International Journal of Advanced Biochemistry Research 2024; SP-8(11): 238-240

International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2024; SP-8(11): 238-240
www.biochemjournal.com
Received: 13-08-2024
Accepted: 16-09-2024

VA Dhole
PG Student, Department of Genetics and Plant Breeding, Post Graduate Institute, Dr. PDKV, Akola, Maharashtra, India

Dr. Archana W Thorat
Senior Research Scientist AICRP Pulses Research Unit, Dr. PDKV, Akola, Maharashtra, India

Dhanashila S Sutar
Senior Research Assistant Collage of Agriculture, VNMKV, Parbhani, Maharashtra, India

Pratiksha D Mahalle
PG Student, Department of Genetics and Plant Breeding, Post Graduate Institute, Dr. PDKV, Akola, Maharashtra, India

Abha P Nerkar
PG Student, Department of Genetics and Plant Breeding, Post Graduate Institute, Dr. PDKV, Akola, Maharashtra, India

Corresponding Author:
VA Dhole
PG Student, Department of Genetics and Plant Breeding, Post Graduate Institute, Dr. PDKV, Akola, Maharashtra, India

Genetic variability studies in chickpea (*Cicer arietinum* L.)

VA Dhole, Dr. Archana W Thorat, Dhanashila S Sutar, Pratiksha D Mahalle and Abha P Nerkar

DOI: https://doi.org/10.33545/26174693.2024.v8.i11Sd.2875

Abstract
The present study entitled “Genetic Variability Studies in Chickpea (*Cicer arietinum* L.)” was carried out during *rabi* 2023-24 at Pulses Research Unit, Dr. PDKV, Akola. The study was undertaken on thirty- four genotypes of chickpea using Randomized Block Design with three replications. The observations were recorded on eleven quantitative traits. Analysis of variances indicated significant differences among the genotypes for all the traits under study. The phenotypic coefficient of variation (PCV) was higher than genotypic coefficient of variation (GCV). The high values of GCV and PCV were observed for seed yield per plant. All the characters studied exhibited high heritability except for the days to 50 % flowering, days to maturity, and protein % exhibited moderate heritability. High estimate of heritability coupled with high genetic advance as percent of mean was observed for eight characters which may attribute to the preponderance of additive gene action and possessed high selective value.

Keywords: Genetic variability, chickpea, heritability, genetic advance, GCV & PCV

Introduction
Knowledge of genetic control and yield components is useful to the Breeder. Success of selection depends on the extent of genetic variability in a population. The study of genetic variation, heritability and genetic advance gives reliable information as to the nature and magnitude of variation for the elite plant characters. An attempt was made in this experiment to study the genetic variability, heritability and genetic advance in chickpea (*Cicer arietinum* L.).

Materials and Methods
Thirty-four genotypes chickpea were selected from a wide range of germplasm. The experimental material under present study comprised of thirty-four genotypes of chickpea. These were sown in randomized block design with three replications during *rabi* 2023-24. Plot size was 4 m row length and 10 cm plant to plant distance. All agronomic and plant protection practices were carried out whenever necessary. Five plants of each variety from each replication were selected randomly and observations were recorded on days to 50 % flowering and days to maturity, while plant basis data for plant height, plant height up to first pod, protein%, number of primary branches per plant, number of secondary branches per plant, number of seeds per pod, number of pods per plant, 100 seed weight and seed yield per plant. The mean values of these observations were computed and analysed statistically. Different genetic components were computed by the method by Panse and Sukhatme (1967).

Results and Discussion
The analysis of variance for different characters showed significant differences, indicating the presence of substantial genetic variation among the genotypes selected for study. The range mean GCV (%), PCV (%), heritability (bs) (%) genetic advance are presented in table 2.
The highest phenotypic and genotypic variance covariance were recorded seed yield per plant and number of secondary branches while the lowest genotypic variance covariance were recorded for Protein content.

The wide differences between phenotypic and genotypic variance covariance might be due to high influences of environment on these trait. High estimates of Heritability in broad sense were recorded for recorded for number of primary branches per plant (92.51%), number of secondary branches per plant (87.92%), seed yield per plant (87.91), Burton (1953) [3], indicated less environmental influence on these characters and recorded high transmission index. The high heritability indicated that these trait are generally governed by the additive gene action and that the genotype s of the traits strongly reflect the phenotypes similar reports were recorded by Rao and Sharma (1985) [22] and Hare and Deshmukh. The broad sense heritability estimates are the true indicator to the genetic potentiality of the genotypes and its scope is restricted as they are prove ed to be influence with the change in environment. Hence if heritability values are considered in conjunction wit the predicted genetic gain, the reliability of this parameters as a tool in selection programme would increase. It was observed that the characters Number of pods per plant and Seed yield per plant (g) have showed high heritability estimates coupled with high genetic advance. It suggest that in these characters heritability is most likely due to additivd genetic effect and hence direct selection in these characters will be more effective Similar result had been reported in chickpea by Shanumugam Mohan and Kalaimagal Thiyagarajan (2019) [19].

Table 1: Analysis of variances for eleven characters in chickpea

Sr. No.	Characters	Mean Sum of Squares		
		Replications	Genotypes	Error
	Degree of freedom	2	33**	66
1	Days to 50 % flowering	10.48	33.82**	6.92
2	Days to maturity	75.45	107.28**	30.92
3	Plant height (cm)	48.75	93.76**	15.87
4	Plant height up to first pod (cm)	2.23	27.73**	3.12
5	Protein%	0.50	2.22**	0.39
6	Number of primary branches per plant	0.019	0.99**	0.026
7	Number of secondary branches per plant	1.32	12.83**	0.56
8	Number of pods per plant	76.00	378**	24.04
9	Number of seeds per pod	0.04	0.101**	0.015
10	100 seed weight (g)	3.81	27.97**	1.9
11	Seed yield per plant (g)	6.75	68.74**	3.01

Table 2: Parameters of genetic variability for yield and yield contributing characters in chickpea genotype

Sr. No.	Characters	Range		Mean	GCV (%)	PCV (%)	Heritability (bs) (%)	Genetic Advance (GA)	Genetic Advance as percent of mean
		Min.	Max.						
1	Days to 50 % flowering	42.0	57.00	47.80	6.26	8.34	56.42	4.63	9.69
2	Days to maturity	87.33	111.0	98.72	5.11	7.60	45.15	6.98	7.07
3	Plant height (cm)	36.33	59.33	47.63	10.69	13.57	62.05	8.27	17.35
4	Plant height up to first pod (cm)	15.83	29.33	20.36	14.07	16.52	72.49	5.02	24.67
5	Protein%	17.0	20.76	19.10	4.09	5.23	59.97	1.26	6.58
6	Number of primary branches per plant	4.0	6.0	4.90	11.57	12.03	92.51	1.12	22.93
7	Number of secondary branches per plant	6.53	12.66	9.75	20.72	22.10	87.92	3.90	40.04
8	Number of pods per plant	4.67	77.66	58.37	18.62	20.43	83.10	20.42	34.98
9	Number of seeds per pod	1.06	1.73	1.34	12.67	15.60	65.93	0.28	21.19
10	100 seed weight (g)	16.20	28.26	23.27	12.66	13.98	82.06	5..50	23.64
11	Seed yield per plant (g)	11.00	26.49	18.38	25.45	27.15	87.91	9.04	49.17

Conclusions

The experimental studies presence of considerable amount of variability among the genotypes. In general phenotypic coefficient of variation were higher than genotypic coefficient of variation. The characters seed yield per plant and number of secondary branches showed comparatively higher estimate of genotypic and phenotypic coefficient of variation indicating high level of variability and ample scope for effective improvement. The characters number of pods per plant and Seed yield per plant (g) have showed high heritability estimates coupled with high genetic advance as percent of mean indicated additive gene action for this characters.

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