



P-ISSN: 2349-8528

E-ISSN: 2321-4902

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IJCS 2021; 9(1): 2384-2387

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Received: 17-10-2020

Accepted: 30-12-2020

**Parameshwarudu B**M.Sc. Seed Science and  
Technology, SHUATS, Uttar  
Pradesh, India**Arun Kumar Chaurasia**Associate Professor,  
Department of Genetis and Plant  
Breeding, Sam Higginbottom  
University of Agriculture,  
Technology and Sciences,  
Prayagraj, Uttar Pradesh, India**Wasim Khan**Ph.D., Department of  
Agronomy, SHUATS, Uttar  
Pradesh, India**M Sekhar**M.Sc. Department of Agronomy,  
SHUATS, Uttar Pradesh, India**Dhanush Reddy**M.Sc. Department of Agronomy,  
SHUATS, Uttar Pradesh, India**Corresponding Author:****Arun Kumar Chaurasia**Associate Professor,  
Department of Genetis and Plant  
Breeding, Sam Higginbottom  
University of Agriculture,  
Technology and Sciences,  
Prayagraj, Uttar Pradesh, India

## Varietal performance on growth, yield and yielding attributes of chickpea (*Cicer arietinum* L.)

**Parameshwarudu B, Arun Kumar Chaurasia, Wasim Khan, M Sekhar and Dhanush Reddy**

DOI: <https://doi.org/10.22271/chemi.2021.v9.i1ag.11586>

### Abstract

The present investigation entitled The Evaluation of Varietal Performance on Growth and Seed Yield Parameters in Chickpea (*Cicer arietinum* L.) was carried out at Field Experimentation Centre of the Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj (UP) during Kharif-2019. The experiment was laid out in Randomised Blocked Design, consists of 13 varieties, among them V<sub>13</sub> (NBEG-3) significantly increased seed yield parameters of chickpea. with Maximum Number of branches, Number of Nodules per plant, Number of pod per plant, Number of seeds per pod, Pods weight per plant, Seed yield per plant, Seed yield per plot, Biological yield, Harvest index, were observed in V<sub>13</sub> (NBEG-3) Followed by V<sub>4</sub> (GNG-1958), V<sub>5</sub> (JG-11), and V<sub>11</sub> (BG-212).

**Keywords:** Parameters chick pea, varieties, yield

### Introduction

The Leguminaceae family is classified into 650 genera with 18,000 species including chickpea (Varshney *et al.*, 2009) [16]. Chickpea (*Cicer arietinum* L.) is a self-pollinated plant with 16 chromosomes (2n = 16). It is the third most widely cultivated legume crop after dry bean (*Phaseolus vulgaris* L.) and field pea (*Pisum sativum* L.). Chickpea ranks fifth among legumes, and 15<sup>th</sup> among grain crops (Katerji *et al.*, 2001) [5]. It is an important pulse crop of India and an important source of protein in the vegetarian diet. Chickpea (*Cicer arietinum* L.) was first domesticated in the Middle East. It is an important cool season pulse crop and is also called Bengal gram. In terms of pulse production, India contributes about 25% to the total global pulses production (Pooniya *et al.*, 2015) [10]. In India, chickpea is a premier pulse crop grown on an area of 8.25 million ha during 2014-15, contributing 7.33 million tonnes to the national pulse basket with productivity of 889 kg ha<sup>-1</sup>. This accounts for about 70% of the total global area with 67% of global production (Anonymous 2016) [1]. The main chickpea producing states are Madhya Pradesh, Rajasthan, Maharashtra, Andhra Pradesh and Uttar Pradesh

Chickpea contains high amounts of protein, dietary fiber, carbohydrates (64% total carbohydrates), and minerals such as calcium, magnesium, potassium, phosphorus, iron, zinc, and manganese, and it is assumed to be a nutraceutical plant (Thudi *et al.*, 2011) [15]. Due to its high concentration of protein and carbohydrate, chickpea has an important place in human nutrition and plays an especially essential role in solving malnutrition problems in developing countries. Chickpea seeds contain 23% protein, 64% carbohydrates, 47% starch, 5% fat, 6% crude fiber, 6% soluble sugar and 3% ash (FAO, 2010) [4]. Chickpea like other beans is a good source of cholesterol lowering fiber (Pittaway *et al.*, 2006) [9]. In addition to lowering cholesterol, the high fiber content prevents blood sugar levels from rising, making chickpea a good choice for individuals with diabetes, insulin resistance or hypoglycemia (McIntosh and Miller, 2001) [8].

Low availability of pulses causes protein malnutrition. So, there is a great need to ensure nutritional security of ever burgeoning population. There is a big gap between demand and supply of pulses and this can be overcome by increasing the productivity of pulses.

Diversified domestic, industrial and other uses of chickpea and its ability to grow better with low inputs under abrasive edaphic factors and arid environments make it an important component of the cropping system of subsistence farmers in the Indian subcontinent (Verma *et al.*, 2013) [17]. Evaluation of crop germplasm is a pre-requisite, for which the future breeding work is based. The value of germplasm collection relies not only on the number of accessions it possesses, but also upon the genetic diversity present in those accessions for essential economic traits (Reddy *et al.*, 2012) [12].

### Materials and Methods

The present investigation was carried out at field of Seed Science and Technology in the Department of Genetics and Plant Breeding, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P). The site of experiment is located at 25.57° N latitude, 81.51° E longitude and 98 meter above the sea level. This region has subtropical climate with extreme of

summer and winter. The temperature falls down to as low as 1 – 2 °C during winter season especially in the months of December and January. The mercury rises up to 46 – 48 °C during summer. The experimental material consists of 13 varieties and seed of chickpea, which were taken from Regional Agricultural Research Station (Nandyal).

### Results and Discussion

#### Field emergence (%)

The data of field emergence percentage are presented below in Table 1. The mean performance of field emergence ranged from 81.33% to 89.00% with mean value of 85.21%. Significantly maximum percentage of field emergence (89.00%) was recorded by V<sub>8</sub> - KABULI-119 followed by V<sub>5</sub> - JG-11 (88.33%), V<sub>3</sub> - Vaibav (87.00%) and V<sub>1</sub> - PUSA-362 (86.67%). Minimum field emergence was recorded by V<sub>7</sub> - NBEG-47 (81.33%). Similar results of field emergence percent was observed by Babu *et al.*, (2018) [2, 12].

**Table 1:** Mean performance of 13 chickpea varieties for 4 growth parameters

S. No.	Treatments	Field emergence percentage	Plant height at 60 DAS (cm)	Plant height at 120 DAS (cm)	Number of branches per plant
1	V <sub>1</sub>	86.67	22.10	50.60	5.23
2	V <sub>2</sub>	86.00	24.60	52.70	4.87
3	V <sub>3</sub>	87.00	22.07	54.87	5.40
4	V <sub>4</sub>	85.33	21.63	51.30	5.70
5	V <sub>5</sub>	88.33	23.87	53.43	5.53
6	V <sub>6</sub>	82.00	23.13	50.80	4.93
7	V <sub>7</sub>	81.33	23.80	54.33	5.50
8	V <sub>8</sub>	89.00	21.40	52.40	4.70
9	V <sub>9</sub>	84.67	22.47	52.13	5.00
10	V <sub>10</sub>	83.67	21.30	52.93	5.13
11	V <sub>11</sub>	82.33	19.13	50.32	5.37
12	V <sub>12</sub>	85.00	26.33	62.10	6.33
13	V <sub>13</sub>	86.33	22.33	56.27	5.87
Grand Mean		85.21	22.63	53.40	5.35
C.D. (5%)		3.68	4.05	4.27	0.73
SE(m)		1.26	1.39	1.47	0.25
SE(d)		1.78	1.96	2.08	0.35
C.V.		2.57	10.62	4.76	8.05

#### Plant height at 60 DAS (cm)

The data related to Plant height (cm) at 60 DAS are presented in Table 1. The mean performance of plant height at 60 DAS ranged from 19.13 cm to 26.33 cm with mean value of 22.63 cm. Plant height at 60 DAS found non-significantly, maximum height of plant at 60 DAS (26.33 cm) was recorded by V<sub>12</sub> - IPC-1-85 followed by V<sub>2</sub> - Kin Ganesh + (24.60 cm), V<sub>5</sub> - JG-11 (23.87 cm) and V<sub>7</sub> - NBEG-47 (23.80 cm). Minimum plant height at 60 DAS was recorded by V<sub>11</sub> - BG-212 (19.13 cm). Similar results of plant height at 60 DAS was observed by Kaur *et al.*, (2019) [3, 6].

#### Plant height at 120 DAS (cm)

The data related to Plant height (cm) at 120 DAS are presented in the Table 1. The mean performance of plant height at 120 DAS ranged from 50.32 cm to 62.10 cm with mean value of 53.40 cm. significantly maximum height of plant at 120 DAS (62.10 cm) was recorded by V<sub>12</sub> - IPC-1-85 followed by V<sub>3</sub> - Vaibav (54.87 cm), V<sub>7</sub> - NBEG-47 (54.33 cm) and V<sub>5</sub> - JG-11 (53.43 cm). Minimum plant height at 120 DAS was recorded by V<sub>11</sub> - BG-212 (50.32 cm). Similar results of plant height at 120 DAS was observed by Satyajit *et al.*, (2015) [13].

#### Number of branches per plant

The data of number of branches per plant are presented below in Table 1. The mean performance of number of branches per plant ranged from 4.70 to 6.33 with mean value of 5.35. Significantly maximum number of branches (6.33) was recorded by V<sub>12</sub> - IPC-1-85 followed by V<sub>13</sub> - 4C-5 (5.87), V<sub>4</sub> - GNG-1958 (5.70) and V<sub>5</sub> - JG-11 (5.53). Minimum number of branches was recorded by V<sub>8</sub> - KABULI-119 (4.70). Similar results of number of branches per plant was observed by Sharma *et al.*, (2013) [14].

#### Number of pods per plant

The data of number of pods per plant are presented below in Table 2. The mean performance of number of pods per plant ranged from 66.10 to 85.33 with mean value of 76.67. Significantly maximum number of pods (85.33) was recorded by V<sub>2</sub> - Kin Ganesh + followed by V<sub>12</sub> - IPC-1-85 (82.50), V<sub>13</sub> - 4C-5 (80.83) and V<sub>5</sub> - JG-11 (80.10). Minimum number of pods was recorded by V<sub>6</sub> - NBEG-49 (66.10). Similar results of number of pods per plant was observed by Purushothaman *et al.*, (2014) [11].

**Table 2:** Mean performance of 13 chickpea varieties for 7 yield parameters and yield

S. No.	Treatments	Number of pods per plant	Number of seeds per pod	Pods weight per plant (g)	Seed yield per plant (g)	Seed yield per plot (g)	Biological yield (g)	Harvest index (%)
1	V <sub>1</sub>	78.67	1.27	11.23	9.97	323.90	883.56	36.62
2	V <sub>2</sub>	85.33	1.40	10.47	9.40	320.80	853.66	37.42
3	V <sub>3</sub>	72.60	1.33	10.98	9.90	319.53	906.64	35.24
4	V <sub>4</sub>	75.73	1.27	10.28	9.20	317.10	898.30	35.28
5	V <sub>5</sub>	80.10	1.53	10.46	9.43	326.67	824.07	39.62
6	V <sub>6</sub>	66.60	1.27	9.97	8.77	280.07	903.80	31.03
7	V <sub>7</sub>	69.53	1.47	9.75	8.90	275.00	906.97	30.29
8	V <sub>8</sub>	75.90	1.27	11.47	10.40	335.47	820.08	40.90
9	V <sub>9</sub>	76.47	1.33	10.49	9.50	316.87	913.06	34.73
10	V <sub>10</sub>	73.27	1.20	10.11	9.07	294.80	892.33	33.04
11	V <sub>11</sub>	79.20	1.47	10.22	9.20	305.37	937.33	32.57
12	V <sub>12</sub>	82.50	1.67	10.36	9.33	314.10	912.57	34.40
13	V <sub>13</sub>	80.83	1.73	11.71	10.70	345.17	812.77	42.51
Grand Mean		76.67	1.40	10.58	9.52	313.45	881.93	35.67
C.D. (5%)		3.78	0.21	0.56	0.46	38.73	78.48	2.72
SE(m)		1.30	0.07	0.19	0.16	13.27	27.23	0.93
SE(d)		1.83	0.10	0.27	0.22	18.77	38.51	1.32
C.V.		2.93	8.91	3.16	2.88	7.33	5.35	4.52

### Number of seeds per pod

The data of number of seeds per pod are presented below in Table 2. The mean performance of number of seeds per pod ranged from 1.20 to 1.73 with mean value of 1.40. Significantly maximum number of seeds per pod (1.73) was recorded by V<sub>13</sub> - 4C-5 followed by V<sub>12</sub> - IPC-1-85 (1.67), V<sub>11</sub> - BG-212 (1.47) and V<sub>2</sub> - Kin Ganesh + (1.40). Minimum number of seeds per pod was recorded by V<sub>10</sub> - DOLLAR (1.20). Similar results of number of seeds per pod was observed by Satyajit *et al.*, (2015)<sup>[13]</sup>.

### Pods weight per plant (g)

The data of pods weight per plant (g) are presented below in Table 2. The mean performance of pods weight per plant ranged from 9.75 g to 11.71 g with mean value of 10.58 g. Significantly maximum pods weight per plant (11.71 g) was recorded by V<sub>13</sub> - 4C-5 followed by V<sub>8</sub> - KABULI-119 (11.47 g), V<sub>1</sub> - PUSA-362 (11.23 g) and V<sub>3</sub> - Vaibav (10.98 g). Minimum pods weight per plant was recorded by V<sub>7</sub> - NBEG-47 (9.75 g). Similar results of pods weight per plant was observed by Chaudhary *et al.*, (2013)<sup>[3]</sup>.

### Seed yield per plant (g)

The data of seed yield per plant (g) are presented below in Table 2. The mean performance of seed yield per plant ranged from 8.77 g to 10.70 g with mean value of 9.52 g. Significantly maximum seed yield per plant (10.70 g) was recorded by V<sub>13</sub> - 4C-5 followed by V<sub>8</sub> - KABULI-119 (10.40 g), V<sub>1</sub> - PUSA-362 (9.97 g) and V<sub>3</sub> - Vaibav (9.90 g). Minimum seed yield per plant was recorded by V<sub>6</sub> - NBEG-49 (8.77 g). Similar results of seed yield per plant was observed by Singh *et al.*, (2017)<sup>[2, 14]</sup>.

### Seed yield per plot (g)

The data of seed yield per plot (g) are presented below in Table 2. The mean performance of seed yield per plot ranged from 275.00 g to 345.17 g with mean value of 313.45 g. Significantly maximum seed yield per plot (345.17 g) was recorded by V<sub>13</sub> - 4C-5 followed by V<sub>8</sub> - KABULI-119 (335.47 g), V<sub>5</sub> - JG-11 (326.67 g) and V<sub>1</sub> - PUSA-362 (323.90 g). Minimum seed yield per plot was recorded by V<sub>7</sub> - NBEG-47 (275.00 g). Similar results of seed yield per plot was observed by Macar *et al.*, (2017)<sup>[7]</sup>.

### Biological yield (g)

The data of biological yield (g) are presented below in Table 2. The mean performance of biological yield ranged from 812.77 g to 937.33 g with mean value of 881.93 g. Significantly maximum biological yield (937.33 g) was recorded by V<sub>11</sub> - BG-212 followed by V<sub>9</sub> - JAKI-7 (913.06 g), V<sub>12</sub> - IPC-1-85 (912.57 g) and V<sub>7</sub> - NBEG-47 (906.97 g). Minimum biological yield was recorded by V<sub>13</sub> - 4C-5 (812.77 g). Similar results of biological yield was observed by Singh *et al.*, (2017)<sup>[2, 14]</sup>.

### Harvest index (%)

The data of harvest index are presented below in Table 2. The mean performance of harvest index ranged from 30.29% to 42.51% with mean value of 35.67%. Significantly maximum harvest index (42.51%) was recorded by V<sub>13</sub> - 4C-5 followed by V<sub>8</sub> - KABULI-119 (40.90%), V<sub>5</sub> - JG-11 (39.62%) and V<sub>2</sub> - Kin Ganesh + (37.42%). Minimum harvest index was recorded by V<sub>7</sub> - NBEG-47 (30.29%). Similar results of harvest index was observed by Wamatu *et al.*, (2017)<sup>[18]</sup>.

### Conclusion

On the basis of results obtained from the present experiment following conclusions are drawn. The evaluation of varietal performance of different varieties of chickpea and result significantly at field conditions. Total 13 varieties check in this experiment and observe observed V<sub>12</sub> (IPC-1-85) followed by V<sub>13</sub> (4C-5), V<sub>5</sub> (JG-11), V<sub>7</sub> (NBEG-47) and V<sub>9</sub> (JAKI-7) significantly increased the growth, yield and yielding attributes of chickpea. Among the 13 varieties of chickpea IPC-1-85 showed maximum quality and yielding characters and find out all characters lowest in BG-212. These conclusions are based on the results of six months investigation and therefore further investigation is needed to arrive at valid recommendations.

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