Estimation of nature and magnitude of correlation among different traits in chickpea (*Cicer arietinum* L.)

ABSTRACT

The present investigation was carried out for, correlation studies showed that the traits viz., Days to 50% flowering, Days to maturity, Plant height (cm), Primary branches per plant, Number of pods per plant, Number of seeds per pod, 100-seed weight (g), Seed yield per plant (g), Harvest index (%). The estimates of genotypic correlation were higher than the corresponding phenotypic correlation coefficient. It may result from the modifying effect of environment on the association of characters at genotypic level. The seed yield per plant was exhibited significantly and positively correlated with harvest index, number of seeds per pod, primary branches per plant, number of pods per plant, biomass per plant and 100-seed weight at genotypic level. Harvest index, number of seeds per pod, primary branches per plant, number of pods per plant and 100-seed weight were showed positively and significantly correlated with seed yield per plant at phenotypic level. These associations indicated that improvement in seed yield can be achieved by improving the above characters.

Keywords: Correlation, Chickpea, Plant height, Number of seeds per pod, 100-seed weight, Seed yield per plant, Harvest index, seed yield,

INTRODUCTION

Pulses are the major sources of dietary protein in the vegetarian diet in our country. Besides being a rich source of protein, they maintain soil fertility through biological nitrogen fixation in soil and thus play a vital role in furthering sustainable agriculture. In India, chickpea accounts for about 45% of total pulses produced in the country. Similar to the case of other pulses, India is the major producing country for chickpea, contributing for over 75% of total production in the world.

The Chickpea (*Cicer arietinum* L. 2n=16), commonly known as Gram or Bengal gram, is the most important *rabi* pulse of India. Chickpea is predominantly a self pollinated crop and cross-pollination is a rare event, only 0-1 % is reported. It is a type of pulse, with one seedpod containing two or three peas. Chickpea is an important source of protein in the diets of the poor, and is particularly important in vegetarian diets. Also, it is being used increasingly as a substitute for animal protein. Chickpea is a helpful source of zinc, folate and protein. They are also very high in dietary fiber and hence a healthy source of carbohydrates for persons with insulin sensitivity or diabetes.

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Chickpea is the third most important pulse crop, after dry bean and peas, produced in the world. The Desi type chickpea contribute to around 80% and the Kabuli type around 20% of the total production. India is the world leader in chickpea production followed by Pakistan and Turkey. Major producers of chickpea include India, Pakistan and Mexico. India is the largest producer, with about 8.83 million tons in area of 8.52 million hectare with productivity 1036 kg. per hectare in the year 2012-13, (Anonymous, 2012). About 70% of total world production, six countries including India, Australia, Turkey, Myanmar, Pakistan and Ethiopia account for about 90% of world chickpea production. Even though India is the largest producer of chickpea, it still imports chickpea from other countries. The ever-increasing demand for this legume crop, it is essential to improve the production and area under cultivation, at the same time minimizing the stress on this crop plant. Progress in any breeding programme depends upon the extent and nature of

variability existing in the base population. Thus, the success of any breeding programme depends on choice of breeding stocks that have sufficient variability. Yield, the ultimate goal of a breeding programme, is very complex character, which is affected by many genetic as well as environmental factors. Hence the breeder needs some index characters in order to design the selection strategy for indirect selection towards higher yield. An improvement in one character is inherited with positive or negative change in another association studies at genetic level will help the breeder to select the genetic improvement of yield.

METHODS AND MATERIALS

The present investigation on chickpea for correlation studies was conducted at Organic Research Farm (HRF), Karguanji, Department of Genetics and Plant Breding, Institute of Agricultural Sciences, Bundelkhand University, Jhansi during *Rabi* season of 2023-24. Five competitive plants for each entry were randomly selected for recording observations for all the quantitative characters viz., Days to 50% flowering, Days to maturity, Plant height (cm), Primary branches per plant, Number of pods per plant, Number of seeds per pod, 100-seed weight (g), Seed yield per plant (g) and Harvest index (%) in each replication except days to 50 per cent flowering and days to maturity, where observations were recorded on plot basis.

The phenotypic, genotypic and environmental correlation coefficients were calculated from the phenotypic and genotypic components of variances and co- variances as per the procedure suggested by Fisher (1954) and Al-Jibouri *et al*. (1958) and later on formula given by Singh and Choudhary (1979). The estimates of correlation were tested at 5% and 1% level of significance against the expected value from Fisher Table at (n-2) degree of freedom (Fisher and Yates, 1938).

RESULTS AND DISCUSSION

A perusal of table 1 revealed that seed yield per plant exhibited highly significant and significant positive correlation with harvest index (0.790**), number of seeds per pod (0.675**), primary branches per plant (0.611**), number of pods per plant (0.401**) and 100-seed weight (0.330*) respectively at genotypic level. Harvest index (0.670**) followed by number of seeds per pod (0.415**), primary branches per plant (0.400**), number of pods per plant (0.356**) and 100-seed weight (0.298*) were showed positive highly significant and significant correlation with seed yield per plant respectively at phenotypic level. However days to 50 per cent flowering and days to maturity exhibited non-significant and negative correlation with seed yield per plant at both genotypic and phenotypic level. Harvest index (-540**) and number of pods per plant (-0.427**) were showed highly significant and negative correlation at genotypic level.

Further examination of table 1 explained that the number of seeds per pod exhibited highly significant and significant positive correlation with harvest index (0.643** and 0.280*) at both genotypic and phenotypic level respectively. However, harvest index also showed highly significant and negative correlation with days to maturity (-0.648** and -0.449**) at both genotypic and phenotypic level. At genotypic level primary branches (0.994**) followed by number of pods per plant (0.574**) and plant height (0.358**) were showed highly significant and positive correlation. Number of pods per plant (0.393**) at phenotypic level. Days to 50 per cent flowering, days to maturity, number of seeds per pod and 100-seed weight were revealed non-significant but positive correlation with biomass per plant at both genotypic and phenotypic level. Plant height (0.240) also exhibited non-significant and positive association at phenotypic level.

100-seed weight exhibited highly significant and positive correlation with primary branches per plant (0.402**) and days to maturity (0.376**) at genotypic level. It was also exhibited highly significant and positive correlation with days to maturity (0.333**) at phenotypic level. At genotypic level number of seeds per pod showed highly significant and positive correlation with number of pods per plant (0.359**) and plant height (0.344**).

Number of pods per plant exhibited highly significant and positive correlation with primary branches per plant (0.909** and 0.489**) and plant height (0.726** and 0.477**) at both genotypic and phenotypic level.

Primary branches per plant showed significantly and positive correlation with plant height (0.559** and 0.255*) at both genotypic and phenotypic level. Primary branches per plant also showed significant and positive correlation with days to maturity (0.316*) at genotypic level. However, it exhibited non-significant and negative correlation with days to 50 per cent flowering at both genotypic and phenotypic level.

At both genotypic and phenotypic level plant height was exhibited highly significant and positive correlation with days to maturity (0.448** and 0.337**). However, it was exhibited non-significant and negative correlation with days to 50%

flowering (-0.110 and -0.030) at both genotypic and phenotypic level. Days to maturity exhibited non-significant and positive association with days to 50 per cent flowering (0.165 and 0.151) at both genotypic and phenotypic level.

The seed yield per plant had positive significant genotypic correlation with harvest index (0.790**), number of seeds per pod (0.675**), primary branches per plant (0.611**), number of pods per plant (0.401**) and 100-seed weight (0.330*). Thus the correlation coefficient study revealed that the seed yield per plant, harvest index, number of seeds per pod, primary branches per plant, number of pods per plant and 100-seed weight are main traits for crop improvement in chickpea. These findings character association in chickpea are also with the similar trends of results reported by Bhavani *et al.* (2008), Vekariya *et al.* (2008), Vaghela *et al.* (2009), Yucel and Anlarsal (2010), Usman *et al.* (2012), Yadav *et al.* (2014) and Gaur *et al.* (2014) for seed yield per plant and most of the yield attributing traits.

Table 1: Genotypic (r_g) and phenotypic (r_p) correlation coefficients between different characters in chickpea

Characters	R	Days to maturity	Plant height (cm)	Primary branches per plant	Number of pods per plant	Number of seeds per pod	100-seed weight (g)	Harvest index (%)	Seed yield per plant (g)
Days to 50% flowering	G	0.165	-0.110	-0.243	-0.016	-0.081	-0.240	-0.220	-0.225
	P	0.151	-0.030	-0.020	-0.010	-0.071	-0.220	-0.212	-0.185
Days to maturity	G		0.448**	0.316*	0.120	-0.025	0.376**	-0.648**	-0.206
	P		0.337**	0.107	0.005	-0.048	0.333**	-0.449**	-0.166
Plant height (cm)	G			0.559**	0.726**	0.344**	0.166	-0.138	0.153
	P			0.255*	0.477**	0.093	0.123	-0.093	0.042
Primary branches per plant	G				0.909**	0.136	0.402**	0.025	0.611**
	P				0.489**	0.227	0.176	-0.010	0.400**
Number of pods per plant	G					0.359**	0.002	0.112	0.401**
	P					0.246	-0.000	0.017	0.356**
Number of seeds per pod	G						-0.145	0.643**	0.675**
	P						-0.083	0.280*	0.415**
100-seed weight (g)	G							0.020	0.330*
	P							0.012	0.298*
Harvest index (%)	G							-0.040	0.493**
	P							-0.155	0.355**
									0.790**

CONCLUSION

It can be concluded from the above experimental findings that main yield contributing traits are harvest index, number of seeds per pod, primary branches per plant, number of pods per plant,100-seed weight and plant height due to their direct high positive association with seed yield. It indicated the possibilities of simultaneous improvement of these traits by selection. This in turn will improve the seed yield, since they are positively correlated with the seed yield. The traits days to 50 per cent flowering and days to maturity had negative and non- significant correlation with seed yield per plant thereby indicating selection for early maturity would give drought tolerant and drought avoiding genotypes affecting the seed yield positively in chickpea.

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