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Estimation of Genetic Variability and Correlation for Yield and Yield Attributing Characters in Chickpea (*Cicer arietinum* L.)

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Abstract: ***The experiment was conducted to estimate genetic variability and correlation for yield and yield attributing characters in chickpea. Highest GCV and PCV were recorded for effective pods per plant, grain yield per plant and pods per plant. High heritability recorded by number of 50% flowering and seed index. Genetic advance was registered for plant height, number of days to 50% flowering and number of effective pods per plant. High genetic advance ass percent of mean recorded for number of primary branches per plant, harvest index and number of pods per plant. Seed yield per plant exhibited significant and positive correlation both at genotypic and phenotypic level with plant height, number of pods per plant, effective pods per plant, biological yield and harvest index. Genetic advance, heritability and correlation coefficient analysis indicated that these traits may be used for the selection of high grain yielding chickpea genotypes to improve yield of chickpea.***

Keywords: Chickpea, variability, heritability, genetic advance, GCV, PCV, correlation

1. Introduction

Chickpea is the world's third most important winter season food legume is valued for its nutritive seeds with high protein content (25.3 - 28.9%). It is one of the earliest cultivated legumes, where 7500 years old remain have been found in middle east. Plays key role in Indian economy being a staple protein food for the poor and vegetarians which constitute a major population of the country. However, the highest percentage is noted for *Cicer arietinum* L. Yield in India i.e. 70% of total world yield (Aswathi *et al*., 2019). Chickpea is a cheap and important source of protein for those people who cannot afford animal protein or who are largely vegetarian (Gul *et al*., 2013; Hama, 2019). Determination of correlation between yield and its components and to estimate genetic parameters of variability are important for selection of favourable gene and genotypes while breeding (Meena *et al*., 2014). The success in any breeding programme depends upon the nature and magnitude of genetic variability and heritability, which provides better chances of selecting desired types (Kumar *et al*., 2014). Chickpea contain an average of 22% protein, 63% carbohydrate, 8% crude fibre 4.5% fat and 2.7% ash (Hirdyani, 2014). The present study was aimed to assess variability, heritability, genetic advance and correlation coefficients for finding the optimal selection criteria to improve the seed yield of the chickpea.

2. Materials and Methods

The present investigation was carried out at the yield experimentation centre, Department of Genetics and Plant Breeding, Naini Agriculture Institute, Sam Higginbottom University of Agriculture, Technology and Science, Allahabad, U. P. (India) during *rabi*, 2020. The experimental materials consist of 25 genotypes. The experiment was laid out in randomized block design with three replications. The genotypes were sown by hand dibbling in each plot by imposing randomization in each replication. The spacing of 30cm between rows and 10cm between plants. Observations were recorded in each plot and replication by taking five plants randomly for 11 qualitative characters *viz*, number of days to maturity, number of days to maturity, plant height, number of primary branches per plant, number of secondary branches per plant, number of pods per plant, number of effective pods per plant, biological yield, seed index, harvest index and seed yield per plant. The statistical analysis was carried out for different experiment separately per standard statistical procedure. The coefficient of correlations was computed as per the methods suggested by Al - Jibouri *et al.* Heritability and genetic advance was done as per method described by Lush (1949), Johnson *et al., (*1955) and Allard (1960).

3. Result and Discussion

The analysis of variance for different characters was presented in table 1 showed 5% level of significance for plant height, number of primary branches per plant and number of secondary branches per plant. All other qualitative characters showed 1% level of significance. Analysis of variance showed that mean sum of square due to genotype were significant for all the traits, it indicates that presence of sufficient amount of genetic variability for all characters.

Genetic parameters of yield and their components are given in table 2 in the present study highest genotypic variance were found for number of effective pods per plant (27.15) while lowest genotypic variance were found for number of days to maturity (1.09). Highest phenotypic variance was found for effective pods per plant (36.87) while lowest for number of days to maturity (1.68). High heritability (broad sense) was recorded for characters *i.e.*, days to 50% flowering (88.01), seed index (71.75) and number of pods per plant (59.57). Genetic advance ranged highest for plant height (2.405), number of days to 50% flowering (1.881) and number of effective pods per plant (1.291). Genetic advance as mean present ranged highest for number of

primary branches per plant (33.537), harvest index (15.247) and pods per plant (11.021).

The genotypic and phenotypic correlation coefficient were composed among 11 characters table 3. Plant height, number of pods per plant, number of effective pods per plant, biological yield and harvest index showed highly significant positive association with seed yield at both genotypic and phenotypic levels.

Therefore, these characters appeared as greatest important associates of seed yield per plant and have also been observed by preceding workers Renukadevi and Subbalakshmi (2006), Singh (2007), Ali Q et al. (2012), Kumar et al. (2016). The presence of positive and significant association between seed yield per plant and yield related traits suggests that seed yield can be improved through simultaneous selection of these traits (Ramanappa et al., 2013). The correlation coefficient analysis is an important tool which provides symmetrical measurement of nature of interaction between various quantitative traits to determinate the component characters on which selection can be based for the genetic improvement in yield.

Table 1: Analysis of variance for different characters of chickpea

Characters		Days to 50% flowering	Days to maturity	Plant height	Primary branches	Secondary branches	Pods/ plant	Effective pods/ plant	Seed index	Biological yield	Harvest index	Seed yield
Mean sum of squares	Replication (df=2)	1.96	0.04	22.34	0.02	0.42	238.49	234.28	4.96	17.63	10.79	8.04
	Treatment df=24)	40.01**	6.50**	15.95*	0.28*	0.881*	135.99**	141.18**	20.13**	38.94**	95.22**	15.56**
	Error (df=48)	1.74	2.04	7.92	0.14	0.42	25.09	30.99	2.34	8.43	24.93	3.43

**1% level of significance
*5%level of significance

Table 2: Genetic parameters for 11 quantitative traits

Characters	*GCV*	*PCV*	*Heritability*	*GA*	*GA as % mean*
Days to 50%floweering	4.37	4.66	**88.01**	1.881	5.173
Days to maturity	1.09	1.68	42.16	0.873	1.42
Plant height	4.28	8.52	25.26	**2.405**	4.444
Primary branches	9.53	18.96	25.27	0.906	**33.537**
Secondary branches	8.05	15.44	27.15	0.36	9.771
Pods per plant	23.18	30.04	59.57	0.283	11.021
Effective pods per plant	**27.15**	**36.87**	54.24	1.291	10.132
Seed index	10.27	12.12	71.75	0.63	9.257
Biological yield	20.31	27.46	54.69	0.501	5.398
Harvest index	9.45	13.58	48.45	0.676	15.247
Seed yield	24.45	33.24	54.10	0.527	2.554

Table 3: Estimation of phenotypic and genotypic correlation coefficient

		Days to 50% flowering	Days to maturity	Plant height	Primary branches	Secondary branches	Pods/ plant	Effective pods/plant	Seed index	Biological yield	Harvest index	Seed yield
Days to 50% flowering	P	1	0.284*	- 0.132	0.009	0.287*	- 0.249*	- 0.222	- 0.271*	- 0.412**	0.058	- 0.310**
	G	1	0.363**	- 0.195	0.011	0.506**	- 0.395**	- 0.301**	- 0.265*	- 0.489**	0.151	- 0.311**
Days to maturity	P		1	- 0.076	- 0.242*	0.541**	- 0.043	0.22	0.076	- 0.006	- 0.038	0.011
	G		1	- 0.078	- 0.574**	0.703**	- 0.038	0.149	0.162	- 0.154	- 0.151	- 0.086
Plant height	P			1	- 0.162	0.338**	0.268*	0.310**	- 0.072	0.324**	0.280*	0.355**
	G			1	- 0.270*	0.446**	- 0.376**	0.573**	- 0.155	0.376**	0.420**	0.418**
Primary branches	P				1	0.137	- 0.136	- 0.156	- 0.042	- 0.102	- 0.043	- 0.081
	G				1	0.261*	0.271*	- 0.286*	- 0.045	0.176	- 0.196	0.057
Secondary branches	P					1	- 0.531**	- 0.011	- 0.499*	- 0.067	0.113	- 0.012
	G					1	- 0.887**	- 0.176	- 0.475**	- 0.111	- 0.249*	- 0.152
Pods/plant	P						1	0.354**	0.305**	0.397**	0.067	0.528**
	G						1	0.062	0.251**	0.366**	0.081	0.639**
Effective pods/plant	P							1	0.321**	0.680**	0.353**	0.687**
	G							1	0.400**	0.762**	0.373**	0.761**
Seed index	P								1	0.157	0.083	0.178
	G								1	0.335**	0.194	0.173
Biological yield	P									1	0.372**	0.923**
	G									1	0.604**	0.969**
Harvest index	P										1	0.662**
	G										1	0.786**
Seed yield	P											1
	G											1

4. Conclusion

From the present investigation it is concluded that effective pods per plant, seed yield, pods per plant, biological yield and seed index exhibited high GCV, PCV and genetic parameters revealed that heritability and genetic advance as % mean values are high for primary branches per plant, harvest index, seed index, effective pods per plant and biological yield. Correlation coefficient analysis revealed that seed yield per plant exhibited positive and significant association with biological yield, and harvest index at genotypic and phenotypic level. Hence utmost importance should be given to these characters during selection for yield improvement in chickpea.

References

[1] Aswathi, P. V., K. Ganesamurthy and P. Jayamani.2019. Genetic variability for morphological and biometrical traits in chickpea (*Cicer arietinum* L.). Electr. J. Plant breed.10 (2): 699 - 705.
[2] Al - Jibouri, H. A. *et al.* (1958). *Agron. J.*, 50: 633 - 636
[3] Allard RW. Principles of plant breeding. New York: John wiley, 1960.
[4] Ali QM, Ahsan NH, Khan F, Ali M, Elahi, Elahi F. Genetic analysis for various quantitative traits of chickpea (*Cicer arietinum* L.). IJAVMS.2012; 6 (1): 51 - 57
[5] Gul, R., H. Khan, M. Bibi, Q. Ain and B. Imran.2013. Genetic analysis and interrelationship of yield attributing traits in chickpea (*Cicer arietinum* L.). J. Anim. Plant Sci.23 (2): 521 - 526.
[6] Hama, S. J., 2019. Correlation and path coefficient analysis for seed yield and yield components in chickpea under rainfed conditions. J. KerbalanAgric. Sci.6 (1): 26 - 35.
[7] Hirdyani, H., 2014. Nutritional composition of chickpea (*Cicer arietinum* L.) and value - added products. Indian J. Community health.26 (02): 199 - 201.
[8] Johnson HW, Robinson HF, Comstock RE. Estimates of genetic and environmental variability in soyabean. Agron. J.1955; 47: 314 - 318.
[9] Kumar estimation of genetic variability in chickpea (*Cicer arietinum* L.) research in environment and life science, 2016 9 (3): 362 - 364.
[10] Kumar genetic variability, character association and path analysis for economic traits in chickpea.2014 pp 160 - 167.
[11] Lush JL. Heritability of quantitative characters in farm animals. Proc.8th Congr. Gent. Herediates, 1949, suppl.356 - 375.
[12] Meena h, kumar J, Ramesh M. Evaluation of the reaction of chickpea genotypes to drought conditions using various stress tolerance indices. Legume research 2014; 37: 453 - 459.
[13] Ramanappa TM, Chandrashekara, Nuthan D. Analysis of variability for economically important traits in chickpea. international research in applied, natural and social sciences.2013; 1: 133 - 140.
[14] Renukadevi P, Subbalakshmi B. Correlation and path analysis in chickpea. legume research.2006; 29 (3): 201 - 204
[15] Singh SP. Correlation and path coefficient analysis in chickpea (*Cicer arietinum* L.) Int. J Plant Sci.2007; 2: 1 - 4.