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## Morphological variation and yield performance in chickpea (*Cicer arietinum* L.) genotypes

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### Abstract

An experiment was conducted during *rabi*-2019 at the experimental field of the Dr. PDKV, Akola. to study the morphological variability, yield and yield contributing characteristics among the ten chickpea genotypes *viz.*, PDKV Kanchan, Phule Vikram, AKG-1303, Chanoli, GAU-1107, GJC-3, WR-315, JCP-101, C-1821, GJG-0814 and one check JAKI-9218. The experiment was laid out in a RBD with three replications. The variation for days to 50% flowering ranged from 48.00 days (JCP-101) to 57.50 days (Chanoli). JCP-101 was early to flowering.

The variation for plant height ranged from 37.88 cm (Chanoli) to 55.42 cm (PDKV Kanchan). Chanoli was dwarfest one. The variation for number of primary branches/plant had ranged from 2.75 (GJG-0814) to 4.05 (Chanoli). Number of pods per plant showed variation from 77.50 (Chanoli) to 101.75 (Phule Vikram) followed by PDKV Kanchan (101.00). A similar trend was also noticed in seed yield per plant was registered in AKG-1303 (23.30 g) followed by PDKV Kanchan (23.00 g) and Phule Vikram (22.45 g). Out of ten, four genotypes were significantly superior over the check.

**Keywords:** Morphological variation, yield, *Cicer arietinum* L., genotypes

### Introduction

Chickpea (*Cicer arietinum* L.) is one of the most important pulses crop all over the world covering various parts of Asia, Africa, Europe, Australia and South America and North America continents. It contributes for 75% of total production in the world. Chickpea ranks third in pulse crop after dry bean and dry pea with production of about 913 kg/ha (FAO 2012). All over the world it is known as Garbanzo gram, Garbanzo bean, Egyptian pea. It is popularly known by different names in all states of India such as 'gram', 'chana', 'Bengal gram', 'harbara', 'chhole', etc. commonly described by folks of India as "chana" which comes from the Sanskrit word 'chennuk' or 'chanakam'.

The somatic chromosome number is  $2n=16$  with small genome size of 738.09 Mbp. Depend on size of seed and colour, chickpea divided into two types Macrosperma (*kabuli*) and Microsperma (*Desi*) type (Cubero, 1975) [1] with the production share of 25% and 75%, respectively (Soregaon, 2011) [7].

Chickpea is a self-pollinated crop cross pollination is rare only 0-1% is reported. Chickpea is well adapted to semi-arid conditions in winter. It is generally grown on heavy or red soil of pH 5.5 - 8.6. Frost, hillstones & excessive rains damage the crop.

Chickpea protein is rich in lysine and arginine but most deficient in sulphur containing amino acids methionine and cystine (Iqbal *et al.*, 2006). In general, *Kabuli* types are richer in protein content than *desi* types (Singh *et al.*, 2009) [6]. This food legume has diversified uses, and presently as many as 140 countries are importing chickpea (Gaur *et al.*, 2012) [2]. It contains protein 29 percent, carbohydrate 59 percent, fiber 3 percent, oil 5 percent oil and ash 4 percent.

### Method and Materials

Ten genotypes of chickpea *viz.*, PDKV Kanchan, Phule Vikram, AKG-1303, Chanoli, GAU-1107, GJC-3, WR-315, JCP-101, C-1821, GJG-0814 and one check JAKI-9218 were sown in RBD replicated thrice at Pulses Research Unit, Dr. PDKV, Akola, during *rabi*-2019. Seed were sown adopting a spacing 45 x 10 cm.

Observation were recorded for Plant stand, days to 50% flowering, days to maturity, plant height, number of primary branches per plant, number of secondary branches per plant, number of pods per plant, 100 seed weight, Seed yield per plant, number of seeds per pod, number of empty pods per plant, Growth habit, and Lodging resistance in five randomly selected plants in each genotypes in each replication.

## Results and Discussion

The analysis of variance was calculated for all thirteen characters studied and their mean squares values are presented in Table 1. The mean square due to genotypes was highly significant for all characters, while the mean square due to replication were highly non-significant for all characters. Mean performance of genotype presented in table 2. Early to medium maturity duration genotypes are preferred and in the present study among the genotype studied JCP-101 (48 days) was earliest in flowering followed by AKG-1303 (49 days) whereas, parent Chanoli (57.50 days) was the most late in flowering. Comparable results were reported by Kulkarni *et al.* (2004) [4].

Medium to dwarf genotypes are desirable for better crop stand and ultimately for getting good yield. The range for plant height was 37.88 cm to 55.42 cm. PDKV Kanchan (55.42 cm) was with highest plant height followed by Phule Vikram (54.80 cm). Whereas, the genotype Chanoli (37.88 cm) with lowest plant height. Similar trend were found in plant stand, ranged from 28.50 to 30. PDKV Kanchan (30), Phule Vikram (30), AKG-1303 (30), GJC-3 (30), WR-315 (30), JCP-101 (30), C-1821 (30) was highest plants stand and followed by GAU-1107 (29.50) whereas, Chanoli (28.5) having lowest plant stand.

In present study, days to maturity ranged from 98.50 to 107 days GJG-0814 (98.5 days) was earliest followed by PDKV Kanchan (100.5 days), WR-315 (100.5) whereas, GAU-1107 (107 days) and C-1821 (105 days) were late in maturity. Similar results were recorded by Hedge *et al.* (2002) [3].

The character *viz.*, primary branches per plant, Number of secondary branches per plant, number of pods per plant, 100 seed weight, Seed yield per plant, number of seeds per pod, number of empty pods per plant are yield contributing

characters and increase in these characters ultimately result in increased green pod yield. Number of primary branches per plant is an important character in deciding performance genotype.

High number of primary branches per plant ultimately results in high number of pods per plant and high seed yield. Among the genotypes, number of primary branches per plant ranged from 2.75 to 4.05. Among the genotypes, Chanoli (4.05) was noted with maximum number of primary branches per plant followed by Phule Vikram (3.45). The range for number of secondary branches per plant was 19.45 to 23.70. Among the genotypes, GJG-0814 (23.70) was having highest number of secondary branches per plant, whereas, Phule Vikram (19.45) having lowest number of secondary branches per plant.

The main use of chickpea is for edible tender green pods and for dry seed thus the improvement in number of pods per plant is the major objective of chickpea improvement programme.

In the present study, the JAKI-9218 was taken as a standard check, as this has maximum number of pods per plant. Among the ten genotypes, maximum number of pods per plant recorded by AKG-1303 (101.60) whereas Chanoli (77.50) and GAU-1107 (90.80) having lowest number of pods per plant. Similar results were recorded by Yamini *et al.* (2015) [7].

For 100 seed weight character, among the genotype, maximum 100 seed weight recorded by PDKV Kanchan (22.25 g) followed by AKG-1303 (22.15g). For number of green per pod, Phule Vikram (1.25) recorded maximum number of seeds per pod followed by JCP-101 (1.20) whereas, GAU-1107, Chanoli, WR-315, C-1821, and GJG-0814 (1.00) recorded lowest number of seeds per pod. The range for number of seeds per pod was 1.00 to 1.25.

Improvement in yield is a prime important in any crop improvement programme. For seed yield per plant, among the chickpea genotype, the highest average seed yield per plant was recorded by AKG-1303 (23.20 g) followed by PDKVKanchan (23 g) whereas, the genotype Chanoli (8.55 g) gave minimum yield per plant. It was ranged from 8.55 to 23.20 g. Comparable results were reported by Sarode *et al.* (2016) [5].

**Table 1:** Analysis of variance

Sources	d.f.	Plant stand	Days to 50% flowering	Days to Maturity	Plant Height (cm)	No. of Primary branches per plant	No. of Secondary branches per plant	No. of pods per plant	100 seed weight per plant (g)	Seed yield per plant(g)	No. of Seeds per pod	No. of empty pods per plant
		1	2	3	4	5	6	7	8	9	10	11
Replications	1	0.941	6.485	2.485	11.97	0.640	22.36	3.907	0.058	1.951	0.00	0.024
Treatments	33	28.09**	34.53**	8.690**	56.52**	0.738**	18.58*	90.89**	57.77**	67.67**	0.014**	2.19**
Error	33	0.729	13.72	2.515	9.873	0.177	9.464	28.76	2.497	4.951	0.006	0.700

**Note:** \*Significant at 5% level of significance,

\*\* Significant at 1% level of significance

**Table 2:** Mean performance of genotypes for various traits and growth habit

Sr. No.	Genotypes	Plant Stand	Days to 50% Flowering	Days to Maturity	Plant height (cm)	Number of Primary branches per plant	No. of Secondary branches per plant	No. of pods per plant	100 Seed weight (g)	Seed yield per plant (g)	No. of Seeds per pod	No. of empty pods per plant	Growth Habit
		1	2	3	4	5	6	7	8	9	10	11	12
1	PDKV Kanchan	30	54	100.5	55.42	3.30	22.35	101.00	22.25	23	1.15	0	Semi-erect type
2	Phule Vikram	30	51	103.5	54.80	3.45	19.45	101.75	21.80	22.45	1.25	0	Erect type
3	AKG-1303	30	49	104	54.27	3.00	22.75	101.60	22.15	23.20	1.15	0	Erect type
4	Chanoli	28.5	57.50	103	37.88	4.05	22.90	77.50	8.40	8.55	1	3.05	Spreading type
5	GAU-1107	29.5	51.50	107	49.27	2.85	22.40	90.80	19.80	15.45	1	1	Semi -

													erect type
6	GJC-3	30	51	104	48.47	2.90	22.65	93.70	19.50	19.75	1.10	2	Semi-erect type
7	WR-315	30	51	100.5	51.12	3.15	21.40	95.45	20.20	18.85	1	0.9	Spreading type
8	JCP-101	30	48	102.5	50.80	2.85	23.50	98.10	21.60	21.05	1.20	0	Semi-erect type
9	C-1821	30	50.50	105	54.51	3.40	20.05	98.40	21.35	20.95	1	0	Semi-erect type
10	GJG-0814	29.5	51.50	98.5	50.80	2.75	23.70	98.05	21.40	21	1	2.9	Semi-erect type
	Range	28.5 to 30	48 to 57.50	98.5 to 107	37.88 to 55.42	2.75 to 4.05	19.45 to 23.70	77.50 to 101.75	8.40 to 22.25	8.55 to 23.20	1 to 1.25	0 to 3.05	
	General mean	24.857	52.528	104.3	50.60	3.720	22.78	99.42	18.54	19.08	1.070	1.838	
	SE(D)±	0.595	2.590	1.146	2.198	0.294	2.155	3.737	1.104	1.550	0.054	0.583	
	CD5%	1.710	7.445	3.294	6.318	0.845	6.195	10.74	3.174	4.455	0.157	1.676	
	CD1%	2.296	9.995	4.423	8.483	1.135	8.317	14.41	4.261	5.981	0.211	2.250	
	C.V	3.386	6.974	1.554	6.144	11.18	13.38	5.315	8.423	11.48	7.254	44.86	

**Note:** \*Significant at 5% level of significance,

\*\* Significant at 1% level of significance

### Conclusion

Among the genotypes, the genotypes AKG-1303 and PDKV Kanchan showed better performance especially in respect of seed yield per plant. JCP-101 was found to be earliest and Phule Vikram maximum number of pods per plant. Therefore, these genotypes can be taken under consideration for commercial cultivation.

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