ASSESMENT OF VARIABILITY AND CORRELATION FOR QUALITATIVE AND QUANTITATIVE TRAITS IN CHICKPEA (*CICER ARIETINUM* L) GERMPLASM

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Abstract: The experimental material consisted of fifty one chickpea genotypes including three checks i.e. Vijay, Vishal, and Digvijay were collected from NBPGR, New Delhi and Pulses Improvement Project, MPKV, Rahuri in randomized block design (RBD) with two replications. Significant differences were observed amongst the genotypes for quantitative traits such as days to 50 per cent flowering, number of primary branches per plant, number of secondary branches per plant, number of pods per plant, 100 seed weight, seed yield per plant, and seed qualitative traits such as germination percentage, vigour index, dry weight of seedling, electrical conductivity, and moisture content. A wide range of variation was observed for the characters vigour index, number of pods plant-1, calcium, phosphorous, days to 50 per cent flowering, and 100 seed weight. The characters seed yield plant-1, number of secondary branches plant per plant, carbohydrate, dry weight of seedling, vitamin-A, starch, germination percentage, electrical conductivity, crude fiber and protein content showed a considerable amount of variability. Narrow range of variability was observed for number of primary branches plant-1, moisture content, ash, fat, niacin, riboflavin, thiamine, and vitamin-B6. In general, the phenotypic coefficient of variation was higher than the genotypic coefficient of variation for all the characters studied. The highest genotypic and phenotypic coefficient of variation was observed for character electrical conductivity, followed by dry weight of seedling, seed yield per plant, 100 seed weight, number of pods per plant, number of secondary branches per plant, number of primary branches per plant, vitamin-B6, and fat. While for characters vitamin-A followed by niacin, vigour index, calcium, ash, carbohydrate, days to 50 per cent flowering, and thiamine medium estimates of PCV and GCV were observed, Low estimates of PCV and GCV were observed for moisture content, protein content, phosphorous, riboflavin and germination percentage suggesting narrow range of variation for these characters.

Keywords: Chickpea, correlation, qualitative-quantitative traits, variability.

Introduction: Genetic variability is prerequisite for crop improvement as it provides raw material to plant breeders to recombine the genes of different characters in same plant for development of desirable variety. Plant genetic resources are the basis of global food security. They contain diversity of genetic material contained in traditional varieties, modern cultivars, crop wild relatives and other wild species. To fulfill the demand of increasing population and to produce more food, it would be essential to make better use of a broader range of the world's plant genetic diversity. Seed size *per se* is an important aspect of seed vigour which is manifested through higher plant stand, plant growth and yield. Generally big seeds with higher amount of initial food reserves emerge early and uniformly and grow vigorously in field and exhibit early advantage of plant vigour with respect to plant performance and yielding ability compared to small and medium seeds in several crops. On the contrary in some crops even medium, small and bulk seeds were also found to have equal beneficial effects as that of big seeds with respect to field performance. The small and medium seeds require less moisture for germination, emerge early, establish early, grow vigorously and yield equally as that of big seeds. As the seed size *per se* is still a controversial issue and there is a need to study the influence of seed size on plant growth, seed yield and quality in *kabuli* and *desi* chickpea varieties as they show much variation in seed size. Harvest of seed crop at right stage of maturity bear significant influence on seed yield and quality as seeds harvested at right stage of physiological maturity are higher in seed quality on account of lesser field weathering (Bharud and Patil, 1990). Yield losses due to pod drop and shattering are more common with delayed harvest in chickpea.

Material and methodology: The present investigation conducted with fifty one chickpea genotypes including three checks *i.e.* Vijay, Vishal, and Digvijay were collected from NBPGR, New Delhi and Pulses Improvement Project, MPKV, Rahuri. The experiment was conducted at Department of Agricultural Botany and Seed Technology Research Unit, Mahatma Phule Krishi Vidyapeeth, Rahuri, during *rabi* season of 2012-13 in randomized block design (RBD) with two replications. Each genotype was sown in six rows in plot of 4 m length with 45 x 10 cm plant geometry. Five random plants were tagged from each plot to record the data for all the quantitative traits except days to 50 per cent flowering. Days to 50 per cent flowering was computed on plot basis. The quality characters were estimated from three samples of each genotype. The

data were subjected to analysis of variance as per suggested by panse and Shukatnme (1967).

Result and conclusion: The calcium content in different genotypes ranged from 82.58 to 187.40 mg/100g indicating wide range of genetic variation among the genotypes studied for this trait. The carbohydrates in different genotypes ranged from 37.28 to 63.99 per cent revealed wide range of genetic variation for this trait among the genotypes studied. The crude fibre content (3.14 to 8.10%), protein content (17.68 to 25.31%), fat content (0.09 to 1.64%), niacin (0.66 to 2.48 mg/100g), phosphorous content (348.04 to 456.43 mg/100g), riboflavin (0.17 to 0.25 mg/100g), starch content (25.97 to 61.37%), thiamine B1 (0.29 to 0.64 mg/100g), vitamin-B6 (0.22 to 0.86 mg/100g) and vitamin-A (10.46 to 33.78 mg/100g) exhibited narrow to wide range of variation as given in parenthesis, indicating wide range of genetic variation. In general, the estimates of PCV was higher than corresponding GCV for all the traits under study, indicated that these traits were less influenced by environment. High estimates of PCV were observed for electrical conductivity (90.07%), dry weight of seedling (43.44%), seed yield per plant (40.35%) and 100 seed weight (37.58%). Likewise, high estimate of GCV was recorded for character electrical conductivity (86.61%) followed by dry weight of seedling (43.14%), seed yield per plant (39.77%), 100 seed weight (37.35%), number of pods per plant (27.23%), and number of secondary branches per plant (23.52%), indicated the involvement of additive gene action in governing of these traits. Ali *et al.* (2011) also found high GCV and PCV estimates for seed yield and 100 seed weight. Ali et al. (2011) has earlier been noted some deviation from our findings, may be noted due to differences in genetic material.

The traits *like* number of primary branches per plant (22.20%), vitamin-A (18.35%), niacin (18.26%) vigour index (16.31%), calcium (14.21%), starch (13.32), day to 50 per cent flowering (13.21,) thiamine (13.15%), carbohydrates (13.03%) and ash (12.70%) exhibited moderate estimates of PCV. Similarly, moderate estimates of GCV was observed for the characters *viz.,* vitamin-B6 (19.41%), crude fibre (19.07%), number of primary branches per plant (18.65%), vitamin-A (17.62%), Niacin (16.41%), vigour index (15.48%), starch (14.30%), calcium (13.67%), day to 50 per cent flowering (12.91%), ash (12.07%), thiamine (12.06%) and moisture content (10.87%), indicated the involvement of both additive and non additive type of gene action in inheritance of these traits. Ali et al. (2011) has earlier been noted the contrasting results for fat, ash, moisture content, carbohydrate and protein content. This deviation may be noted due to differences in genetic material. A low estimate of PCV was observed for riboflavin (8.35%), protein content (7.88%), phosphorus (6.16%) and seed germination (3.90%). Similarly nature and magnitude was noted low for the characters *like* moisture content (8.84%), Carbohydrates (8.71%), protein content (5.84%), riboflavin (5.45%), phosphorous (5.61%) and germination percentage (3.50%). This was indicated that the trait was governed by non additive gene action. Based on above results and discussion, it was observed that the characters *like* electrical conductivity, dry weight of seedling, seed yield per plant, 100 seed weight, number of pods per plant and number of secondary branches per plant may be improved by simple plant selection methods. Likewise, rest of the characters may be added in recombination/ transgressive breeding for chickpea improvement.

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Table 1. Analysis of variance for twenty four different characters in chickpea

Sr.No.	Characters	Mean sum of square	
		Genotype	Error
		(d.f.50)	(d.f.50)
1.	Days to 50 % flowering	94.79**	2.18
4.	Number of primary branches per plant	1.69**	0.29
3.	Number of secondary branches per plant	16.19**	1.03
4.	Number of pods per plant	569.37**	17.36
5.	100 seed weight (g)	68.70**	0.41
6.	Seed yield per plant (g)	27.15**	0.39
7.	Moisture content (%)	1.98**	0.40
8.	Germination percentage	37.27**	2.78
9.	Vigour Index	485347.66**	17303.94
10.	Dry weight of seedling (g)	2.57**	0.01
11.	Electrical conductivity (dSm^{-1})	1.73**	0.04
12.	Ash (%)	0.20**	0.01
13.	Calcium (mg/100g)	938.79**	36.69
14.	Carbohydrates (%)	68.82**	26.28
15.	Crude fibre (%)	2.31**	0.76
16.	Protein content (%)	4.70**	1.36
17.	Fat content (%)	0.196**	0.008
18.	Niacin (B_3) (mg/100g)	0.21**	0.02
19.	Phosphorus (mg/100g)	1006.05**	93.73
20.	Riboflavin (B_2) (mg/100g)	0.0005**	0.0002
21.	Starch (%)	85.46**	6.08
22.	Thiamine (B_1) (mg/100g)	0.0092**	0.0008
23.	Vitamin-B6 (pyridoxine) (mg/100g)	0.033**	0.006
24.	Vitamin-A (Retinol) (mg/100g)	45.65**	1.84

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