The Pharma Innovation Journal 2023; 12(11): 728-731

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(11): 728-731
© 2023 TPI
www.thepharmajournal.com
Received: 09-09-2023
Accepted: 16-10-2023

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

GP Banjara
Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

GK Shrivastava
Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

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

Evaluation of suitable chickpea (*Cicer arietinum* L.) genotypes under rice-based cropping system of Chhattisgarh plains

Pratibha, GP Banjara and GK Shrivastava

Abstract
The present investigation entitled Evaluation of suitable chickpea (*Cicer arietinum* L.) genotypes under rice-based cropping system of Chhattisgarh plains was carried out at the Instructional cum Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur, (C.G.) during *Rabi* season, 2022-23. The soil of experimental field was clayey (*Vertisols*), neutral in reaction (pH 7.1), medium in organic carbon (0.62%) and low in available nitrogen (229.8 kg ha^{-1}), medium in available phosphorus (12.4 kg ha^{-1}) and high in available potassium (376.5 kg ha^{-1}). The experiment was carried out in randomized block design with eleventh treatment replicated thrice. Genotypes comprised *viz.*, V1- Indira Chana 1, V2- JG 16, V3- JAKI 9218, V4- JG 315, V5- RG 2015-08, V6- NBeG 924, V7- JG 24, V8- RVG 202, V9- RVG 203, V10- IPC 2005-62 and V11- JG 36. The crop was sown on 15th November, 2022 and harvested on 9th March 2023. The findings from one season experiment revealed that among eleven chickpea genotypes *viz*., Indira chana^{-1}, JG 16, JAKI 9218, JG 315, RG 2015-08, and NBeG 924, JG-24, RVG-202, RVG-203, 1PC 2005-62 and JG-36 the yield attributes (number of pods plant^{-1}, number of seeds pod^{-1} and 100 seed weight), seed yield (1814 kg ha^{-1}) and stover yield (2690 kg ha^{-1}) were significantly higher under variety JG-24 over others, but it was at par to RG 2015-08, RVG-202 and JG 315 with seed yield of 1697, 1690 and 1678 kg ha^{-1}, respectively.

Keywords: chickpea, suitable, cropping, *Cicer arietinum* L.

Introduction
Pulses are an important component of the predominantly vegetarian Indian diet. These are not only important for sustainable agriculture because they enrich the soil through biological nitrogen fixation, but they also fit in various cropping systems without interfering with the main cereal or oilseed crops. Among the pulses, chickpea, or Bengal gram (*Cicer arietinum* L.), is a nutritionally dense crop that contains 21 percent protein, 61.5 percent carbohydrates, and 4.5 percent fat. It is also high in calcium, iron and niacin and it has medicinal properties. It is a rabi-season crop that is primarily grown as a rainfed crop in many parts of the state. Chickpea is a legume belongs to family Fabaceae, subfamily Faboideae. It is also known as gram, Bengal gram, garbanzo, Egyptian pea, ceci, cece or chana, or Kabuli Chana (Particularly in Northern India). It can grow in areas of low rainfall and poor soils (Neumann *et al.*, 2011) [4]. It is one of the earliest cultivated legumes, 7,500-year-old remains have been found in the Middle East (Philologos, 2005) [6]. The plant grows between 20 to100 cm high and has small feathery leaves on either side of the stem. Chickpeas are a type of pulse, with one pod containing 1-4 seeds (Herbst, 2001) [3].

Chickpea is the second most important pulse crop after pigeon pea in the world for human diet and other use. It is cultivated in area of 149.66 lakh ha with a total production of 162.25 lakh tonnes and average productivity of 1252 kg ha^{-1}. The major chickpea growing countries of the world are India, Australia, Pakistan, Russ. Fed., Turkey, Iran, Myanmar, USA, Ethiopia, and Mexico. India ranked first in the area (118.99 lakh ha). The highest productivity of 2138 kg ha^{-1} is observed in Ethiopia followed by Mexico, Canada and USA. India has very low productivity of 956 kg ha^{-1}.

India is the world's largest producer of chickpeas, accounting for 64 percent of global production. It is grown on an area of 10.47 million hectares in India, with a total production of 11.35 million metric tonnes and a productivity of 1116 kg ha^{-1}. Rajasthan (23.44%), Maharashtra (22.89%), Madhya Pradesh (21.87%), Uttar Pradesh (7.50%), Karnataka (7.26%), Gujarat (5.62%), Andhra Pradesh (4.92%), and Chhattisgarh rank ninth in terms of chickpea production in India (Anonymous, 2020) [1]. In 2022, the area, production, and productivity of chickpea in Chhattisgarh were 385.99 thousand hectares, 277.40 thousand tonnes, and 719 kg ha^{-1}, respectively (Anonymous, 2022) [2]. Chickpeas are the second-most important crop grown in Chhattisgarh after rice. Rajnandgaon, Bemetara, Mungeli, Balod, Janjgir-champa, Raipur, Durg, Kawardha, Korba, Bilaspur, Balod, Dhamtari, Baloda Bazar, and Raigarh are the major chickpea- growing districts in Chhattisgarh. (Sumit *et al.* 2022) [11].

Rice-based cropping systems are a combination of farming practices that include rice as the primary crop, followed by the cultivation of other crops. Rice-based cropping is a major cropping system practiced in India, which includes crop rotation involving cereals, pulses, oilseeds, and so on. In India, the chickpea crop is planted after the kharif crops (primarily rice). This cropping system is referred to as a rice-based cropping system. Cropping System Based on rice farmers can now grow two crops per year, whereas previously they could only grow one. The new system combines rice varieties that ripen early and late with chickpeas. Because long-duration rice varieties can be harvested too late, there is still time to sow a chickpea crop in late-sown conditions to take advantage of the moisture still left in the soil and ensure that the land is not left fallow. Farmers can now grow an extra crop, which is a significant advantage in areas where irrigation is not required. Paddy is Chhattisgarh's main crop, and it is grown on a large scale. Rice crops are planted at different times of the year, depending on soil type and water availability.

Materials and Methods

The field experiment entitled Evaluation of suitable chickpea (*Cicer arietinum* L.) genotypes under rice-based cropping system of Chhattisgarh plains was conducted at Instructional cum Research Farm, IGKV, Raipur, (Chhattisgarh) during *rabi* season of 2022-23. The details regarding soil, weather condition, materials used and techniques adopted during the course of investigation are briefly described in this chapter. The soil of experimental field was clayey (*Vertisols*), neutral in reaction (pH 7.1), medium in organic carbon (0.62%) and low in available nitrogen (229.8 kg ha^{-1}), medium in available phosphorus (12.4 kg ha^{-1}) and high in available potassium (376.5 kg ha^{-1}). The experiment was carried out in randomized block design with eleventh treatment replicated thrice. Genotypes comprised *viz.*, V1- Indira Chana 1, V2- JG 16, V3- JAKI 9218, V4- JG 315, V5- RG 2015-08, V6- NBeG 924, V7- JG 24, V8- RVG 202, V9- RVG 203, V10- IPC 2005-62 and V11- JG 36. The crop was sown on 15th November, 2022 and harvested on 9th March 2023.

Results and Discussion Yield attributes

Number of pods plant^{-1}

Number of pods plant^{-1} was significantly affected due to different genotypes and take have been presented in Table 4.8. Number of pods plant^{-1} was significantly higher under genotype V7- JG-24 as compared to others and it was at par to V5 - RG 2015-08, V8 - RVG-202 and V4- JG 315. Neenu *et al.* (2014) [5] noted that the significantly higher number of pods plant^{-1} and seed index were recorded under variety V2 (JG 11) (41.75) followed by variety V3 (JG 315) and the lower number of pods plant^{-1} and seed index were produced by variety V1 (JG 16) (33.25).

Number of seeds pod^{-1}

Number of seeds pods^{-1} was significantly influenced due to different genotypes and data have been presented in Table 4.8. Genotype V7- JG-24 had significantly maximum number of seeds pod^{-1} and it was at par to genotypes V5 - RG 2015-08, V8 - RVG-202 and V4- JG 315 and lowest was recorded from genotype V10 - IPC-2005-62. Number of seeds pods^{-1} was significantly influenced due to different genotypes which might be due to genetic variation. The similar results were also reported by Kabir *et al.* (2009) [7] who concluded that maximum number of seeds pod^{-1} was found in variety BARI Chhola-4 followed by variety BARI Chhola-2. The lowest number of seeds pod^{-1} was found in BARI Chhola-6.

100 seed weight (g)

100 Seed weight was significantly differed due to various genotypes and data have been presented in Table 4.8. Significantly higher 100 seed weight was recorded under genotype V7- JG-24 as compared to others, but it was at par to V5- RG 2015-08, V8- RVG 202 and V4- JG 315. Significantly lowest 100 seed was recorded from genotype V10 - IPC-2005-62. Data regarding 100 seed weight was influenced by the different chickpea genotypes and JG-24 recorded maximum 100 seed weight fallowed by RG 2015-08, RVG-202 and JG-315. The similar results were also reported by Karasu *et al.* (2009) [8] who noted that the effects of cultivars were statistically significant at 1% probability level on the 1000 seed weight. While, maximum 1000 seed weight was obtained from Canıtez- 87 cultivar (498.2 g) and popular local genotype Yerli (497.9 g).

Seed yield (kg ha^{-1})

Seed yield of chickpea was found to be influenced significantly by different genotypes and tada have been presented in Table 4.9. Seed yield was significantly higher under genotype V7 - JG-24 as compared to others, but it was at par to genotypes V5- RG 2015-08, V8- RVG-202 and V4- JG 315. Significantly lowest seed yield was recorded under genotype V10 - IPC-2005-62. The similar results were also reported by Kushwaha *et al.* (2021) [9] who also observed that the highest seed yield was found in Avrodhi, which was significantly superior over rest of the varieties. It is attributed due to the increased number of primary and secondary branches plant^{-1}, increased number of pods plant^{-1}, number of seeds pod^{-1} and 1000-seed weight, the grain and biological yield ultimately increased.

Stover yield (kg ha^{-1})

Stover yield of chickpea was influenced significantly due to different genotypes and data are presented in Table 4.9. Data clearly indicate that genotype JG-24 produced significantly maximum stover yield and it was at par to genotype V5- RG 2015-08, V8- RVG-202 and V4- JG 315. Significantly lowest stover yield was recorded from genotype V10 - IPC-2005-62. The similar results were also reported by Kushwaha *et al.*

(2021) [9] who revealed that stover yield varied significantly among the four varieties V1 Pragati (K-3256), V2 (Pusa-256), V3 (Avrodhi) and V4 (Pant G-186). The highest seed and stover yields were found in Avrodhi, which was significantly superior over rest of the varieties.

Table 1: Yield attributes of different chickpea genotypes under rice-based cropping system

Treatment		Number of pods plant^{-1}	Number of seeds pod^{-1}	Seed index (g)
V1:	Indira Chana 1	30.2	1.2	20.49
V2:	JG 16	33.7	1.3	23.29
V3:	JAKI 9218	34.5	1.4	23.57
V4:	JG 315	35.4	1.5	23.76
V5:	RG 2015-08	37.6	1.5	24.49
V6:	NBeG 924	31.6	1.3	20.87
V7:	JG-24	39.7	1.7	27.10
V8:	RVG-202	37.2	1.5	23.86
V9:	RVG-203	31.2	1.3	20.67
V10:	IPC-2005-62	27.8	1.2	19.93
V11:	JG-36	33.3	1.3	20.91
S.Em±		1.72	0.07	1.19
CD (P=0.05)		5.06	0.20	3.50

Harvest index (%)

Harvest index did not differ significantly among the chickpea genotypes and data are presented in Table 2. The highest harvest index was recorded under V8 - RVG- 202 followed by from the genotypes V9- RVG-203. The genotype V7- JG-24 recorded numerically the lowest harvest index. The data regarding harvest index revealed that the chickpea genotypes clearly expressed non-significant effect on the harvest index. The similar results were also reported by Shah *et al.* (2007) [10] who observed that greater returns with improved method of cultivated of chickpea by farmer is attributed to higher grain and stover yields due to more soil moisture availability during crop growth period and it was efficiently utilized by JG11 variety and produced higher yields. Earlier studies at Bellary indicated that improved varieties of chickpea, *i.e.*, JG11 and BGD103 produced higher yield during both drought and normal years over other varieties evaluated.

Table 2: Seed yield, stover yield and harvest index of chickpea genotypes under rice-based cropping system

Treatment		Seed yield (kg ha^{-1})	Stover yield (kg ha^{-1})	Harvest Index (%)
V1:	Indira Chana 1	1500	2253	39.97
V2:	JG 16	1600	2367	40.29
V3:	JAKI 9218	1625	2376	40.61
V4:	JG 315	1678	2443	40.71
V5:	RG 2015-08	1697	2458	40.80
V6:	NBeG 924	1537	2297	40.10
V7:	JG-24	1814	2690	39.78
V8:	RVG-202	1690	2452	40.90
V9:	RVG-203	1533	2232	40.83
V10:	IPC-2005-62	1373	1987	40.80
V11:	JG-36	1570	2358	40.02
S.Em±		55.98	84.17	1.40
CD (P=0.05)		165.15	248.31	NS

Conclusion

The findings from one season experiment revealed that among eleven chickpea genotypes *viz*., Indira chana^{-1}, JG 16, JAKI 9218, JG 315, RG 2015-08, and NBeG 924, JG-24, RVG-202, RVG-203, 1PC 2005-62 and JG-36, the yield attributes (number of pods plant^{-1}, number of seeds pod^{-1} and 100 seed weight), seed yield (1814 kg ha^{-1}) and stover yield (2690 kg ha^{-1}) were significantly higher under variety JG-24 over others, but it was at par to RG 2015-08, RVG-202 and JG 315 with seed yield of 1697, 1690 and 1678 kg ha^{-1}, respectively.

References

1. Anonymous 2020, Government of India Ministry of Agriculture & Farmers Welfare, Department of Agriculture, Cooperation & Farmers Welfare, Directorate of Economics and Statistics. Agricultural Statistics at a Glance, 2020, 62-63.
2. Anonymous 2022, Agriculture Development and Farmer Welfare and Bio-Technology Department, Directorate Agriculture, Chhattisgarh Raipur, varshik prativedan, 2021-22, 10.
3. Herbst ST. The new food lover's companion comprehensive definitions of nearly 6000 food, drink, and culinary terms. Barron's cooking guide. Hauppauge, NY: Barron's educational series, 2001, ISBN 0764112589.
4. Neumann U, Kosier B, Jahnke J, Priefer UB, Al-Halbouni D. Soil factors exhibit greater influence than bacterial inoculation on alfalfa growth and nitrogen fixation. FEMS Microbiology Ecology. 2011;77:590-599.
5. 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):053-057.
6. Philologos. Chickpeas – On Language. Jewish Daily Forward, 2005.
7. Kabir Fazlul AM, Bari MN, Karim Md. Abdul, Khaliq Qazi Abdul, Ahmed Jalal Uddin. Effect of sowing time and cultivars on the growth and yield of chickpea under rainfed condition. Bangladesh Journal of Agricultural Research. 2009;34(2):335-342.
8. Karasu A, Oz M, 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):59-64.
9. Kushwaha BL, Singh VK, Kaptan B, Dev S, Namdev HP. Response of Chickpea (*Cicer arietinum* L.) Cultivars to Organic Sources of Plant Nutrients. International Journal of Current Microbiology and Applied Sciences. 2021;10:ISSN:2319-7706

10. Sah Supradip, Mina Banshi L, Kundu Samaresh, Gupta Hari S. Effect of organic manures and integrated nutrient management on yield potential of bell pepper (*Capsicum annuum*) varieties and on soil properties, 2007, 127-137. Received 22 Jun 2007, Published online: 06 March 2008.
11. Sumit GP, Kumar S, Rathore AL, Mahilang A. Effect of different intercropping system on growth, yield attributes and yield of chickpea (*Cicer arietinum* L.), 2022.