇: (T₁ – Multimicronutrient). The gross and net plot size of each experimental unit 5.4 m × 4.5 m in size (Gross). The net plot size was 4.2 m × 3.9 m. Sowing was done on 18th feb 2025 by dibbling method with seed rate 10-12 kg ha⁻¹. The recommended dose of fertilizer for pigeon pea crop was 25:50:00 NPK kg ha⁻¹. The data collected from various observation were organized into tables and analysis using analysis of variance (ANOVA). The significance of treatment was tested by *F* test Panse *et al.*, (1967) [3].

Result and Discussion

Growth attributes

Growth attributing characters viz., plant height (cm), leaf area (dm²), number of branches, number of functional leaves plant⁻¹, dry matter accumulation (g) per plant and number of pods plant⁻¹ were influenced significantly due to different treatments (Table 1).

The full package of practices (T₁) recorded the highest values for plant height (181.00 cm), functional leaves (54.67 plant⁻¹), leaf area (2.63 dm² plant⁻¹), branches (8.37 plant⁻¹) and total dry matter accumulation (173.60 g plant⁻¹), which were at par with the treatment in which application of multimicronutrient (T₇), seed treatment (T₅) and weeding (T₃) was not done, and significantly superior over the remaining treatments. The lowest values were generally recorded in the treatments where fertilizer (T₂), plant protection (T₄) and nipping

(T₆) were not done. The pronounced effect of full package of practices might be attributed to the combined effect of all production practices, which ensured better nutrient availability and favourable conditions for vegetative growth and dry matter accumulation in pigeonpea. These findings were in conformity with the results of Bishnu *et al.*, (2024) [4], Gagare *et al.*, (2019) and Varatharajan *et al.* (2019).

The number of pods plant⁻¹ was influenced by different treatments (Table 1). The maximum number of pods plant⁻¹ was recorded with the application of full package of practices (T₁) which was at par with the treatments in which application multimicronutrient (T₇), seed treatment (T₅), weeding (T₃) was not done and found significantly superior over rest of treatments. The full package of practices may be attributed to better crop nutrition, which favoured flowering and pod setting. The lower pod number under full package – fertilizer (T₂) could be due to inadequate nutrient availability, restricting reproductive growth. This finding is in agreement with Bishu *et al.*, (2024) [4].

Yield attributes

The yield attributing characters and seed yield of pigeonpea were influenced by different treatments. The full package of practices (T₁) recorded the highest values for number of seeds pod⁻¹ (4.80), number of seeds plant⁻¹ (754), seed yield plant⁻¹ (90.48 g) and seed yield (2996 kg ha⁻¹). The number of seeds pod⁻¹ and seed index were non-significantly influenced by different treatments. The number of seeds plant⁻¹ and seed yield (kg ha⁻¹) which were at par with the treatment in which application of multimicronutrient (T₇), seed treatment (T₅) and weeding (T₃) was not done. The seed yield plant⁻¹ which were at par with the treatment in which application of multimicronutrient (T₇), seed treatment (T₅) was not done. The highest seed yield (2996 kg ha⁻¹) was recorded with T₁, which was significantly superior over the remaining treatments. The lowest seed yield (2004 kg ha⁻¹) was recorded under T₂, where application of fertilizer was not done. The higher seed yield under T₁ might be attributed to improved crop growth, better pod formation, higher number of seeds plant⁻¹ and efficient translocation of photosynthates towards developing seeds. Similar results was found by Gagare *et al.*, (2024), Zafar *et al.*, (2003) [5] and Bansode *et al.*, (2019) [6].

Reduction in yield due to resource constraints

The higher seed yield (2996 kg ha⁻¹) was produced with the full package of practices (T₁). Among the various single production factor constraints, fertilizer was found to be most crucial factor caused yield reduction up to 33% followed by plant protection 31 %, nipping 18 %, weeding 10%, seed treatment 8 % and multimicronutrient 3 % as compared to full package of practices and found to be as major resource constraints in pigeonpea production.

From the results, it may be inferred that adoption of the full package of practices was effective for obtaining higher growth and seed yield in pigeonpea. Among the various single production factor constraints, fertilizer and plant protection were found to be crucial for reducing seed yield in pigeonpea, followed by nipping and weeding.

Table 1. Growth attributes of pigeonpea as influenced by various treatments.

Treatments	Mean plant height (cm)	Mean no. of functional leaves plant ⁻¹	Leaf area (dm ²) plant ⁻¹	Mean no. of branches plant ⁻¹	Total dry matter accumulation (g) plant ⁻¹	No. of pods plant ⁻¹
T ₁ : Full package of practices	181.00	54.67	2.63	8.37	173.60	220.67
T ₂ : T ₁ - Fertilizer	137.33	36.67	1.94	6.34	140.67	174.00
T ₃ : T ₁ - Weeding	164.33	48.60	2.29	7.83	159.00	205.00
T ₄ : T ₁ - Plant protection	148.67	38.00	2.07	6.54	148.33	189.50
T ₅ : T ₁ - Seed treatment	168.67	49.00	2.37	8.20	166.67	208.00
T ₆ : T ₁ - Nipping	152.00	43.93	2.20	6.97	151.67	194.00
T ₇ : T ₁ - Multimicronutrient	174.67	51.27	2.49	8.30	171.33	213.67
SE(m)±	8.49	3.11	0.10	0.32	6.61	8.65
CD @ 5%	25.44	9.33	0.31	0.94	19.81	25.94
General mean	160.95	46.02	2.29	7.51	158.75	200.69

Table 2. Yield and yield attributes of pigeonpea as influenced by various treatments.

Treatments	No. of seed pod ⁻¹	No. of seeds plant ⁻¹	Seed yield plant ⁻¹ (g)	Seed index (g)	Seed yield (kg ha ⁻¹)	Percent reduction in yield over full package
T ₁ : Full package of practices	4.80	754	90.48	13.67	2996	-%
T ₂ : T ₁ - Fertilizer	4.10	611	73.32	12.33	2004	33%
T ₃ : T ₁ - Weeding	4.47	674	80.88	13.22	2709	10%
T ₄ : T ₁ - Plant protection	4.23	632	75.92	12.78	2071	31 %
T ₅ : T ₁ - Seed treatment	4.53	703	84.36	13.27	2753	8%
T ₆ : T ₁ - Nipping	4.37	648	77.80	12.99	2464	18%
T ₇ : T ₁ - Multimicronutrient	4.60	748	89.72	13.29	2910	3%
SE(m)±	0.249	27	3.3	0.67	119	-
CD @ 5%	NS	82	9.10	NS	356	-
General mean	4.44	682	82	13.08	2559	-

Conclusion

Application of full package of practices recorded higher growth and yield attributes as well as seed yield of pigeon pea. While missing of fertilizer and plant protection as a individual caused the reduction in yield and notified as a major resource constraints in pigeon pea production.

Acknowledgement

We are grateful to College of Agriculture Latur, VNMKV, Parbhani for the financial assistance and infrastructural facilities provided for the conduct of this research work.

References

- Anonymous. kharif prospectus 2023. www. Kharif, DPD. Ministry of Agriculture. 2023.
- Saxena KB. Genetic improvement of pigeon pea. Tropical plant biology. 2008;1:159-178.
- Panse VG, Sukhamate PV. Statistical methods for agricultural workers. ICAR, New Delhi. 1967:361.
- Bishnu P, Gunri SK, Barman M. Effect of Production Components of Lentil (*Lens culinaris* Medik.) under Different Resource Constraints Practices. Indian Journal of Agricultural Research. 2024;58:1063.
- Zafar M, Maqsood M, Anser MR, Zahid Ali ZA. Growth and yield of lentil as affected by phosphorus. 2003.
- Bansode MD, Suryavanshi VP, Chavan KA. Production constraints analysis of kharif French bean (*Phaseolus vulgaris* L.) in vertisols. Journal of Pharmacognosy and Phytochemistry. 2019;8(4):252-254.
- Chavan PG, Patange MJ, Patole VB, Karanjikar PN. Effect of production constraints on seed yield and economics of chickpea (*Cicer arietinum* L.). The Pharma Innovation Journal. 2022;11(2):1526–1529.
- Gagare YM, Kalegore NK, Bajgude JS. Optimization of Cowpea (*Vigna unguiculata* L. Walp) Production under Resource Constraints. Journal of Agriculture Research and Technology. 2018;43(2):383.
- Jadhav VT, Kute NS. Nutrient and pest management practices for enhancing growth and yield of pigeonpea (*Cajanus cajan* L.). Journal of Food Legumes. 2019;32(3):206-207.
- Kumar S, Tomar J, Kishore GR, Kumar A, Singh S. Effect of phosphorus and sulphur on growth and yield of pigeon pea (*Cajanus cajan*). Adv. Res. J. Crop Improv. 2012;3:50-52.
- Reddy MM, Padmaja B, Malathi S, Rao LJ. Effects of micronutrients on growth and yield of pigeonpea. Journal of SAT Agricultural Research. 2007;5(1).
- Varatharajan T, Choudhary AK, Pooniya V, Dass A, Meena MC, Gurang B, Harish MN. Influence of different integrated crop management modules on growth indices and productivity of pigeonpea in semi-arid north Indian plains. Ann. Agric. Res. New Ser. 2018;39:398-405.

How to cite this article: Bhuje S, Suryavanshi V, Patange MJ, Kakde M, Lomate P. Resource constraints analysis in pigeon pea (*Cajanus cajan* L.). *International Journal of Research in Agronomy*. 2026;9(9):1485-1487. doi: <https://www.doi.org/10.33545/2618060X.2026.v9.i9t.6721>