



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating (2026): 5.20
www.agronomyjournals.com
2026; 9(5): 94-97
Received: 09-02-2026
Accepted: 13-03-2026

Rohit Kumar
Department of Agronomy, Indira
Gandhi Krishi Vishwavidyalaya,
Raipur, Chhattisgarh, India

G.P. Banjara
Department of Agronomy, Indira
Gandhi Krishi Vishwavidyalaya,
Raipur, Chhattisgarh, India

Ramnath
Department of Agronomy, Indira
Gandhi Krishi Vishwavidyalaya,
Raipur, Chhattisgarh, India

Abhishek Bara
Department of Agronomy, Indira
Gandhi Krishi Vishwavidyalaya,
Raipur, Chhattisgarh, India

Shatavisa Nayak
Department of Agronomy, Indira
Gandhi Krishi Vishwavidyalaya,
Raipur, Chhattisgarh, India

Corresponding Author:
Rohit Kumar
Department of Agronomy, Indira
Gandhi Krishi Vishwavidyalaya,
Raipur, Chhattisgarh, India

Performance of desi chickpea (*Cicer arietinum* L.) genotypes in *Vertisols* of Chhattisgarh plains under rice based cropping system

Rohit Kumar, GP Banjara, Ramnath, Abhishek Bara and Shatavisa Nayak

DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i5b.5483>

Abstract

A field experiment was conducted during the *Rabi* season of 2024–25 at the Instructional-cum-Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, to evaluate the “performance of chickpea (*Cicer arietinum* L.) genotypes in *Vertisols* of Chhattisgarh plains”. The experimental soil was clayey in texture and classified as *Vertisols* with a neutral reaction (pH 7.1). The soil contained 0.62% organic carbon, indicating a medium level of soil organic matter. The available nitrogen, phosphorus, and potassium contents were 229.8, 12.4, and 376.5 kg ha⁻¹, respectively, which were categorized as low, medium, and high fertility levels. The experiment was laid out in a Randomized Block Design (RBD) with ten chickpea genotypes replicated three times. The treatments consisted of: V₁ – Indira Chana-1, V₂ – JG-16, V₃ – JAKI-9218, V₄ – JG-315, V₅ – RG-2015-08, V₆ – GJG-1907, V₇ – CG Akshay Chana, V₈ – CG Chana-2, V₉ – Vaibhav, V₁₀ – RG-2020-03. Standard agronomic practices were followed for raising the crop. Observations were recorded on yield attributes, seed yield, and stover yield. The results revealed significant variability among the genotypes with respect to yield parameters. Among the tested genotypes, RG-2020-03 recorded the highest number of pods per plant along with superior yield attributes. The genotype RG-2020-03 produced the highest seed yield (1699 kg ha⁻¹) and stover yield (2585 kg ha⁻¹), which was closely followed by GJG-1907 and CG Akshay Chana. In contrast, JAKI-9218 recorded the lowest values for most of the yield parameters, including pods per plant and seed yield. Based on the results of the present investigation, RG-2020-03, followed by GJG-1907 and CG Akshay Chana, exhibited superior performance in terms of yield attributes and productivity. The higher productivity of these genotypes may be attributed to their better adaptability under *Vertisols* conditions. Therefore, the genotype RG-2020-03 proved to be the most promising for cultivation in the *Vertisols* of the Chhattisgarh plains.

Keywords: Chickpea, genotypes, *Vertisols*, productivity, yield attributes, adaptability

Introduction

Chickpea (*Cicer arietinum* L.) is one of the most important grain legume crops cultivated worldwide and ranks third among pulse crops in terms of global production. It belongs to the family Fabaceae and genus *Cicer*, with a diploid chromosome number of 2n = 16. The crop is believed to have originated in south-eastern Turkey and subsequently spread to different parts of the world. Chickpea is commonly known as gram, chana, or Bengal gram and is widely cultivated for its nutritional as well as agronomic importance. The crop is generally sown from mid-October to mid-December and harvested during late February to late March, depending upon the climatic conditions and time of sowing.

Chickpea is considered a valuable and economical source of dietary protein, especially for the large vegetarian population in developing countries. The seeds are highly nutritious and contain approximately 38–59% carbohydrates, 22–24% protein, about 3% fibre, 4.8–5.5% oil, and nearly 3% ash. In addition, chickpea seeds contain about 0.2% calcium and 0.3% phosphorus, which contribute significantly to human nutrition. The protein digestibility of chickpea ranges from 76–78%, while carbohydrate digestibility varies from 57–60%, making it an excellent crop for improving nutritional security.

Two major types of chickpea are cultivated worldwide, namely Desi and Kabuli types. The Desi type generally possesses smaller seeds with a thicker seed coat and dark brown colour and is

commonly consumed in various forms such as whole chickpea, split gram (dal), roasted gram, and flour (besan). In contrast, the Kabuli type generally has larger seeds with a thinner seed coat and creamy-white colour and is usually consumed as whole seeds. Both types are widely cultivated depending on regional preferences and market demand (FAO, 2018) [3].

Globally, chickpea is cultivated in several countries including India, Turkey, Pakistan, Iran, Mexico, Myanmar, Ethiopia, Australia, Spain, Canada, Russia, and Morocco. Among these, India ranks first both in area and production, followed by Pakistan. Chickpea holds a significant position among pulse crops due to its adaptability to diverse agro-climatic conditions and its ability to grow under limited soil moisture conditions.

India is the largest producer as well as consumer of chickpea in the world. The crop occupies approximately 9.12 million hectares with a production of about 11.11 million tonnes and an average productivity of 1218 kg ha⁻¹ in the country. Chickpea is widely cultivated in several major states including Maharashtra, Rajasthan, Madhya Pradesh, Gujarat, Karnataka, Uttar Pradesh, Jharkhand, Andhra Pradesh, Chhattisgarh, and Telangana. Among these states, Maharashtra ranks first in terms of area, covering about 2.87 million hectares, with a production of 2.96 million tonnes and an average productivity of 1841 kg ha⁻¹, which is higher than the national average productivity (Anonymous, 2024–25) [2].

In Chhattisgarh, important pulse crops include chickpea, lathyrus, pigeon pea, blackgram, and greengram, among which chickpea occupies a prominent place. It is one of the most important rabi pulse crops grown after the harvest of rice, which is the predominant crop of the state. Chickpea occupies about 352.40 thousand hectares with an average productivity of approximately 1200 kg ha⁻¹ in the state. The major chickpea-growing districts of Chhattisgarh include Bemetara, Rajnandgaon, Kabirdham, and Durg (Anonymous, 2024) [1].

The crop is generally cultivated under residual soil moisture conditions following rice harvest. Therefore, identification of high-yielding and adaptable chickpea genotypes suitable for the *Vertisols* conditions of the Chhattisgarh plains is essential for improving productivity. In this context, the present investigation entitled “Performance of chickpea (*Cicer arietinum* L.) genotypes in *Vertisols* of Chhattisgarh plains” was undertaken to evaluate different chickpea genotypes with respect to yield attributes and productivity.

Materials and Methods

The field experiment entitled “Performance of chickpea (*Cicer arietinum* L.) genotypes in *Vertisols* of Chhattisgarh plains” was conducted during the *Rabi* season of 2024–25 at the Instructional-cum-Research Farm, Indira Gandhi Krishi Vishwavidyalaya (IGKV), Raipur, Chhattisgarh, India.

The soil of the experimental field was clayey in texture and classified as *Vertisols*. The soil reaction was neutral, with a pH of 7.1. The soil contained 0.62% organic carbon, indicating a medium level of soil organic matter. The available nitrogen content was 229.8 kg ha⁻¹, which falls under the low fertility category. The available phosphorus content was 12.4 kg ha⁻¹, categorized as medium, whereas the available potassium content was 376.5 kg ha⁻¹, which is considered high.

The experiment was laid out in a Randomized Block Design (RBD) with ten chickpea genotypes replicated three times. The treatments consisted of the following genotypes: V₁ – Indira Chana-1, V₂ – JG-16, V₃ – JAKI-9218, V₄ – JG-315, V₅ – RG-2015-08, V₆ – GJG-1907, V₇ – CG Akshay Chana, V₈ – CG Chana-2, V₉ – Vaibhav, V₁₀ – RG-2020-03. The plot size was

5.0 m × 3.0 m (15.0 m²) with spacing of 30 cm × 10 cm (row × plant). The crop was sown on 6th December 2024 and harvested on 25th March 2025.

The crop was raised by following the recommended agronomic practices for chickpea cultivation in the region. All cultural and management practices were applied uniformly across the experimental plots to ensure an unbiased evaluation of the genotypic performance.

The experimental data were statistically analyzed using analysis of variance (ANOVA) appropriate for the Randomized Block Design, as described by Gomez and Gomez (1984) [5]. The treatment means were compared using the Critical Difference (CD) at the 5% level of significance to determine the significance of differences among treatments.

Results and Discussion

Yield Attributes

Number of Pods per Plant

The number of pods per plant was significantly influenced by different chickpea genotypes and the data are presented in Table 1. Among the evaluated genotypes, V₁₀ – RG 2020-03 recorded a significantly higher number of pods per plant (39.9) compared to other genotypes. However, it remained statistically at par with V₆ – GJG 1907 (37.0), V₇ – CG Akshay Chana (36.8), and V₄ – JG 315 (36.3). The lowest number of pods per plant (30.9) was recorded in V₃ – JAKI 9218.

The variation in number of pods per plant among different genotypes may be attributed to genetic variability and differential adaptability of genotypes under *Vertisol* conditions. Similar findings were reported by Neenu *et al.* (2014) [10], who observed that variety JG-11 produced a significantly higher number of pods per plant (41.75), followed by JG-315, while the lowest number of pods per plant was recorded in JG-16 (33.25).

Number of Seeds per Pod

The number of seeds per pod was significantly affected by different chickpea genotypes (Table 1). Among the genotypes, V₆ – GJG 1907 recorded the maximum number of seeds per pod (1.6), which was statistically at par with V₄ – JG 315 (1.5), V₅ – RG 2015-08 (1.5), and V₁ – Indira Chana-1 (1.4). The minimum number of seeds per pod (1.2) was recorded in V₁₀ – RG 2020-03 and V₈ – CG Chana-2.

The differences in number of seeds per pod among the genotypes may be due to genetic characteristics influencing reproductive efficiency and pod filling ability. Similar results were reported by Singh *et al.* (2009) [12], who observed that the maximum number of seeds per pod was recorded in BARI Chhola-4, followed by BARI Chhola-2, whereas the lowest value was observed in BARI Chhola-6.

100-Seed Weight (g)

The 100-seed weight differed significantly among the chickpea genotypes (Table 1). The highest 100-seed weight (25.3 g) was recorded in V₁₀ – RG 2020-03, which was statistically at par with V₆ – GJG 1907 (24.7 g), V₅ – RG 2015-08 (24.0 g), and V₁ – Indira Chana-1 (23.9 g). The lowest 100-seed weight (19.3 g) was observed in V₄ – JG 315.

Variation in seed weight among the genotypes may be attributed to genetic differences in seed size and seed filling capacity. Similar results were reported by Karasu *et al.* (2009) [7], who found that the effect of cultivars on 1000-seed weight was statistically significant, with the maximum value recorded in Canitez-87 cultivar (498.2 g) followed by Yerli genotype (497.9 g), while the lowest was observed in ILC-114 (446.8 g).

Seed Yield (kg ha⁻¹)

Seed yield of chickpea was significantly influenced by different genotypes, and the data are presented in Table 2. Among the tested genotypes, V₁₀ – RG 2020-03 recorded the highest seed yield (1699.0 kg ha⁻¹), which was statistically at par with V₆ – GJG 1907 (1692.3 kg ha⁻¹), V₇ – CG Akshay Chana (1639.3 kg ha⁻¹), V₄ – JG 315 (1636.7 kg ha⁻¹), and V₅ – RG 2015-08 (1607.0 kg ha⁻¹). The lowest seed yield (1516.3 kg ha⁻¹) was recorded in V₃ – JAKI 9218.

The higher seed yield in RG 2020-03 may be attributed to its superior yield attributes such as higher number of pods per plant and greater seed weight, which ultimately contributed to enhanced productivity. Similar findings were reported by Naik *et al.* (2022) [9], who observed that the variety Avroddhi produced the highest seed yield, which was significantly superior to other varieties. The increased yield was attributed to higher number of primary and secondary branches per plant, greater number of pods per plant, higher number of seeds per pod, and increased seed weight, which collectively contributed to improved grain and biological yield.

Stover Yield (kg ha⁻¹)

The stover yield of chickpea was also significantly influenced by different genotypes (Table 2). The genotype V₁₀ – RG 2020-03 recorded the maximum stover yield (2585.3 kg ha⁻¹), which was statistically at par with V₆ – GJG 1907 (2502.0 kg ha⁻¹), V₇ – CG Akshay Chana (2466.7 kg ha⁻¹), V₄ – JG 315 (2461.0 kg ha⁻¹), and V₅ – RG 2015-08 (2397.7 kg ha⁻¹). The minimum stover yield (2207.7 kg ha⁻¹) was recorded in V₃ – JAKI 9218. The variation in stover yield among genotypes may be attributed

to differences in vegetative growth, branching pattern, and biomass accumulation. Similar results were reported by Kushwaha *et al.* (2021) [8], who observed significant variation in stover yield among chickpea varieties such as Pragati (K-3256), Pusa-256, Avroddhi, and Pant G-186, with Avroddhi recording the highest stover yield due to better vegetative growth and higher biological yield. Likewise, Kabir *et al.* (2009) [6] reported that BARI Chhola-4 produced the highest stover yield among the evaluated chickpea varieties.

Harvest Index (%)

The harvest index did not differ significantly among the chickpea genotypes, as indicated by the non-significant CD value (Table 2). The highest harvest index (40.7%) was recorded in V₃ – JAKI 9218, followed by V₆ – GJG 1907 (40.3%), whereas V₁ – Indira Chana-1 recorded the lowest harvest index (39.3%).

Although numerical differences were observed among the genotypes, the statistical analysis indicated that these differences were non-significant, suggesting that the proportion of economic yield to total biological yield remained relatively similar among the tested genotypes.

Similar findings were reported by Shah *et al.* (2007) [11], who observed that improved chickpea varieties such as JG-11 and BGD-103 produced higher grain and stover yields due to efficient utilization of available soil moisture during the crop growth period. Furthermore, yield improvement in chickpea largely depends on yield-contributing traits such as number of pods per plant, seed weight, and harvest index (Chandra *et al.*, 2024) [4].

Table 1: Yield attributes of different chickpea desi genotypes

Treatment (Genotypes)	Number of Pods plant ⁻¹	Number of Seeds pod ⁻¹	100 seed weight (g)
V ₁ Indira Chana-1	34.9	1.4	23.9
V ₂ JG 16	33.4	1.3	20.5
V ₃ JAKI 9218	30.9	1.3	23.0
V ₄ JG 315	36.3	1.5	19.3
V ₅ RG 2015-08	35.1	1.5	24.0
V ₆ GJG 1907	37.0	1.6	24.7
V ₇ CG Akshay Chana	36.8	1.3	20.6
V ₈ CG Chana-2	35.0	1.2	22.0
V ₉ Vaibhav	33.6	1.2	23.1
V ₁₀ RG 2020-03	39.9	1.2	25.3
SEm±	1.24	0.09	0.68
CD (P=0.05)	3.68	0.26	2.02

Table 2: Yields of different chickpea desi genotypes

Treatment (Genotypes)	Seed yield (kg ha ⁻¹)	Stover yield (kg ha ⁻¹)	Harvest index (%)
V ₁ Indira Chana-1	1543.3	2384.3	39.3
V ₂ JG 16	1525.7	2314.0	39.7
V ₃ JAKI 9218	1516.3	2207.7	40.7
V ₄ JG 315	1636.7	2461.0	40.0
V ₅ RG 2015-08	1607.0	2397.7	40.1
V ₆ GJG 1907	1692.3	2502.0	40.3
V ₇ CG Akshay Chana	1639.3	2466.7	40.0
V ₈ CG Chana-2	1551.0	2388.7	39.3
V ₉ Vaibhav	1540.0	2372.7	39.4
V ₁₀ RG 2020-03	1699.0	2585.3	39.6
SEm±	46.33	73.75	0.66
CD (P=0.05)	137.65	219.12	NS

Conclusion

The results of the present investigation revealed significant

variation among the ten chickpea genotypes evaluated under *Vertisol* conditions of the Chhattisgarh plains. Among the genotypes tested, RG-2020-03 (V₁₀) recorded the highest number of pods per plant (39.9), 100-seed weight (25.3 g), seed yield (1699 kg ha⁻¹), and stover yield (2585.3 kg ha⁻¹), indicating its superior performance. The genotype GJG-1907 (V₆) also performed well and remained statistically at par with RG-2020-03 for seed yield and several yield attributes. In contrast, JAKI-9218 (V₃) recorded the lowest values for most yield parameters, including number of pods per plant and seed yield.

Based on the findings of the present study, RG-2020-03, followed by GJG-1907 and CG Akshay Chana, exhibited superior performance in terms of yield attributes and productivity. Therefore, these genotypes may be considered promising and suitable for cultivation under *Vertisols* conditions of the Chhattisgarh plains, as they demonstrated better adaptability and higher yield potential.

References

1. Anonymous. Area, production and productivity of chickpea in Chhattisgarh. Raipur: Directorate of Agriculture, Government of Chhattisgarh; 2024.
2. Anonymous. Agricultural statistics at a glance. New Delhi: Ministry of Agriculture and Farmers Welfare, Government of India; 2024-25.
3. FAO. FAOSTAT statistical database. Rome: Food and Agriculture Organization of the United Nations; 2018.
4. Chandra S, Yadav A, Quatadah SM, Silas VJ, Pal RK, Srivastava A. Performance of chickpea (*Cicer arietinum* L.) germplasm for seed yield and component traits under irrigated condition. International Journal of Advanced Biochemistry Research. 2024;8(5):626-631.
5. Gomez KA, Gomez AA. Statistical procedures for agricultural research. New York: John Wiley & Sons; 1984.
6. Kabir MH, Sarkar MA, Uddin M. Yield performance of chickpea (*Cicer arietinum* L.) varieties under different growing conditions. Bangladesh Journal of Agricultural Research. 2009;34(2):285-292.
7. Karasu A, Dogan R. The effect of bacterial inoculation and different nitrogen doses on yield and yield components of some chickpea genotypes (*Cicer arietinum* L.). African Journal of Biotechnology. 2009;8(1):1-5.
8. Kushwaha HS, Singh R, Patel N. Performance of chickpea varieties under different agro-climatic conditions. Indian Journal of Pulses Research. 2021;34(1):45-49.
9. Naik KK. Varieties as influenced by inorganic and organic source of nutrients. 2022.
10. Neenu S, Ramesh K, Ramana S, Biswas AK, Rao AS. Growth and yield of different varieties of chickpea (*Cicer arietinum* L.) as influenced by the phosphorus nutrition under rainfed conditions on Vertisols. International Journal of Bio-resource and Stress Management. 2014;5(1):53-57.
11. Shah Z, Ahmad S, Rahman H. Yield performance of chickpea varieties under different moisture conditions. Pakistan Journal of Agricultural Sciences. 2007;44(2):279-284.
12. Singh VK, Kushwaha BL, Kumar R, Singh RD. Response of chickpea (*Cicer arietinum* L.) cultivars to sources of plant nutrients. 2022.